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PROCEEDINGS OF THE  
41<sup>ST</sup> INTERNATIONAL  
CONGRESS OF THE ISAE  
*Merida, Mexico*



Francisco Galindo and Lorenzo Alvarez (*editors*)

PROCEEDINGS OF THE  
41<sup>ST</sup> INTERNATIONAL CONGRESS  
OF THE ISAE  
*Merida, Mexico*

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"Animal welfare is an essential part of the  
morale and culture of civilized nations"

*Benito Juarez, President of Mexico (1862)*



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**Scientific Committee:**

Francisco Galindo (Chair)  
Agustín Orihuela (Chair)  
Lorenzo Álvarez  
Carlos González Rebeles  
Moisés Heiblum  
Juan Carlos Ku  
Xavier Manteca  
Jeremy Marchant-Forde  
Joy Mench  
Rodolfo Ungerfeld

**Organising Committee:**

Francisco Galindo (Chair)  
Anne Sisto (Chair)  
Valeria Aguilar  
Andrés Aluja  
Ana Cataño  
Adriana Cossío  
Andrés Ducoing  
Sandra Hernández Méndez  
Ana Montellano  
Jorge Luis Puerto  
Luis Felipe Rodarte  
Alberto Tejeda

**Scientific Committee Assistant:**

Mónica De la Fuente

**Web Design & Maintenance:**

Ana Galindo  
Luis Fernando Cázares

**Editorial design:**

F. Avril Braulio Ortiz

**Conference Registration:**

MAELCA,  
Congresos, eventos y convenciones

**Cover Design:**

Ana Galindo

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## **Referees**

Ted H. Friend  
Harold Gonyou  
Carlos Gonzales Rebeles  
Moisés Heiblum  
Linda Keeling  
Lena Lidfors  
Xavier Manteca  
Jeremy Marchant-Forde  
Lindsay Matthews  
Joy A. Mench  
Gerardo Suzan  
Edward O. Price  
Rodolfo Ungerfield  
Francisco Galindo  
Agustín Orihuela

## **Editorial assistance:**

Agustín Orihuela  
Carlos González Rebeles  
Adriana Cossio  
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# UADY

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DE YUCATÁN

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# THE CONFERENCE VENUE

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The Lecture theatres Yucatan are located in the Fiesta Americana Hotel, in the first floor. The room 'Club de Industriales' is where coffee will be served, and the posters will be viewed. This room is located in the second floor.



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# LOCAL TRAVEL INFORMATION

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## THE CLIMATE

Merida has a warm and humid climate. The rainy season is long and goes from May to January with average temperatures of 33°C and 22°C during August. Showers are usually short and predictable in the summer. Time difference: Time in Merida is 6 hours behind of Greenwich Mean Time (GMT/UT).

## TRANSPORT

### Merida International Airport (MID)

Merida's airport is 13km or 15 minutes from the city center on the Southwestern outskirts of town, near the entrance to Highway 180. It receives daily flights from Mexico City, Cancun and direct flights from Atlanta, Houston and Miami. The best way to get to the hotel is by taxi. There is a taxi booth out of the main building. Car-rental agencies, tourist information, duty free shops, restaurants and other services are available inside the airport.

### Cancun International Airport (CUN)

The airport consists of two buildings, the main terminal and the FBO terminal. Both terminals have arrival and departure concourses. The main terminal is used for domestic and international scheduled flights from major airlines. The FBO terminal is used mainly for chartered airlines/flights and private planes.

### Mexico City – Benito Juarez International Airport (MEX)

The Metropolitan area of Mexico City ranges a population close to 20 million, holds the most important airport of the country, which serves 35 per cent of all aeronautic operations.

[http://www.aicm.com.mx/home\\_en.php](http://www.aicm.com.mx/home_en.php)

### How to get to Merida by ground

Another option to get to Merida is flying to Cancun and then taking a bus to Merida. It is a four hour trip and the coach arrives to a station located in front of the Congress Venue Hotel, the Fiesta Americana Hotel. Cancun Bus Station Pino Mz. 23 S.M. 56 Lt. 1 y 2, entre Av. Tulum y Av. Uxmal Cancún, Q. Roo For more information about schedules and fares, please, go to:

<https://www.ticketbus.com.mx/ticketbus/eng/index.jsp>

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# CONFERENCE PROGRAMME

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## ORAL PRESENTATIONS AND SOCIAL PROGRAMME







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# MONDAY 30<sup>TH</sup> JULY 2007

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- 10:00** Council Meeting (Sala de Consejo, Fiesta Americana Hotel)  
**13:00** Registration (Salón Celestún, Fiesta Americana Hotel)  
**14:00** Installation of posters (Club de Industriales, Fiesta Americana Hotel)  
**18:00** Coaches depart from Fiesta Americana Hotel to the Old University Building

	<b>ALINE S. DE ALUJA SPECIAL LECTURE</b> Old University Building Lecture Theatre
<b>18:30</b>	<b>Author:</b> Martín Aluja <b>Title:</b> Insect Welfare: should we care? <b>Chair:</b> Francisco Galindo

**19:00 – 22:00** Welcome Reception (Old University Building Square)

## TUESDAY 31<sup>ST</sup> JULY 2007

**08:00** Registration (Salón Celestún, Fiesta Americana Hotel)

**08:00** Installation of posters (Club de Industriales, Fiesta Americana Hotel)

**09:00** Congress opening (ROOM: YUCATAN I)

	<b>THE D.G.M. WOOD-GUSH MEMORIAL LECTURE</b> ROOM: YUCATAN I Chair: Marek Spinka
<b>09:30</b>	<b>Author:</b> Donald M. Broom <b>Title:</b> Cognitive ability and awareness in domestic animals and decisions about obligations to animals

**10:30** Coffee Break and Poster Session 1 (Club de Industriales)

**11:15** Spoken Papers

	ROOM: YUCATAN I	ROOM: YUCATAN II
	Chair: Joe Garner	
<b>11:15</b>	<b>Plenary Paper 1</b> <b>Author:</b> Mike Mendl <b>Title:</b> Investigating the mental experiences of animals	
	<b>TOPIC: COGNITION, EMOTION AND ANIMAL WELFARE</b> Chair: Joe Garner	<b>TOPIC: BEHAVIOUR AND CONSERVATION</b> Chair: Valeria Aguilar
<b>12:00</b>	<b>Author:</b> Burman OHP, Parker RMA, Paul ES, Mendl MT <b>Title:</b> Using successive negative contrast as a novel indicator of emotional state	<b>Author:</b> Budgen P, Goodwin D <b>Title:</b> Dispersion of the White-Fronted Capuchin ( <i>Cebus albifrons trinitatis</i> ) at the Bush Bush Wildlife Sanctuary, Nariva Swamp, Trinidad, West Indies.
<b>12:20</b>	<b>Author:</b> Reefmann N, Furrer R, Heberlein M, Wechsler B, Gygas L <b>Title:</b> Ears and Emotion – Behavioural indicators of affective valence in sheep	<b>Author:</b> Kanaan VT, Pajor EA <b>Title:</b> The effects of early social environments on the pre- and post-weaning behaviour and growth of raccoons ( <i>Procyon lotor</i> ) in a rehabilitation center

<b>12:40</b>	<p><b>Author:</b> Parker RMA, Paul ES, Burman OHP, Mendl MT</p> <p><b>Title:</b> Judgement bias and emotional state: Unpredictable housing and judgements of ambiguity in rats - a two-choice procedure</p>	<p><b>Author:</b> MacKinnon KM, Newberry RC, Wielebnowski NC, Pelican KM</p> <p><b>Title:</b> Identifying early indicators for successful pairing of clouded leopards in captive breeding programs</p>
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**13:00** Lunch

**14:20** Spoken Papers

	<b>ROOM: YUCATAN I</b>	<b>ROOM: YUCATAN II</b>
	<p><b>TOPIC: COGNITION, EMOTION AND ANIMAL WELFARE</b></p> <p><b>Chair:</b> Ted H Friend</p>	<p><b>TOPIC: BEHAVIOURAL ENRICHMENT</b></p> <p><b>Chair:</b> Ruth Newberry</p>
<b>14:20</b>	<p><b>Author:</b> Hothersall BC, Harris PA, Gale EV, Nicol CJ</p> <p><b>Title:</b> Young horses (<i>Equus caballus</i>) prefer relative spatial cues to visual cues in a food-finding discrimination task</p>	<p><b>Author:</b> Zapata B, Caiozzi A, Cubillos G</p> <p><b>Title:</b> Environmental Enrichment on South American Camelids in a Chilean Zoo</p>
<b>14:40</b>	<p><b>Author:</b> Langbein J, Nürnberg G, Manteuffel G</p> <p><b>Title:</b> Short and long-term concurrent recall of 2d shapes in dwarf goats</p>	<p><b>Author:</b> Kim LC, Milam RJ</p> <p><b>Title:</b> The effects of color, size, hardness, and material on environmental enrichment device interaction in Orange-winged Amazon parrots (<i>Amazona amazonica</i>)</p>
<b>15:00</b>	<p><b>Author:</b> Abeyesinghe SM, McMahon CE, Jarvis JR., Wathes CM</p> <p><b>Title:</b> Behavioural determination of the hen's spatial contrast sensitivity</p>	<p><b>Author:</b> Leone EH, Estevez I</p> <p><b>Title:</b> Environmental enrichment improves broiler breeder welfare and reproductive performance</p>
<b>15:20</b>	<p><b>Author:</b> Sumita Sugnaseelan, Wathes CM, Broom DM</p> <p><b>Title:</b> Image perception in sheep</p>	<p><b>Author:</b> Riber AB, Archer GS, Mench JA</p> <p><b>Title:</b> Effects of environmental enrichment on activity and cannibalism in young Muscovy ducks</p>

**15:40** Coffee Break and Poster Session 2 (Club de Industriales)

**16:20** Spoken Papers

	<b>ROOM: YUCATAN I</b>	<b>ROOM: YUCATAN II</b>
	<b>Chair:</b> Eberhard von Borell	
<b>16:20</b>	<b>Plenary Paper 2</b> <b>Author:</b> Adroaldo Zanella <b>Title:</b> Pain and Emotion	
	<b>TOPIC: PAIN</b> <b>Chair:</b> Eberhard von Borell	<b>TOPIC: BEHAVIOURAL ENRICHMENT</b> <b>Chair:</b> Jeremy Marchant-Forde
<b>17:00</b>	<b>Author:</b> Kielland C, Skjerve E, Zanella AJ <b>Title:</b> A novel instrument to assess attitudes toward pain in cattle	<b>Author:</b> Docking CM, van de Weerd HA, Day JEL, Edwards SA <b>Title:</b> Does pigs' synchrony of object use vary with different enrichment objects?
<b>17:20</b>	<b>Author:</b> Mainau E, Ruiz de la Torre JL, Dalmau A, Manteca X <b>Title:</b> A possible scale to measure ease of farrowing and pain caused by parturition	<b>Author:</b> Statham PTE, Green LE, Mendl MT <b>Title:</b> Effects of providing straw at different stages of life on tail-biting in pigs
<b>17:40</b>	<b>Author:</b> Heinrich A, Duffield T, Lissemore K, Millman ST <b>Title:</b> Behaviour and pain sensitivity of dairy calves following dehorning and the efficacy of Meloxicam and relieving the pain response	<b>Author:</b> Stewart CL, O'Connell NE, Boyle LA <b>Title:</b> The effect of dietary fibre level and access to straw on the welfare of group housed sows
<b>18:00</b>	<b>Author:</b> Fisher AD, Paull DR, Lee C, Colditz IG <b>Title:</b> The effects of analgesia for castration and tail-docking of lambs	<b>Author:</b> Bøe KE, Andersen IL, Jorgensen GHM <b>Title:</b> Feeding space and type of roughage for dairy goats

**18:20 – 19:10** Dinner

**19:10 – 22:00** Parallel Workshops



# WEDNESDAY 1<sup>ST</sup> AUGUST 2007

08:45 Spoken Papers

	ROOM: YUCATAN I	ROOM: YUCATAN II
	Chair: Laura Boyle	
08:45	<b>Plenary Paper 3</b> <b>Author:</b> Frederick Provenza <b>Title:</b> Behavior-Based Grazing Management for Herbivores and Ecosystems	
	<b>TOPIC: EXTENSIVE SYSTEMS</b> <b>Chair:</b> Agustín Orihuela	<b>TOPIC: FEATHER PECKING</b> <b>Chair:</b> Joy Mench
09:30	<b>Author:</b> Matthews LR, Aspin P, Roche J, Kolver E <b>Title:</b> Variation in body condition in dairy cattle and motivation to feed at pasture	<b>Author:</b> Dixon LM, Duncan IJH, Mason GJ <b>Title:</b> What's in a peck? A comparison of the motor patterns involved in feather pecking, dustbathing and foraging
09:50	<b>Author:</b> Gazzola PA, Boyle LA, French P, Hanlon AJ, Mulligan FJ <b>Title:</b> Foraging behaviour of dry cows in out-wintering systems	<b>Author:</b> Lambton SL, Knowles TG, Yorke C, Nicol CJ <b>Title:</b> Gentle and Severe Feather Pecking: One Problem or Two?
10:10	<b>Author:</b> Winckler C, Mwai O, Huber RC <b>Title:</b> Behaviour on pasture of herded ankole and crossbred (Ankole x Holstein) heifers in an open grazing system in south western Uganda	<b>Author:</b> Uitdehaag KA, Rodenburg TB, Komen H <b>Title:</b> Effect of mixed housing on feather pecking in laying hens
10:30	<b>Author:</b> Baraza E, Valiente-Banuet A <b>Title:</b> Effects of dietary supplementation on domestic goat foraging behaviour during the dry season at a semiarid thornscrub in the Biosphere Reserve of Tehuacán-Cuicatlán (México).	<b>Author:</b> Harlander-Matauschek A, Benda I, Lavetti C, Bessei W <b>Title:</b> Laying hens selected for and against feather pecking and their preference of eating litter substrate

10:50 Coffee Break and Poster Session 3 (Club de Industriales)

**11:30** Spoken Papers

	<b>ROOM: YUCATAN I</b>	<b>ROOM: YUCATAN II</b>
	<b>TOPIC: EXTENSIVE SYSTEMS</b> <b>Chair:</b> Lindsay Matthews	<b>TOPIC: HORSE WELFARE</b> <b>Chair:</b> Rodolfo Ungerfeld
<b>11:30</b>	<b>Author:</b> Koene P <b>Title:</b> Behaviour, health and welfare of feral horses and cattle in nature reserves	<b>Author:</b> von Borstel U, Duncan IJH, Keeling LJ, Shoveller AK, Millman ST <b>Title:</b> Impact of riding in rollkür posture on welfare of performance horses
<b>11:50</b>	<b>Author:</b> Keppler C, Haase R, Knierim U <b>Title:</b> Factors influencing the use of free-range areas by laying hens	<b>Author:</b> Friend TH, Keen AH, Bingham GM, Krawczel PD, Iacono CM <b>Title:</b> Activity of loose horses during 90- minute on-truck rest stops

**12:10** Preparation for Excursions

**12:30** Excursions Coach Departure



## THURSDAY 2<sup>ND</sup> AUGUST 2007

### 09:00 Spoken Papers

	<b>ROOM: YUCATAN I</b>	<b>ROOM: YUCATAN II</b>
	<b>Chair:</b> Don Broom	
<b>09:00</b>	<b>Plenary Paper 4</b> <b>Author:</b> Jeffrey P Rushen, Fernando T. Borderas, Anne Marie B De Passillé, Marina A. G. Von Keyserlingk, Daniel M. Weary <b>Title:</b> Behaviour and Production Related Disease	
	<b>TOPIC: BEHAVIOUR AND PRODUCTION RELATED DISEASE</b> <b>Chair:</b> Don Broom	<b>TOPIC: SOW LOCOMOTION</b> <b>Chair:</b> Anna Valros
<b>09:45</b>	<b>Author:</b> Smith LA, Marion G, White PCL, Hutchings MR <b>Title:</b> Livestock disease risk: a consequence of behaviour in a complex environment	<b>Author:</b> Pittman MR, Garner JP, Richert BT, Pajor EA <b>Title:</b> A flooring comparison: the impact of rubber matting on the behavior and welfare of group housed sows during breeding
<b>10:05</b>	<b>Author:</b> Hänninen L, Kaihilahti J, Taponen S, Hovinen M, Pastell M, Pyörälä, S <b>Title:</b> Does behaviour predict acute endotoxin mastitis in dairy cows?	<b>Author:</b> Lay DC, Schenck EL, McMunn KA, Nielsen BD, Richert BT, Marchant-Forde JN <b>Title:</b> The effects of exercise on production, interbirth intervals, and lying behaviours in gestating stall-housed gilts
<b>10:25</b>	<b>Author:</b> Langford FM, Rutherford KMD, Jack MC, Sherwood L, Lawrence AB, Haskell MJ <b>Title:</b> Behavioural synchrony, cow comfort indices and herd-level lameness on organic and conventional dairy farms in the UK	<b>Author:</b> Tuytens FAM, Wouters F, Struelens E, Sonck B, Duchateau L <b>Title:</b> Synthetic lying mattress improves lying comfort of pregnant sows

### 10:45 Coffee Break and Poster Session 4 (Club de Industriales)

**11:20** Spoken Papers

	<b>ROOM: YUCATAN I</b>	<b>ROOM: YUCATAN II</b>
	<b>Chair:</b> James Serpell	
<b>11:20</b>	<b>Plenary Paper 5</b> <b>Title:</b> Research in Clinical Ethology <b>Author:</b> Xavier Manteca , Marta Amat, Jaume Fatjó	
	<b>TOPIC: BEHAVIOUR AND PRODUCTION RELATED DISEASE</b> <b>Chair:</b> Suzanne Millman	<b>TOPIC: RESEARCH IN CLINICAL ETHOLOGY</b> <b>Chair:</b> Moisés Heiblum
<b>12:00</b>	<b>Author:</b> Olmos G, Boyle LA, Horan B, Berry DP, Mee JF, Hanlon AJ <b>Title:</b> Locomotion ability of Holstein-Friesian genotypes under two grazing systems	<b>Author:</b> Amat M, Fatjó J, Mariotti V, Castellort R, Ruiz de la Torre JL, Manteca X <b>Title:</b> Epidemiology of feline behaviour problems in Spain
<b>12:20</b>	<b>Author:</b> Baird LG, O'Connell NE, McCoy MA <b>Title:</b> Effect of breed and production system on locomotion scores in dairy cattle	<b>Author:</b> Brunt MW, Leung MCK, Smith TK, Millman ST <b>Title:</b> The effects of gastrointestinal illness on the intra-specific social behaviour of <i>Canis familiaris</i>
<b>12:40</b>	<b>Author:</b> Borderas FT, De Passillé AMB, Rushen JP <b>Title:</b> Behavioural correlates of induced fever in dairy calves	<b>Author:</b> Ruiz-Izaguire E, De Groot J, Van der Borg J, Graat L <b>Title:</b> Developing a model diagnosis for separation anxiety based on a behavioural test

**13:00** Lunch

**14:20** Spoken Papers

	<b>ROOM: YUCATAN I</b>	<b>ROOM: YUCATAN II</b>
	<b>TOPIC: BEHAVIOUR AND PRODUCTION RELATED DISEASE</b> <b>Chair:</b> Birte Nielsen	<b>TOPIC: RESEARCH IN CLINICAL ETHOLOGY</b> <b>Chair:</b> Xavier Manteca



<b>14:20</b>	<p><b>Author:</b> Sandilands V, Baker L, McGovern R, Thorp BH, Brocklehurst S, Sparks NHP</p> <p><b>Title:</b> Walk this way: comparing the ability of a force plate or gait scoring to predict chicken leg health according to post mortem data</p>	<p><b>Author:</b> Duffy DL, Serpell JA</p> <p><b>Title:</b> Development of pre-training tests for guide and assistance dogs.</p>
<b>14:40</b>	<p><b>Author:</b> Blatchford RA, Mench JA, Wakenell PS, Archer GS</p> <p><b>Title:</b> The effect of light intensity on broiler behavior and leg health</p>	<p><b>Author:</b> Pal Kr S</p> <p><b>Title:</b> Seasonal changes of aggressive behaviour in free-ranging dogs (<i>Canis familiaris</i>) in relation to sex, age and places</p>
<b>15:00</b>	<p><b>Author:</b> Berk J, Cottin E</p> <p><b>Title:</b> Effect of stocking densities and elevated platforms on behaviour, walking ability and leg posture of Tom turkeys</p>	<p><b>Author:</b> Nahlik J, Baranyiova E, Tyrlik M</p> <p><b>Title:</b> Children and dogs - bites in various situations</p>
<b>15:20</b>	<p><b>Author:</b> Boyle LA, O'Driscoll KMK, Olmos G, Gazzola PA, Gleeson D, O'Brien B</p> <p><b>Title:</b> Effect of switching milking frequency in mid-lactation on dairy cow behaviour, milk leakage and udder firmness</p>	<p><b>Author:</b> Forkman B, Svartberg K, Temrin H</p> <p><b>Title:</b> The effect of breeding for shows on the temperament of dogs</p>
<b>15:40</b>	<p><b>Author:</b> Alonso-Spilsbury M, Mota-Rojas D, Orozco-Gregorio H, González-Lozano M, Olmos-Hernández A, Sánchez-Aparicio P, Ramírez-Necoechea R</p> <p><b>Title:</b> Apgar score modified for piglets: new insight for peri-natal ethophysiological clinics</p>	<p><b>Author:</b> Dalla Villa P, Slater M, Di Nardo A, Pediconi O, Candeloro L, Alessandrini B, del Papa S</p> <p><b>Title:</b> Free-roaming dogs and cats in central Italy: public perceptions and magnitude of the problem</p>

**16:00** Coffee Break and Poster Session 5 (Club de Industriales)

**16:30 – 18:30** ISAE Annual General Meeting

**18:30** Preparation for Banquet

**19:30** Buses depart for Banquet

**20:00 – 24:00** Banquet

# FRIDAY 3<sup>RD</sup> AUGUST 2007

09:00 Spoken Papers

	<b>ROOM: YUCATAN I</b>	<b>ROOM: YUCATAN II</b>
	<b>Chair:</b> Mike Mendl	
<b>09:00</b>	<b>Plenary Paper 6</b> <b>Title:</b> Assessment of stress <b>Author:</b> Eberhard von Borell	
	<b>TOPIC: STRESS AND BEHAVIOUR</b> <b>Chair:</b> Mike Mendl	<b>TOPIC: CALF WELFARE</b> <b>Chair:</b> Stine B. Christiansen
<b>09:40</b>	<b>Author:</b> Krebs N, Sutherland AM, McGlone JJ <b>Title:</b> Can stress be decreased by exposure to odors or pheromones? Behavioral, immunological and physiological effects	<b>Author:</b> Loberg JM, Hernandez C, Thierfelder T, Jensen MB, Lidfors L, Berg C <b>Title:</b> Two-step weaning reduces stress in dairy cattle
<b>10:00</b>	<b>Author:</b> Goumon S, Merlot E, Roussel S, Duvaux –Ponter C, Boissy A, Veissier I, Meunier-Salaün MC <b>Title:</b> Effect of repeated social instability in pregnant sows on learning ability of the offspring	<b>Author:</b> De Passillé AMB, Rushen JP, Borderas FT <b>Title:</b> Does feeding level affect non-nutritive sucking by dairy calves?
<b>10:20</b>	<b>Author:</b> Hernández CE, Oliver MH, Bloomfield HF, Held S, Harding EJ, Matthews LR <b>Title:</b> Periconceptual undernutrition in sheep increases aversion to humans and modifies laterality in the offspring	<b>Author:</b> Nielsen PP, Jensen MB, Thierfelder T, Lidfors L <b>Title:</b> Milkbar design and weaning by diluted the milk affects dairy calves' behaviour
<b>10:40</b>	<b>Author:</b> Dwyer CM, Moinard C, McIlvaney KM, Ormandy E, Morgan CA, Bünger L <b>Title:</b> Behavioural development is delayed in mouse pups following maternal undernutrition in pregnancy	<b>Author:</b> Siegford JM, Sharra MK <b>Title:</b> Estimating when beef calves are ready to be weaned based on social behavior and time budgets

11:00 Coffee Break and Poster Session 6 (Club de Industriales)

11:30 Spoken Papers

	<b>ROOM: YUCATAN I</b>	<b>ROOM: YUCATAN II</b>
	<b>TOPIC: SOCIAL BEHAVIOUR</b> Chair: Fernando Borderas	<b>TOPIC: RUMINANT WELFARE</b> Chair: Anne Marie de Pasillé
<b>11:30</b>	<b>Author:</b> Špinka M, Illmann G, Chaloupková H, Neuhauserová K, Kratinová P <b>Title:</b> Pregnant sows' vocalizations around feeding as related to hunger and aggression	<b>Author:</b> Laister S, Hesse N, Zucca D, Knierim U, Minero M, Canali E, Winckler C <b>Title:</b> Suitability of selected behavioural indicators for on-farm welfare assessment in loose housed dairy cattle
<b>11:50</b>	<b>Author:</b> Poletto R, Richert BT, Marchant-Forde JN <b>Title:</b> Behavioral effects of "step-up" ractopamine feeding program on finishing pigs	<b>Author:</b> Fregonesi JA, Veira D, von Keyserlingk MAG, Weary DM <b>Title:</b> Dairy cows show strong preference for stalls with dry versus wet bedding
<b>12:10</b>	<b>Author:</b> Ungerfeld R, González-Pensado S, Vilariño M, Menchaca A <b>Title:</b> Social dominance of female dairy goats and response to superovulatory treatments during the non-breeding season	<b>Author:</b> Kondo S, Takahashi M, Mitani T, Kashiwabara H, Ueda K, Nakatsuji H <b>Title:</b> Differences of lying-standing action and locomotion posture between cows kept on pasture and in cowshed
<b>12:30</b>	<b>Author:</b> Machado Filho LCP, Coimbra PAD, Machado TMP, Lipiarski VP, Hötzel MJ <b>Title:</b> Social dominance, water trough location and cows' drinking behaviour	<b>Author:</b> Botheras NA, Hemsworth PH, Chaplin SJ, Rushen JP <b>Title:</b> Effect of milking order and time off pasture on the behaviour and productivity of dairy cows
<b>12:50</b>	<b>Author:</b> Gibbons JM, Donald RD, Turl RM, Maggs LA, Wall E, Lawrence AB, Haskell MJ <b>Title:</b> The effect of selective breeding on sociability of dairy cows	<b>Author:</b> Alvarez L, Ortiz L, Galindo F, Zarco L <b>Title:</b> Cortisol daily profile in the domestic goat ( <i>Capra hircus</i> ) during the breeding and the nonbreeding season

**13:10-14:30** Lunch on your own - Free time in Merida

**14:30** Spoken Papers

	<b>ROOM: YUCATAN I</b>	<b>ROOM: YUCATAN II</b>
	<b>TOPIC: POULTRY WELFARE</b> Chair: Inma Estevez	<b>TOPIC: THERMAL ENVIRONMENT &amp; BEHAVIOUR</b> Chair: Paul Koene

<b>14:30</b>	<b>Author:</b> Thogerson CM, Hester PY, Mench JA, Newberry RC, Garner JP <b>Title:</b> The effect of feeder space allowances on behavior of hens housed in conventional cages	<b>Author:</b> Heleski CR, Murtazashvili I <b>Title:</b> Daytime shelter seeking behaviour in domestic horses
<b>14:50</b>	<b>Author:</b> Rodenburg TB, Uitdehaag AK, Ellen DE, Komen H <b>Title:</b> Effect of genetic selection method and of beak trimming on response to an approaching human and to a novel object	<b>Author:</b> Gaskill BN, Rohr SA, Pajor EA, Garner JP <b>Title:</b> Assessment of mouse temperature preferences in a home cage environment
<b>15:10</b>	<b>Author:</b> Wichman A, Keeling LJ <b>Title:</b> Is sham dustbathing “normal” dustbathing for a bird which has never experienced litter	<b>Author:</b> Tucker CB, Rogers AR, Schütz KE <b>Title:</b> Effect of solar radiation on dairy cattle behaviour, use of shade and body temperature in a pasture-based system
<b>15:30</b>	<b>Author:</b> Kristensen HH <b>Title:</b> The nocturnal behaviour of broiler chickens	<b>Author:</b> Schütz KE, Davison D, Cox NR, Matthews LR <b>Title:</b> The importance of shade to dairy cattle – Trade-off between shade use and resting when exposed to different levels of lying deprivation

**15:50** Coffee Break

**16:20** Spoken papers

	<b>ROOM: YUCATAN I</b>	<b>ROOM: YUCATAN II</b>
	<b>TOPIC: ASSESSMENT METHODOLOGY</b> Chair: Janice Swanson	<b>TOPIC: FREE PAPERS</b> Chair: Alison Hanlon
<b>16:20</b>	<b>Author:</b> Patterson-Kane EG, Pajor EA, Kirkden RD <b>Title:</b> Motivation for food in swine: the food-metric scale	<b>Author:</b> Rigamonti MM <b>Title:</b> Facial cues and personality traits in dogs, monkeys and humans
<b>16:40</b>	<b>Author:</b> Trudelle-Schwarz McGowan R, Ulibarri CM, Cloutier S, Newberry RC <b>Title:</b> Willing to work? the influence of circulating gonadal steroids on contrafreeloading in laying hens	<b>Author:</b> Malmkvist J <b>Title:</b> Periparturient nest building: does it matter to farmed mink?



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<b>17:00</b>	<b>Author:</b> Asher L, Bateson M <b>Title:</b> Testing two assumptions of the economic approach to measuring motivational strength	<b>Author:</b> Baxter EM, Edwards SA, Sherwood L, Farish M, Jarvis S <b>Title:</b> Breeding for improved pre-weaning piglet survival in alternative farrowing systems
<b>17:20</b>	<b>Author:</b> McLeman MA, Abeyesinghe SM, Owen R, Wathes CM <b>Title:</b> Investigating social discrimination of flock-mates by laying hens: a comparison of two operant methods	<b>Author:</b> Valros AE, Heinonen M, Hälli O, Peltoniemi O <b>Title:</b> Frequent blood sampling through catheters does not appear to affect farrowing behaviour in sows
<b>17:40</b>	<b>Author:</b> Dalmau A, Fàbrega E, Velarde A <b>Title:</b> Validation of the “approachavoidance” behaviour to assess fear in pigs	<b>Author:</b> Velarde A, Gispert M, Oliver MA, Soler J, Tibau J, Fàbrega E. <b>Title:</b> The effect of immunocastration on the behaviour of pigs
<b>18:00</b>	<b>Author:</b> Brown JA, De Lange CFM, Mandell IB, Robinson AB, Squires J, Purslow PP, Widowski TM <b>Title:</b> Measurement of temperament on-farm as a predictor of stress response at slaughter	<b>Author:</b> González-Pensado S, Ungerfeld R <b>Title:</b> Does the competition between high and low hierarchical rams exposed to estrous ewes affect their mating behavior?

**18:20** Close of Congress

**19:00** Farewell Party- Hotel Fiesta Americana



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# CONFERENCE PROGRAMME

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## POSTER PRESENTATIONS







# POSTER PRESENTATIONS

Each poster will be presented during 3 sessions. Authors are expected to stand by their poster during the sessions to which their poster is allocated.

- GROUP 1**            Poster session 1 (10:30-11:15 Tuesday 31<sup>st</sup> July)
- GROUP 1**            Poster session 2 (15:40-16:20 Tuesday 31<sup>st</sup> July)
- GROUP 1 and 2**    Poster session 3 (10:50-11:30 Wednesday 1<sup>st</sup> August)
- GROUP 2**            Poster session 4 (10:45-11:20 Thursday 2<sup>nd</sup> August)
- GROUP 2**            Poster session 5 (16:00-16:30 Thursday 2<sup>nd</sup> August)
- Poster session 6 (11:00-11:30 Friday 3<sup>rd</sup> August)
- Poster session 7 (15:50-16:20 Friday 3<sup>rd</sup> August)

## GROUP 1 POSTERS

The following posters will be presented during poster sessions 1-3. They should be installed before the beginning of Poster session 1 (10:30 Tuesday 31<sup>st</sup> July) and removed at the end of the congress (Friday 3<sup>rd</sup> August).

Number	Title	Authors
P1/01	The relationship between tongue-playing behaviour and viscera disease after the slaughter of beef cattle	Abe N, Morita T, Noguchi S, Tanaka T
P1/03	The effect of parity number and time of separation from the calf on behavior, milk production and fertility of the cow	Alejos de la Fuente JI, Ortega Cerrilla ME, Galindo F, Landois Palencia LL, Hernández Garay A, Torres Cardona MG
P1/05	Effect of the increase of foraging opportunities on behaviour, welfare and reproduction efficiency of group-housed arab breeding mares	Benhajali H, Richard-Yrisb MA, Ezzaouia M, Charfia F, Hausberger M
P1/07	An exploration of the practice of box-resting' horses in the UK	Bettley CD, Nicol CJ, Harris PA

Number	Title	Authors
P1/09	Vocalisations and acoustic parameters of flock noise from feather and non-feather pecking commercial laying flocks	Bright A
P1/11	The effect of arena size, shape and complexity on movement and use of space in the house mouse ( <i>Mus musculus</i> )	Brooks RM, Stricklin WR
P1/13	Tail-base lesions in donkeys carrying tourists in Jordan: risk factors and tourist attitudes to donkey welfare	Burn CC, Pritchard JC, Farajat M, Twaissi A, Whay HR
P1/15	Serotonin and aggressiveness in chickens	Cheng H, Dennis RL
P1/17	Community-based neutering program to control dog and cat populations and predatory behavior in the Galapagos	Clifford EL
P1/19	Water trough location, availability of shade and drinking behaviour of cattle on pasture	Coimbra PAD, Nunes AP, Machado Filho LCP, Hötzel MJ
P1/21	Productive and ethologic behavior of sheep grazing weeds of coffee plantation, compared with grasses with and without complementation, and its effect in the dry matter <i>in situ</i> disappearance	Davila P, Sangines L, Acevedo A, Pérez-Gil F
P1/23	Effect of co-mingling piglets during lactation on sow maternal behaviour	Devillers N, Torrey S, Farmer C
P1/25	Characterisation of objective behavioural indices for the assessment of chronic and acute pain states in horses	Eager RA, Jones E, Waran NK, Price J, Mayhew IG, Fleetwood-Walker SM
P1/27	Does attachment behavior exist in owned cats?	Edwards C, Heiblum M, Tejada A, Galindo F
P1/29	Behavior of dairy cows in an alternative bedded pack housing system	Endres MI, Barberg AE
P1/31	The effects of rearing broiler chickens under different light intensities on fear responses	Fagerberg G, Mench JA, Archer GS
P1/33	A comparison of dog keeping practices in the Caribbean and North America: a developmental issue?	Fielding WJ
P1/35	Measuring the steepness of the dominance hierarchy in groups of northern elephant seal females	García Aguilar MC

<b>Number</b>	<b>Title</b>	<b>Authors</b>
P1/37	The relationship between pregnant cows' behavior, calf weight and postpartum levels of progesterone	Gomez Danes AA, Ortega Cerrilla ME, Sanchez Torres Esqueda MT, Herrera Haro JG, Galindo F
P1/39	Non-invasive evaluation of coping strategies in four wild carnivores species (Mexican grey wolf, coyote, ocelot and African lion), above their relocation in new enclosures	Hernández S, Gual FS, Romano M, Galindo F, Valdez R, Rivera A
P1/41	Effects of pasture on lameness in dairy cows	Hernandez-Mendo O, von Keyserlingk MAG, Veira DM, Weary DM
P1/43	Characteristics of animal welfare in the extensive cattle systems of Uruguay	Huertas SM, Cesar D, Gil AD
P1/45	Does carefulness of sow's lying-down behaviour influence crushing of newborn piglets?	Illmann G, Pokorná Z, Neuhauserová K, Chaloupková H, Šimečková M
P1/47	The use of rooting material by growing pigs in relation to time of feeding	Jensen MB, Pedersen LJ
P1/49	Diurnal behaviour, impact of weather and use of shadow trees in wildebeest, zebras, and Thomson's gazelles	Jung J, Eriksson P
P1/51	How farmed blue foxes value various cage enrichments	Koistinen T, Mononen J, Korhonen HT
P1/53	Is carprofen, a non-steroidal anti-inflammatory analgesic, safe for use in Pekin ducks?	Kurosawa TA, Cheng H, Marchant-Forde RM
P1/55	Investigating the effect of feeding space on aggression and feeding behaviour of dairy cows	Lang FC, Haskell MJ, Roberts DJ
P1/57	Effect of the type of rearing on the establishment of social structure in female goat kids at weaning	Lara EA, Sisto AM, Ducoing AE, Terrazas A
P1/59	Behavioral and physiological indicators as predictors of piglet viability during the suckling period	Maglaras GE, Skoufos IA, Giza EG, Filos EG, Vatzias GA, Tzora AS
P1/61	Rats show aversion to argon over a range of flow rates	Makowska IJ, Niel L, Kirkden R, Weary DM

Number	Title	Authors
P1/63	Movement and use of space in confinement; the effects of group size and pen size in broilers ( <i>Gallus gallus domesticus</i> )	Mallapur A, Estevez I, Miller C, Christman M
P1/65	Overall welfare improvement by implementation of lameness intervention measures in dairy cattle	March S, Brinkmann J, Winckler C
P1/67	Using obedience training in animal assisted activities	Mariotti V, Tejedor S, Anzizu L, Amat M, Manteca X, Fatjó J
P1/69	Environmental enrichment for grazing female goats	Martínez M, Ducoing AE, Sisto AM, Soberón A
P1/71	Ammonia exposure for 24 hours reduces aggressive behavior in newly weaned pigs	Massey MA, Krebs N, McGlone JJ
P1/73	Correlations between sow temperament and piglet weight in Mexican creole pigs	Mota-Rojas D, Alonso-Spilsbury M, Mayagoitia-Novales L, Ramírez-Necoechea R
P1/75	Fast and slow growing broiler strains differ in their free choice of whole wheat proportion in diet	Nielsen BL, Steinfeldt S
P1/77	Grazing behaviour and milk production from f1 (Holstein-Zebu) cows in an elephant grass ( <i>Pennisetum purpureum</i> ) pasture in Veracruz, Mexico	Nochebuena GN, Valles B
P1/79	Changes in feeding and lying behaviour of dairy cows between pasture and winter accommodation	O'Driscoll KMK, Boyle L, French P, Hanlon AJ
P1/81	Are there preferences between animals of the same breed when they are together in the same flock?	Ortiz C, De Lucas J, Fausto E
P1/83	The influence of sole ulcer and digital dermatitis on dairy cow behaviour and production	Pavlenko A, Thierfelder T, Bergsten C, Ekesbo I, Lidfors L
P1/85	Aerosol intake in one day old broiler chicks	Pérez de Villarreal M, Ruiz de la Torre JL, Manteca X
P1/87	The effect of maternal sire on temperament and mothering ability of maiden merino ewes	Porter AD, Chaplin SJ, Laird C
P1/89	Regrouping in domestic goats: how long does it take to be unfamiliar?	Ramírez A, Galindo F, Alvarez L

Number	Title	Authors
P1/91	Animal welfare evaluation in zoological parks	Rangel-Negrin A, Cue AIM, Rivera JAR, Gual FS
P1/93	Influence of an unpredictable stressor on behavioural and physiological responses of experienced or naïve Holstein heifers	Rigalma K, Roussel S, Oliveira A, Louyot T, Duvaux-Ponter C
P1/95	Sexual behaviour measurement and fecal progesterone determination in captive bighorn sheep ( <i>Ovis canadensis</i> ) female group	Rodríguez NC, Rodarte LF, Rivera JA, Mejía O
P1/97	Effect of the environmental enrichment (ee) on the welfare and productive behavior in dairy goats in suckling and development stages in confinement	Rosas AP, Sisto AM, Ducoing AE
P1/99	High stocking density rotational grazing: the relationship between social hierarchy and grazing patterns of Holstein cows	Schmitt AL, Murphy WM, Silman J, Abdul-wahid F
P1/101	Changes of ration with the eating activity of cows	Shimada T, Mouri K, Morita S, Hoshiba S
P1/103	The hormonal treatments to induce maternal behaviour does not reproduce the normal absence of sexual receptivity in the periparturient ewes	Soto R, Romeyer A, Terrazas A, Serafin N, Poindron P
P1/105	The effect of space allowance on behavior of weaned pigs during transportation	Sutherland MA, Krebs N, McGlone JJ
P1/107	Behavioural approach of oestrous beef cows toward a bull on a pasture	Takeda K, Kondo H, Shimizu K, Sato S, Takahashi S
P1/109	Meloxicam therapy for calves with neonatal calf diarrhea complex	Todd CG, McKnight DR, Millman ST, Duffield TF, Leslie KE
P1/111	Gait analysis of pigs walking on dry, wet or greasy concrete floor	Thorup VM, Tøgersen FA, Jørgensen B, Jensen BR
P1/113	Maintenance behaviour of owned and unowned dogs in Cozumel island	Torres-Villegas CP, Galindo F, Cuaron A
P1/115	This drinker sucks! Drinker preferences in young piglets	Torrey S, Toth ELM, Widowski TM
P1/117	Grazing behavior of alpine and ¾ Alpine - ¼ Boer kids	Trujillo A, Alarcón A, Vargas CE, Soberón A
P1/119	Patterns of maternal offspring behaviour of dairy sheep and potential associations with mammary health	Tzora AS, Skoufos IA

Number	Title	Authors
P1/121	A survey of dehorning practices and pain management in goats	Valdmanis LA, Menzies PI, Millman ST
P1/123	Influence of various odours on the foraging behaviour of bank voles ( <i>Clethrionomys glareolus</i> )	Verplancke G, Vandestrade N, Le Boulengé É

## GROUP 2 POSTERS

The following posters will be presented during poster sessions 3-5. They should be installed before the beginning of Poster session 1 (10:30 Tuesday 31<sup>st</sup> July) and removed at the end of the congress (Friday 3<sup>rd</sup> August).

Number	Title	Authors
P2/02	Stability in resource holding power (rhp) over years in farmed silver fox vixens ( <i>Vulpes vulpes</i> ) and the resource values impact on the contents of fights	Akre KA, Hovland AL, Andersen IL, Bakken M
P2/04	Assessment of behavioral synchrony of broiler chickens under varying light intensities	Alvino G, Archer GS, Mench JA
P2/06	Effect of <i>Taenia pisiformis</i> infection on the behavior and health of domestic rabbits ( <i>Oryctolagus cuniculus</i> )	Betancourt MA, Orihuela A, Aguirre V, Vázquez R, Flores-Pérez FI
P2/08	Lameness prevalence and behavioural traits in cubicle housed organic dairy herds	Brinkmann J, March S, Winckler C
P2/10	Animal shelter demography in Catalonia, Spain	Castelltort R, Ruiz de la Torre JL, Fatjó J, Amat M, Mariotti V, Manteca X
P2/12	Are cows able to orgasm?	Christiansen SB, Forkman B
P2/14	Impact of visual contact with the surrounding environment and human activity on growth rate, chromodacryorrhea secretion and behaviour of laboratory rats	Cloutier S, Newberry RC
P2/16	Quantifying animal behavior: why methods are important	Dailey JW, Mitloehner FM, Carroll JA
P2/18	Inter-observer variability of approach-avoidance behaviours to assess fear at slaughterhouse	Dalmau A, Hautekiet V, Van Steenberghe L, Rodriguez P, Geers R, Velarde A

Number	Title	Authors
P2/20	Breeding behavior in sheep whit special emphasis in service capacity, selectivity and harem conformation	De Lucas J, Fausto E, Valenzuela G, Gómez R
P2/22	Modeling the effect of sterilization rate on owned dog population size in central Italy	Di Nardo A, Candeloro L, Budke CM, Slater MR
P2/24	Influences of predator presence and handling on body temperature and running wheel activity in golden hamsters	Eberli P, Gebhardt-Henrich SG, Steiger A
P2/26	Effects of duration and proximity of humans on fear of humans in laying hens ( <i>Gallus gallus domesticus</i> )	Edwards L, Coleman G, Hemsworth PH
P2/28	Interspecific empathy and behaviour recording: the case of Mexican gray wolf ( <i>Canis lupus bailey</i> ) in captivity	Escobar-Ibarra I, Mayagoitia-Novales L, Chiappa P, González Rebeles-Islas C, Ramírez-Necoechea R, Mota-Rojas D, Alonso-Spilsbury M.
P2/30	Different pig breeds, different behavioural strategies?	Fernández X, Tibau J, Piedrafita J, Fàbrega E
P2/32	Management factors associated to DFD meat in bovine on desartic climate	Figuerola-Saavedra F, Pérez-Linares C, Barreras-Serrano A
P2/34	On-farm evaluation of group-housing for sows	Geverink NA, Tuytens FAM
P2/36	Subclinical mastitis changes the patterns of maternal - offspring behaviour in sheep	Gougoulis DA, Kyriazakis I, Fthenakis GC
P2/38	Decrease of the time in the clinical treatment of the schizophrenic patient with the presence of dogs as a support within therapy: study of 3 cases	Hernández SL, Rodarte LF, Mancilla BE
P2/40	Effect of flooring systems on locomotion behaviour in dairy cattle	Heutinck LFM, Van Dooren HJC, Ouweltjes W
P2/42	Fish welfare: an area for concern? Fin erosion currently found in UK farmed rainbow trout ( <i>Oncorhynchus mykiss</i> )	Hoyle I, Oidtmann B, Ellis T, Turnbull JF, North BP, Nikolaidis J, Knowles TG
P2/44	Nursery pig preference to floor types	Hulbert LE, Krebs N, Dailey JW, Sutherland MA, McGlone JJ
P2/46	Stocking rate effects on cattle ingestive behaviour, leaf availability and botanical composition of native gramma pastures in the humid tropics of Mexico	Jarillo RJ, Castillo GE, Ramírez AL

<b>Number</b>	<b>Title</b>	<b>Authors</b>
P2/48	Intake and grazing behavior of hokkaido native horses fed supplementary hay in winter woodland	Kawai M, Miyoshi Y, Houkiyama H, Matsuoka S
P2/50	Increased stocking density affects the behaviour of lactating dairy cattle	Krawczel PD, Hill CT, Dann HM, Ballard CS, Hovey RC, Grant RJ
P2/52	Influence of genotype on aggression of piglets during weaning and mixing	Lait PJP, Toscazo M, Held S, Humphrey T, Bailey M, Mendl MT
P2/54	Sensory sensitivity: a horse's temperamental dimension	Lansade L, Lecomte M, Pichard G
P2/56	Functional test of the hypothalamic-pituitary-adrenal axis of sows housed in various environments	Lay DC
P2/58	Validation of an automatic system to detect position changes in puerperal sows	Mainau E, Dalmau A, Ruiz de la Torre JL, Manteca X
P2/60	Foraging behaviour of nectarivorous bats in preserved and disturbed habitats	Maldonado S, Stoner K
P2/62	Do guanacos tolerate visitors in protected areas? Behavioural changes in response to tourists of a guanaco population in the Monte desert	Malo JE, Acebes P, Ginnoni SM, Borghi CE, Traba J
P2/64	Animal welfare perception of retailers in Spain	Maria GA, Miranda de la Lama GC, Villarroel M
P2/66	Effects of herbivore browsing on the morphology and essential oils contents of juniper shrubs; a field phenomenon	Marko G, Gyuricza V, Bernath J, Altbacker V
P2/68	Tryptophan supplementation in piglets weaned at 21 days of age	Martínez-Trejo G, Ortega Cerrilla ME, Figueroa Velasco JL, Galindo Maldonado FA, Herrera Haro JG, Rodarte Covarrubias LF, Lara Bueno A
P2/70	Differing attitudes of students in different cultural background towards animal welfare and ethics issues	Meng J, Cross N, Phillips C
P2/72	Factors influencing resting behaviour in free stalls	Morita S, Takeuchi M, Kageyama A, Haruta T, Shimada T, Hoshiba S.
P2/74	Magnetotherapy may ameliorate the incidence of weaving in stereotypic horses	Murphy J



Number	Title	Authors
P2/76	The aversive effect of wolf's feces on sika deer ( <i>Cervus nippon</i> )	Ninomiya S, Kaneda N, Abe N, Sato S
P2/78	Effect of the time of separation of the kid on the behavior and milk production of French Alpine goats	Nuñez JL, Gutiérrez J, Sisto AM
P2/80	Spider monkey ( <i>Ateles geoffroyi</i> ) behavior study in two dissimilar captivity conditions at the "Miguel Alvarez del Toro regional zoo", in Chiapas, Mexico	Olea y Wagner KA
P2/82	Regrouping in domestic goats: its effects on blood cortisol levels	Ortiz L, Alvarez L
P2/84	Validation of the open field test and stress-induced hyperthermia to asses fear behaviour in ewes	Pedernera-Romano C, Ruiz de la Torre JL, Badiella L, Manteca X
P2/86	Effect of the natural horsemanship techniques in the heart rate and behavioral parameter of warm blood horses loading into trailer	Pérez L, Houpt K, Rodríguez A, Sisto AM, Tejeda A, Aguilar A
P2/88	Mother– young recognition in Mexican Pelibuey sheep	Ramírez M, Alvarez L, Soto R, Lara E, Serafin N, Terrazas A
P2/90	Effect of straw bedding maintenance on the behaviour and preferences of dairy cows kept in cubicle system with straw bedding and soft lying mats	Reiter K, Abriel M, Freiburger F
P2/92	Sexual empathic ethogram of the captive jaguar ( <i>Panthera onca</i> )	Rocha-Jaime C, Escobar-Ibarra I, Reyes-Aceves D, Ramírez-Necoechea R, Mota-Rojas D, Alonso-Spilsbury M
P2/94	Ingestive behaviour of dual-purpose cows grazing native pastures with and without the legume <i>Arachis pintoii</i>	Rodríguez HK, Castillo GE, Jarillo RJ, 't Mannetje L, Aluja SA
P2/96	Determination of a stray voltage threshold using behavioural measurements in Holstein heifers	Roussel S, Rigalma K, Oliveira A, Louyot T, Duvaux-Ponter C
P2/98	Tiger predation and cattle management practices in an oil palm-livestock integration system	Sharma R, Jayasilan MA, Vidyadaran MK, Sharma D
P2/100	The influence of mixing piglets pre-weaning on their performance and survival rate	Skoufos IA, Maglaras GE, Daoutis IV, Vasilios KK, Spanelis EA, Mallisiova EN, Tzora AS

Number	Title	Authors
P2/102	Effects of local anaesthetic and a non-steroidal anti-inflammatory analgesic on stress responses of calves to disbudding	Stewart M, Stookey JM, Stafford KJ, Tucker CB, Rogers AR, Dowling SK, Verkerk GA, Webster JR
P2/104	Fractal analysis for grazing paths of cows - effects of group size and paddock area	Tada S, Kondo H, Takahashi M, Ueda K, Nakatsuji H, Kondo S
P2/106	Prenatal malnutrition impairs vocal structure in lambs	Terrazas A, Hernández UA, Olazabal A, Hernández F, Sanchez H, Medrano A, Soto R
P2/108	Determining the optimum age for tail docking and ear notching neonatal pigs	Torrey S, Devillers N, Lessard M, Farmer C, Widowski TM
P2/110	Appetite in swine following combinations of dexfenfluramine and deprivation length	Toscano MJ, Lay DC, Craig B, Pajor EA
P2/112	Dental development and mastication in domestic swine ( <i>Sus scrofa</i> ) – what we do and do not know	Tucker AL, Widowski TM
P2/114	Calf rearing practices: first step in the development of a welfare monitoring system.	Vasseur E, Borderas F, Cue R, Lefebvre D, Pellerin D, Rushen JP, Wade K, De Passillé AMB
P2/116	The number of visitors to the aquarium influences the behavior of manatees	Villanueva-García C, Brousset DM, Romano MC, Galindo F
P2/118	Effect of prepartum training for milking on milking behavior and productive performance of dairy cows	Vishwakarma KV, Kamboj LM, Prasad S
P2/120	The interaction between attention and dominance status in the captive Guinea baboon	Wagner KE
P2/122	Intracerebroventricularly administered oxytocin attenuated cortisol secretion, but not behavioural responses, during isolation in Holstein steers	Yayou K, Ito S, Kasuya E, Sutoh M, Ohkura S, Okamura H
P2/124	Influence of an artificial teat canal in a feeder teat on intersucking behaviour in groups of automatically milk fed calves	Zerbe F, Fischer A

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# ALINE S. DE ALUJA

## SPECIAL LECTURE

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## INSECT WELFARE: SHOULD WE CARE?

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**Martín Aluja**

Martín Aluja. Instituto de Ecología, A.C. Apartado Postal 63, C.P. 91000. Xalapa, Veracruz, MEXICO.

*[martinaluja@inecol.edu.mx](mailto:martinaluja@inecol.edu.mx)*

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This talk, honoring Aline Schünemann Hofer, will address an issue that has not been a visible part of the animal welfare agenda: shouldn't we also be concerned about insect welfare? Shouldn't we feel more empathy for them as Buddhists do? For example, do we really know if insects feel pain? Furthermore, what is the difference between packed chicken cages in production lines and packed fruit fly (Tephritidae) rearing cages in mass rearing facilities? Finally, why is it wrong to exterminate cheetahs but acceptable to do so in the case of *Anastrepha hamata*? Insects are an integral part of ecosystems and yet when management schemes are thought out or implemented, few remember them and as a result entire guilds vanish due to deforestation or habitat fragmentation. Should we care about this? To address these and related issues, I will use true fruit flies (i.e., Diptera: Tephritidae) as opposed to Diptera: Drosophilidae) and their parasitoids as a model system. First, I will introduce the audience to the wonders of fruit fly behavior, in particular learning, oviposition, feeding and sexual behavior. Then, I will review our recent work on the possible existence of individual "personality" among fruit flies. Based on the latter, I will address the issue of where do we draw the line along the phylogenetic tree when it comes to concerns on animal welfare. Comparing work on "higher" organisms, I will share ideas and preliminary results of ongoing research on stress and wellbeing as measured by varying conditions of the immune system and nutritional reserves. I finish sharing some ethical and philosophical thoughts and reviewing principles/guidelines that should be followed until we are able to more decisively answer the lingering questions related to possible pain/stress in insects. While we find out, why don't we follow William Cowper (1731-1800) who once wrote: "I would not enter on my list of friends . . . . the man who needlessly sets foot upon a worm". Or as Aline would put it, "don't harm any donkey because they remind me too much of my sons".

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# THE D.G.M. WOOD-GUSH MEMORIAL LECTURE

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# COGNITIVE ABILITY AND AWARENESS IN DOMESTIC ANIMALS AND DECISIONS ABOUT OBLIGATIONS TO ANIMALS

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**Donald M Broom**

Centre of Animal Welfare and Anthrozoology, Department of Veterinary Medicine, University of Cambridge,  
Madingley Road, Cambridge CB3 0ES, United Kingdom

*dmb16@cam.ac.uk*

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Observation of behaviour, especially social behaviour, and experimental studies of learning and brain function give us information about the complexity of concepts that animals have. In order to learn to obtain a resource or carry out an action, they may: relate stimuli such as human words to the reward, perform sequences of actions including navigation or detours, use words, discriminate among other individuals, copy the actions of other individuals, distinguish between individuals who do and do not have information, or act so as to cause humans or other animals to carry out actions. In some cases, stimuli, individuals or actions are remembered for days, weeks or years. Events likely to occur in the future may be predicted and changes over time taken into account. Recognition and learning may be associated with changes in physiology behaviour and negative feelings. Such information helps to provide evidence of sentience and the level of awareness. A sentient individual is one that has some ability to: evaluate the actions of others in relation to itself and third parties, remember some of its own actions and their consequences, assess risk, have some feelings and have some degree of awareness. Most people consider that they have obligations to some animals. Animals might be protected because such an animal is considered to have intrinsic value or the central concern may be its welfare. It will be argued that, in social species, there has been selection promoting some moral behaviours such as attempts to avoid harm to others, collaboration and other altruistic behaviour. An evaluation of such behaviour may provide one of the criteria for decisions about whether or not to protect the animal species. Other criteria may be: whether or not the animal is known as an individual, similarity to humans, level of awareness, extent of feelings, being large, being rare, being useful or having aesthetic quality.



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# PLENARY PRESENTATIONS

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## INVESTIGATING THE MENTAL EXPERIENCES OF ANIMALS

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**Mike T Mendl**

Centre for Behavioural Biology, Department of Clinical Veterinary Science, University  
of Bristol, United Kingdom

*Mike.Mendl@bristol.ac.uk*

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“Let us not mince words. Animal welfare involves the subjective feelings of animals.” Marian Dawkins’ (1990) succinct statement is increasingly accepted by animal welfare scientists, and probably identifies the roots of public concern about animal welfare. However, it also presents us with two challenging questions. (1) To what extent are non-human animals consciously aware of sensations, emotions and thoughts, and how does this vary between species? (2) Assuming some sort of conscious mental experience, how can we measure what individuals are experiencing at any given time? We are a long way from answering either of these questions, but progress is being made. Given that other humans, through the facility of language, are the best source of information we have about conscious experience and its relationship with behaviour, physiology, and brain function (variables that we can measure directly in animals), it is intuitively appealing, though not without risk of anthropomorphism, to use humans as ‘models’ for animals. From an animal welfare perspective, two important dimensions of mental experience are emotion and episodic memory. Emotion can be conceptualised as comprising behavioural, physiological, cognitive and subjective (conscious) components. Existing measures of animal emotion focus on behaviour and physiology but, in humans at least, these may dissociate from reported subjective experience of emotion. Human studies indicate that cognitive measures may be reliable indicators of subjective emotional valence (positivity or negativity), and such measures are now being developed for animals. Episodic memory is characterised by an ability to place events in time (what, where, when (www)) and to consciously recall these events. Lack of this ability restricts one to living life ‘in the present moment’. Animal studies are starting to probe the existence of www capabilities and episodic memory-like phenomenology, and studies of brain-damaged patients give us some insight into what ‘living in the present’ is like, and its potential consequences for an individual’s welfare.

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## THE EMOTIONAL BRAIN AND THE CONSEQUENCE OF ITS DYSFUNCTION FOR ANIMAL WELFARE

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**Adroaldo Zanella**

Norwegian School of Veterinary Science, Norway

*Adroaldo.zanella@veths.no*

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Brain imaging techniques, PET and MRI or fMRI can offer valuable information related to the mechanisms controlling emotions. The brain representation of human empathy is a fascinating example. Empathic responses to pain in familiar human subjects were measurable in areas of the brain which processed pain. Gender bias in empathic responses to pain yielded surprising results. Female brains empathized with the pain of "cheaters" while rewarding processes were activated in the brain of males observing pain experienced by cheaters. Recently, brain imaging studies showed that hidden intentions can be exposed through differential activation in prefrontal cortex areas. Pain threshold in mice can be affected by the pain experienced by a familiar cage mates. Poor welfare is likely to be associated with brain dysfunction. We demonstrated that the opioid system is dysfunctional in sows housed in crates and we also showed that the opioid mediated dysfunction is exacerbated in susceptible phenotypes which performed high levels of stereotypies. Recently we proposed that the consequences of weaning age on aggression in pigs were caused by impairments in social, spatial memory and fear mediated by stress responsive pathways in the hippocampus and frontal cortex. Our previous studies involved terminal experiments followed by tissue collection to assess changes in receptor binding, neurotransmitter concentration and mRNA expression. Tissue samples have limited relevance to understand complex biological processes. Information obtained using tissue samples is restricted to one data point in the life trajectory of the brain, which shows enormous plasticity. Brain imaging techniques will provide very useful information to assess affective states and emotional responses in animals.

# BEHAVIOR-BASED GRAZING MANAGEMENT FOR HERBIVORES AND ECOSYSTEMS

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**Frederick D. Provenza**

Department of Wildland Resources, Utah State University, U.S.A.

*stan@cc.usu.edu*

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Once understood, behavioral principles and processes can be transformed into practices that provide an array of solutions to challenges people face in attempting to manage landscapes for the well being of the many species of plants and animals that depend upon them. Unlike the infrastructure of a ranch such as corrals, fences, and water development, behavioral solutions cost very little to implement, they are not fossil-fuel intensive, and they are easily transferred from one situation to the next. In the case of grazing, behavior-based management is increasingly attractive given growing economic and environmental concerns with fire, herbicides, and mechanical means of rejuvenating landscapes. While we have learned much during the past three decades about how genes interact with social and biophysical environments to create foraging behaviors, scientists and managers remain generally unaware of the power of behavior to transform ecosystems, despite compelling evidence. The issue isn't if creatures are adapting to ongoing changes in social and biophysical environments, they do so every day of their lives. The only question is whether or not people want to participate in the process. If so, behavior-based management offers opportunities, for example, to use understanding: 1) of the relationship between palatability and plant biochemistry to rejuvenate landscapes to benefit wild and domestic animals, 2) of the importance of variety in the diet and daily grazing sequences of livestock to enhance wildlife benefits to land owners, managers, and users, and 3) of the value of biochemical complementarities for developing plant mixes for pastures that provide a full range of benefits -- nutrition and health for plants, herbivores, and people -- without the unsustainable costs associated with fertilizers, herbicides, insecticides, antibiotics and anthelmintics.

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## USING KNOWLEDGE OF ANIMAL BEHAVIOUR TO IMPROVE ANIMAL HEALTH

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**<sup>1</sup>Jeffrey P Rushen\*, <sup>2</sup>Fernando T. Borderas, <sup>1</sup>Anne Marie B De Passillé,  
<sup>2</sup>Marina A. G. Von Keyserlingk, <sup>2</sup>Daniel M. Weary**

<sup>1</sup>Agriculture and Agri-Food Canada, Canada

<sup>2</sup>Animal Welfare Program, University of British Columbia, Canada

\*[Rushenj@agr.gc.ca](mailto:Rushenj@agr.gc.ca)

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Intensively-housed, high-producing farm animals suffer from a variety of health ailments commonly called production diseases. These diseases, including lameness, metabolic and reproductive disorders, endemic infectious diseases and mortality of young animals, are costly for producers and serious threats to animal welfare. In this paper we show how an improved understanding of animal behaviour can be used to improve the early detection and treatment of these disorders. A series of recent studies have shown how detailed studies of gait in cattle, pigs and poultry can help refine and validate lameness scoring systems, improve the early detection of lameness, and suggest methods for automated detection. We also review 'sickness behaviours' that are believed to reflect a motivational state and function to support the immune response and help animals cope with the illness. Knowledge and careful monitoring of these behaviours can speed up our ability to identify sick animals. For example, changes in feeding behaviour of dairy and beef cattle identify animals suffering from a variety of illnesses some time before traditional veterinary diagnosis. Knowledge of animal behaviour may also help us understand why these ailments occur and find some treatment. For example, high rates of pre-weaning mortality in pigs may reflect impaired maternal behaviour or constraints placed on maternal behaviour by the housing environment. Constraints on the adaptability of feeding behaviour of cows may help explain metabolic illness, and patterns of social behaviour may help explain the transmission of infections within groups of animals. Knowledge of animal behaviour clearly can help us deal with production-related disease.



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## RESEARCH ON CLINICAL ETHOLOGY: UNDERSTANDING INDIVIDUAL DIFFERENCES IN ANIMAL BEHAVIOUR

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**Xavier Manteca\*, Marta Amat, Jaume Fatjó**

School of Veterinary Science, Universitat Autònoma de Barcelona, Facultat de Veterinària, Spain

*xavier.manteca@uab.es*

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A large proportion of companion animals show behaviours that are problematic from the owner's point of view. In dogs, such problem behaviours include aggression, excessive barking, inappropriate elimination, destructiveness and compulsive behaviours. The prevention and treatment of problem behaviours has become an increasingly important part of veterinary medicine and is referred to as "behavioural medicine" or "clinical ethology". The objective of this paper is to illustrate how research in clinical ethology may yield useful knowledge on fundamental aspects of animal behaviour, including the mechanisms underlying individual differences in behaviour. The domestic dog is the most diverse mammalian species and its genome is far better known than that of most other species; therefore, research in dog behaviour may be a very interesting model to understand individual differences in behaviour. Aggression is one of the most frequent behaviour problems in dogs. As many other species, dogs show a large individual variability in aggressive behaviour. Serotonin activity in the central nervous system appears to be negatively correlated with aggressive behaviour in individual dogs, and in particular, dogs showing impulsive aggression (i.e. dogs that do not show clear warning signals before an aggressive episode) seem to be the ones with the lowest serotonin activity. Serotonin activity in the brain is affected by a variety of factors, including thyroid activity. In turn, it has been suggested that domestication may have modified thyroid activity. A variety of other factors such as disease, diet and physical exercise may also affect serotonin activity. Although not fully explored in the domestic dog, early experiences could also have a long-lasting effect on central serotonin activity. Thus, the interplay between environment, genetics, serotonin and aggressive behaviour in the dog may provide a unique model to understand how individual animals come to differ in their propensity to behave aggressively.

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## ASSESSMENT AND INTERPRETATION OF STRESS IN FARM ANIMALS

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**Eberhard von Borell**

Institute of Agricultural and Nutritional Sciences, University of Halle, Germany

*eberhard.vonborell@landw.uni-halle.de*

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The concept of stress has been historically linked to threatening events to which an individual responds by activation of neurophysiologic mechanisms to resist and prevent major damage. These responses to a challenge may be behavioural, autonomic, endocrine and/or immunological. The temporal and context specific coping characteristics depend on the sensing and signalling of information by non-cognitive and/or cognitive centres of the nervous system and were related to individual (proactive and reactive) coping styles. Psychophysiological stress has also been interpreted as the inability of an individual to cope with environmental threats leading to a state of reduced welfare. Recent concepts have considered the adaptive value and positive aspects of stress in the context of welfare research, as farm animals are often kept in environments that provide little physical and mental stimulation. This paper is intended to provide an insight on the assessment and interpretation of new emerging non-invasive indicators of stress (such as cardiac responses and stress metabolites) as recently documented by a working group of the EU concerted action (COST 846) dealing with measuring of stress and welfare in farm animals. The validity and limitations of some of these measures are discussed in relation to current stress concepts.

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# ORAL PRESENTATIONS

## TUESDAY 31<sup>ST</sup> JULY 2007

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## USING SUCCESSIVE NEGATIVE CONTRAST AS A NOVEL INDICATOR OF EMOTIONAL STATE

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Oliver HP Burman\*, Richard MA Parker, Elizabeth S Paul, Mike T Mendl

University of Bristol, UK.

\*[Oliver.burman@bristol.ac.uk](mailto:Oliver.burman@bristol.ac.uk)

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Attempts to assess the emotional state of animals are critical to gaining an understanding of their welfare. We used the successive negative contrast (SNC) paradigm – in which individuals unexpectedly shifted from a large to a small reward display a significantly reduced response compared to individuals exposed only to the small reward - to determine whether individuals in an induced negative emotional state would be particularly sensitive to a downshift in reward outcome. Twenty-four rats were group-housed (3 rats/cage) with environmental enrichment (e.g. shelters) for 12 weeks before half of the cages had the enrichments removed for the duration of the experiment (4 weeks). Individuals from the enriched and unenriched cages were trained to run down a runway to obtain either a 12 pellet (n=6 per treatment) or 1 pellet reward (n=6 per treatment). After 12 days, rats running for 12 pellets took significantly less time to reach the reward (GLM:  $F_{1,19}=15.6$ ,  $P=0.001$ ) than those running for 1 pellet, but with no significant treatment difference (enriched vs unenriched) ( $F_{1,19}=0.3$ , NS) or reward\*treatment interaction ( $F_{1,19}=0.4$ , NS). Reward levels were subsequently downshifted from 12 pellets to 1 pellet. As expected, all rats receiving the increment downshift demonstrated a SNC effect, with downshifted individuals displaying a significantly increased latency to feed compared to those rats exposed only to the 1 pellet reward (day\*treatment\*reward  $F_{4,76}=5$ ,  $p=0.001$ ). However, for unenriched rats this effect was enhanced, reflected as a delayed return to a faster running speed following the downshift compared to the enriched rats. This result suggests that the response of rats to a reward downshift was significantly enhanced when this downshift occurred in conjunction with a negative affective state induced by the absence of environmental enrichment. Such a technique may therefore be useful in determining the background emotional state of rats exposed to changing environmental conditions.

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## EARS AND EMOTION – BEHAVIOURAL INDICATORS OF AFFECTIVE VALENCE IN SHEEP

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<sup>1,2</sup>Nadine Reefmann\*, <sup>3</sup>Rebecca Furrer, <sup>3</sup>Marianne Heberlein,  
<sup>1</sup>Beat Wechsler, <sup>1</sup>Lorenz Gyax

<sup>1</sup> Federal Veterinary Office, Centre for Proper Housing of Ruminants and Pigs, Switzerland.

<sup>2</sup> University of Muenster, Department of Animal Behaviour, Germany.

<sup>3</sup> University of Zuerich, Department of Animal Behaviour, Switzerland.

\*Nadine.Reefmann@art.admin.ch

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In order to assess the welfare of animals in a given environment, ideally, the emotional states of each individual are taken into account. The demand for objective and easy-to-measure parameters of affective states is still high. Therefore, this investigation aimed to find subtle behaviour patterns of sheep that indicate negative, neutral, and positive emotional states. 19 sheep were each observed in three situations of different emotional valence. Separation (S) was used to provoke a negative affective state, ruminating (R) was considered as a neutral, and the provision of food (F) as a positive situation. Every 15 seconds during 5 minutes, tail posture (up or down), and ear position (forward, centre, backward) were recorded. Frequencies were compared across situations using the Friedman test ( $\chi^2$ ) and, where applicable, the Page's trend test (L). During separation, the tail was mainly up (median ( $m$ )=0.62), whereas it was down during ruminating and feeding ( $m_R=0$ ,  $m_F=0$ ;  $\chi^2=33.09$ ;  $df=2$ ;  $p<0.001$ ). Forward ear posture was high during separation ( $m_S=0.76$ ), decreased to ruminating ( $m_R=0.14$ ), and further to feeding ( $m_F=0$ ;  $L=262$ ;  $k=3$ ;  $n=19$ ;  $p<0.01$ ). An inverse pattern was found for the backward ear position ( $m_S=0.1$ ,  $m_R=0.57$ ,  $m_F=0.92$ ;  $L=264.5$ ;  $k=3$ ;  $n=19$ ;  $p<0.01$ ). Similar to the forward ear position, the frequency of changing the ear posture decreased from separation to feeding ( $m_S=0.52$ ,  $m_R=0.48$ ,  $m_F=0.26$ ;  $L=257$ ;  $k=3$ ;  $n=19$ ;  $p<0.01$ ). These results indicate that an upward tail, combined with forward ears, and increased ear activity are characteristic for a negative emotional experience in sheep, and that relaxed tail, backward ears, and low frequency of ear movements indicate a positive affective state. Despite the demand for further validation, emotional states seem to have subtle behavioural correlates in sheep. In particular, ear postures may indicate the valence of affective states, resulting in a promising method to judge situations from the animal's perspective.

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# JUDGEMENT BIAS AND EMOTIONAL STATE: UNPREDICTABLE HOUSING AND JUDGEMENTS OF AMBIGUITY IN RATS - A TWO-CHOICE PROCEDURE

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Richard MA Parker\*, Elizabeth S Paul, Oliver HP Burman, Mike T Mendl

Centre for Behavioural Biology, Department of Clinical Veterinary Science, University of Bristol, UK.

\*[richard.parker@bristol.ac.uk](mailto:richard.parker@bristol.ac.uk)

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In humans, cognitive processing undergoes characteristic changes which correlate with felt emotional states and traits. If we can measure any such cognitive biases in animals, we may therefore tap a seam of information which closely reflects any subjective emotional experience. To this end, Harding et al (2004) developed a novel paradigm designed to measure 'optimism' and 'pessimism' in rodents; their results suggest there is an analogous link between cognition and affect in rats and humans. Here, we attempt to replicate their findings, and to develop their methodology further. We trained 16 rats to press a lever when they heard tone A to receive two pellets of food, and to press a different lever when they heard tone B to receive one pellet of food (with appropriate counterbalancing); a pilot study showed that rats prefer two pellets over one pellet. Once trained, the rats received a series of probe trials presenting tonal frequencies different to those encountered in their training. We then introduced unpredictable changes, designed to be mildly stressful, to the husbandry regime of half the rats, and after 18 days all received the probe sessions once more. It was hypothesised that the unpredictable housing treatment would induce a more negative affective state, and a reduced tendency to press the lever associated with the larger food reward in response to the probe tones, i.e. a bias towards 'pessimism' compared with the control group. However, after fitting a cumulative normal curve to the response choice data from probes intermediate in tonal frequency to A and B, and comparing the probable point of bisection (the tone at which there is an equal probability of pressing either lever) in a repeated measures ANOVA, we found the interaction between treatment and time of testing (i.e. baseline and post-treatment) was not significant ( $F=2.482$ ,  $d.f.=1,12$ ,  $p=0.141$ ). This may reflect a change in design from Harding et al (2004), namely the use of unconditioned stimuli which are both positively reinforced, rather than one which is positive, and one which is negative. Alternatively, or in addition, the hedonic difference between the two unconditioned stimuli may not be large enough to be sensitive to any changes in cognitive bias. Further experiments are proposed to examine these issues further.

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## DISPERSION OF THE WHITE-FRONTED CAPUCHIN (*Cebus albifrons trinitatis*) AT THE BUSH BUSH WILDLIFE SANCTUARY, NARIVA SWAMP, TRINIDAD, WEST INDIES

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Paul S Budgen\*, Deborah Goodwin

School of Psychology, University of Southampton, UK.

\*paulaway2000@yahoo.co.uk

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Previous surveys in 1972, 1995, and 2003 of the two endemic species of primates in Trinidad, *Cebus albifrons trinitatis* and *Alouatta seniculus insulanus*, have shown that anthropogenic activity, primarily habitat destruction and hunting, have reduced numbers to 8 and 30 (1995) and 31 and 34 (2003), respectively. Troops were confined to fragmented pockets of rainforest, leaving little opportunity for dispersal. Not all troops were located within areas protected by statute and the enforcement of legislation may be inadequate. In 2006 this pilot observational study of *C. albifrons trinitatis* was conducted in Bush Bush Wildlife Sanctuary (BBWS), where conservation measures are robustly supported by the government of Republic of Trinidad and Tobago (RoTT). The aims were to conduct a population survey and assess methods for future longitudinal studies. Walked transects were conducted using GPS (Garmin GPSMap 76CSX) with continuous data recording under the BBWS canopy. This enabled visual and auditory data for study subjects and other features e.g. fruiting trees, to be recorded and plotted. Forty seven individuals were observed on 5 sampling days. The subject index of dispersion was calculated ( $\bar{x}=9.4$ ,  $s^2=124.32$ ,  $\text{loD}=13.23$ ) and Chi-Square calculated from the index of dispersion multiplied by the degrees of freedom  $v$  ( $n-1=4$ ),  $X^2=52.89$ , indicating a clumped dispersal. This combined with limited qualitative evidence gained indicates that, within BBWS, *C. albifrons trinitatis* numbers are at worst stable and at best increasing slightly. A GPS receiver will be used in subsequent research so that points, transect lines and clusters may be accurately recorded and revisited ensuring consistency throughout the study. The overall objective of the longitudinal study remains to rigorously assess the effectiveness of conservation measures and to determine whether additional steps are achievable and necessary to ensure the continued survival of free-ranging primates within Trinidad.



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# THE EFFECTS OF EARLY SOCIAL ENVIRONMENTS ON THE PRE- AND POST-WEANING BEHAVIOUR AND GROWTH OF RACCOONS (*Procyon lotor*) IN A REHABILITATION CENTER

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Vanessa T Kanaan\*, Edmond A Pajor

Purdue University, USA.

\*vkanaan@purdue.edu

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The purpose of this study was to determine how different social environments affected the pre- and post-weaning behaviour and growth of raccoons (*Procyon lotor*). At 7 weeks of age, 24 orphaned raccoons were assigned to one of three social environments: littermate pairs (LM, n=4, 8 raccoons), non-littermate pairs (NL, n=4, 8 raccoons) or housed singly with a stuffed animal (S, n=8, 8 raccoons). Body weight and behaviour were recorded weekly. At 12 weeks of age, individuals from each treatment were mixed in outdoor pens (8 pens of 3 animals). Behavioural responses to the novel pens and to an unfamiliar human were collected. Body weight was recorded for the next four weeks. All data were analyzed using GLM and Tukey's post-hoc means tests. S spent less time interacting with the stuffed animal than LM and NL spent interacting with their cage-mates during the first two weeks of the pre-weaning period (all comparisons  $P < 0.001$ ). However, during the second week, S spent more time resting in physical contact with the stuffed animal than LM ( $P < 0.01$ ) and NL ( $P = 0.07$ ) with their cage-mate. NL spent more time engaging in activities alone than LM ( $P < 0.05$ ). When introduced to the novel pens, S vocalized more and explored the pens more than LM and NL (all comparisons  $P < 0.05$ ). When exposed to an unfamiliar human, S spent less time exposed than LM ( $P < 0.05$ ) and NL ( $P = 0.08$ ), and spent less time investigating the pen than LM ( $P < 0.05$ ) and NL ( $P < 0.05$ ). There were no differences in weight gained among treatments throughout the experiment. The relatedness of cage-mates had little effect on behaviour. Singly housed individuals responded differently to novel pens and avoided humans more than those raised with cage-mates. Stuffed animals provided to S did not compensate for the lack of a cage-mate during the pre-weaning period.

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## IDENTIFYING EARLY INDICATORS FOR SUCCESSFUL PAIRING OF CLOUDED LEOPARDS IN CAPTIVE BREEDING PROGRAMS

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<sup>1,2</sup>Katherine M MacKinnon\*, <sup>1</sup>Ruth C Newberry, <sup>3</sup>Nadja C Wielebnowski, <sup>2</sup>Katharine M Pelican

<sup>1</sup> Department of Animal Sciences and Department of VCAPP, Center for the Study of Animal Well-Being,  
Washington State University, USA.

<sup>2</sup> Conservation and Research Center, Smithsonian National Zoological Park, USA.

<sup>3</sup> Chicago Zoological Society, Brookfield Zoo, USA.

\*[mackinnonk@wsu.edu](mailto:mackinnonk@wsu.edu)

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Pairing the endangered clouded leopard (*Neofelis nebulosa*) for reproduction in captivity is risky due to unpredictable male aggression toward females, which can result in lethal attacks or a need to intervene and separate the pair due to injury or expected injury. To assess potential early indicators for successful pairings (i.e., pairings producing pregnancies), we examined behavioural records and hormonal data from animals in the clouded leopard breeding program at the Khao Kheow Open Zoo in Thailand. We predicted that aggressive and stereotyped behaviour would be displayed more often during initial introductions in failed than successful pairs and that affiliative behaviour would be displayed more often in successful than failed pairs. We also predicted that individuals in failed pairs would have higher faecal cortisol levels than individuals in successful pairs. Behavioural observations were made of paired males and females 2-5 times weekly during supervised visitations. Daily faecal samples were collected for hormone analysis by enzyme immunoassay. Females tended to display more hissing/growling ( $t_7 = 1.86, p < 0.1$ ) and pacing ( $t_7 = 1.96, p < 0.1$ ) than males. No significant differences were found between successful ( $n=4$ ) and failed ( $n=4$ ) pairs in measures of affiliation (grooming, sniffing and rubbing, analyzed separately and combined), aggression (growling/hissing), and stereotypy (pacing). Females cried more frequently per 30 min observation period in failed pairs ( $0.18 \pm 0.084$ ) than females in successful pairs ( $0.01 \pm 0.012$ ; GLM,  $p < 0.05$ ) and also tended to give more prusten vocalizations in failed ( $1.35 \pm 1.152$ ) than successful pairs ( $0.03 \pm 0.018$ ; GLM,  $p = 0.06$ ). As predicted, males in failed pairs tended to have higher cortisol levels than males in successful pairs ( $165.5 \pm 63.84$  versus  $80.3 \pm 4.63$ ; GLM,  $p = 0.11$ ). The results suggest that behaviour and hormone levels during supervised introductions could provide useful early indicators of whether a pair will reproduce successfully.

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## YOUNG HORSES (*Equus caballus*) PREFER RELATIVE SPATIAL CUES TO VISUAL CUES IN A FOOD-FINDING DISCRIMINATION TASK

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<sup>1</sup>Becky C Hothersall\*, <sup>2</sup>Pat A Harris, <sup>3</sup>Emma V Gale, <sup>4</sup>Christine J Nicol

<sup>1</sup> Department of Clinical Veterinary Science, University of Bristol, UK.

<sup>2</sup> WALTHAM Centre for Pet Nutrition, UK.

<sup>3</sup> Hartpury College/University of Bristol, UK.

<sup>4</sup> Department of Clinical Veterinary Science, University of Bristol, UK.

\*[b.hothersall@bristol.ac.uk](mailto:b.hothersall@bristol.ac.uk)

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Previous studies of discrimination learning suggest that horses attend to spatial cues in preference to visual ones. However, spatial cues have generally confounded global and relative spatial information, and the impact of previous experiences or training has not been quantified. This study examined the effect of cue modality on the performance of unweaned 4.5 month old foals in a discrimination learning task. Foals learnt to find a food reward in one of three covered buckets, in any of four positions within the test arena. Nine foals each underwent 10 trials per day and the learning criterion was defined as 70% correct choices on two consecutive days ( $p < 0.05$ , Binomial test with  $n=10$  and  $p_0=0.333$ ). In Stage 1 the rewarded bucket was signified both by visual cues (Striped, Chequered or Plain pattern) and by relative spatial cues (Left, Middle or Right position). Foals took between two and 10 days to complete the task. On reaching criterion, the cues were separated and foals had to ignore the inappropriate cue in Stage 2. For the Spatial group ( $n=5$ ), only the relative position remained relevant; for the Visual Group ( $n=4$ ) bucket pattern was the salient cue. Spatial group foals completed Stage 2 faster than Visual group foals (Mann Whitney U exact test,  $p=0.016$ ). Spatial group foals all reached criterion in the minimum possible period of two days, whereas no Visual group foal reached criterion within the maximum testing period of 15 days to complete both stages. Visual group foals initially persisted in responding to the previously correct position and individuals adopted different strategies when this proved unsuccessful. In conclusion, the findings suggest that young horses do have a preference for using relative spatial cues in a food-finding task.

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## SHORT AND LONG-TERM CONCURRENT RECALL OF 2D SHAPES IN DWARF GOATS

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**Jan Langbein\*, Gerd Nürnberg, Gerhard Manteuffel**

Department of Behavioural Physiology, Research Institute for the Biology of  
Farm Animals, Germany.

\*[langbein@fbn-dummerstorf.de](mailto:langbein@fbn-dummerstorf.de)

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Among farm animals, horses have been shown to remember concurrently up to 20 different discriminations for six months and sheep remembered pictures of conspecifics even after a 2-year break. In this study, we investigated concurrent recall of previously learned 2D shapes over short and long periods in dwarf goats ( $n=8$ ). Applying an automated learning device, the animals consecutively learned ten four-choice discrimination problems. Each task ran for five days and was preceded by one day where all shapes were rewarded to test for spontaneous stimuli preferences. Starting from problem two, each task was followed by one day where the shapes of the last two problems were presented in a mixed series to test concurrent short-term recall. After task ten a mixed series were presented containing shapes of all previous problems to test concurrent long-term recall. With the exceptions of problem one and three, the dwarf goats reached the learning criterion in all problems within two days. The problem had an impact on the number of trials to reach the criterion (Mixed Model,  $F_{9,59.4}=9.8$ ,  $p<0.001$ ). When previous and actual problems were presented concurrently, success rate were well above the criterion in all except of one of the mixed series. Thereby, success rate was lower in previous problems compared to actual ones ( $F_{1,119}=15.43$ ,  $p<0.001$ ). Furthermore, success rate was above the learning criterion in seven problems when all previously learned problems were presented concurrently in a mixed series. Two animals recalled seven problems, all others at least five. Most goats recalled problems learned up to six weeks ago. Results indicate a capacity to concurrently recall a large number of 2D shapes over longer periods in dwarf goats comparable to similar findings in horses.

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## BEHAVIOURAL DETERMINATION OF THE HEN'S SPATIAL CONTRAST SENSITIVITY

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Siobhan M Abeyesinghe\*, Claire E McMahon, John R Jarvis, Christopher M Wathes

Royal Veterinary College, United Kingdom.

\*sabeyesinghe@rvc.ac.uk

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The visual system of the domestic fowl's progenitor evolved under very different natural lighting environments to those in which hens are routinely housed. Greater understanding of the hen's visual capabilities, such as resolution of spatial detail, is required to understand fully the impact of artificial environments on visually mediated behaviours, such as social recognition, and welfare. Spatial contrast sensitivity of the hen was determined using an operant conditioning paradigm. Seven Hyline hens were trained to discriminate a sine-wave grating stimulus (spatial frequency 0.8 cycles.deg<sup>-1</sup>, modulation depth = 1) from a uniform grey field of the same mean luminance (20 cd.m<sup>-2</sup>). Stimuli were simultaneously presented on two VDUs, 400 mm distant from Perspex pecking panels through which they were viewed. Stimuli swapped positions quasi-randomly such that they were presented an equal number of times, but not more than three consecutively, on each side. Pecks to the panel showing the grating were rewarded with maggots (FR3); incorrect responses resulted in 5 s time out (FR1). Five hens met the success criterion ( $\geq 16/20$  correct choices during two successive sessions; Binomial distribution,  $p < 0.001$ ) and a Stepwise Approximation Procedure was subsequently used to determine their contrast sensitivity thresholds for a range of spatial frequencies (0.08 to 8 cycles.deg<sup>-1</sup>) at two luminances (20 and 0.3 cd.m<sup>-2</sup>) by varying the modulation depth of each grating stimulus until birds could no longer discriminate it from the paired grey field ( $< 16/20$  correct choices). Overall, spatial sensitivity peaked around 1.0 cycles.deg<sup>-1</sup> but was considerably less than for humans, indicating hens are unable to perceive the same degree of spatial detail. The maximum acuity for the chicken was 7 cycles.deg<sup>-1</sup> (N=5) and this was reduced by the lower stimulus luminance (3 cycles.deg<sup>-1</sup>; N=2). If fine spatial detail of key features is important in visually mediated behaviour then this is likely to be compromised by low lighting intensities.

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## IMAGE PERCEPTION IN SHEEP

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**<sup>1</sup>Sumita Sugnaseelan\*, <sup>2</sup>Christopher M Wathes, <sup>3</sup>Don M Broom**

<sup>1</sup> Dept. Animal Science, Faculty of Agriculture, Universiti Putra Malaysia, Malaysia.

<sup>2</sup> Centre for Animal Welfare, Dept Clinical Veterinary Sciences, The Royal Veterinary College, United Kingdom.

<sup>3</sup> Dept. Veterinary Medicine, University of Cambridge, United Kingdom.

\*[sseelan@yahoo.com](mailto:sseelan@yahoo.com)

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The ability of lambs to discriminate two life-size conspecific frontal facial photographs was investigated, to establish whether they could then associate the images with the corresponding live animals. Two lambs, free of facial markings or skin pigmentation, were used as visual stimuli, and presented simultaneously at a distance of 2 m in a Y-maze with a mean illuminance of 200 lux. The positions of the visual stimuli were alternated in a Gellerman series, and a correct choice resulted in a food reward. Twelve lambs were randomly assigned to two groups, each trained to respond positively to one of the photographs. Each lamb was subjected to 20 trials per session, every alternate day, with the success criterion set at  $\geq 15$  correct choices, for four successive sessions. The lambs succeeded in discriminating the facial photographs within four to nine sessions. There was no difference between the sheep in the two groups in the rate of learning. Subsequently, eight lambs (four from each group) were tested randomly for their ability to associate the facial photograph with the corresponding live animal. Each lamb underwent a daily session of 14 trials, with the success criterion set at  $\geq 11$  correct choices in either three successive sessions or three out of five sessions. Six animals achieved the criterion, with one making 100% positive discrimination, in their first session. All eight lambs achieved the criterion with 50% making over 90% correct choices in the second session. By the end of third session, all had made  $\geq 12$  correct choices with six completing the task in a run. The two animals, which required a fourth session, attained 100% by the end of that session. These results provide preliminary evidence that sheep are capable of making an association between a two-dimensional photograph and the corresponding live animal.

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## ENVIRONMENTAL ENRICHMENT ON SOUTH AMERICAN CAMELIDS IN A CHILEAN ZOO

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**<sup>1</sup>Beatriz Zapata\*, <sup>2</sup>Andrea Caiozzi, <sup>2</sup>Guillermo Cubillos**

<sup>1</sup> Facultad de Ciencias Veterinarias y Pecuarias, Universidad de Chile, Chile.

<sup>2</sup> Zoológico Nacional, Chile.

\*bzapata@uchile.cl

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South American camelids (SACs), guanaco, vicuna, llama and alpaca are native species of Chile. These species are kept in zoos and when the captive conditions are barren low diversity of behaviour and stereotypies are commonly observed. This study aims to assess the behavioural changes due to an environmental enrichment program (EEP) applied to the SACs, kept at the National Zoo, Chile. The EEP pointed to enhance the behavioural diversity and to reduce stereotypies. Nine alpacas, 8 llamas and 3 vicunas were used and kept in separated cages. The EEP comprised complex feeders, scents and a swimming pool. Behavioural recording of activity budget was carried out in a basal phase (BP), then the EEP was implemented and new observations were done in three phases with 20 days interval. To compare the behavioural changes and interactions with enrichment items between BP and the following stages, paired-t test was used and to assess the species effect Kruskal-Wallis test was applied. The three species used all the enrichment items, except the scents. The tactile stimulation given for some feeders evoked the natural browsing on brushes and the swimming pool was used for drinking water and bathing. The main activity budget changes were: stationary behaviours reduction in alpacas from 27% to 8% ( $Z=-2,52$ ,  $p=0.012$ ) and foraging behaviour in traditional feeders from 51% to 28% ( $F_{(1,6)}=13,5$ ,  $p=0.01$ ) in llamas and from 70% to 29% ( $F_{(1,2)}=61,04$ ,  $p=0.02$ ) in vicunas. Stereotypies were low duration/frequency and presented mainly at the BP. The behavioural changes lasted for more than 1,5 months and the stereotypies after the EEP disappeared. The increasing interaction with enrichment items, the decrease of the stereotypies, the evocation of natural behaviours show that the EEP applied to SACs was positive for their welfare.

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# THE EFFECTS OF COLOR, SIZE, HARDNESS, AND MATERIAL ON ENVIRONMENTAL ENRICHMENT DEVICE INTERACTION IN ORANGE-WINGED AMAZON PARROTS (*Amazona amazonica*)

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Lilian C Kim\*, James R Milam

University of California, USA.

\*lckim@ucdavis.edu

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Cage enrichment devices (ED), i.e., cage “toys,” are often provided to captive parrots as a means of promoting a behaviorally stimulating environment, but it is not clear whether particular properties of EDs are more effective than others in eliciting interaction. We tested preference for color, size and hardness of wooden cube EDs and whether cubes were preferred to flat rawhide strips. Orange-winged Amazon parrots (*Amazona amazonica*; N=10-12, mixed-sex, 4-5 years of age) were individually housed in cages each equipped with two computer-monitored omnidirectional switches attached to cage ceilings. EDs were suspended from the switches; any interactions generating lateral movement and causing switch closure (“use” of ED) were continuously recorded. Preference for 3.8cm<sup>3</sup> softwood (Douglas fir) cubes of eight different colors was tested by presenting each bird with all combinations of colors, two colors at a time. Daily switch activity averages were computed for each bird and subjected to ANOVA. Yellow softwood cubes elicited greater use than red, orange, green, blue, violet, brown or natural ( $p < 0.05$ ). Preference for size of yellow hardwood cubes was tested by presenting combinations of cubes of three sizes: 2.5cm<sup>3</sup>, 3.8cm<sup>3</sup>, and 5.1cm<sup>3</sup>; the smallest blocks were preferred over the larger two ( $p < 0.01$ ). Preference for hardness of wood was tested by presenting birds with 3.8cm<sup>3</sup> yellow cubes made of either Douglas fir (“soft”) or birch/maple (“hard”); birds preferred soft cubes ( $p < 0.01$ ). Preference for 3.8cm<sup>3</sup> cubes was then compared to 3.8cm×7.6cm rawhide strips; cubes were greatly preferred ( $p < 0.01$ ). The results show that color, hardness, size and material all strongly influence ED use by captive Amazon parrots. Other stimulus properties might be similarly investigated to develop more behaviorally engaging EDs. Further evaluation of ED interaction and preference may ultimately reveal the biological basis of preferences, such as a potential link to foraging substrates missing in the captive environment.



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# ENVIRONMENTAL ENRICHMENT IMPROVES BROILER BREEDER WELFARE AND REPRODUCTIVE PERFORMANCE

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Erin H Leone\*, Inma Estevez

Dept. of Animal and Avian Sciences, University of Maryland, USA.

\*[ehleone@umd.edu](mailto:ehleone@umd.edu)

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Environmental enrichment is crucial in the design of environments that fully address the biological needs of captive animals. While enrichment programs have been shown to improve health and welfare of broilers less is known of the potential applications to commercial broiler breeder operations. We investigated the potential benefits of cover panels for reproductive performance, which would encourage producers to adopt enrichment techniques. This demonstration trial occurred on five commercial broiler breeder farms, each with a control and panel treatment room containing approximately 7000 females and 800 males. A second trial included three farms with approximately 10,000 females and 1,100 males per room. Reproductive performance was measured by the number of eggs/female/week and weekly fertility and hatchability % from 25 to 60 weeks. The weekly location of marked males was also recorded in the first trial. Reproductive performance was tested with a mixed model ANCOVA whereas space use was modelled with a traditional ANOVA in SAS (v9). Cover panels improved egg laying ( $p < 0.05$ ) by 2.1% and maintained better hatchability (1.6% avg. increase;  $p < 0.05$ ) and fertility ( $p = 0.05$ ) throughout the breeding cycle. Similarly, in the second trial there was a 1.7% improvement in laying and a 2% increase in hatchability ( $p < 0.05$ ). Male home ranges, based on minimum convex polygons, were larger in the enriched ( $259 \pm 24.4 \text{ m}^2$ ) vs. control flocks ( $184 \pm 23.1 \text{ m}^2$ ;  $p < 0.05$ ). Providing enrichment in the form of cover panels improved reproductive performance most likely by increasing males' mating opportunities and reducing female stress. We found clear economic benefits to providing enrichment, an estimated \$3 million if all breeder houses of the participating company were outfitted with the panels. These results demonstrate that environmental enrichment is not only beneficial for broiler breeder welfare but is also economically advantageous, resulting in a win-win situation for both animal welfare and production.

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## EFFECTS OF ENVIRONMENTAL ENRICHMENT ON ACTIVITY AND CANNIBALISM IN YOUNG MUSCOVY DUCKS

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<sup>1</sup>Anja B Riber\*, <sup>2</sup>Gregory S Archer, <sup>2</sup>Joy A Mench

<sup>1</sup> Section of Ethology, Department of Large Animal Sciences, Faculty of Life Sciences, University of Copenhagen, Denmark.

<sup>2</sup> Department of Animal Science, University of California, Davis, USA.

\*Anja.Riber@agrsci.dk

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Cannibalism is a major problem for commercial production of Muscovy ducks (*Cairina moschata*). Surprisingly little is known about the ontogeny of cannibalism in ducks or how to reduce/prevent the problem in a welfare-friendly way. The preventative mechanism typically used by the industry is bill-trimming, which causes acute pain. We hypothesized that cannibalism in Muscovy ducks is a form of redirected foraging, and thus investigated the effects of environmental enrichments designed to promote foraging behaviour on the ontogeny of cannibalism. Groups of 17 non-bill-trimmed female Muscovy ducklings were randomly assigned from day-old to one of three treatments (5 replicate pens/treatment): 1) feed-enrichment, FE (corn-silage, alfalfa, chick-crumbs mixed with gravel, and mealworms on Astro turf), 2) water-enrichment, WE (water+strings, water+plastic-objects, water+chick-crumbs, and water), and 3) control, CON (empty troughs). Floors were covered with wood-shavings, and food and water were available *ad libitum*. Behaviour was video-recorded during the daylight hours on days 7-18 of age. FE and WE foraged significantly more than CON (FE: 35.3% of observation periods; WE: 35.4%; CON: 28.7%;  $P < 0.0001$ ) and spent significantly less time inactive (FE: 48.5%; WE: 48.9%; CON: 56.5%;  $P < 0.0001$ ). There were no differences between FE and WE on these measures, and no other significant differences in behaviour among the treatments. FE spent 9.4%, WE 12.2%, and CON 1.1% of the observation periods using the enrichments. Treatment had no effect on body-weight from 0-34 days of age ( $P = 0.999$ ). Although time spent foraging was increased in FE and WE, cannibalism broke out in all treatment groups beginning at 15 days of age. At the end of the experiment (35 days of age), there was no difference among treatments in the total number of ducklings with injuries inflicted by cannibalism ( $P = 0.445$ ). Thus, our findings suggest that cannibalism in Muscovy ducks does not develop from an unfulfilled motivation for foraging.

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## A NOVEL INSTRUMENT TO ASSESS ATTITUDES TOWARD PAIN IN CATTLE

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Camilla Kielland\*, Eystein Skjerve, Adroaldo J Zanella

Norwegian School of Veterinary Science, Norway.

\*[Camilla.kielland@veths.no](mailto:Camilla.kielland@veths.no)

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Attitudes toward pain might influence pain management and consequent welfare indicators at farm level. Photos can elicit empathic responses to pain in humans. We developed an instrument which presents photos, and asks for a score, of 18 painful conditions common to dairy cattle. Our goal is to assess animal welfare on farms which will be selected based on clusters made according to their attitudes toward pain. We piloted the survey on 300 veterinary students. Using two identical surveys we tested the hypothesis that a visual analogue scale (VAS) (n=150) would provide similar pain scores compared to the data obtained using numeral rating scale (NRS) (n=150). In both scales, 0 represented no pain and 10 indicated unbearable pain. The survey was used to assess how pattern analysis may be used to divide the tested population into distinct groups. The response rate was 40% (n=121). Gender ratio in the two different surveys did not differ. Graphical examinations of the data using box plot revealed a pattern where scores were slightly higher using the NRS (range 3.0-7.8) than VAS (range 3.7-8.6). The observed pattern among the variables was similar for NRS and VAS. After graphical evaluating the data, we used multivariate regression to test if the overall pattern was influenced by test method, gender and student year. The regression showed that the variability was linked to student year ( $p < 0.01$ ), gender ( $p = 0.019$ ) and test method ( $p < 0.01$ ), these values should be interpreted with caution due to the very sensitive method with regards to the number of responses. Complete linkage cluster analysis revealed 2 distinct groups within the VAS and NRS, with a more even distribution using VAS. VAS and NRS yielded comparable results but the possibility to get more distinct groups in the students tested with the VAS may be of importance to look for the consequence of different attitudes toward pain on animal welfare.

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## A POSSIBLE SCALE TO MEASURE EASE OF FARROWING AND PAIN CAUSED BY PARTURITION

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**<sup>1</sup>Eva Mainau\*, <sup>1</sup>José L Ruiz de la Torre, <sup>2</sup>Antoni Dalmau, <sup>1</sup>Xavier Manteca**

<sup>1</sup> Departamento Biología Celular, Inmunología y Fisiología, Universidad Autónoma de Barcelona, España.

<sup>2</sup> Instituto de Recerca y Tecnología Agroalimentarias (IRTA), España.

\*[eva\\_mainau@hotmail.com](mailto:eva_mainau@hotmail.com)

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Piglet crushing is one of the main causes of piglet mortality during the first 48h after birth. Most piglets are crushed when the sow moves from standing to lying or sitting position. Pain may cause a higher frequency of body position changes and, in consequence, increase the probability of piglet crushing. Since pain is a complex parameter, the aim of this work was to obtain an ease of farrowing score (EFS), as an indirect measure of pain. Forty hybrid (Large White x Landrace) sows from first to eighth parity housed in individual crates were used. Sow activity (time in each posture and number of posture changes) was registered continuously for 1 day before and 1 day after farrowing using video recordings. Rectal temperature was recorded (9:00h and 19:00h) for seven days around farrowing. Farrowing parameters registered were duration, between-birth intervals, number, viability and position of the piglets (head or back born), number of stillborns, number of vocalizations and sow posture at birth. To obtain the scale based on 13 farrowing behavioural variables, a preliminary ease of farrowing score (EFS) was assessed using Principal Components Analysis (PCA). A principal component analysis yielded five factors with an eigenvalue higher than 1.1 that accounted for 82% of the total variation between individuals. The two largest principal components were "posture" and "activity" of sows during farrowing and explained 28.39% and 23.50% of the variance, respectively. EFS was negatively correlated with total time sitting during farrowing ( $r=0.56$ ;  $p=0.0002$ ) and with percentage of stillborns ( $r=0.60$ ;  $p<0.0001$ ), and was positively correlated with total time lying down during farrowing ( $r=0.55$ ;  $p<0.0001$ ) and with percentage of newborns with high viability ( $r=0.48$ ;  $p=0.0001$ ). A negative correlation was found between activity before farrowing and EFS ( $r=0.39$ ;  $p=0.001$ ). It is suggested that impossibility to perform nest building behaviour in crates leads to restlessness, contributing to a more difficult farrowing. No relation was found between EFS and activity after farrowing. EFS appear to be a good approximation to a pain scale. However, this will be confirmed in a second phase of this project by using an analgesic (Metacam®, Boehringer-Ingelheim).

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## BEHAVIOUR AND PAIN SENSITIVITY OF DAIRY CALVES FOLLOWING DEHORNING AND THE EFFICACY OF MELOXICAM AND RELIEVING THE PAIN RESPONSE

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**Anneliese Heinrich, Todd Duffield, Kerry Lissemore, Suzanne T Millman\***

Ontario Veterinary College, Department of Population Medicine, University of Guelph, Canada.

\*[smillman@uoguelph.ca](mailto:smillman@uoguelph.ca)

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Dehorning is a painful procedure routinely performed on dairy farms. The objectives of this study were (1) to describe the duration of pain when calves were dehorned using a local anesthetic and (2) to determine if Meloxicam (Metacam®, Boehringer Ingelheim, Germany) is effective at mitigating the pain response to the procedure. Meloxicam is a preferential COX-2 inhibiting NSAID with a half-life of approximately 26 hours in bovines. In this study 60 Holstein heifer calves, age 6 to 12 weeks, were blocked by age and randomly assigned to Meloxicam and control treatments. Ten minutes prior to dehorning, calves received a lidocaine cornual nerve block and an I.M injection of either Meloxicam (0.5 mg/kg) or saline. Calves were dehorned using heat cauterization. Twenty-four hours prior to dehorning calves were sham dehorned using the unheated dehorner. Digital video recording was used to collect behaviour data for 24 hours following sham and 48 hours following dehorning. Continuous observation was used. General activity was also measured using an activity meter. Pain sensitivity was measured at 4 sites around the horn bud at 4 hours following treatment using an algometer which we validated for use in bovines. Data were analyzed using the Mixed and Glimmix procedures in SAS. Ear flicking showed a significant treatment by time interaction ( $p=0.03$ ). Preliminary behaviour data suggests that Meloxicam treated calves performed less ear flicking for at least 28 hours following dehorning. There was also a visible circadian pattern to behaviour, with calves demonstrating the majority of pain-related behaviours, ear flicking, head shaking and head rubbing, in the late afternoon. Meloxicam treated calves displayed significantly less pain sensitivity than Controls ( $p=0.008$ ). There was a significant effect of location, with the sites closest to the ear being the most sensitive ( $p<0.001$ ). Dehorning causes inflammatory pain that can be alleviated by Meloxicam.

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## THE EFFECTS OF ANALGESIA FOR CASTRATION AND TAIL-DOCKING OF LAMBS

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Andrew D Fisher\*, David R Paull, Caroline Lee, Ian G Colditz

CSIRO, Australia.

\*[Andrew.Fisher@csiro.au](mailto:Andrew.Fisher@csiro.au)

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Although the tail-docking of lambs and the castration of male lambs are common procedures on many farms, the operations can cause pain and discomfort. The aim of this study was to determine the effectiveness of two analgesic strategies. Male merino 6-week-old lambs ( $17.6 \pm 0.39$  kg) were assigned to ten treatments ( $n=7$  or 8 per treatment), incorporating knife, ring or sham castration, and gas-iron or sham tail-docking. The analgesics were carprofen (4mg/kg) or saline injection administered 90min before surgery, and a topical lignocaine/bupivacaine spray immediately after surgery or no spray administered. Behaviours measured for 12h after surgery included foot stamping, rolling, wound licking and postural classification including ventral lying, lateral lying, dog-sitting, normal standing and hunched-back standing. The results showed that castrated and tail-docked lambs had lower growth rates in the 2 weeks after surgery compared with controls, and that the growth rate of knife-castrated animals was lower than that of ring-castrated lambs (55.6 vs. 144.1 g/d, respectively;  $s.e.=30.68$ ;  $p=0.05$ ). Carprofen and topical anaesthetic administration had no effect on growth rates of castrated and tail-docked lambs ( $p>0.05$ ). Plasma cortisol was increased by all surgical treatments compared with controls at 0.5 h, but there were generally no differences between treatments at 6 h. Ring castration produced a lower peak cortisol response than knife castration (75.6 vs. 125.2 nmol/l, respectively;  $s.e.=7.34$ ;  $p<0.001$ ). Analgesic treatments did not alter the cortisol response to ring castration and tail-docking, but cortisol response to knife castration and tail-docking was reduced by the administration of topical anaesthetic to both scrotum and tail stump, with and without carprofen injection. The effect of treatments on behaviour will also be presented. The results suggest that ring castration in young lambs produces a lesser response than knife castration, and that the response to knife castration and tail-docking can be ameliorated by topical analgesic strategies.

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## DOES PIGS' SYNCHRONY OF OBJECT USE VARY WITH DIFFERENT ENRICHMENT OBJECTS?

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**<sup>1</sup>Caroline M Docking\*, <sup>1</sup>Heleen A Van de Weerd, <sup>1</sup>Jon EL Day, <sup>2</sup>Sandra A Edwards**

<sup>1</sup>ADAS UK Ltd, UK.

<sup>2</sup>School of Agriculture, Food and Rural Development, University of Newcastle, UK.

\**Caroline.Docking@adas.co.uk*

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The extent to which animals synchronise their use of enrichment objects may have important implications for the animals' welfare as a result of potential social competition for the objects. Thirty commercial groups of 12 finishing pigs were exposed to one of five enrichment treatments (6 replicates); straw (ST), a commercially available BiteRite (BR), substrate dispenser (SD) filled with straw, rootable feed dispenser (FD) filled with flavoured feed and chewable liquid dispenser (LD) filled with flavoured water, for 7 weeks. Video recordings were made of the pigs' behaviour and videos from the first full day (week 1) and one day in weeks 3 and 7 were subsequently analysed. The observed performance of object use, when at least one other member of the group was also performing that behaviour, was compared with the probability that such concurrence occurred by chance. Data were checked for normality and subjected to ANOVA and t-tests. All treatment groups synchronised their behaviour to a much greater extent than expected by chance ( $p < 0.001$ ). The degree of synchrony (0 to 1) of object use remained relatively constant over the seven week period (0.21, 0.25, 0.22, for weeks 1, 3 and 7 respectively,  $s.e.d. = 0.043$ ,  $p = 0.645$ ). The degree of synchrony of object use was highest for the treatments using straw (ST and SD) compared with the other treatments (0.40, 0.35, 0.20, 0.13 and 0.05 for SD, ST, FD, BR and LD respectively,  $s.e.d. = 0.057$ ,  $p < 0.001$ ). There were no treatment  $\times$  week interactions. Pigs show a higher degree of behavioural synchronisation of object use than expected by chance. Such synchronisation may have implications for the level of enrichment provision that should be provided to commercial groups.

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## EFFECTS OF PROVIDING STRAW AT DIFFERENT STAGES OF LIFE ON TAIL-BITING IN PIGS

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<sup>1</sup>Poppy TE Statham\*, <sup>2</sup>Laura E Green, <sup>1</sup>Mike T Mendl

<sup>1</sup> Department of Clinical Veterinary Science, University of Bristol, UK.

<sup>2</sup> Ecology and Epidemiology Group, Department of Biological Sciences, University of Warwick, UK.

\*[poppy.statham@bristol.ac.uk](mailto:poppy.statham@bristol.ac.uk)

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Tail-biting is a welfare concern on pig farms. Recent studies indicate that early provision of straw may help prevent tail-biting. The effect of providing straw at different stages of life was investigated by following large groups of pigs from birth to slaughter on a commercial farm. Six replicates of four treatments were used (No Straw (NS), Straw From 12 weeks (SF), Straw From Weaning (SW), Straw Throughout Life (ST)). One replicate was excluded due to circumstances beyond our control. Of the remaining 20 groups, 14 had tail-biting outbreaks (NS=3, SF=2, SW=4, ST=5), 8 of these being classified as severe (NS=2, SF=1, SW=2, ST=3). Treatment had no effect on the distribution of tail-biting outbreaks (Chi-square) for either all outbreaks ( $p=0.190$ ) or severe outbreaks ( $p=0.644$ ). Low power resulting from a small sample may partly explain this. However it appears that straw did not have a protective effect, since most outbreaks were observed in the ST treatment. This unexpected finding may be explained by the study farm's management practices which resulted in less straw being provided in the period after 12 weeks when most outbreaks took place. This may have caused a perceived lack of straw in animals receiving straw before this period (ST, SW). Since removal of straw has been associated with tail-biting, a decline could have the same effect. Alternatively, another factor may have been over-riding our treatment effect. Therefore all candidate factors were compared between groups with severe, low-level and no tail-biting outbreaks (ANOVAs and Kruskal-Wallis tests). This preliminary analysis showed a tendency for larger groups to have more tail-biting outbreaks ( $\chi^2=5.44$ ,  $df=2$ ,  $p=0.066$ ). All groups consisted of 3 litters. Differences in group size resulted from variation in numbers born and surviving. It is therefore possible group size, and therefore stocking density, was more influential than the treatment applied.



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# THE EFFECT OF DIETARY FIBRE LEVEL AND ACCESS TO STRAW ON THE WELFARE OF GROUP HOUSED SOWS

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<sup>1</sup>Charlotte L Stewart\*, <sup>1</sup>Niamh E O'Connell, <sup>2</sup>Laura A Boyle

<sup>1</sup> Agri-Food and Biosciences Institute, N. Ireland.

<sup>2</sup> Pig Production Research Centre, Ireland.

\*cstewart23@qub.ac.uk

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This study assessed the effects of dietary fiber and access to straw on the welfare of pregnant sows housed in small static groups. In a 2 x 2 factorial design experiment, pregnant sows (n=128) were offered one of two diets: (1) High (H) fiber diet with 10% crude fiber (CF), or (2) Control (C) diet with 5% CF and (1) access to straw (S) in racks or (2) no (N) straw. Groups of four sows were formed at the start of the 4-week treatment period. Sows were housed in pens with voluntary cubicles and a slatted exercise area and were fed twice a day. Back fat levels were assessed before mixing and 4 weeks later. Aggressive interactions were assessed immediately post mixing. Injury scores were recorded one week post mixing. General activity scans were made one day per week at hourly intervals over a 12-hour period. Focal observations and sham chew scans were made on two non-consecutive days each week. Straw usage was also recorded. There were no treatment effects on back fat levels at the end of the treatment period ( $P>0.05$ ). Diet had no effect on post mixing aggression ( $P>0.05$ ) or on injury scores ( $P>0.05$ ). C sows spent more time inactive ( $P<0.005$ ) and bar biting ( $P<0.05$ ) while active. H sows spent more time lying with eyes closed ( $P<0.005$ ) and HS sows were involved in more bouts of exploration while active ( $P<0.005$ ). Dietary treatment had no effect on straw usage ( $P>0.05$ ). HS reduced sham chewing ( $P<0.001$ ). S had no effect on general activity levels ( $P>0.05$ ) but S sows were involved in fewer bouts of headthrusting ( $P<0.05$ ). Increasing the fiber content of the sows diet and provision of straw had positive effects on sow welfare in small static groups.

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## FEEDING SPACE AND TYPE OF ROUGHAGE FOR DAIRY GOATS

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**Knut E Bøe\*, Inger L Andersen, Grete HM Jorgensen**

Department of Animal and Aquacultural Sciences, Norwegian University of Life Sciences, Norway.

\*[knut.boe@umb.no](mailto:knut.boe@umb.no)

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Recently there has been an increased interest in simplifying the roughage feeding for goats by the use of *ad libitum* feeding of roughage in feed racks, as opposed to individual feeding. These feeding systems may often involve a reduced number of feeding places per animal or a restriction in feeding space and hence competition may increase. The aim of this experiment was to examine how type of roughage and restricted feeding space affected feeding time, feed intake and the level of aggressive competition in groups of dairy goats. In a 3 x 2 factorial experiment with number of goats per feeding place (1, 2, 3) and type of roughage (silage or hay) as main treatments, we tested a total of 48 adult goats divided into 8 groups. Roughage was given *ad libitum* and all groups were exposed to all treatments. From 24 hour video recordings at the end of each experimental period (one week) we scored activity and behaviours such as feeding, queuing, standing/walking and lying using instantaneous sampling with 10 minutes intervals. All incidents of social interactions were scored continuously for six hours between 09:00 and 15:00 hours. Individual goats from each group were ranked as high, medium or low according to the number of times they were displaced from the feed barrier by another goat. In order to test the effects of number of goats per feeding place, within each roughage type we used a mixed model of analysis of variance with the following class variables: number of goats per feeding place (1, 2 or 3), roughage type (silage or hay), the interaction between number of feeding places and roughage type and group (1 to 8), where group was specified as a random effect. Mean values per group were used as statistical unit. The goats spent significantly less time feeding and more time queuing in front of the feed barrier as the number of goats per feeding place increased. The number of displacements at the feed barrier and aggressive interactions increased with an increasing number of goats per feeding place, and the aggression level was higher when offered hay than silage. Some individuals reduced their time spent feeding by more than 80 % when increasing the number of goats per feeding place from 1 to 3. Low ranked goats spent significantly less time feeding and more time queuing than goats in medium and high rank categories. In conclusion, restricting the feeding space into less than one feeding place per goat can not be recommended.

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# ORAL PRESENTATIONS

## WEDNESDAY 1<sup>ST</sup> AUGUST 2007

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## VARIATION IN BODY CONDITION IN DAIRY CATTLE AND MOTIVATION TO FEED AT PASTURE

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<sup>1</sup>Lindsay R Matthews\*, <sup>2</sup>Penny Aspin, <sup>2</sup>John Roche, <sup>2</sup>Eric Kolver

<sup>1</sup> Animal Behaviour and Welfare, AgResearch, New Zealand.

<sup>2</sup> Dexcel, New Zealand.

\*[lindsay.matthews@agresearch.co.nz](mailto:lindsay.matthews@agresearch.co.nz)

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Bodyfat in high-producing dairy cattle declines markedly during lactation. A common perception is that thin animals are continually highly-motivated to eat (i.e. "hungry"). Resting and feeding are both highly-valued activities to dairy cattle. We examined the strength of motivation to eat in cows differing in body condition by measuring the degree to which resting was defended when body condition varied. In each of two lactations, ten cows were allocated to each of three feeding treatments (ad lib pasture with 0, 3 or 6 kg concentrate supplement fed individually) for each of two genotypes (representing High and Low rates of body condition loss). Within treatments, body condition (assessed fortnightly) using a 10-point body condition score (BCS) scale) was similar at the beginning of lactation, but varied widely within and across treatments as the lactation progressed. At each of three stages of lactation (Early, Mid and Late), measurements were made of BCS, individual pasture (using alkanes) and concentrate intakes, and of time spent grazing, ruminating, resting, and standing for two 24h periods. Data were analysed by linear regression (intake or behavioural measures calculated as a function of variation in BCS within a treatment), with p set at 0.05. BCS varied between 2.5 and 8 across all treatments. All of the concentrate was consumed each day. There were no diet x genotype interactions. The percentage of time spent grazing and ruminating (combined) and forage intakes increased with decreasing BCS in 3/6 observation periods, and the percentage of time spent resting decreased with decreasing BCS in 2 of these same observation periods. The study shows that, at some stages of lactation, thinner animals eat more and for longer periods than better conditioned animals, and that, at times, they sacrifice resting in order to do so, thereby demonstrating a high motivation to feed.

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## FORAGING BEHAVIOUR OF DRY COWS IN OUT-WINTERING SYSTEMS

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**<sup>1</sup>Paolo A Gazzola\*, <sup>1</sup>Laura Boyle, <sup>1</sup>Padraig French, <sup>2</sup>Alison J Hanlon, <sup>2</sup>Finbar J Mulligan**

<sup>1</sup> Moorepark Research Centre, Teagasc, Ireland.

<sup>2</sup> School of Agriculture, Food Science and Veterinary Medicine, University College Dublin, Ireland.

\**paul.gazzola@teagasc.ie*

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Temperate climates allow producers to keep dairy cows outside during the winter (out-winter). Out-wintering diets such as brassica forages or winter grass are cost effective but little is known about the foraging strategies cows employ on such diets. The aim of this study was to compare foraging behaviour of 88 pregnant dairy cows on kale, swedes and pastured grass to cows indoors on grass silage. Cows were blocked according to parity, liveweight, body condition score (BCS) and calving date, and randomly assigned to treatment. Foraging behaviour was measured in 9 cows per treatment. Eating and ruminating times (min/d), number of bouts, bite rate and mastication rate were recorded over two 24-hour periods using IGER recorders (Ultra Sound Advice, London, UK). Data were analyzed by SAS using a mixed model which included block as a random variable and period as a repeated measure. All data were normal with the exception of bites/min which was normalized by log transformation. Eating times did not differ but indoor cows had more bouts per day (16.1) compared to kale (13.6), swedes (12.9) and grass (9.8; SE 1.40;  $p < 0.05$ ). Ruminating times were 560, 338, 366 and 270 min/ d for indoor, kale, swedes and grass (SE 29.2). Grass cows spent the least amount of time ruminating ( $p < 0.01$ ). They also had fewer ruminating bouts ( $P < 0.05$ ). Respective numbers of ruminating bouts were 17.1, 17.0, 16.8, and 13.2 (SE 1.35). Mastications/min were higher in kale (29.4) and swedes (29.0) compared to indoor (22.6) and grass cows (10.5; SE 2.30;  $p < 0.05$ ). Out-wintered cows have fewer but longer eating bouts compared to indoor cows. Cows on grass performed long eating bouts and spent little time ruminating indicating that grass is an inadequate out-wintering feed. Cows fed brassica forages require more mastications in order to break down and ingest feed.

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## BEHAVIOUR ON PASTURE OF HERDED ANKOLE AND CROSSBRED (ANKOLE X HOLSTEIN) HEIFERS IN AN OPEN GRAZING SYSTEM IN SOUTH WESTERN UGANDA

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<sup>1</sup>Christoph Winckler, <sup>2</sup>Okeyo Mwai, <sup>1,3</sup>Reinhard C Huber\*

<sup>1</sup> Institute of Livestock Sciences/Department of Sustainable Agricultural Systems; University of Natural Resources and Applied Life Sciences, Austria

<sup>2</sup> International Livestock Research Institute (ILRI), Kenya

<sup>3</sup> Instituto de Biologia Molecular e Celular (IBMC), Portugal

\*[rhuber@ibmc.up.pt](mailto:rhuber@ibmc.up.pt)

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The aim of this study was to assess the behaviour on pasture of the indigenous purebred Ankole cattle breed and crossbred (Ankole x Holstein) animals under typical management conditions in south western Uganda. 12 focal heifers in each of four groups (2 groups per genotype) were continuously observed regarding their grazing, social and comfort behaviour. Application of a general linear mixed model revealed no significant differences in grazing behaviour patterns (eating, walking, standing) between the genotypes. Walking distances of Ankole and Ankole x Holstein animals were also similar as was the incidence of agonistic interactions. However, Ankole cattle engaged in more non agonistic social interactions ( $\text{Chi}^2$ ;  $p < 0.001$ ) than their crossbred counterparts. Individual distances were lower in Ankole (1.7m vs 3.5m;  $p < 0.001$ ) heifers and also more herd mates were present within a radius of 5 meters around the focal animal than in crossbred herds. The most important comfort behaviour pattern in both genotypes was self licking, which occurred to similar extent in Ankole and crossbred heifer groups ( $p = 0.316$ ). While crossbred animals scratched themselves ( $p = 0.019$ ) and rubbed on objects ( $p = 0.09$ ) more often than Ankole heifers, the latter used more often their horns for scratching ( $p = 0.001$ ). Although Ankole cattle and their Holstein crosses did not differ in grazing, distances walked during grazing and agonistic behaviours, the significant differences between the two genotypes in herd cohesion/distribution may pose challenges on the management of crossbred animals under extensive open grazing conditions as present in south western Uganda. The differences in comfort behaviour might indicate elevated external parasite pressure (ticks) in crossbreds. Further studies on animals of different production levels and on other behavioural aspects (e.g. docility tests, human-cattle interactions etc.) are necessary to obtain more conclusive comparative behavioural results. Information on the behaviour of both genotypes may also be relevant for breeding and management decisions.

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# EFFECTS OF DIETARY SUPPLEMENTATION ON DOMESTIC GOAT FORAGING BEHAVIOUR DURING THE DRY SEASON AT A SEMIARID THORNSCRUB IN THE BIOSPHERE RESERVE OF TEHUACÁN-CUICATLÁN (MÉXICO)

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Elena Baraza\*, Alfonso Valiente-Banuet

Instituto de Ecología UNAM (Ecology Institute UNAM), México.

\*ebaraza@ugr.es

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Farmers can alter livestock foraging behaviour by supplementation, since an herbivore's nutritional state may affect its preferences. In seasonally dry environments, the scarcity of natural forages during the dry season makes supplementation indispensable. It is important to evaluate supplementation influence on livestock food preference in order to estimate possible consequence for vegetation. We analyzed how supplementation affects domestic goats foraging behaviour at the semiarid thornscrub in the Biosphere Reserve of Tehuacán-Cuicatlán (México). We compared the foraging behaviour of two groups of eight goats: Supplemented receiving 500 g of concentrate before foraging and Control without food supplementation. Two observers accompanied the flock during foraging, recording the time spent on any consumed element by each goat during 5-7 min. Each goat was observed 9-10 times at five different moments throughout the dry season (February-May). For each goat, the mean time spent on each element during all observation at each moment was used to calculate plant species and functional groups (herbs, trees) consumption. Data were analyzed by rmANOVA with factors for group and time. The Control group consumed a higher number of different elements per unit time than the Supplemented one ( $F_{1,142}=6.82$ ;  $P=0.01$ ). Supplemented group spent higher proportion of time browsing on trees ( $F_{1,12}=16.83$ ;  $P=0.0015$ ), specially on *Acacia subangulata* ( $F_{1,12}=22.85$ ;  $P=0.0004$ ), which was the unique tree species that retains green leaves during all dry season. However, these differences can be explained by the interaction between goats instead of variations on preferences. Supplemented goats, with a higher weight/height ratio ( $F_{1,13}=9.932$ ;  $P=0.0076$ ), aggressively tend to displace Control individuals from more palatable elements as *A. subangulata*, forcing them to consume greater number of elements. Hence, although the supplementation allowed animals to maintain a better corporal condition, it did not exert any influence on food selection, resulting in no variation of goat-mediated effect on vegetation.

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# WHAT'S IN A PECK? A COMPARISON OF THE MOTOR PATTERNS INVOLVED IN FEATHER PECKING, DUSTBATHING AND FORAGING

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Laura M Dixon\*, Georgia J Mason, Ian JH Duncan

Animal and Poultry Science, University of Guelph, Canada.

\*[ldixon@uoguelph.ca](mailto:ldixon@uoguelph.ca)

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The two main hypothesized causes of feather pecking concern motivations to forage or to dustbathe. Previous work (e.g. on 'autosshaping') has shown that the detailed morphology of pecks involved in drinking and feeding, or in working for food or water, differ. We therefore used this approach to try and resolve the foraging/dustbathing problem, quantifying the motor patterns involved in foraging and dustbathing pecks and comparing them to feather-pecking pecks. White Leghorn females were raised in wire floor pens. At six weeks, the sixty birds performing the most feather pecking were video recorded while pecking at forages, dustbaths, novel objects, water, and bird models which could be feather pecked. To avoid pseudoreplication, three types of each stimulus were used whenever possible. We recorded the duration of the peck, the duration of head fixation before the peck, and the duration from head fixation to beak contact with the stimuli. Mixed models, blocked by stimulus type, assessed whether feather pecks resembled or differed from either dustbath or foraging pecks. Severe feather pecks and gentle feather pecks were different ( $P < 0.05$  for all measures). The motor patterns involved in pecking during dustbathing and foraging were also different ( $p < 0.0001$  for all measures). Severe feather pecks proved similar to the forage pecks (NSD: power  $> 0.95$ ), but different from all other pecks including dustbathing ( $p < 0.0001$  for all measures). Gentle feather pecks were significantly different from all others ( $p < 0.01$  for all measures). These results indicate that severe feather-pecking derives from motivations to forage, not to dust-bathe; and that gentle feather pecks arise from a motivation not investigated here (possibly to allo-groom). More broadly, they suggest that finely analyzing 'fixed action pattern' morphology can help elucidate the motivational bases of puzzling behaviours in captive animals.

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## GENTLE AND SEVERE FEATHER PECKING: ONE PROBLEM OR TWO?

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Sarah L Lambton\*, Toby G Knowles, Caroline Yorke, Christine J Nicol

University of Bristol, UK.

\*[sarah.lambton@bristol.ac.uk](mailto:sarah.lambton@bristol.ac.uk)

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Feather pecking may manifest in two forms, gentle (GFP) and severe (SFP), between which the relationship is unclear. They may occur on a continuum, they may be separate behaviours with similar risk factors, or be separate behaviours with different causes. Clarifying their relationship is important in studying the impact of feather pecking, and interpreting results from those past studies which did not differentiate between them. The current prospective epidemiological study investigates the relationship between these two behaviours across 62 free range and organic UK farms (119 flocks). Flocks were visited at 25 and 40 weeks, when rates of GFP and SFP, and levels of feather damage, were recorded. Management data were also collected on each farm. All farms showed some feather pecking. GLMs showed that, overall, GFP decreased with age ( $F_{1,109}=22.77$ ,  $p<0.001$ ) and decreased as SFP increased ( $F_{1,109}=4.12$ ,  $p=0.045$ ). SFP increased with age ( $F_{1,109}=10.7$ ,  $p=0.001$ ). When the data were divided by visit, SFP at visit 2 increased with SFP at visit 1 ( $F_{1,46}=16.55$ ,  $p<0.001$ ), feather damage ( $F_{1,46}=4.5$ ,  $p=0.039$ ) and flock age ( $F_{1,46}=5.1$ ,  $p=0.029$ ), but decreased as GFP at visit 2 increased ( $F_{1,46}=5.0$ ,  $p=0.03$ ). SFP and GFP at visit 1 were negatively correlated ( $r=-0.408$ ,  $p<0.001$ ). Flocks in which feather pecking was identified by the farmer had a higher mean rate of SFP ( $p<0.001$ ) and a lower mean rate of GFP ( $p=0.005$ ). Farm management differentially affected the two forms, e.g. GFP rate was higher in flocks that had been beak trimmed ( $p<0.001$ ), while SFP rate was lower ( $p<0.001$ ). GFP and SFP occurred in different places, and at different times. SFP later in life was predicted by earlier SFP, not earlier GFP. Indeed, later GFP could not be predicted by earlier GFP. Feather damage was related to SFP, but not GFP. In conclusion GFP and SFP appear to follow different patterns.

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## EFFECT OF MIXED HOUSING ON FEATHER PECKING IN LAYING HENS

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**Koen A Uitdehaag\*, T Bas Rodenburg, Hans Komen**

Animal Breeding and Genomics Centre, Wageningen University, The Netherlands.

*\*koen.uitdehaag@wur.nl*

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The objective of the present study was to investigate the effect of mixed housing on the occurrence of feather pecking in adult laying hens. These hens were from two different genetic origins: one line showing low levels of feather pecking (LF) and one line showing high levels of feather pecking (HF). Hens were housed in either pure or mixed cages from day 1 after hatch until 46 weeks of age. Pure cages consisted of hens from one line only and mixed cages consisted of an equal number of hens from each line. From 18 weeks of age until the end of the laying period, hens were kept in 4-bird cages which were randomly divided over three tiers of a battery cage system. Occurrence of feather pecking was assessed by evaluation of feather damage to back and rump at 39 and 46 weeks of age. Cage means for pure housing and pair means for mixed housing were used as experimental units. A two-way analysis of variance with interaction was performed on average on 14 experimental units per line-environment combination using a GLM procedure. Feather damage to back and rump at 39 and 46 weeks of age was significantly higher ( $P < 0.01$ ) in the HF as compared with the LF line. Hens from the HF line in the mixed cages had significantly more damage ( $P < 0.05$ ) to back and rump at 39 and 46 weeks of age than HF hens in the pure cages. Feather damage in hens from the LF line was not affected by mixed housing. These results suggest a negative impact of mixed housing on feather damage in HF hens.

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## LAYING HENS SELECTED FOR AND AGAINST FEATHER PECKING AND THEIR PREFERENCE OF EATING LITTER SUBSTRATE

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Alexandra Harlander-Matauschek\*, Isabel Benda, Corina Lavetti, Werner Bessei

University of Hohenheim, Germany.

\*[harland@uni-hohenheim.de](mailto:harland@uni-hohenheim.de)

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Experiments have shown that feather pecking in laying hens increases when animals from a litter housing system are moved to non-litter system. This supports the hypothesis that feather pecking in laying hens is redirected litter pecking behaviour to the feathers of other birds. Laying hens which not only peck at but also eat the substrate can offer more information on redirected behaviour. The objective of the current study was to investigate the amount of substrate eaten in high (HFP) and low (LFP) feather pecking birds when wood shavings and feathers were offered simultaneously in a choice test. Ten LFP and 10 HFP birds were kept in individual cages (c). Three groups of 5 HFP and 3 groups of 5 LFP birds were kept on litter (l). Each bird was tested in an arena equipped with three identical bowls filled with mash (10g), wood shavings (3g) and 5 pieces of loose feathers, respectively. Birds were tested twice for a period of 10 minutes per test. The amount of substrate eaten was recorded. Both lines ate wood shavings and did not differ in the amount of shavings eaten. Caged birds consumed more shavings than birds kept on litter ( $14\% \pm 7$  vs.  $5 \pm 2$ ,  $p < 0.001$ ). A significant line X management interaction could be attributed to the caged HFP birds which consumed more feathers (HFPC;  $54\% \pm 15$ , LFPC;  $2 \pm 2$ ; HFPI;  $10 \pm 10$ ; LFPI;  $12 \pm 7$ ,  $p < 0.001$ ). Our results showed that both lines were motivated to eat shavings. The availability of wood shavings did not alter the motivation for feathers in HFP birds. The motivation for eating litter, the implications thereof on laying hen welfare and the special preference of HFP birds for eating feathers needs further investigation.

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## BEHAVIOUR, HEALTH AND WELFARE OF FERAL HORSES AND CATTLE IN NATURE RESERVES

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**Paul Koene**

Department of Animal Science, Wageningen University, Netherlands.

*Paul.koene@wur.nl*

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In Europe domesticated grazers are purposely returned back to nature reserves to manage the vegetation: they are de-domesticated. These animals seem to adapt well to free-living conditions. We measured adaptation of horses and cattle in the largest nature reserve of the Netherlands, the Oostvaardersplassen. Many new facts were found. Horse' harems were organized in bands of hundreds of animals. Heck cattle' contact structure varied strongly during the year and caused a low risk of disease exchange between nature reserve and farming environment. De-domesticated animals also undergo suboptimal conditions that influence their well-being. During winter periods the horses showed low mortality, while Heck cattle showed higher mortality. An International Scientific Committee reviewed the welfare risks and advised to reactively cull low condition animals to avoid unnecessary suffering. However, census data were in general insufficient to advise precisely on behaviour and welfare issues. During these suboptimal periods we observed 40 adult (2004-2005 and 2005-2006) and 30 juvenile (2005-2006) Heck cattle and measured body condition score (BCS) and many behaviour, health and welfare parameters once every two weeks. By recording individual life histories and using logistic regression methods significant predictors of mortality were found. Surprisingly, high BCS in autumn was not predictive for winter survival: high condition bulls lost their condition significantly faster ( $p < 0.001$ ) than low condition bulls and cows. Diarrhoea - recorded early in autumn - was predictive of end of winter mortality ( $p < 0.001$ ). Calves younger than 1 year showed a higher mortality than older calves ( $p < 0.005$ ), but mortality appeared to be predictive only from data the day before dying ( $p < 0.01$ ). These findings are an important input for the polarized societal discussion about animal welfare and management of de-domesticated animals in nature reserves. The life history approach promises to be an important tool for discovering welfare indicators in free-living animals.

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## FACTORS INFLUENCING THE USE OF FREE-RANGE AREAS BY LAYING HENS

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**Christiane Keppler\*, Robert Haase, Ute Knierim**

Farm Animal Behaviour and Husbandry, Faculty of Organic Agricultural Sciences,  
University of Kassel, Germany.

\*[ckeppler@wiz.uni-kassel.de](mailto:ckeppler@wiz.uni-kassel.de)

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Good outdoor use is desirable for the prevention of feather pecking. We, therefore, investigated possible effects of strain, shelter, weather conditions, hens' experience and feather condition on free-range use. 387 non beak-trimmed laying hens from three strains (Lohmann silver-LS, Lohmann tradition-LT, Tetra SL-TSL) were kept in 9 floor pens with perches and daylight (3 replicates per strain). After rearing with daylight, the hens received access to a covered outside-run in the 27th week of life and to the free-range (5.2 m<sup>2</sup>/bird) in the 44th week of life. The proportion of hens on the free-range and distance from the house (<2m, 2-10m, 10-20m or >30m) were directly recorded with instantaneous scan sampling every 15 minutes from day 1 to 41 at 17 observation days. Overall free-range use was good with 26.6 %. There was no difference between strains (LS: 29.8 %, LT: 23.7 %, TSL: 26.4 %, n=3, P=0.25, Kruskal-Wallis). Free-range use did not increase with increasing experience (n=8 observation days, Spearman R=-0.24), but more hens moved further away (>10m) from the house (R>0.83, p=0.01). After two weeks of free-range access the grass was cut from about 40 cm to 10 cm height. This increased use in the area >10 m from 1.5 % to 11.6 % (p<0.01, n=9, paired Wilcoxon). Those zones with trees were better used (3.3 %) than similar zones without (0.9 %, n=3 with trees, n=6 without trees, p<0.05, Mann-Whitney). Finally, the more cloudy the days, the more hens were in the free-range (Spearman R=0.84, n=13, p<0.01). Mean feather condition per group, scored at week 50, had no effect on free-range use (Spearman R=-0.12, n=9, p=0.76, probably due to moderate weather conditions during this time. Results confirm that hens prefer shadowy free-range with good oversight, but shelter from above. All three strains are similarly suitable for free-range conditions.

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## IMPACT OF RIDING IN ROLLKÜR-POSTURE ON WELFARE OF PERFORMANCE HORSES

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<sup>1</sup>Ulrike U von Borstel\*, <sup>1</sup>Ian JH Duncan, <sup>1</sup>Anna K Shoveller,  
<sup>2</sup>Linda J Keeling, <sup>3</sup>Suzanne T Millman

<sup>1</sup>Department of Animal and Poultry Science, University of Guelph, Canada.

<sup>2</sup>Department of Animal Environment and Health, Swedish University of Agricultural Science, Sweden.

<sup>3</sup>Department of Population Medicine, University of Guelph, Canada.

\*[uvonbors@uoguelph.ca](mailto:uvonbors@uoguelph.ca)

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Rollkür, the hyperflexion of the horse's neck, is employed as a training method by a number of high-level competition dressage riders; however, its use is controversial as it may adversely affect the horse's welfare. The objective of this study was to determine (1) if horses will show differences in stress responses as measured by heart rate and behaviour when ridden in Rollkür as compared to regular collection, and (2) if they show preferences between the two riding styles when given the choice. Fifteen riding horses inexperienced with Rollkür were tested for side preferences in a Y-maze set up in a riding arena. Subsequently, horses were ridden 30 times through the Y-maze randomly alternating between sides. Each ride through was preceded by a brief stop with loose reins in the entrance to the Y-maze. Riding through one maze-arm was always followed by a short round ridden in Rollkür, whereas riding through the other maze-arm was followed by a short round ridden in regular collection. Association of maze-arms with treatments was randomized across horses, but both treatments included riding equally in both clockwise and counterclockwise circles either in walk or trot. Immediately after the conditioning phase, horses were again repeatedly ridden into the maze, however, after the brief stop the riders did not predefine any directions to the horse other than to move forward, leaving it to the horse to decide which arm of the maze to enter. Mixed model analysis revealed no significant ( $p>0.1$ ) differences in heart rates between treatments, but higher ( $p<0.05$ ) frequencies of aversive behaviour such as tail swishing during Rollkür. Moreover, 14 of the 15 horses chose significantly ( $p<0.05$ ) more often the side associated with the normal collection rather than Rollkür. These findings indicate that the Rollkür position may be uncomfortable for horses unaccustomed to it.

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## ACTIVITY OF LOOSE HORSES DURING 90-MINUTE ON-TRUCK REST STOPS

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Ted H Friend\*, Heidi A Keen, Glenda M Bingham, Peter D Krawczel, Christa M Iacono

Department of Animal Science, Texas A&M University, College Station, TX, USA.

\*t-friend@tamu.edu

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Mandatory rest stops in which horses remain on board the transport vehicle during long distance transport are being debated. A common hypothesis is that a distinct quiet period followed by a voluntary increase in activity is indicative of horses receiving meaningful rest. An earlier study by this laboratory found that unrestrained horses did not show a distinct quiet period or an increase in activity near the end of 1-hour-long on-truck rest stops after 8 or 17 hours of transport. The aim of this study was to determine if horses would demonstrate rest if the duration of the on-truck rest stop and duration of transport were increased. A single-deck semi-trailer separated into three compartments was used for each of two shipments. Each shipment consisted of three groups of mature slaughter horses averaging 476 kg/horse and loaded at an average density of 397.3 kg/m<sup>2</sup> (10 to 12 horses per compartment). The 1.5-hour rest stops occurred at 6-hour intervals during transport and before unloading, for a total of three rest stops during trips that averaged 23 hours. Direct observation by three observers was used to determine the percentage of visible horses "active" in each compartment at 1-minute intervals. Activity was highly variable within and between shipments, with 23 of 34 increases in alertness due to aggression between horses or noise outside the trailer. Similar to our earlier study, no trends were evident for resting followed by an increase in activity near the end of the rest stops. Also, the percentage of horses active during the first ( $42.6 \pm 5.1$ ), second ( $38.7 \pm 8.5$ ) and third ( $39.1 \pm 5.8$ ) rest stops was similar ( $P > .89$ ), indicating that these horses were not fatigued to the point of reducing activity during on-board rest stops after 23 hours of transport.



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# ORAL PRESENTATIONS

## THURSDAY 2<sup>ND</sup> AUGUST 2007

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## LIVESTOCK DISEASE RISK: A CONSEQUENCE OF BEHAVIOUR IN A COMPLEX ENVIRONMENT

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<sup>1</sup>Lesley A Smith\*, <sup>2</sup>Glenn Marion, <sup>3</sup>Piran CL White, <sup>4</sup>Michael R Hutchings

<sup>1</sup> Scottish Agriculture College/University of York, UK.

<sup>2</sup> Biomathematics Et Statistics Scotland, UK.

<sup>3</sup> University of York, UK.

<sup>4</sup> Scottish Agriculture College, UK.

\*lesley.smith@sac.ac.uk

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Heterogeneous distributions of forage resources and faeces results in localised accumulations of nutrients and parasites, creating trade-offs between the costs of disease transmission and the benefits of nutrient intake in grazing systems. Each contact between livestock and faeces in the environment is a potential disease transmission event. Thus, herbivores must make foraging decisions in complex environments which will affect their intake of both nutrients and parasites. However, the pattern of forage and faecal resources in the environment will also be affected by the grazing management system in place. The aim of this study is to investigate the theoretical impact of grazing management on the risk of disease to cattle. We use a spatially explicit individual based stochastic foraging model to simulate herbivore grazing behaviour based on three empirically observed behavioural rules of thumb: herbivores preferentially select (i) tall swards; (ii) nutrient rich swards; and (iii) non- faecal contaminated swards. The model was parameterised to simulate cattle grazing under three types of grazing management: set stock (i.e. where sward growth and cattle intake are in equilibrium in a single field); a two pasture rotation grazing system with increasing number of rotations; and a rotational grazing system with two rotations and increasing subdivisions of the pasture. Overall cattle contact with faecal contaminated patches was greatest in the set stocking scenario, with the largest number of contacts (up to 6.5x greater) with faecal contaminated patches compared to rotational grazing systems. However, in rotation grazing systems rotation number greatly affects levels of contact with faeces relative to set stock (e.g. 1<sup>st</sup> rotation has 6x greater contacts verses subsequent rotations with 1.5x fewer contacts than set stock). These interactions between behaviourally mediated contact patterns and grazing management have implications for the risk of macroparasite and microparasite disease transmission to livestock.

## DOES BEHAVIOUR PREDICT ACUTE ENDOTOXIN MASTITIS IN DAIRY COWS?

<sup>1,3</sup>Laura Hänninen\*, <sup>2</sup>Jutta Kaihilahti, <sup>3</sup>Suvi Taponen, <sup>3</sup>Mari Hovinen, <sup>4</sup>Matti Pastell, <sup>3</sup>Satu Pyörälä

<sup>1</sup> Research Centre for Animal Welfare, University of Helsinki, Finland.

<sup>2</sup> Research Centre for Animal Welfare and MTT Agrifood Research, Finland.

<sup>3</sup> Department of Production Animal Medicine, University of Helsinki, Finland.

<sup>4</sup> Department of Agrotechnology, University of Helsinki, Finland.

\*[laura.hanninen@helsinki.fi](mailto:laura.hanninen@helsinki.fi)

There is a need to distinguish sick individuals in large dairy barns. Automatic behaviour detection would be a feasible method, but we lack knowledge of which behavioural features change and how, in different disease outbreaks. Acute endotoxin mastitis was induced in 6 dairy cows, for the purpose of another study. Cows were in their 1<sup>st</sup> or 2<sup>nd</sup> lactation and housed in a stanchion barn. We filmed the cows' behaviour continuously with a 12h mode during one day before induction (day -1) and at the induction day (day 0). From the videos we analysed mean hourly bout durations, frequencies and total durations the cows spent resting and ruminating. To follow up the inflammation, milk samples were taken and the cows' health status was checked at regular intervals. We analysed the differences between days in hourly behavioural and milk parameters and clinical findings with a mixed model, taking repeated observations into account. Cows were used as their own controls. Activity changed as the inflammation proceeded ( $p < 0.05$  for all); at 2 hours after induction cows were resting more and standing shorter bouts than at according hours during the control day, but from 3 to 11 hours after induction, cows were resting less. Cows were also ruminating less from 4 hours to 8 hours after induction. Body temperature started to rise 4 hours after induction, reaching the peak values 6 hours after induction and returned to normal 12 hours after induction. Milk cell count was increased after 6 hours from induction. The cows' resting behaviour changed rapidly after the onset of endotoxin mastitis. Resting and rumination are promising behaviours to be tested further for automatic disease detection in large dairy units.

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# BEHAVIOURAL SYNCHRONY, COW COMFORT INDICES AND HERD-LEVEL LAMENESS ON ORGANIC AND CONVENTIONAL DAIRY FARMS IN THE UK

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Fritha M Langford\*, Kenny MD Rutherford, Mhairi C Jack, Lorna Sherwood,  
Alistair B Lawrence, Marie J Haskell

SAC, UK.

\*Fritha.Langford@sac.ac.uk

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There has been a large increase in the number of organic dairy farms in the UK in recent years. However, there is little information on the impact of organic regulations on cow welfare. We aimed to investigate the relationships between behaviour and health on organic and conventional dairy farms. Twenty organic and 20 conventional farms throughout the UK were visited over two winters. Organic and conventional farms were paired for housing type, herd size, milk production and geographic location. On each farm, cows were locomotion scored to assess herd lameness prevalence and key aspects of management and housing quality were recorded. Instantaneous behavioural scans of milking cows were taken every 15mins for 2.5h after morning feeding. Herd behavioural synchrony was calculated for all farms and cow comfort indices were calculated for cubicle-housed herds (13 pairs). Smaller proportions of organic than conventional cow groups were lying down in bedded areas ( $F_{1,37}=6.9, P<0.01$ ), whereas a larger proportion of organic cows were active in the passageways ( $F_{1,37}=14.8, P<0.001$ ). Cubicle design ( $F_{4,19}=30.5, P<0.001$ ), type of cubicle bedding ( $F_{2,19}=9.4, P<0.01$ ) and standing area available ( $F_{3,19}=7.7, P<0.05$ ) were associated with time spent standing or lying in cubicles. Lameness positively correlated with proportion of cows lying down ( $R^2=55.3, P<0.01$ ). Synchrony varied with housing type, with straw-housed cows being more synchronous than cubicle-housed cows ( $P<0.001$ ) On cubicle farms, changes in synchrony over the scan period differed between organic and conventional farms ( $F_{9,30}=17.6, P<0.05$ ). 'Cubicle occupancy' was the only cow comfort index to differ between organic and conventional farms with conventional having a higher cubicle occupancy than organic cows ( $56.5\pm 5.3\%$  vs  $44.7\pm 6.1\%$ ,  $F_{1,137}=4.91, P<0.05$ ). In conclusion, most variation in dairy cow behaviour was explained by housing type and cubicle factors. However, lying behaviour differed with organic status and correlated with herd-level lameness scores, suggesting that there is potential for organic farms to offer improved dairy cow welfare.

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## A FLOORING COMPARISON: THE IMPACT OF RUBBER MATTING ON THE BEHAVIOR AND WELFARE OF GROUP HOUSED SOWS DURING BREEDING

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Monica R Pittman\*, Joseph P Garner, Brian T Richert, Edmond A Pajor

Purdue University, USA.

\*[mrpittma@purdue.edu](mailto:mrpittma@purdue.edu)

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Sows may be group housed during the breeding period. These pens typically have concrete flooring, which can cause injury to the sows and may hinder their ability to rest comfortably. There has been little work done to assess the impact of flooring on the behavior and welfare of sows. We hypothesize that the addition of rubber mats will improve sow welfare by increasing traction for postural adjustments and will be more comfortable when resting. Landrace x Yorkshire sows (132) were housed in pens of 4 at breeding. The pens contained a slatted group area and 4 feeding stalls. Rubber mats (measuring 183 cm x 61 cm x 0.635 cm) were added to the feeding stalls of half of the pens and rotated to the opposite pens for each replication. The behavior of the sows was recorded throughout the experiment and was analyzed post-breeding for time budget information and detailed lying and standing behavior. Data were analyzed with split-plot GLM and post-hoc Tukey tests. The pattern of behaviors performed in the stall *versus* group area was different for mat and concrete treatments (GLM:  $F_{2,150}=11.64$ ;  $P<0.001$ ). Tukey tests showed that only resting behaviors were affected. We then examined resting behavior in detail. Time spent in different lying postures (sternal *versus* lateral) did not differ between treatments. However, sows on mats performed more of their lying behavior in the stalls, whereas concrete sows performed more of their lying in the group area ( $F_{1,90}=27.28$ ;  $P<0.001$ ). In the stalls, sows on mats laid down and stood up more frequently than did those on concrete ( $F_{1,30}=13.53$ ;  $P<0.001$ ). In conclusion, sows showed a preference for resting on mats. This appears to be due to increased ease of postural adjustment (as shown by the higher frequency of standing and lying), which may in turn benefit long-term comfort.

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## THE EFFECTS OF EXERCISE ON PRODUCTION, INTERBIRTH INTERVALS, AND LYING BEHAVIOURS IN GESTATING STALL-HOUSED GILTS

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<sup>2</sup>Donald C Lay Jr, <sup>1</sup>Erin L Schenck\*, <sup>2</sup>Kimberly A McMunn, <sup>3</sup>Brian D Nielsen,  
<sup>1</sup>Brian T Richert, <sup>2</sup>Jeremy N Marchant-Forde

<sup>1</sup> Purdue University, USA.

<sup>2</sup> USDA-ARS-LBRU, USA.

<sup>3</sup> Michigan State University, USA.

\*elschenc@purdue.edu

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Lameness in breeding age gilts and sows is a major cause of early culling, causing increase economic losses and welfare concerns. Stall housed sows tend to have more joint, foot and leg problems than group housed sows. The aims of this study were to determine if exercise would decrease lameness and have an affect on production, inter-birth intervals and lying behaviours during lactation. The study was composed of three treatment groups; control (C, n=5), high exercise (H, n=7, 121.9 m 2 d/wk and 426.7 m for 3 d/wk) and low exercise (L, n=4, 121.9 m 5 d/ wk). All gilts were stall housed for the duration of gestation and H and L gilts were exercised from d 35 to 110 of gestation. Gilts were moved into farrowing crates on d 112 of gestation for approximately 24 d. Video recorders were used to record inter-birth intervals. After farrowing, lying behaviour was recorded for 3 d. Lying behaviour was measured by recording the time of 3 different stages of lying (standing to kneeling, kneeling to rotating shoulders, lowering hind limbs to ground). GLM procedures of SAS were used to analyze data. There was no difference in the length of gestation, number of piglets born alive or weaned, litter birth weight, adjusted average piglet weaning weight, and average interbirth interval ( $P>0.05$ ) among treatments. The C group took more time to lie ( $P<0.05$ ) than the H group in stages 2, 3 and the total lying time was greater. In conclusion, exercise during gestation has no effects on production variables or average interbirth intervals, but it does influence lying behaviours.

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## SYNTHETIC LYING MATTRESS IMPROVES LYING COMFORT OF PREGNANT SOWS

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**<sup>1</sup>Frank AM Tuytens\*, <sup>1</sup>Filip Wouters, <sup>1</sup>Ester Struelens, <sup>2</sup>Bart Sonck, <sup>3</sup>Luc Duchateau**

<sup>1</sup> Animal Science Unit, Institute for Agricultural and Fisheries Research, Belgium.

<sup>2</sup> Unit Technology and Food, Institute for Agricultural and Fisheries Research, Belgium.

<sup>3</sup> Department of Physiology, Biochemistry and Biometrics, Faculty of Veterinary Medicine, Ghent University, Belgium.

\*[frank.tuytens@ilvo.vlaanderen.be](mailto:frank.tuytens@ilvo.vlaanderen.be)

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Lying comfort is important for sow welfare of sows as they spend 80% of their time lying. Nevertheless, sows are predominantly housed on bare concrete floors. Straw-bedding is rarely provided due to cost, labour, hygiene, and manure drainage concerns. The objective of this study was to evaluate a prototype lying mat as an alternative to straw bedding to improve sow lying comfort. The experiment was conducted during autumn-winter on a dynamic group of 47 uniquely marked gestating sows housed in a pen with five communal lying areas. Lying mats were installed in three lying areas while the concrete floors of the remaining lying areas remained uncovered (period 1). After five weeks the position of the lying mats was rotated (period 2). 24h image-recordings were made every 2-4 days from five weeks prior to the installation of the mats until five weeks after rotation of the mats. The effects of the mats on lying area occupancy and behaviour (activity, lying bout duration, lying posture, lying duration per posture, getting-up duration, frequency of changing lying posture) were analysed. Sows, and sows habituated to the experimental set-up in particular, showed a preference for lying areas with mats ( $p < 0.05$ ). This preference was more pronounced in period 2 than period 1. The effect of period, however, was confounded with stocking density and ambient temperature. Mats did not significantly affect activity (standing, sitting, or lying), lying bout duration, duration of lying per lying posture (sternal, half recumbent, recumbent) or getting-up duration. Sows lying on mats as compared to concrete, however, changed lying posture more often ( $z = -3.05$ ,  $p < 0.05$ ) and were more likely to adopt a recumbent instead of sternal lying posture ( $z = -2.93$ ,  $p < 0.01$ ). Under conditions of this experiment, covering concrete floors with synthetic mats appears to be a promising alternative to straw-bedding for improving lying comfort.



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## LOCOMOTION ABILITY OF HOLSTEIN-FRIESIAN GENOTYPES UNDER TWO GRAZING SYSTEMS

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<sup>1,2</sup>Gabriela Olmos\*, <sup>3</sup>Laura Boyle, <sup>3</sup>Brendan Horan, <sup>3</sup>Donagh P Berry,  
<sup>3</sup>John F Mee, <sup>2</sup>Alison J Hanlon

<sup>1</sup> Moorepark Dairy Production Research Centre, Teagasc, Ireland.

<sup>2</sup> School of Agriculture, Food Science & Veterinary Medicine, UCD, Ireland.

<sup>3</sup> Moorepark Dairy Production Research Centre, Teagasc, Ireland.

\*[Gabriela.olmos@teagasc.ie](mailto:Gabriela.olmos@teagasc.ie)

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Three genotypes of spring-calving Holstein-Friesian dairy cows (n=126) with respective average value ( $\pm$ SD) economic breeding index (EBI; Nov. 2005) of 30 (13.6), 70 (9.7) and 80 (18.67) were allocated to either a high concentrate (2.8 LU/ha and 1,200 kg concentrate/cow/yr) or low concentrate (2.6 LU/ha and 500 kg concentrate/cow/yr) grass based feed system. Clinical lameness (CL) was recorded routinely and the effect of genotype or feed system on the logic of the probability of CL (CL=1 if lame within the first 200 days in milk, otherwise CL=0) was modelled using logistic regression. Locomotion ability (LA) was assessed fortnightly using 6 different gait aspects (spine curvature, speed, tracking, head carriage, abduction/adduction and general symmetry). Each aspect was scored from 1 (not-lame) to 5 (severely lame). All gait aspects and as well as the average LA were set at a threshold of 4. The hazard of a cow reaching the threshold at day  $t$  post-calving, given that it had not reached the threshold by time  $t-1$ , was modelled using survival analysis. Incidence of CL was 25%. The EBI 30 genotype tended to have higher incidence of CL (P=0.09) and poorer LA (P=0.09) compared to the other genotypes. Feed system had no significant effect on CL although animals on the high concentrate feed system had a significantly greater hazard of poorer LA (hazard ratio = 3.05; 95% CI: 1.78 to 5.25). Of the different aspects of locomotion, spine curvature differed (P $\leq$ 0.05) across genotypes. The EBI 70 and 80 genotypes exhibited a lower hazard of an inferior spine score than the EBI 30 genotype. This study indicates that selection for higher EBI will have no deleterious effect on LA or CL and actually may favour better locomotion. Nonetheless, being a short-term study, further measures across time are required to confirm these results.

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## EFFECT OF BREED AND PRODUCTION SYSTEM ON LOCOMOTION SCORES IN DAIRY CATTLE

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<sup>1</sup>Lorna G Baird\*, <sup>2</sup>Niamh E O'Connell, <sup>3</sup>Maurice A McCoy

<sup>1</sup> Agri-Food and Biosciences Institute, Northern Ireland.

<sup>2</sup> Agri-Food and Biosciences Institute, and Queens University Belfast, Northern Ireland.

<sup>3</sup> Department of Agriculture and Rural Development for Northern Ireland, and Queens University, Belfast, Northern Ireland.

\*[Lorna.baird@afbini.gov.uk](mailto:Lorna.baird@afbini.gov.uk)

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It is commonly believed that Holstein Friesian (HF) cattle have poor hoof health compared to other dairy cattle breeds. However, little scientific evidence exists to support this claim and to promote the benefits of hoof health in alternative dairy breeds. The present study assessed the effects of HF and Norwegian (N) genotypes on lameness in dairy cattle within different production systems. Following calving, HF (n=39) and N (n=45) heifers were allocated to one of three dietary treatments balanced for breed (high level of concentrate ("High"), low level of concentrate ("Low"), and grass-based ("Grass")). "High" and "Low" animals were continuously housed whereas the "Grass" treatment grazed from peak to late lactation. Animals were locomotion scored on a scale of 1 (normal) to 5 (severely lame) every two weeks during Lactation 1 and 2. Scores were averaged by lactation. Locomotion scores were higher in Lactation 2 than Lactation 1 (2.11 and 1.81, respectively;  $p < 0.001$ ). Higher locomotion scores were observed in N animals compared to HF animals (2.02 and 1.90, respectively;  $p < 0.001$ ). In Lactation 1, 5 HF and 14 N cows were scored as 'obviously lame' with similar numbers in Lactation 2. Diet had no influence on average locomotion score ( $p = 0.20$ ). No interactions between diet and breed were observed ( $p = 0.32$ ). Breed influenced lameness in dairy cows in the present study; however the relationship between breed and locomotion score was not in the expected direction. Breed differences in hoof health parameters (sole lesions, digital dermatitis, and hoof dimensions) still need to be quantified.

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## BEHAVIOURAL CORRELATES OF INDUCED FEVER IN DAIRY CALVES

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<sup>1</sup>Fernando T Borderas\*, <sup>2</sup>Anne Marie B De Passillé, <sup>2</sup>Jeffrey P Rushen

<sup>1</sup> Animal Welfare Program, University of British Columbia / Universidad Autónoma Metropolitana-X,  
Canada / México

<sup>2</sup> Pacific Agri-Food Research Centre. Agriculture and Agri-Food Canada, Canada

\*borderas@interchange.ubc.ca

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The incidence of illness among dairy calves remains high and the increased use of group housing makes detection of disease more difficult. Our aim was to better describe calves' early behavioural responses to illness to help improve early detection. Injections of bacterial lipopolysaccharide (LPS) induce a short-term and reversible fever similar to that found with bacterial infection. We examined the behavioural correlates of this fever. 12 dairy calves at each of two ages (3wk and 20 wk), housed in individual pens and fed milk and concentrates with free access to hay and water were injected i.v. with one of two low doses (0.025 or 0.05 µg/kg) of LPS just prior to feed delivery with saline injections as a control. 16 calves showed an increased body temperature (>39.5°C) lasting 2-8h with a maximum temperature of 40.59±0.52 °C attained 4.62±0.96 hrs after the LPS injection. Video recordings were used to measure durations of behaviours during a 4h period when body temperatures were elevated. We found (PROC MIXED) a decreased duration (min) of rumination (LPS vs saline 6.02±3.48 vs 23.03±6.40, p<0.01), hay eating (23.58±6.50 vs 31.99±7.07, p<0.05), and frequency of self-grooming (13.37±2.67 vs 22.95±2.67, p<0.05), and an increased duration of inactivity (157.47±7.68 vs 111.36±12.52, p<0.01). Changes in these behaviours therefore may indicate the beginning of illness. Time spent lying down, lying down with head supported and amount of concentrate and milk consumed were not affected (p>0.10). There were no differences between the two doses and no interactions between LPS and the age of the calves. A more precise description of the behaviours associated with fever will help detect sick animals at an earlier stage. Low doses of LPS help identify behavioural changes occurring before a full scale infection develops. However, the short duration of the effect and differences between calves in sensitivity to LPS limit the effectiveness of this model of illness.

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## EPIDEMIOLOGY OF FELINE BEHAVIOUR PROBLEMS IN SPAIN

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**Marta Amat\*, Jaume Fatjó, Valentina Mariotti, Raquel Castelltort,  
Jose L Ruiz de la Torre, Xavier Manteca**

Clinical Ethology Service, School of Veterinary Science. Universitat Autònoma de Barcelona, Spain.

\*[marta.amat@uab.es](mailto:marta.amat@uab.es)

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Behaviour problems are one of the main reasons of euthanasia and relinquishment of cats to animal shelters. In order to develop preventive strategies it is necessary to have good epidemiological data, which could differ from one geographical area to another. There is no published information about the epidemiology of feline behaviour problems in Spain. A retrospective study was designed to evaluate the prevalence and main characteristics of feline cases in the caseload of the Animal Behaviour Clinic at the Barcelona School of Veterinary Medicine. Three hundred thirty six cats presented for a behaviour problem between 1998 and 2006 were included in the analysis. The main owner's complaint was aggression (47%) followed by inappropriate elimination (39%). Sixty four percent of aggression cases involve conflicts between cats and 34% aggression towards people. From all problems of inappropriate elimination, 59% involved urination, 32% urination and defecation and 9% defecation. Regarding breed related factors, most cats (75%) were crossbreed. Seventy percent of Persian cats were presented for a problem of elimination. Forty seven percent of patients were males and 53% were females. Forty six percent of cats were obtained from the street and 29% were homebred. Most cases of aggression directed towards family members meet the criteria for play related aggression and petting related aggression. Although it seems to be a certain degree of overlap between some categories of diagnosis, 68% of inappropriate elimination cases were clearly related to litterbox aversions and 17% to urine marking. Nevertheless, it should be remembered that these results come from a referral practice caseload that may not reflect the prevalence of behaviour problems in the general feline population.

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## THE EFFECTS OF GASTROINTESTINAL ILLNESS ON THE INTRA-SPECIFIC SOCIAL BEHAVIOUR OF *Canis familiaris*

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<sup>1</sup>Michael W Brunt, <sup>2</sup>Maxwell CK Leung, <sup>2</sup>Trevor K Smith, <sup>1</sup>Suzanne T Millman\*

<sup>1</sup> Department of Population Medicine, Ontario Veterinary College, University of Guelph, Canada.

<sup>2</sup> Department of Animal and Poultry Science, Ontario Agricultural College, University of Guelph, Canada.

\*smillman@uoguelph.ca

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During illness animals exhibit behavioural changes, including lethargy, anorexia, fever, adipsia and anhedonia, that are believed to comprise an evolutionary strategy. Social motivation generally decreases during illness, but responses of familiar individuals during illness have not been explored. The objective of this study was to determine the effects of gastrointestinal illness on social motivation of dogs. Twelve mature beagles were assigned to three treatment diets: a control diet (C), a diet formulated with grains contaminated with *Fusarium* mycotoxins (MT), and a MT diet that included a polymeric glucomannan mycotoxin adsorbent, which was expected to reduce the toxic effects of the MT (B). All dogs received the three diets for 14 days in a Latin square design. Dog were individually released into the centre aisle of the housing room for four minutes per day, and social interactions with neighbouring dogs were recorded by an observer, who was blind to treatment groups and who viewed dogs through a window outside the room. Statistical analysis was conducted utilizing a generalized linear mixed model with the fixed effects being treatment, day and treatment\*day interaction. The model random effects were treatment period and focal dog. The mean frequency of social interactions decreased from 5.22 (C) to 4.24 (MT) ( $p=0.001$ ). Additionally, attempts at physical contact ( $p=0.010$ ) and visual contact ( $p=0.037$ ) were less frequent by dogs in the MT treatment. Conversely, physical proximity, olfactory contacts and arousal did not significantly differ with diet. The mycotoxin diet and the mycotoxin diet containing the polymeric glucomannan mycotoxin adsorbent did not significantly differ. In conclusion, induction of gastrointestinal illness caused decreases in assertive social interactions while not affecting behavioural elements that were likely associated with exploratory motivation. Flexibility of behavioural responses supports the concept of sickness as a motivational system. These findings present new opportunities to evaluate the welfare of laboratory dogs.

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## DEVELOPING A MODEL DIAGNOSIS FOR SEPARATION-RELATED PROBLEMS BASED ON A BEHAVIOURAL TEST

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<sup>1</sup>Elisa Ruiz-Izaguirre\*, <sup>2</sup>Johanna de Groot, <sup>3</sup>Joanne AM van der Borg, <sup>4</sup>Lisette Graat

<sup>1</sup>Animal Production Systems Group, Department of Animal Sciences, Wageningen University,

<sup>2</sup>Adaptation physiology Group, Department of Animal Sciences, Wageningen University

<sup>3</sup>Ethology Group, Department of Animal Sciences, Wageningen University

<sup>4</sup>Quantitative Veterinary Epidemiology Group, Department of Animal Sciences, Wageningen University

\*[eliza.ruiz@wur.nl](mailto:eliza.ruiz@wur.nl)

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The diagnosis of separation-related problems is difficult due to non-specific signs common to different aetiologies. Common owner reported problems include: vocalisations, house-soiling and destructive behaviour. Part of the dogs suffering from separation-related problems have separation anxiety (SA), which may be defined as problem behaviour motivated by anxiety that occurs exclusively in absence of the owner. Currently there is no agreement on objective criteria for differentiation of SA from other diagnoses within the spectrum of separation-related problems. The objective of this study was to develop a diagnostic tool to differentiate sub-diagnoses of separation-related problems. Methods included comparisons of C-barq questionnaires to behavioural test results of 46 dogs (20 problem dogs according to the owner and 26 controls). The test consisted of three phases (I: dog + owner, 5 minutes; II: dog alone, 20 min; III: dog + owner, 1 min). Behaviour of the dog was recorded through a one-way screen. Behaviours reported by owners vs. behaviours observed in the test room were compared with the Kappa (K) value test. The agreements were moderate, e.g.: restlessness (K=0.62, CI 0.39-0.85), peeping (K=0.67, CI 0.46-0.88) and barking (K=0.68, CI 0.47-0.89). Exact logistic regression was used to find odds ratio (OR) for behaviours shown by problem dogs compared to control dogs. Cut-off values for behaviours were defined according to statistical and ethological considerations. Dogs barking in the test room had a 9 fold increased risk of belonging to the problem group (P=0.0109; OR=8.9, 90 per cent CI 1.85 to 66.31). Behaviours with significant OR's (jumping, locomotion and vocalisations) were used to create different diagnostic groups. The most severe group (9 out of 20 problem dogs) might be the 'true SA' dogs. We conclude that diagnosis of separation-related problems based on a behavioural test may help to objectively differentiate the aetiology of separation-related problems, particularly SA.

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## WALK THIS WAY: COMPARING THE ABILITY OF A FORCE PLATE OR GAIT SCORING TO PREDICT CHICKEN LEG HEALTH ACCORDING TO POST MORTEM DATA

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<sup>1</sup>Victoria Sandilands\*, <sup>1</sup>Laurence Baker, <sup>1</sup>Rod McGovern, <sup>2</sup>Barry H Thorp,  
<sup>3</sup>Sarah Brocklehurst, <sup>1</sup>Nicholas HP Sparks

<sup>1</sup> Scottish Agricultural College, UK.

<sup>2</sup> Aviagen Ltd, UK.

<sup>3</sup> Biomathematics Et Statistics Scotland, UK.

\*[Vicky.Sandilands@sac.ac.uk](mailto:Vicky.Sandilands@sac.ac.uk)

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Welfare of chickens kept for meat, in particular their leg health and gait, is a major concern to FAWC and other welfare groups. However, an objective, reliable, on-farm method of assessing chickens' walking style (gait) is arguably not available. Here, we aimed to further develop force plate (FP) technology to objectively assess gait in chickens and compare measurements from FP and Bristol Gait Score (BGS, subjective score 0-5 assigned to birds based on walking style) methods with post mortem (PM) results. Twelve groups of chickens (n=964 total) were reared to 6 weeks of age. Weekly from 3 weeks of age, each bird was encouraged to walk along a 0.8 m long FP in the home pen. The FP had load cells in each corner that measured forces applied in vertical, longitudinal, and lateral directions that were recorded directly onto a PC. This provided data on walking style e.g. step length, width, stance time per foot. Birds were simultaneously assessed by BGS. At 6 weeks of age, one third of birds (n=338) selected for a variety of BGS were culled and examined PM for various leg health parameters e.g. footpad and hock scores, limb torsion; and presence of pathologies e.g. femoral head necrosis and tibial dyschondroplasia. Multiple regression was used to fit PM results to FP or BGS measurements at 3, 4, 5 and 6 weeks of age and best fits were assessed on the basis of sensitivity (SE) and specificity (SP). FP data were better at predicting PM results than BGS, particularly at four (e.g. hock: 0.75 SE, 0.76 SP; significant pathologies: 0.63 SE, 0.68 SP) and five weeks of age (e.g. footpad: 0.76 SE, 0.77 SP, hock: 0.74 SE and SP). The results suggest that FP gives a more accurate assessment of gait/leg health than BGS, according to PM.

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## THE EFFECT OF LIGHT INTENSITY ON BROILER BEHAVIOR AND LEG HEALTH

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<sup>1</sup>Richard A Blatchford, <sup>1</sup>Joy A Mench\*, <sup>2</sup>Patricia S Wakenell, <sup>3</sup>Gregory S Archer

<sup>1</sup> Department of Animal Science, University of California, USA.

<sup>2</sup> School of Veterinary Medicine, University of California, USA.

\*[jamench@ucdavis.edu](mailto:jamench@ucdavis.edu)

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Broilers are typically raised commercially in dim lighting. It has been suggested that providing brighter diurnal light intensity could improve leg health and provide opportunities for more normal behavioral rhythms. We therefore examined the effects of three light intensities (5, 50, and 200 lux) on behavior and leg condition of broilers (N = 455, with 4 replicate pens/treatment). Broilers were reared under these intensities from 1-6 wk of age; photoperiods consisted of 16L: 8D with 1 lux intensity during the scotophase for all treatments. General activity was measured continuously using passive infra-red detection, and feeding activity measured by feed consumed per hour, during one 24-hour period per pen each week. At 6 weeks of age, all broilers were gait scored using a 0-5 scoring system, weighed, euthanized, and evaluated for the occurrence of leg abnormalities. There were no significant differences between treatments for body weight (mean =  $2.32 \pm 0.01$  kg;  $P = 0.58$ ), feed conversion ratio ( $0.18 \pm 0.004$ ;  $p=0.77$ ), or feeding activity ( $0.94 \pm 0.04$  kg/hr;  $p=0.98$ ). There were also no significant differences in gait score, but broilers reared with 50 lux had more ( $p=0.002$ ) hock erosions (32 broilers) than those reared with either 5 or 200 lux (17 and 10 broilers). Broilers reared with 5 lux showed less ( $p=0.001$ ) change in activity between day and night than with 50 or 200 lux, and also a trend to be less ( $p=0.08$ ) active during the day than 50 or 200 lux. Thus, rearing broilers with higher-intensity lighting is effective in increasing activity, but does not decrease lameness. However, intermediate light intensity (50 lux) was associated with somewhat poorer leg health.



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## EFFECT OF STOCKING DENSITIES AND ELEVATED PLATFORMS ON BEHAVIOUR, WALKING ABILITY AND LEG POSTURE OF TOM TURKEYS

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Jutta Berk\*, Ellen Cottin

Institute for Animal Welfare and Animal Husbandry, Germany.

\*[Jutta.Berk@fal.de](mailto:Jutta.Berk@fal.de)

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The objective of the study was to evaluate the effect of different stocking densities and an elevated platform as environmental enrichment and a resting place on the behaviour of male turkeys (BUT Big6). In total 1,224 turkeys were used in two trials. The turkeys were housed in 6 floor compartments (each 18 m<sup>2</sup>) with litter or in 6 floor compartments (each 18 m<sup>2</sup>) with litter, elevated platforms (5.5 m<sup>2</sup>) and ramps at a low (38.2 kg/m<sup>2</sup>) or a normal (50 kg/m<sup>2</sup>) stocking density (SD). The number and the behaviour (locomotion, standing, sitting) of animals was recorded on the floor as well as on the platform. Turkeys were evaluated for leg posture and walking ability at 6, 12, 15 and 20 weeks of age. The data were analysed using GLM-Procedure for analysis of variance (SAS). The turkeys spent most of their time sitting (56.4%, 54.4%), followed by standing (38.3%, 39.7%) and locomotion (5.3%, 5.9%), in trial 1 and 2 respectively. SD did not influence behaviour. In the enriched compartments turkeys sat significantly more on the elevated platforms compared to the floor area (71.5 vs. 46.2%) unlike standing (25.7 vs. 46.9%) and locomotion (2.8 vs. 6.9%). The average use of platforms did not differ between trials (28.6 vs. 27.6%). With increasing age walking ability and leg posture deteriorated independent of SD or housing condition ( $p < 0.05$ ). The results indicate that heavy turkeys showed a preference for perching and appropriate possibilities should be offered in practice. The deterioration of walking ability and leg posture with increasing age suggest that the fast growth rate seems to have a larger influence on welfare parameters than enrichment of the environment. In spite of the increased possibilities of locomotion in the lower SD this had no positive effects on the behaviour.

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## EFFECT OF SWITCHING MILKING FREQUENCY IN MID-LACTATION ON DAIRY COW BEHAVIOUR, MILK LEAKAGE AND UDDER FIRMNESS

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Laura A Boyle\*, Keelin KM O'Driscoll, Gabriela Olmos, Paolo A Gazzola,  
David Gleeson, Bernadette O'Brien

Teagasc – Irish Agriculture and Food Development Authority, Moorepark Research Centre, Ireland.

\*[laura.boyle@teagasc.ie](mailto:laura.boyle@teagasc.ie)

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Changing milking frequency (MF) offers benefits to producers with seasonal calving herds. Our aim was to evaluate if switching MF affects behaviour, udder firmness and milk leakage. Spring calving cows (n=42) were blocked according to calving date, milk yield and parity and randomly assigned to three treatments from calving: i) twice daily milking for the full lactation (2x); ii) 2x switched to once daily (2x1x) and iii) 1x switched to 2x (1x2x). MF was switched at 110 [19.7 SD] days in milk (Day 0). Prior to the morning milking on days -2, -1, +1, +2 and +7 five aspects of locomotion were scored from 1 (normal) to 5 (severely abnormal) and milk leakage was recorded. In the milking parlour udder firmness was scored from 0=loose to 3=hard. Step/kicking behaviour during cluster attachment was also scored. Lying behaviour of 10 cows/treatment was recorded using Tinytag™ data loggers during 3 periods i) -7 to -1; ii) 0 to +2 and iii) +5 to +10 days. Data were analysed in SAS using general linear mixed models and chi-square tests. On day +1, six of 14 2x1x cows, and no cows in the other treatments were leaking milk ( $P<0.01$ ). More 2x1x cows had udder firmness scores of 3 (2x1x: 5/9; 1x2x: 0/14; 2x: 2/12;  $P<0.05$ ). Treatment had no effect on locomotion or on behaviour in the parlour ( $P>0.05$ ). There was no effect of MF on lying duration prior to switching ([mean/24hr period] 2x: 10.7hrs; 2x1x: 10.4hrs; 1x2x: 11.2hrs, SEM 0.335;  $P>0.05$ ). However, 2x1x cows lay less (9.9hrs) in days 0 to +2 compared to 1x2x cows (11.5hrs) (SEM 0.457;  $P<0.01$ ). This difference was still apparent the following week (8.0 vs. 9.3hrs, SEM 0.253;  $P<0.001$ ). Switching from 2x to 1x daily milking caused transient udder distension and a reduction in lying time which have implications for cow welfare.

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## APGAR SCORE MODIFIED FOR PIGLETS: NEW INSIGHT FOR PERI-NATAL ETHOPHYSIOLOGICAL CLINICS

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**María Alonso-Spilsbury\*, Daniel Mota-Rojas, Hector Orozco-Gregorio, Miguel González, Adriana Olmos-Hernández, Pedro Sánchez, Ramiro Ramírez-Necochea**

Laboratorio de Etología, Producción Porcina y Fauna Silvestre,  
Universidad Autónoma Metropolitana Unidad Xochimilco, México.

*\*maspilsbury@hotmail.com*

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Since the early 1950's Virginia Apgar designed a scale to evaluate newborn motor and neurological reflexes. The test has also been widely used in biomedical research using guinea pigs, rabbits and piglets. However, in veterinary medicine it has no use. The aim of this paper is to provide new insights on the Apgar modified score for piglets, which has been used as a tool in a more comprehensive study on piglet asphyxia by our team of researchers, as a mean to assess early postnatal piglet viability. In this retrospective study, ethophysiological and biochemical traits from 16,500 piglets were monitored in a 2-year study in three commercial pig farms. Briefly, Apgar score consisted in the sum of 5 indicators obtained within the first min of birth; these were: gasping attempt latency, latency to first standing on foot, cardiac frequency, meconium staining, and snout colour grading. Each indicator has a value of 2, thus, an excellent score is 10, and 5 a poor one. So far, our results show that neonates with evidence of acute foetal suffering (AFS) had 3 points less in the Apgar score compared with those newborns without AFS. From every 100 neonates scored with zero in the first gasping latency (took >1 min to breath) 86% of them showed a latency to first suckling of >1 hour. Failed piglets with a score lower than 5 and showing severe asphyxia, had a lactate figure >95 mg/dL ( $P<0.005$ ) and pH levels <7.0 ( $P<0.001$ ). There was a high correlation ( $r^2=0.71$ ) between the low Apgar scored piglets and severe meconium stained and hypoglycaemic piglets. Also, a high correlation between the vitality score and latency to first suckling ( $r^2=0.75$ ,  $P<0.001$ ) was found. Therefore, the Apgar modified score for piglets proved to be a suitable test to evaluate the neonate vitality in commercial farms.

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## DEVELOPMENT OF PRE-TRAINING TESTS FOR GUIDE AND ASSISTANCE DOGS

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**Deborah L Duffy, James A Serpell\***

Center for the Interaction of Animals and Society, School of Veterinary Medicine,  
University of Pennsylvania, USA.

\*[serpell@vet.upenn.edu](mailto:serpell@vet.upenn.edu)

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Roughly 50% of dogs bred and raised as potential guide or assistance dogs do not succeed through training. Among failed dogs, the majority are rejected for behavioural reasons. Ideally, dogs with the best temperaments would be chosen as breeders in order to improve the behavioural phenotype and thus reduce the numbers of failed dogs. However, it has been a challenge to assess a dog's temperament until after it has begun training, by which time most dogs have been neutered. While many organizations have developed methods for testing behaviour prior to training, currently there is no universally agreed upon protocol, and the methods in place have rarely been tested for validity or reliability. This paper describes the development of a series of standardized behavioural tests for measuring dogs' reactions to a variety of stimuli and situations relevant to guide/assistance dog performance. These tests are designed to be simple to implement and applicable to any organization, enabling meaningful comparisons across schools. The test series currently includes six subtests that measure the dogs' responses to: 1) invasive handling (being touched and manipulated in a manner similar to a veterinary exam), 2) a looming object (large object falling nearby), 3) a threatening stranger (a human approaching in a mildly threatening manner), 4) a fleeing prey-like lure, 5) an unfamiliar dog and 6) a sudden loud noise. The first three of these tests have been fully developed and reveal strong inter-observer reliability ( $n=6$  observers, Pearson's  $r \geq 0.70$ ,  $p < 0.005$  ( $n=3$  dogs),  $r \geq 0.58$ ,  $p < 0.025$  ( $n=3$  dogs), and  $r \geq 0.72$ ,  $p < 0.0001$  ( $n=7$  dogs) for subtests #1, 2 and 3, respectively). Theoretical and practical considerations involved in the process of test development will also be addressed.

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## SEASONAL CHANGES OF AGGRESSIVE BEHAVIOUR IN FREE-RANGING DOGS (*Canis familiaris*) IN RELATION TO SEX, AGE AND PLACES

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Sunil Kr Pal

Katwa Bharati Bhaban, India.

[drskpal@rediffmail.com](mailto:drskpal@rediffmail.com)

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In nature aggressive behaviour is mainly aimed at survival. Most previous studies have been conducted to illustrate the development of aggressive behavior. The purpose of this study was to observe the seasonal changes of aggressive behavior in different places in free-ranging dogs (*Canis familiaris*). Data were collected in order to compare the intra- and inter-group aggression in different seasons, and also to evaluate the levels of aggression in relation to sex and age of the dogs. Observations on the aggressive behavior of free-ranging dogs from two neighbouring groups were recorded in this study. Animals were observed for 4h/day, and for a total 1440h over 360 days. Behavioural data were collected using ad libitum and focal-animal sampling. Group home range sizes were maximum in late monsoon and then in winter. Inter-group aggression was more common than that of the intra-group aggression. Mean ( $\pm$  S.E.) seasonal number of intra- and inter-group aggressive encounters of individual dog was greatest in winter ( $16.21 \pm 3.37$  and  $34.43 \pm 7.00$  respectively) and then in late monsoon ( $13.79 \pm 2.73$  and  $31.00 \pm 5.42$  respectively). The places in relation to aggression were not same ( $\chi^2 = 423.65$ ,  $df = 4$ ,  $p < 0.05$ ). Lactating females were more aggressive in the feeding places and in the nest sites, and adult males were more aggressive in the mating places and at the territorial boundaries. Although individual differences in aggression were observed, overall levels of aggression were higher among the adult females than for other. The adult dogs of either sex based on aggressive encounters influenced dominance hierarchies and territory maintenance. These results suggest that aggressive behavior of free-ranging dogs changes with the seasons and places; and also variable with the sex and age of the dogs.

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## CHILDREN AND DOGS - BITES IN VARIOUS SITUATIONS

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<sup>1</sup>Jan Nahlik, <sup>1</sup>Eva Baranyiova\*, <sup>2</sup>Mojmir Tyrlik

<sup>1</sup> University of Veterinary and Pharmaceutical Sciences Brno, Czech Republic.

<sup>2</sup> Masaryk University, Faculty of Arts, Brno, Czech Republic.

\*Actavet@vfu.cz

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The aim of this study was to further analyse dog bites to children in the Czech Republic. Data were obtained from a questionnaire completed in randomly selected schools with children aged 4 to 13 years. A total of 103 dog bites to 92 children were analysed using chi square ( $\chi^2$ ) test. This time we looked at the size of dogs that bit children in various interactions. Most children were bitten in their home when disturbing a sleeping dog (83.3%;  $\chi^2=7.862$ ,  $df=1$ ,  $p<0.01$ ). Dogs, most often disturbed when resting or sleeping, were small dogs (83.3%,  $\chi^2=7.482$ ,  $df=2$ ,  $p<0.022$ ). When petting a dog, most children were bitten by a medium size (45.5%), large (31.8%) and small dog (22.7%);  $\chi^2=5.588$ ,  $df=2$ ,  $p<0.068$ ). Children injured by own dog had accidentally caused pain to it before being bitten (83.3%;  $\chi^2=7.862$ ,  $df=1$ ,  $p<0.012$ ). Five children reported to have accidentally caused pain to a dog and were bitten thereafter, always by a small dog ( $\chi^2=7.482$ ,  $df=2$ ,  $p<0.022$ ). Three children reported to have deliberately caused pain to a dog – these were all small dogs - (100.0%,  $\chi^2=6.279$ ,  $df=2$ ,  $p<0.05$ ). Children also teased dogs and were bitten most frequently by a small dog (75.0%),  $\chi^2=6.98$ ,  $df=2$ ,  $p<0.032$ ). Girls (50.0%;  $\chi^2=6.2$ ,  $df=2$ ,  $p<0.038$ ) and boys (80%;  $4.302$ ,  $df=2$ ,  $p<0.122$ ) were bitten in the head region mostly by small dogs. Girls were bitten in the hands (64.4%) more often than boys ( $\chi^2=3.27$ ,  $df=1$ ,  $p<0.077$ ). Boys were bitten in the feet/legs more often (74.4%) than girls (25.6%), ( $\chi^2=8.311$ ,  $df=1$ ,  $p<0.004$ ). These results indicate that children are more presumptuous when interacting with small dogs and underestimate their defence and suggest some differences between the approach of boys and girls to dogs.

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## THE EFFECT OF BREEDING FOR SHOWS ON THE TEMPERAMENT OF DOGS

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**<sup>1</sup>Björn Forkman\*, <sup>2</sup>Kent Svartberg, <sup>3</sup>Hans Temrin**

<sup>1</sup> Department of Large Animal Sciences, University of Copenhagen, Denmark.

<sup>2</sup> Department of Anatomy and Physiology, Swedish University of Agricultural Sciences, Sweden.

<sup>3</sup> Department of Zoology, Stockholm University, Sweden.

\*bjf@life.ku.dk

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The goal of many breeders is success for their dogs in competitions, often dog shows. In shows there is an emphasis on the exterior of the animal, and to a smaller extent the temperament of the dog. In the current study we compared the self-reported breeding goals of dog breeders with the temperament of their dogs. Questionnaires were collected from breeders who had had their dogs tested in the Swedish Dog Mentality Assessment (data included here are the breeds with more than 50 breeders): Boxer (54 breeders, 1409 dogs), rough-haired collie (62 breeders, 653 dogs), flat-coated retriever (70 breeders, 437 dogs), Labrador retriever (171 breeders, 400 dogs), and German shepherd (203 breeders, 4921 dogs). A regression analysis was made between each breeder's interest in dog shows and six welfare relevant measures in the Dog Mentality Assessment. No significant regression was found for the flat-coated retrievers, whereas the Labradors were less social and harder to handle if the breeder was interested in shows ( $R\text{-sq}= 4.6\%$   $p=0.03$ ,  $R\text{-sq}= 5\%$   $p=0.02$ ). There was a tendency for both Collies and Boxers to be frightened of sounds if the breeder was interested in shows ( $R\text{-sq}= 4.9\%$   $P=0.11$ ,  $R\text{-sq}= 6.1\%$   $p=0.08$ ). The German shepherds showed a dramatic picture however, 18% of the variation in play ( $p=0.000$ ), 9% of the variation in fear in a sudden appearance situation ( $P=0.000$ ) as well as 11% of the fear shown as a reaction to a sudden noise ( $p=0.000$ ) was explained by the breeders interest in dog shows, more interest positively correlated with higher levels of fear and lower of play. The German shepherds were also harder to handle if the breeder was interested in shows ( $R\text{-sq}= 4.6\%$ ,  $p=0.003$ ). The results suggest that at least for some breeds the breeding for shows results in more fearful and less social dogs.

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## FREE-ROAMING DOGS AND CATS IN CENTRAL ITALY: PUBLIC PERCEPTIONS AND MAGNITUDE OF THE PROBLEM

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<sup>1</sup>Paolo Dalla Villa<sup>2</sup>, <sup>2</sup>Maragert Slater, <sup>1</sup>Antonio Di Nardo, <sup>1</sup>Ombretta Pediconi,  
<sup>1</sup>Luca Candeloro, <sup>1</sup>Barbara Alessandrini, Stefania Del Papa

<sup>1</sup> Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale", Italy.

<sup>2</sup> Dept of Veterinary Integrative Biosciences, College of Veterinary Medicine, USA.

\*[p.dallavilla@izs.it](mailto:p.dallavilla@izs.it)

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A telephone survey of randomly selected households was conducted in central Italy. The purpose was to obtain data on the locations, numbers and problems associated with free-roaming dogs and cats in the area. The response rate was 74% (397 households). Ninety percent of respondents reported that free-roaming dogs and cats were a problem. Personal safety was the most commonly reported concern, followed by animal welfare, public health and environmental sanitation. Sixty nine percent of respondents actually saw free-roaming dogs or cats in the areas they live. Dogs were most commonly seen, but cats were seen in greater numbers. Overall, 10% and 5% of respondents cared for free-roaming cats and dogs, respectively. These results confirm the presence of large numbers of free-roaming dogs and cats in the area. They also indicate concerns about animal welfare, which is consistent with legislation making it illegal to euthanize healthy animals. Respondents believed that the government had primary responsibility for these animals. Using the information from this study, research on the underlying causes of abandonment of dogs and cats or failing to sterilize them should undertaken to begin to address this problem. Funding for existing laws and new, carefully considered interventions are needed to address the sources of free-roaming dogs and cats and to handle existing homeless animals.



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# ORAL PRESENTATIONS

## FRIDAY 3<sup>RD</sup> AUGUST 2007

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## CAN STRESS BE DECREASED BY EXPOSURE TO ODORS OR PHEROMONES IN PIGS? BEHAVIORAL, IMMUNOLOGICAL AND PHYSIOLOGICAL EFFECTS

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Nadège Krebs\*, Mhairi A Sutherland, John J McGlone

Texas Tech University, USA.

\*krebsnadege@yahoo.fr

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Weaning is a stressful event for piglets. Odors and pheromones can decrease aggressive behavior and improve performance in groups of newly-weaned pigs. The objective of this study was to determine the effects of individual exposure to odors and pheromones following acute stress on behavior, immunology and cortisol levels. Nursing pigs (n=7/treatment) were separated from the sow, transported for 30 min and isolated for 30 to 60 min in a room with a randomly-assigned treatment sprayed in the crate: control (C, water), amyliacetate (AA) or synthetic maternal pheromone (MP, Suilence®, CEVA Santé Animale). Blood samples were taken before transport (T1), after transport (T2) and after exposure to the treatment (T3) for immunological and cortisol data. Maintenance behaviors (standing, lying, sitting) and the treatment-related behaviors (close contact with the treatment, orientation of the head towards the treatment) were continuously recorded during exposure. Control pigs spent more ( $p < 0.05$ ) time standing ( $46.7\% \pm 4.26$ ) compared to MP ( $31.8\% \pm 3.81$ ) and AA-exposed pigs ( $31.5\% \pm 3.81$ ). Transport did not affect ( $p > 0.05$ ) the percentage of lymphocytes, neutrophils and the Neutrophil:Lymphocyte (N:L) ratio but after treatment exposure (T3), the percentage of lymphocytes were lower ( $p < 0.05$ ), the percentage of neutrophils were higher ( $p < 0.05$ ) and N:L ratio was higher ( $p < 0.05$ ) compared to T1 and T2. AA reduced ( $p < 0.05$ ) the percentage of lymphocytes, increased ( $p < 0.05$ ) the percentage of neutrophils and increased ( $p < 0.05$ ) the N:L ratio (T1:  $46.3 \pm 10.4$ ; T2:  $60.8 \pm 13.7$ ; T3:  $119.1 \pm 9.3$ ) compared to T1 and T2. Transport increased ( $p < 0.05$ ) cortisol levels (T1:  $28.0 \text{ ng/mL} \pm 10.6$ ; T2:  $108.7 \text{ ng/mL} \pm 10.2$ ) but cortisol levels were not affected ( $p > 0.05$ ) by any treatment (T3:  $92.1 \text{ ng/mL} \pm 10.2$ ). Odor exposure had no effect ( $p > 0.05$ ) on lymphocyte proliferation. In conclusion, pigs lied down more when exposed to an odor (AA) or a pheromone (MP) than when they were exposed to nothing. Cortisol was not decreased by any treatment but AA affected some immune measures.

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## EFFECT OF REPEATED SOCIAL INSTABILITY IN PREGNANT SOWS ON LEARNING ABILITY OF THE OFFSPRING

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<sup>1</sup>Sébastien Goumon, <sup>1</sup>Elodie Merlot, <sup>2</sup>Sabine Roussel, <sup>2</sup>Christine Duvaux-Ponter,  
<sup>1</sup>Alain Boissy, <sup>1</sup>Isabelle Veissier, <sup>1</sup>Marie-Christine Meunier-Salaün\*

<sup>1</sup>INRA, France.

<sup>2</sup>Ecole Agronomique de Paris-Grignon, France.

\*[marie-christine.salaun@rennes.inra.fr](mailto:marie-christine.salaun@rennes.inra.fr)

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Repeated stress on pregnant females decrease learning abilities of offspring in rodents. Our study aimed to evaluate such an effect in prenatally stressed piglets born to sows submitted to repeated social disruption during pregnancy. Primiparous sows were housed in pairs and either submitted to eight social mixings during the third trimester of pregnancy (Stressed S, n=18) or remained in stable pairs during the same period (Control C, n=17). Two weaned piglets per litter born to S (n=15) and C sows (n=13) were accustomed to a T-shape room. Thereafter they were submitted individually to a learning test in the same room with one branch of the T leading to food (initial task); the test was then repeated with the other branch leading to the food (reverse task). The learning performance was assessed by the number of trials necessary to choose the rewarded arm on 3 successive trials, out of 12 trials, and the latencies to choose this arm. Non parametric analyses were applied. The number of trials to reach the learning criterion in the initial task did not differed in S ( $4.5 \pm 0.4$  trials) and C piglets ( $5.4 \pm 0.6$  trials), as in the reverse task ( $S=7.6 \pm 0.7$ ;  $C=6.2 \pm 0.7$  trials). The latency to choose the rewarded arm did not differed both in the initial task ( $S=11.2 \pm 1.3s$ ;  $C=15.9 \pm 3.6s$ ) and in the reverse task ( $S=13.7 \pm 1.6s$ ;  $C=14.1 \pm 2.2s$ ). In conclusion, performances in the initial task have to be evaluated in a larger sample. The low performance during the reverse task may come from piglets being all disturbed by the changes associated to the reversal. Further studies are needed concerning the period of application of the stressor during pregnancy and the consequences on other cognitive tasks.

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# PERICONCEPTIONAL UNDERNUTRITION IN SHEEP INCREASES AVERSION TO HUMANS AND MODIFIES LATERALITY IN THE OFFSPRING

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<sup>1,3</sup>Carlos E Hernandez, <sup>1</sup>Mark H Oliver, <sup>2</sup>Frank H Bloomfield, <sup>2</sup>Suzanne Held,  
<sup>2</sup>Jane E Harding, <sup>3</sup>Lindsay R Matthews\*

<sup>1</sup> Liggins Institute, University of Auckland, New Zealand.

<sup>2</sup> Centre for Behavioural Biology, University of Bristol, UK.

<sup>3</sup> Animal Behaviour and Welfare, AgResearch, New Zealand.

\*[lindsay.matthews@agresearch.co.nz](mailto:lindsay.matthews@agresearch.co.nz)

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Undernutrition confined to the time around conception in ewes results in numerous endocrine and metabolic alterations in their offspring. However, its effects on postnatal behaviour have not been studied. We studied behaviour and cognitive ability in 4-month old lambs born to ewes randomly allocated into two nutritional groups: well nourished (control, n=36) and mildly undernourished from 60 days before until 30 days after mating (UN; 10-15% body weight reduction, n=26). The lambs were evaluated in a human approach/avoidance arena-test (10min) and in a left-right choice maze. In the arena, we measured mean distance from and time to approach the human, and number of vocalisations, defecations and urinations. In the maze, we assessed side preference (>60% choice; both exits open) and performance on two reversal (R) learning episodes (one exit closed) using social and feeding motivation as rewards. Reversal learning was assessed as runs required to reach criterion (three correct consecutive choices) on R1 and R2, and change in runs required to reach criterion from R1 to R2. Data were compared using standard least squares analyses allowing for twin/singleton status and sex, Fisher's exact test or Wilcoxon rank sum test. UN lambs were slower to approach the human (67 vs 34 sec, sed=11; p<0.05), and males maintained a greater distance from the human (4.2 vs 3.6 m, sed=0.3; p<0.05) and vocalized less (53 vs 75 vocalizations, sed=8; p<0.01) than females independent of treatment. Side preference was affected by maternal undernutrition in females (40% UN vs 86% controls preferred right; p<0.01) but not males. Reversal learning was similar in the two groups. These results demonstrate that mild maternal undernutrition around conception increases aversion to humans and alters laterality in the offspring. Relatively minor challenges at critical prenatal periods of development can affect the behaviour of lambs at least up to 4-months old.

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## BEHAVIOURAL DEVELOPMENT IS DELAYED IN MOUSE PUPS FOLLOWING MATERNAL UNDERNUTRITION IN PREGNANCY

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Cathy M Dwyer\*, Christine Moinard, Kirstin M McIlvaney, Elizabeth Ormandy,  
Colin A Morgan, Lutz Bünger

Scottish Agricultural College, UK.

\*[Cathy.dwyer@sac.ac.uk](mailto:Cathy.dwyer@sac.ac.uk)

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Maternal undernutrition has a long term impact on the health and survival of the offspring. In this study we investigated 1) whether prenatal undernutrition had a impact on neonatal behavioural development in mice; and 2) whether the offspring of mouse lines selected for different growth traits would be disproportionately affected. Mice (n=54) of three lines: fast growing, fat (FF), fast growing, lean (FL) and normal growth, lean (NL) were assigned to one of two nutritional treatments on day 1 of gestation: ad libitum feed intake (C) or pair-fed 80% of ad libitum (R). All dams were fed ad libitum after birth, and three pups from each line were cross-fostered onto each dam within treatment. One male and one female pup from each line per litter (n=324) were assessed daily for physical development and the development of reflex responses and motor skills until d16. Data were analysed by linear mixed models. R dams gave birth to smaller litters than C dams (C=16.8, R=15.4 pups, s.e.d.=0.53,  $p<0.05$ ), and to lighter pups ( $p<0.001$ ). R pups of FL dams were disproportionately lighter than other lines ( $p<0.01$ ). Pup physical development was significantly delayed in R pups (e.g. teeth eruption (d): C=10.30, R=10.69, s.e.d.=0.08,  $p<0.001$ ). The appearance of reflexes (forepaw grasp and placing, vibrissae placing, righting, cliff drop response, negative geotaxis, climbing) were all delayed by approximately 0.5d in R pups compared to C (e.g. maximal righting response (d): C=5.90, R=6.58, s.e.d.=0.19,  $p<0.001$ ). R pups tended to be slower to start crawling ( $p=0.08$ ) and were slower to walk ( $p<0.001$ ) than C pups. There were no significant interactions between pup line and treatment, or effects of foster dam on neonatal behavioural development. The data suggest that prenatal undernutrition causes a significant developmental delay in pup physical and neurological development, which is not compensated by neonatal nutritional rehabilitation.

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## TWO-STEP WEANING REDUCES STRESS IN DAIRY CATTLE

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**<sup>1</sup>Jenny M Loberg\*, <sup>1</sup>Carlos Hernandez, <sup>2</sup>Tomas Thierfelder, <sup>3</sup>Margit Bak Jensen,  
<sup>1</sup>Lena Lidfors, <sup>4</sup>Charlotte Berg**

<sup>1</sup> Swedish University of Agricultural Sciences, Dep. of Animal Environment and Health, Sweden.

<sup>2</sup> Swedish University of Agricultural Sciences, Dep. of Biometry and Engineering, Sweden.

<sup>3</sup> Research Center Foulum, Dep. of Animal Health, Welfare and Nutrition, Denmark.

<sup>4</sup> Swedish Animal Welfare Agency, Sweden.

\*[Jenny.loberg@hnh.slu.se](mailto:Jenny.loberg@hnh.slu.se)

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The aim of this study was to investigate if the prevention of suckling, and the separation from a foster cow in two steps lower the behavioural stress reaction in calves as compared with if the two events occur simultaneous. Twelve groups with one cow and four calves each were used. Calves were either prevented from suckling by simultaneous separation from the cow at 10 weeks of age (control, n=6 groups), or fitted with a nose-flap, which prevented them from suckling at 10 weeks of age and kept with the cow for another 2 weeks before they were separated at 12 weeks of age (two-step, n=6 groups). Behaviour of the calves and heart rate was recorded, and saliva samples were taken after the calves were prevented from suckling (both treatments) and after separation of two-step calves. Behaviours and saliva cortisol were analyzed with a GLIM and heart rate data was analyzed with a GLM. When prevented from suckling, two-step calves vocalized (1.7 calls/h) and walked less ( $p<0.001$ ) compared to control calves (64.8 calls/h), but there was no difference in heart rate or cortisol. Calves in the two-step treatment sniffed the interior of the pen less ( $p<0.001$ ) and were less social with calves in the group ( $p<0.001$ ) compared to calves in the control treatment. At separation calves in the two-step group vocalize (1.9 calls/h) and walked less ( $p<0.001$ ) and they also had lower heart rate (99 bpm;  $p<0.001$ ) and lower increase in cortisol (-0.43 nmol/l;  $p<0.05$ ) than control calves (67 calls/h; 107 bpm; 0.3 nmol/l). We conclude that weaning in two steps by first preventing suckling and secondly separating the calf from the cow reduces the behavioural reaction to both and the physiological reaction to the separation in dairy calves when weaned from foster cows.

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## DOES FEEDING LEVEL AFFECT NON-NUTRITIVE SUCKING BY DAIRY CALVES?

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<sup>1</sup>Anne Marie B de Passillé\*, Jeffrey P Rushen, <sup>1,2</sup>Fernando T Borderas

<sup>1</sup> Agriculture and Agri-Food Canada, Canada.

<sup>2</sup> University of British Columbia, Canada.

\*[depassilleam@agr.gc.ca](mailto:depassilleam@agr.gc.ca)

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Non-nutritive sucking by milk-fed dairy calves has been shown to occur after the milk meal and to be stimulated by the taste of milk. Recent evidence suggests that an increased feeding level can affect sucking motivation. In this study we examined how offering milk via an automated feeder at a level of 12 L/d vs 4 L/d would affect sucking behaviour of calves kept in small groups (8-12 calves). We video taped the teat in the feeder so as to observe the head and mouth of the calf during and after drinking milk. Differences between treatments were tested using t-test (SAS). A single meal where the calves drank 2L was selected for 7 calves on each feed level at 2 and 4 weeks of age. Calves on the low feed level spent less time in nutritive sucking ( $2.4 \pm 0.2$  min; vs:  $3.9 \pm 0.6$  min;  $p=0.03$ ) and had fewer nutritive sucking bouts ( $1.1 \pm 0.2$  bout vs  $6.0 \pm 0.9$ ) than calves on the high feed level. Non-nutritive sucking was observed after nutritive sucking mainly for the calves on the low feed level who spent more time ( $1.27 \pm 0.17$  min vs:  $0.08 \pm 0.07$  min;  $p<0.01$ ) and showed a higher frequency ( $2.8 \pm 0.4$  vs  $0.6 \pm 0.5$ ;  $p<0.01$ ) of non-nutritive sucking bouts than calves on the high feed level. These results indicate that non-nutritive sucking is greatly reduced by higher feeding levels, suggesting that non-nutritive sucking by calves can be a response to hunger. These results indicate that non-nutritive sucking is greatly reduced by higher feeding levels, suggesting that non-nutritive sucking.



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## MILKBAR DESIGN AND WEANING BY DILUTED THE MILK AFFECTS DAIRY CALVES' BEHAVIOUR

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<sup>1</sup>Per Peetz Nielsen\*, <sup>2</sup>Margit Bak Jensen, <sup>3</sup>Tomas Thierfelder, <sup>1</sup>Lena Lidfors

<sup>1</sup> Department of Animal Environment and Health, Swedish University of Agricultural Sciences, Sweden.

<sup>2</sup> Institute of Animal Health, Welfare and Nutrition, Faculty of Agricultural Sciences, University of Aarhus, Denmark.

<sup>3</sup> Biometry and Engineering, Swedish University of Agricultural Sciences, Sweden.

\*per.peetz.nielsen@hnh.slu.se

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The effect of milkbar design and weaning method on milk and concentrate intake, weight gain and behaviour were investigated. Two blocks of six pens with four calves in each were fed three litres of whole milk per calf twice a day trough an artificial teat connected to a milkbar. Concentrate and hay were fed ad-libitum. Half of the pens were fed via a milkbar with separate milk compartments, SC, whilst the other half were fed via a milkbar with a common milk compartment, CC. Calves were gradually weaned during a 10 day period, starting at an average age of 47 days. Half of the pens in each block were weaned by gradually diluting the milk with water while maintaining the volume (WW), whereas the other pens were weaned by gradually reducing milk volume (GW). During and one week after weaning the concentrate intake per pen was recorded. Behavioural observations were performed during a period of 30 min following milk feeding, once before and once during weaning, using instantaneous sampling with 30 seconds interval. Individual milk intake was measured twice by weighing the calves before and after milk feeding. SC calves had a higher daily weight gain than CC calves ( $P < 0.05$ ). There was no effect of milkbar design on the variation in milk intake between the calves within groups. WW calves had a lower concentrate intake during weaning than GW calves ( $P < 0.01$ ). However, they spent more time eating concentrate and hay ( $P < 0.05$ ) whereas the GW calves were lying more ( $P < 0.001$ ) during the observation period. The results show that the milkbar design affects weight gain even though it does not affect the variation in milk intake. Furthermore, weaning calves by gradually diluting the milk with water reduces the concentrate intake during and after weaning, possibly through increased disturbances in the group around feeding.

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## ESTIMATING WHEN BEEF CALVES ARE READY TO BE WEANED BASED ON SOCIAL BEHAVIOR AND TIME BUDGETS

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Janice M Siegford\*, Megan K Sharra

Michigan State University, USA.

\*[siegford@msu.edu](mailto:siegford@msu.edu)

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Beef calves are typically weaned between 6-8 months of age when calves are thought to be dependent upon grass for nutrition and less socially reliant upon their dams. Cow-calf interactions and time budgets were evaluated to determine if 6 mo calves are ready to be weaned socially and physically. Instantaneous observations were performed on 48 Angus x Simmental cow-calf pairs at an experiment station in Lake City, MI. Scan samples of behavior and cow-calf interactions were taken every 20 min for 8 h over two consecutive days when the majority of calves were 2, 3, 4, and 6 months of age. Data were analyzed using a generalized linear mixed model. Calves tended to lie more than cows ( $P=0.07$ ). More lying was seen at 2 mo than at 4 mo ( $P=0.03$ ). Across time, calves walked more than cows ( $P=0.01$ ) while cows ruminated more than calves ( $P<0.01$ ). Calves grazed less than cows ( $P<0.01$ ). Grazing significantly increased from 2 mo through 6 mo ( $P<0.01$ ), until grazing by cows and calves was similar. No differences were seen over time in the number of times calves nursed, therefore, nursing may remain socially if not nutritionally important. Calves initiated more contact ( $P<0.01$ ), but cows licked calves more often ( $P=0.01$ ). Amount of contact and distance between cow-calf pairs did not change over time ( $P>0.05$ ), except at 4 mo when bulls were present for breeding. At this time, calves were closer to dams ( $P=0.01$ ), but less contact occurred than at 2 or 3 mo ( $P=0.02$ ). These results indicate a strong cow-calf bond is maintained for up to 6 mo even though calves graze as much as cows at this age. Weaning of calves at 6 mo may be more distressful socially than physically, underscoring the need to refine weaning methods that breaking this social bond less stressfully.

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# PREGNANT SOWS' VOCALIZATIONS AROUND FEEDING AS RELATED TO HUNGER AND AGGRESSION

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Marek Špinka\*, Gudrun Illmann, Helena Chaloupková,  
Kristýna Neuhauserová, Petra Kratinová

Institute of Animal Science, Prague – Uhřetín, Czechia.

\*[spinka@vuzv.cz](mailto:spinka@vuzv.cz)

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The aim of this study was to assess whether the rate of high-pitched vocalizations by sows around the time of feeding is a valid indicator of hunger and aggression levels. Sixteen groups of 3-6 pregnant sows were observed. Each group was recorded in three treatments: in Control treatment, the sows had been given a standard amount of food during the 5 a.m. feeding before the observation, in Hunger treatment, they had received half of the amount and in Satiety treatment, they had got double the amount. On the subsequent 1 p.m. feeding, the sows were observed between 10 min before and 15 min after they were fed dry food in a standard way in a trough. Vocalizations (other than normal grunting) and aggression (head knocks and bites) were recorded through a combination of one-zero and instantaneous sampling at 15 s intervals. Vocalization was much higher during 5 min before food was given (BeforeF) than during 5 min after the food was delivered (AfterF). Aggression, on the other hand, was higher AfterF than BeforeF. The amount of vocalization was not influenced by the treatments (mixed model, BeforeF:  $F_{2, 46.8}=2.21$ ,  $p=0.12$ ; AfterF,  $F_{2, 43.6}=21.52$ ,  $p=0.23$ ). Vocalizations were closely correlated with aggression AfterF (within groups, across treatments: Cochran-Mantel-Haenszel statistics for non-zero correlation,  $DF=1$ , value= 9.9,  $p=0.002$ ; across groups: Spearman  $r=0.85$ ,  $n=16$ ,  $p<0.0001$ ), but only non-significantly correlated with aggression BeforeF (within groups, across treatments: Cochran-Mantel-Haenszel,  $DF=1$ , value=2.7,  $p=0.10$ ; across groups: Pearson  $r=0.41$ ,  $p=0.12$ ). The Hunger treatment incited sows to a higher level of aggression BeforeF (aggression occurring in 24% of the scans) than both the Control (11%) and the Satiety treatment (10%). We conclude that neither the level of hunger nor the rate pre-feeding aggression are reflected in the vocalization rates; however, the aggression during the actual feeding is closely linked to vocalization rates. Therefore, recording pig vocalization has a potential for indirect assessment of aggression in some situations.

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## BEHAVIORAL EFFECTS OF “STEP-UP” RACTOPAMINE FEEDING PROGRAM ON FINISHING PIGS

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<sup>1</sup>Rosangela Poletto\*, <sup>2</sup>Brian T Richert, <sup>1</sup>Jeremy N Marchant-Forde

<sup>1</sup> USDA-ARS- Livestock Behavior Unit, USA.

<sup>2</sup> Department of Animal Sciences, Purdue University, USA.

\*[rpoletto@purdue.edu](mailto:rpoletto@purdue.edu)

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A better understanding of behavioral and neuroendocrine effects of ractopamine (RAC), a  $\beta$ -adrenergic agonist widely used as swine feed additive, is needed to elucidate its impact on pig welfare. Our aim was to evaluate the effects of a “step-up” RAC feeding program on behavior of finishing pigs. Thirty two pigs (16 barrows and 16 gilts) were assigned to pens of four (by gender) as either control (CTR) or RAC treatment. Treated animals were fed RAC at 5ppm for 2 weeks, then 10ppm for two more weeks until slaughter. The dominant and subordinate pigs in each pen were determined at assignment by continuous behavior observation (36h). Behavior was also continuously recorded for 24h on the day before dietary treatment (Phase I), four days during RAC 5ppm (Phase II), and four days during RAC 10ppm (Phase III). Ten-minute scan sampling was used to define time-budgets. Repeated mixed models were used to analyze behavioral data, presented as average percentages of total time. In general, RAC fed pigs spent less time inactive (73.73 vs. 77.86 $\pm$ 0.07;  $p < 0.05$ ) and more time alert (3.65 vs. 1.55 $\pm$ 0.03;  $p < 0.01$ ); however, there were phase by treatment interactions for these behaviors ( $p < 0.05$ ). Time spent bar biting (0.28 vs. 0.12 $\pm$ 0.002;  $p < 0.01$ ) and sham-chewing (2.35 vs. 1.64 $\pm$ 0.01;  $p < 0.05$ ), in addition to time spent sitting (1.50 vs. 0.42 $\pm$ 0.02;  $p < 0.05$ ), were also greater in RAC fed pigs compared to CTR. Initiated non-aggressive social behavior tended to be higher in subordinate compared to dominant pigs (2.41 vs. 1.47 $\pm$ 0.02;  $p = 0.07$ ), whereas engagement in agonistic interactions was higher in RAC pigs (treatment by phase;  $p < 0.05$ ) and subordinate gilts (gender by rank;  $p < 0.05$ ). Higher activity of RAC pigs may lead to increased aggression in the home pen, and greater incidence of oral-related behaviors proposed as stereotypic may be related to neuroendocrine effects of the compound, potentially disrupting finishing pigs’ welfare.

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## SOCIAL DOMINANCE OF FEMALE DAIRY GOATS AND RESPONSE TO SUPEROVULATORY TREATMENTS DURING THE NON-BREEDING SEASON

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Rodolfo Ungerfeld\*, Silvana P González, Marcela Vilariño, Alejo Menchaca

Departamento de Fisiología, Facultad de Veterinaria, Montevideo, Uruguay.

\*piub@internet.com.uy

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The objective was to determine if there is a relation between the goat's hierarchical position into a herd and the number of corpus luteum and the embryo quality obtained in superovulatory treatments during the non-breeding season. Therefore 34 superovulatory treatments with FSH were applied to 20 goats during the non-breeding season. Does were allocated in two groups of 10 individuals, and 332 and 569 agonistic interactions were registered in each group to calculate the success index (SI=number of individuals displaced/ number of individuals displaced + number of individuals that displace it). The animals were classified in three categories according to their SI: Low (<0.33), Medium (0.33-0.66), and High (>0.66). A significant relation was observed between SI and number of corpus luteum (CL) in both groups of does (pooled data,  $r=0.42$ ,  $P<0.01$ ). High and Medium SI goats had significant more CL than Low SI animals ( $17.5 \pm 3.0$ ,  $13.1 \pm 1.3$  and  $8.2 \pm 1.5$ ,  $P<0.01$ ). The number of transferable embryos (TE), and the percentage of recovered embryos (RE) that were TE (TE/RE) were not related with the SI (TE= $6.4 \pm 1.7$ ,  $5.7 \pm 1.3$  and  $2.9 \pm 0.9$ ; TE/RE= $60.7 \pm 11.7$ ,  $52.2 \pm 11.4$  and  $64.5 \pm 13.6$  for High, Medium and Low SI respectively,  $P>0.1$ ). Embryo quality (TE/CL= $62.3 \pm 5.9$ ,  $60.4 \pm 8.9$  and  $37.6 \pm 10.2$  %) tend to be better in High and Medium SI goats than in Low SI animals ( $P=0.1$ ). There was a link between hierarchical position and the number of corpus luteum, and there may be a better quality of the embryos produced by high ranked does. As the number of transferable embryos is the main determinant of the viability of superovulatory programmes, the difference observed may be of direct impact on those programmes, and may be considered to develop different managements of treated animals.

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## SOCIAL DOMINANCE, WATER TROUGH LOCATION AND COWS' DRINKING BEHAVIOUR

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Luis Carlos P Machado\*, Paula AD Coimbra, Thiago MP Machado,  
Vivian P Lipiarski, Maria José Hötzel

Universidade Federal de Santa Catarina, Brasil.

\*pinheiro@cca.ufsc.br

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Social dominance influences the use of resources by animals, especially when restricted. Water is an essential resource; therefore, a study to verify whether the location of the water trough would affect its use by animals of different social rankings was conducted. The drinking behaviour of 4 groups of eight non-pregnant cows each, on rotational grazing was compared under two situations: water trough (500L round PVC container, 0.6m high) inside the paddock (P) or in a 4m wide access corridor, 150m from the grazing paddock (C). Each group was directly observed in each situation from 6am to 6pm, and all drinking events and agonistic interactions were registered. A sociometric matrix classifying dominant (D), middle (M) and subordinate(S) animals was constructed. The number of drinking events and the time spent drinking were then compared in regard to the three social status groups. All groups withheld more drinking events in the P than in the C situation (D and M,  $P < 0.02$ ; S,  $P < 0.01$ ). D cows showed no difference in time spent drinking ( $P > 0.14$ ), but M (114 s/d/cow vs. 56 s/d/cow;  $P < 0.05$ ) and S cows (105 s/d/cow vs. 34 s/d/cow;  $P < 0.02$ ) drank longer in the P situation. Therefore S and M cows had less drinking events and drank for shorter periods of time in the C situation. There were no statistical differences among D, M and S animals in the P situation. However, D cows drank more often (1.12 events/d/cow vs. 0.63 events/d/cow;  $P < 0.02$ ) and longer (71 s/d/cow vs. 34 s/d/cow;  $P < 0.02$ ) than subordinate cows when the water trough was in the corridor. In the C situation, M cows showed no difference to both D and S cows in either behaviour ( $P > 0.14$ ). Hence, when in face of any kind of restriction, social dominance is a major factor affecting drinking behaviour, limiting the S animals' water intake.

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## THE EFFECT OF GENETIC SELECTION FOR HEALTH, FERTILITY AND LIFESPAN ON SOCIABILITY OF DAIRY COWS

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Jenny M Gibbons\*, Ramona D Donald, Ruth M Thurl, Lindsey A Maggs, Eileen Wall,  
Alistair B Lawrence, Marie J Haskell

SAC, Scotland.

\*[jenny.gibbons@sac.ac.uk](mailto:jenny.gibbons@sac.ac.uk)

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There is a general consensus within the UK dairy industry that health and longevity of dairy cows is declining. This may, in part, be due to breeding goals that focus primarily on production. There is an urgent need to address these concerns by developing balanced breeding goals to include health. However, it is important to consider any consequences that such breeding goals may have on dairy cow temperament and welfare. Sociability is an aspect of temperament that requires attention, as animals may adopt social strategies that are linked to health which may compromise welfare or be ethically undesirable. It is important to measure individuals' sociability in order to develop suitable temperament scores that can be used in future breeding programmes or as part of welfare assessment schemes. The aim was to measure sociability of first lactation Holstein-Friesian dairy cows selected from sires that scored high (H, n=144) and low (L, n=114) for 'fitness' traits (health, fertility and lifespan) to produce two treatment groups on 33 commercial farms. Sociability was recorded using instantaneous scan sampling of social behaviour to measure position, synchrony, neighbour identity and distance to nearest neighbour of the H and L cows within the herd. Synchrony was defined as the proportion of scans that H and L cows were observed exhibiting the same activity that the majority of the herd were engaged in. No significant differences were found between H and L for nearest neighbour distance ( $P > 0.05$ ) and position within the housing area ( $P > 0.05$ ). Cows from the H group showed less social synchrony ( $F_1 = 4.29$ ,  $P = 0.038$ ) and spent more time with 1<sup>st</sup> lactation cows as neighbours ( $F_1 = 4.82$ ,  $P = 0.028$ ). In conclusion daughters from sires scoring high for health, fertility and lifespan may have reduced sociability. This highlights the importance of assessing the correlated effects of selective breeding, in this case for fitness, on behavioural traits.

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## SUITABILITY OF SELECTED BEHAVIOURAL INDICATORS FOR ON-FARM WELFARE ASSESSMENT IN LOOSE HOUSED DAIRY CATTLE

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**<sup>1</sup>Simone Laister\***, **<sup>2</sup>Nina Hesse**, **<sup>3</sup>Daniela Zucca**, **<sup>2</sup>Ute Knierim**, **<sup>3</sup>Michela Minero**,  
**<sup>3</sup>Elisabetta Canali**, **<sup>1</sup>Christoph Winckler**

<sup>1</sup> Department of Sustainable Agricultural Systems, University of Natural Resources and Applied Life Sciences Vienna, Austria

<sup>2</sup> Department of Farm Animal Behaviour and Husbandry, University of Kassel

<sup>3</sup> Faculty of Veterinary Medicine, University of Milan, Italy.

\*[simone.laister@boku.ac.at](mailto:simone.laister@boku.ac.at)

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The aim of our study was to test whether behavioural parameters including *head butt* (HB), *displacing* (DP), *chasing-up* (CU), *agonistic total* (AGO), *slipping* (SP), *falling* (FA), *injurious total* (INJ), *tongue rolling* (TR), *sitting* (SI) and *abnormal total* (ABN) as well as potential positive indicators (*social licking*, SL; *playing*, PL; *horning*, HO) can be reliably recorded in the course of on-farm welfare assessment protocols in loose housed dairy cows. Inter-observer reliability was tested for 3 observers using live observations (n=22) and video clips (n=55). To investigate short-, mid- and long-term intra-farm consistency 31 farms in Austria, Germany and Italy (12–150 cows/herd; cubicle and deep litter systems) were visited three times at intervals of about 60 and 180 days following the first visit. To test day-to-day repeatability, 11 of these farms were visited on two consecutive days during one of the study periods. Frequencies of behaviours were recorded using continuous behaviour sampling (4h/day). For the parameters HB, DP, CU, AGO, SL, and HO inter-observer agreement (Kendall's coefficient of concordance) ranged between  $W=0.83-0.96$  ( $p < 0.0001$ ). At herd-level, day-to-day repeatability was highest for HB, *chasing*, AGO, PL and SI (Spearman rank correlations;  $r_s=0.81-1.00$ ,  $p < 0.0001-0.019$ ). Correlation coefficients regarding intra-farm consistency (days 1-60, 60-180, 1-180) above  $r_s=0.60$  were found for agonistic and injurious parameters and HO, and tended to decrease with longer intervals. Consistency across all days was above Kendall's  $W=0.70$  in HB, DP, AGO, SP and INJ. Only when the median frequency on herd level was  $\geq 0.10$  events/animal\*h, parameters were regarded as suitable for short-term observations. This was the case for HB, DP, AGO and SL. We conclude that the parameters HB, DP, AGO can be reliably recorded whereas positive indicators as well as injurious and abnormal behaviours are less suitable for inclusion in on-farm welfare assessment protocols for loose housed dairy cattle.



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## DAIRY COWS SHOW STRONG PREFERENCE FOR STALLS WITH DRY VERSUS WET BEDDING

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<sup>1,2</sup>Jose A Fregonesi\*, <sup>3</sup>Douglas Veira, <sup>2</sup>Marina AG von Keyserlingk, <sup>2</sup>Daniel M Weary

<sup>1</sup> Universidade Estadual de Londrina –UEL and CAPES, Brasil.

<sup>2</sup> University of British Columbia, Canada.

<sup>3</sup> Agriculture and Agri-food Canada, Canada.

\*jafregonesi@yahoo.co.uk

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Increased time spent standing outside of the stall increases the risk of lameness in dairy cattle. Cows prefer and spend more time lying down on stalls with more bedding, but no work to date has addressed the effects of bedding quality. Bedding in stalls often becomes wet either for exposure to the elements or from faeces and urine. The aim of this study was to test the effects of wet bedding on stall preference and use. Four groups of six non-lactating Holstein cows were housed in freestalls bedded daily with 10-15 cm of fresh sawdust. Following a 5 d adaptation period, cows were tested sequentially with access to stalls with either kiln dried or wet sawdust bedding ( $86.4 \pm 2.1$  versus  $26.5 \pm 2.1$  % dry matter) each for 2 d. This 'forced' phase was followed by a 2 d choice phase during which cows had free access to stalls containing either wet or dry bedding. Stall usage was assessed using 24 h video recordings scanned at 10 min intervals, and responses were analyzed using a mixed model with group ( $n = 4$ ) as the observational unit. The minimum and maximum environmental temperatures during the experiment were  $3.4 \pm 2.2$  and  $6.8 \pm 2.5$  °C, respectively. During the choice phase all cows spent more time lying down in the dry stalls ( $p < 0.001$ ), spending on average  $12.5 \pm 0.3$  h lying in these stalls and under an hour lying stalls with wet bedding. When cows had access to stalls with wet bedding they spend on average  $8.7 \pm 0.8$  h/d lying down, and this figure increased to  $13.9 \pm 0.8$  h/d when cows were provided stalls with dry bedding ( $p < 0.001$ ). When cows only had access to stalls with wet bedding they also spent more time standing in the stall and standing in the alley ( $p < 0.001$ ). In conclusion, dairy cows show a strong preference for a dry lying surface, and spend much more time standing outside of the stall when no dry lying surface is available.

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## DIFFERENCES OF LYING-STANDING ACTION AND LOCOMOTION POSTURE BETWEEN COWS KEPT ON PASTURE AND IN COWSHED

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Seiji Kondo\*, Makoto Takahashi, Tomohiro Mitani, Hiroyuki Kashiwabara,  
Koichiro Ueda, Hiroki Nakatsuji

Grad. School of Agriculture, Hokkaido University, Japan.

\*skon@anim.agr.hokudai.ac.jp

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To identify effects of grazing on health and welfare for cattle, differences of actions in lying-standing and locomotion posture were compared between cows kept on pasture and in cowshed. In Exp. 1, behaviors of 4 dry cows grazed on a pasture through a grazing season were recorded by VTR during 5-hr in each 8 days. On another 6 lactating cows kept in tie-stall all a day, their behavior were recorded by VTR through a 24-hr. The time-duration of following actions was compared for both groups: A time spent from stepping of fore-legs to lie until completing lying (L1), a time spent from the starting to bent a fore-leg until completing lying (L2), a time spent from the starting to stretch out a neck until completing standing(S), and a lying duration(LD). In Exp. 2, lameness score (Sprecher et al.,1997) through 3 complete steps were evaluated on VTR-records in 97 cows kept in day-night grazing farms (DG), 101 in daytime-grazing farms (TG) and 432 in free-stall-system without grazing (NG). In Exp.1, tie-stall cows spent longer seconds at L1 than grazing cows (10.7 vs 9.2,  $P<0.05$ ), while there was no difference of L2 and LD in both groups. S was 8.5 sec for tie-stall cows but 6.2 sec for grazing cows ( $P<0.01$ ). In Exp. 2, frequency distributions of each score in DG and TG were not different, though there was a difference between grazing-cows and NG (KS test,  $P<0.01$ ). Proportions of score 1 (normal) in DG and TG was 75.4 and 83.4%, while that in NG was 51.5%. In NG, cows of lameness and severely lameness (scores 4 and 5) were occupied 15.7%, while only 3 cows were score 4 and non cows in score 5 in DG and TG. Grazing cows may behave lying-standing and walking as a natural pattern than zero-grazing.

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## EFFECT OF MILKING ORDER AND TIME OFF PASTURE ON THE BEHAVIOUR AND PRODUCTIVITY OF DAIRY COWS

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<sup>1</sup>Naomi A Botheras\*, <sup>2</sup>Paul H Hemsworth, <sup>2</sup>Sarah J Chaplin, <sup>3</sup>Jeffrey P Rushen

<sup>1</sup> The Ohio State University, Columbus, OH, USA.

<sup>2</sup> Animal Welfare Science Centre, The University of Melbourne, Australia.

<sup>3</sup> Agriculture and Agri-Food Canada, Canada.

\*[botheras.1@osu.edu](mailto:botheras.1@osu.edu)

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Dairy cows in Australia graze outdoors year-round. With increasing herd sizes, cows may walk long distances (up to 1.5 km) between pasture and the milking facility, and wait considerable time (up to 3 h) to be milked. When the duration of milking is long, a consistent milking order results in the last cows to be milked spending longer away from pasture than other cows. We investigated effects of position in the milking order and time spent off pasture on dairy cow behaviour and productivity. At each of three farms (650, 550, 350 cows), 12 multiparous cows that consistently entered early (EARLY) and 12 multiparous cows that consistently entered late (LATE) in the milking order were observed at pasture, every 15 min during daylight and every 30 min at night. Milk yield and liveweight were measured once. Data were analysed by ANOVA. LATE cows spent  $187 \pm 33.5$  min (mean  $\pm$  SD) longer off pasture than EARLY cows. EARLY cows were observed more often lying down (farm1:  $40.7 \pm 8.47$  vs.  $35.6 \pm 5.72$ ,  $P < 0.05$ ; farm2:  $36.0 \pm 12.7$  vs.  $30.2 \pm 8.13$ ,  $P < 0.05$ ; farm3:  $38.7 \pm 4.85$  vs.  $31.3 \pm 4.54$ ,  $P < 0.001$ ) and more often idling ( $30.4 \pm 6.28$  vs.  $18.9 \pm 4.81$ ,  $P < 0.001$ ;  $17.6 \pm 7.48$  vs.  $12.0 \pm 3.89$ ,  $P < 0.07$ ;  $18.4 \pm 5.19$  vs.  $12.1 \pm 4.67$ ,  $P < 0.05$ ) than LATE cows. There was no difference in the number of times cows were observed grazing. At farm1, LATE cows had lower liveweights than EARLY cows ( $565 \pm 37.7$  vs.  $500 \pm 22.3$  kg,  $P < 0.05$ ). At the other farms, LATE cows had lower milk yields than EARLY cows ( $30.0 \pm 5.50$  vs.  $23.8 \pm 5.16$  kg,  $P < 0.05$ ;  $40.1 \pm 6.78$  vs.  $31.8 \pm 2.84$  kg,  $P < 0.01$ ). Reductions in observed lying and idling suggest less opportunities for rest for LATE cows, and reduced liveweights or milk yields of LATE cows, along with similar observed grazing times, suggest these cows were unable to achieve a feed intake similar to EARLY cows. Thus, time off pasture may have important implications for the behaviour, welfare and productivity of grazing dairy cows.

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## CORTISOL DAILY PROFILE IN THE DOMESTIC GOAT (*Capra hircus*) DURING THE BREEDING AND THE NONBREEDING SEASON

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<sup>1</sup>Lorenzo Alvarez\*, <sup>1</sup>Leopoldo Ortiz, <sup>2</sup>Francisco Galindo, <sup>3</sup>Luis Zarco

<sup>1</sup> Centro de Enseñanza Práctica e Investigación en Producción y Salud Animal (CEPIPSA).

<sup>2</sup> Departamento de Etología y Fauna Silvestre.

<sup>3</sup> Departamento de Reproducción Animal.

Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, México.

\*alorenzo@servidor.unam.mx

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A seasonal modulation of glucocorticoid levels have been described in several species, with its concentrations commonly being elevated during the breeding season. With the aim of determining the daily blood cortisol profile in the domestic goat during the breeding and nonbreeding season, four daily blood samples were taken during 12 days, beginning at different time, in a total of twelve adult goats. The levels of the glucocorticoid were determined by RIA and analyzed considering season (breeding and nonbreeding) and time of day (diurnal: 07:00-18:00h; nocturnal: 19:00-06:00h), using ANOVA and t tests. Oestrous behaviour was observed daily during the experiment. The average cortisol levels throughout the day were higher in the breeding than the nonbreeding season ( $28.9 \pm 5.0$  vs.  $9.3 \pm 0.9$  nmol/L respectively;  $p < 0.05$ ). The area under the daily cortisol curve was higher during the breeding ( $694.9 \pm 121.7$ ) than the nonbreeding season ( $224.2 \pm 22.6$ , nmol/L;  $p < 0.05$ ). During the breeding season, the average cortisol levels were higher in diurnal times than in nocturnal ( $33.1 \pm 5.4$  vs.  $24.7 \pm 5.0$  nmol/L respectively;  $p < 0.05$ ), and the highest levels of the corticoid were found when oestrous behaviour occurred. During the nonbreeding season the average cortisol values were similar in diurnal and nocturnal times ( $10.4 \pm 1.0$  vs.  $8.2 \pm 1.0$  nmol/L respectively;  $p > 0.05$ ). It is concluded that in the domestic goat, the daily levels of blood cortisol are higher during the breeding season than the nonbreeding season, probably due to an effect of estradiol. In addition, during the breeding season, the cortisol level undergoes significant changes during the day with the highest values in diurnal times. Supported by PAPIIT IN210006.

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## THE EFFECT OF FEEDER SPACE ALLOWANCES ON BEHAVIOR OF HENS HOUSED IN CONVENTIONAL CAGES

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<sup>1</sup>Collette M Thogerson\*, <sup>1</sup>Patricia Y Hester, <sup>2</sup>Joy A Mench,  
<sup>3</sup>Ruth C Newberry, <sup>1</sup>Joseph P Garner

<sup>1</sup> Department of Animal Sciences, Purdue University, Indiana, USA.

<sup>2</sup> Department of Animal Science, University of California, Davis, USA.

<sup>3</sup> Department of VCAPP, Washington State University, Pullman, USA.

\*collette@purdue.edu

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Inadequate feeder space for laying hens could increase competition at the feed trough causing aggression, disrupted feeding, reduced productivity, and mortality. Feeder space research using modern laying hen strains is limited; thus, our goal was to evaluate how feeder space allocation affects feeding behavior. We tested the hypothesis that decreasing feeder space would increase monopolization of the feeder by certain hens and decrease feeding by their cagemates. We housed 480 Hy-Line W-36 hens at five per cage (stocking density, 434.3 cm<sup>2</sup> per hen; feeder space 12.2 cm per hen). Baseline measures were taken for two weeks and then hens were restricted to 5.8, 7.1, 8.4, 9.7, 10.9, or 12.2 cm of feeder space per hen (16 cages per treatment). Behavior was assessed over a 24 h period monthly for each cage. We recorded feeding behavior every 10 minutes, and for each hen calculated time spent feeding (% of time the hen is feeding) and synchrony (mean number of additional hens feeding at the same time), and averaged these scores per cage. We also calculated for each cage: feeder occupancy (% of time any hen was feeding), and feeder monopolization (the probability that feeder access was equally distributed between all hens). Data were analyzed using a response-surface incorporating tier, treatment, age and repeated measures. With reduced feeder space, hens spent less time feeding (GLM:  $F_{2,680}=20.06$ ;  $P<0.001$ ); synchronized their feeding bouts to a lesser extent (GLM:  $F_{2,680}=24.74$ ;  $P<0.001$ ); and the feeder was occupied for less time (GLM:  $F_{2,675}=3.54$ ;  $P=0.030$ ) compared to baseline. Reduced feeder space did not result in monopolization of the feeder by certain individuals. With reduced feeder space, the hens abandoned species typical synchronous feeding, and all hens spent less time at the feeder. In conclusion, our results suggest that the Hy-Line W-36 hens adapted behaviorally to reduced feeder space.

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## EFFECT OF GENETIC SELECTION METHOD AND OF BEAK TRIMMING ON RESPONSE TO AN APPROACHING HUMAN AND TO A NOVEL OBJECT

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**T Bas Rodenburg\*, Koen A Uitdehaag, Esther D Ellen, Hans Komen**

Animal Breeding and Genomics Centre, Wageningen University, The Netherlands.

*\*bas.rodenburg@wur.nl*

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Laying hens are typically selected on own performance. Group selection is a novel method which includes the interaction with cage members in the selection decision, and can be used to select against mortality due to cannibalism. Hence, it is also expected that group selected birds will be less fearful than individually selected birds. The aim of this study was to assess the effect of genetic selection method and of beak trimming on response to an approaching human and to a novel object. To meet this aim, 168 four-bird cages from a second generation of group selection against mortality were compared with 300 cages with birds from a control line. Half of the birds from each population were beak trimmed. Birds were housed in the top tier of a three level battery system from 17 weeks of age. At 20 weeks of age the human approach- and novel object test was performed. The human approach test entailed that the experimenter appeared in front of the cage and recorded the immediate response of the birds: either holding still or moving away from the experimenter. After 10 s, the experimenter placed a novel object on the feeding trough and recorded the response of the cage over a 30 s period: either, holding still / approaching the novel object or moving away. Data were analyzed in SAS using the Genmod procedure for a binomial distribution, testing effects of selection method, beak trimming and their interaction. Group selected birds that were beak trimmed moved away more frequently from an approaching human than birds from the other experimental groups (Chi-square=10.47;  $P<0.01$ ). Contrary to expectations, there was no overall difference in fearfulness between group-selected and control birds at 20 weeks of age. This may be different when birds will be retested at 40 weeks of age.

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## IS SHAM DUSTBATHING "NORMAL" DUSTBATHING FOR A BIRD WHICH HAS NEVER EXPERIENCED LITTER

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Anette Wichman\*, Linda J Keeling

Swedish University of Agricultural Sciences, Sweden.

\*Anette.wichman@hmh.slu.se

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Birds usually dustbathe in litter material, but in the absence of this they show sham dustbathing. The question addressed in this study was whether birds which have been reared without litter and are used to perform sham dustbathing consider this to be 'real' (normal) dustbathing and are satisfied with this or, if given the opportunity, they would choose nevertheless to dustbathe in a functional substrate? We used the push-door as operant method to quantify motivation to dustbathe in 28 adult laying hens from four different treatments. The treatments reflected different previous experience of litter and were based on the time period during rearing that birds had been housed with access to peat; (1) never, (2) early rearing, (3) late rearing and (4) always. All hens were deprived of peat before the start of the test, which was carried out when the birds were adult, and they were tested every fifth day in a series of trials with increasing resistance of the push-door. A hen was removed from the test when she no longer successfully pushed through the door. The mean resistance birds pushed open to get access to litter was  $13.9 \pm 1.24$  Newton and there was no difference between birds with different previous experience of peat. Neither depending of whether they had access to peat during early rearing (GLM  $F_{1,24}=1.08$ ,  $p=0.31$ ), late rearing (GLM  $F_{1,24}=0.34$ ,  $p=0.57$ ), nor the interaction between these (GLM  $F_{1,24}=0.01$ ,  $p=0.91$ ). This implies that sham dustbathing is not satisfying, or perceived as normal dustbathing, for birds that developed dustbathing behaviour in the absence of litter since birds that had no previous experience of peat were as motivated to work to get access to this substrate as birds used to dustbathing in peat.

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## THE NOCTURNAL BEHAVIOUR OF BROILER CHICKENS

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**Helle H Kristensen**

Department of Large Animal Sciences, Faculty of Life Sciences, Copenhagen University, Denmark.

*hek@life.ku.dk*

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The nocturnal behaviour of broiler chickens was investigated with the objectives of 1) providing a general ethogram of the behaviour of broilers in the scotoperiod 2) assessing the effects of age and temporal variations in the light regime on the nocturnal behaviour of broilers. The behaviour of 12 groups of eight male ROSS 308 broiler chickens was recorded by infra-red sensitive video cameras and sampled instantaneous every 15 minutes for a 24-hour period at two and six weeks of age. Six groups experienced an undisturbed 8h scotoperiod, whilst six groups experienced a split scotoperiod of 8L:4D:8L:4D (L=light, 20 lux; D=dark, 0 lux, Osram 830 fluorescent light, no dusk or dawn). Hence, all groups were given a total of eight hours of darkness in each 24-hour period, allowing assessment of the importance of the temporal variations in the scotoperiod. Although behaviour was recorded in both the photo- and scotoperiods, this paper is limited to the latter. Overall, the broilers spent the scotoperiods resting (lying 44%, sitting 46%) standing (4%) and preening (4.5%). Behaviours, such as feeding, drinking, walking and foraging were rarely observed in the scotoperiod, irrespective of the light regime and age (0.5%, 0.02%, 0.5% and 0.0%, respectively). Broilers were less active in undisturbed (8h) than in split (4+4h) scotoperiods at two but not six weeks of age (Logistic analysis,  $X^2=6.18$ ,  $p=0.01$ , 1df). Nocturnal sitting and lying behaviour were significantly affected by light regime (Logistic analysis,  $X^2=4.68$  and  $6.79$ ,  $p=0.03$  and  $0.009$ , 1df, respectively). The birds preened significantly more during the scotoperiod at 6 than at 2 weeks of age (Logistic analysis,  $X^2=4.87$ ,  $p=0.03$ , 1df) irrespective of the light regime. The results suggest that most of the frequently observed nocturnal behaviours of broiler chickens are affected by the way in which the total amount of darkness is provided.



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## DAYTIME SHELTER SEEKING BEHAVIOUR IN DOMESTIC HORSES

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Camie R Heleski\*, Irina Murtazashvili

Michigan State University, USA

\*[heleski@msu.edu](mailto:heleski@msu.edu)

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Though many researchers are concerned about domestic horses spending excessive time in stalls, there is also concern about extensively kept horses having too little shelter access. Limited refereed information is available regarding factors associated with shelter seeking behavior (SSB) in domestic horses. To this end, we observed 50-60 horses housed in 8 separate pastures, each containing a shed. We predicted horses would use shelters more in cold, wet weather than in temperate weather. In phase 1, horses were observed over 12 months. Instantaneous samples were taken of how many horses were using a shed per pasture. Up to 676 scans were taken for each of the 8 pastures over 12 months (total observations = 5075). In phase 2, randomly selected focal animals were observed twice/wk for 16 wks. 44 focal animals were observed (total n = 1408 observations). Temperature (-9° to 34° C), wind speed (0 to 14.5 m/s), and precipitation were recorded. Though there were many weather conditions in which shelter usage was less than 10%, certain conditions contributed significantly to SSB. E.g., when it was snowing and wind speed was > 5 m/s, 62% of horses sought shelter. When it was raining and wind speed was > 5 m/s, 50% of horses sought shelter. Overall, there was more SSB when it was raining or snowing ( $p < 0.01$ ). The second phase of the study was fitted to a linear probability model. When wind speed was  $\geq$  annual average (4.5 m/s), rain increased the probability of a horse using a shelter by 33%; snow by 21%. With mature horses, it was frequently noted that small numbers would dominate the use of the shed. In foals, many more would share shed space ( $p < 0.01$ ). Though sheds often went unused, they appear to be an important option in certain weather conditions.

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## ASSESSMENT OF MOUSE TEMPERATURE PREFERENCES IN A HOME CAGE ENVIRONMENT

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Brianna N Gaskill\*, Stephanie A Rohr, Edmond A Pajor, Joseph P Garner

Purdue University, USA.

\*bgaskill@purdue.edu

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In laboratory environments mice are housed at 20-24°C. However their thermoneutral zone, where the body uses no additional energy to heat or cool itself, is 26-34°C. This inescapable challenge to homeostasis is by definition stressful, and will therefore affect many physiology. Mouse home cage temperature preferences are unknown; and prepubescent temperature physiology is poorly characterised. Our goal was to test the hypothesis that mice under standard laboratory conditions are not housed at a preferred temperature. We assessed the temperature preferences of C57BL/6 mice in standard laboratory housing from 4 to 12 weeks of age. Forty-eight mice (24 male and 24 female in groups of 3) all born on the same day were randomly assigned to one of 8 age treatments. One cage of males and one cage of females was tested each consecutive week. Mice were tested in a set of three connected cages. Each cage's temperature was set using a water bath. Over three days each group of mice was acclimated to each of the three temperatures (20°C, 25°C, or 30°C) in a random order. Then each group was given free access to all temperatures the last three days, and video taped continuously. The location and three behavioral categories (active, inactive, and maintenance) were recorded by instantaneous scan samples every 10 minutes over the three days and time budgets calculated. Angular transformed data was analyzed as a split-plot GLM with post-hoc Tukey tests. While both sexes chose warmer temperatures overall ( $F_{2,64}=69.59$ ;  $p<0.001$ ), they preferred warmer temperatures only for maintenance and inactive behaviors ( $F_{2,64}=19.16$ ;  $p<0.001$ ). This effect was most pronounced in females ( $F_{4,64}=3.26$ ,  $p=0.017$ ). As temperature selection varies by time of day, these behavioural differences cannot be due to passive responses to ambient temperature ( $F_{6,154}=7.26$ ;  $p<0.001$ ). We conclude that mice at 20-24°C are not housed at their preferred temperature.

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## EFFECT OF SOLAR RADIATION ON DAIRY CATTLE BEHAVIOUR, USE OF SHADE AND BODY TEMPERATURE IN A PASTURE-BASED SYSTEM

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<sup>1</sup>Cassandra B Tucker\*, <sup>2</sup>Andrea R Rogers, <sup>2</sup>Karin E Schütz

<sup>1</sup> Animal Science Department, University of California, Davis, USA.

<sup>2</sup> AgResearch, Ltd., New Zealand.

\*[cbtucker@ucdavis.edu](mailto:cbtucker@ucdavis.edu)

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Our aim was to understand how the level of protection from solar radiation, as provided by shade cloth, influenced the behaviour and physiology of dairy cattle. We compared the behaviour and body temperature of pastured dairy cattle kept in one of four treatments: no shade or free access to shade cloth that blocked either 25%, 50% or 99% of solar radiation (n=3 groups per treatment, 3 animals/group). The linear effect of treatment (1 df) was tested against the group term (8 df) with PROC GLM in SAS. Shade use increased with higher levels of protection from solar radiation (total shade use, 25%: 1.3 h, 50%: 3.0 h, 99%: 3.3 h/15.5 day-time h, SEM: 0.22 h,  $P<0.001$ ). Time spent in shade was positively related to ambient solar radiation, and increased in all treatments even on days with relatively low levels of ambient solar radiation (range of daily mean: 32 - 347 W/m<sup>2</sup>). Standing was the most common behaviour under shade (25%: 1.1 h, 50%: 2.7 h, 99%: 2.9 h/15.5 day-time h, SEM: 0.21 h,  $P=0.001$ ). Treatments had no effect on time spent lying or grazing (lying: no shade: 9.0 h, 25%: 9.1 h, 50%: 9.5 h, 99%: 8.8 h/24 h, SEM: 0.33 h,  $P=0.63$ ; grazing: no shade: 9.0 h, 25%: 9.1 h, 50%: 9.1 h, 99%: 9.3 h/24 h, SEM: 0.19 h,  $P=0.23$ ). Cows with more protection from solar radiation had lower minimum body temperature (no shade: 37.9°C, 25%: 37.9°C, 50%: 37.9°C, 99%: 37.7°C, SEM: 0.05°C,  $P=0.004$ ). On days with higher levels of ambient solar radiation, cows with more protection had smaller increases in body temperature between milkings (10:00 to 14:00 h,  $P=0.006$ ). Together, these results demonstrate that the degree of protection from solar radiation is an important design feature of effective shade for dairy cattle.

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## THE IMPORTANCE OF SHADE TO DAIRY CATTLE – TRADE-OFF BETWEEN SHADE USE AND RESTING WHEN EXPOSED TO DIFFERENT LEVELS OF LYING DEPRIVATION

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<sup>1</sup>Karin E Schütz\*, <sup>2</sup>Deborah Davison, <sup>1</sup>Neil R Cox, <sup>1</sup>Lindsay R Matthews

<sup>1</sup> AgResearch Limited, New Zealand.

<sup>2</sup> Dexcel Limited, New Zealand.

\*Karin.schutz@agresearch.co.nz

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This study aimed to investigate the importance of shade to lactating dairy cows in summer. Twelve cows were tested 9 times in a test arena for 1hr, under a range of ambient environmental conditions, where they were given an opportunity to stand in shade (80% solar radiation blocked), or to stand or rest in a non-shaded area, when deprived of lying for 0, 3 or 12hrs. We hypothesized that cows at lower temperature-humidity indices (THI) would increase their resting time when exposed to longer deprivation times, and at higher THI, the shade use would increase. Every time the cow entered a new area and changed positions between upright and lying, the time was noted in order to measure time spent in each area. Respiration rate (RR) and body temperature were measured regularly. Ambient temperature (T) and relative humidity (RH) were recorded, from which THI was calculated. All weather variables were divided into 3 categories (low, medium, high) and analysed separately. At highest THI category (>75), RR was higher ( $p<0.001$ ), the cows moved around more ( $p=0.020$ ) and tended to use the shade more frequently ( $p=0.094$ ). At highest T category (>30°C), RR was higher ( $p=0.009$ ), the cows tended to move around more ( $p=0.073$ ) and visit the shaded area more frequently ( $p=0.083$ ). With increasing T categories, cows deprived of lying for 12hrs spent more time in shade ( $p=0.021$ ) and shade usage became similar between treatment groups. At highest RH category (>55%), RR decreased ( $p<0.001$ ) and cows spent less time in shade ( $p<0.001$ ), moved around less ( $p=0.039$ ) and tended to lie down more in the non-shaded area ( $p=0.064$ ). Our results suggest a possible high need for shade during hot days (high T), since cows deprived of lying chose to use shade instead of lying, however, more research is needed in order to confirm this.

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## MOTIVATION FOR FOOD IN SWINE: THE FOOD-METRIC SCALE

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<sup>1</sup>Emily G Patterson-Kane\*, <sup>1</sup>Edmond A Pajor, <sup>2</sup>Richard D Kirkden

<sup>1</sup> Purdue University, USA.

<sup>2</sup> IFM-Biology, Linköping University, Sweden.

\**rattitude@gmail.com*

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Animal welfare scientists are increasingly using operant methods to determine animals' environmental needs. The use of an operant response (such as lever-pressing) helps us to avoid placing undue emphasis on resources that animals prefer only when the choice is relatively effortless. However, these studies generally do not establish reference values for baseline and maximum response levels. In the absence of clear reference values, levels of responding can easily be misinterpreted. There is a need for more comprehensive use of reference scales based upon well-understood resources. The purpose of this experiment was to use different feeding levels to develop a food-based reference scale of sow motivation—to establish which response rates correspond with baseline, moderate and high levels of motivation. This experiment used forty-five sows divided into groups that were fed 0%, 25%, 50% 75% or 100% of their daily *ad libitum* meal prior to testing. Sows' operant responding and food reward consumption was significantly increased by reducing the amount pre-fed (ANOVA  $df=4$   $F=9.36/6.71$   $p=.000/.001$ ). The resulting scale (with an exponential relation and a range of 214 presses) is the first food-metric scale to be developed for swine. These results provide a controlled and intuitive context to aid in the interpretation of prior and ongoing operant research relating to social contact and pen enrichment for gestating sows. The results also demonstrate some confounding variables that affect levels of operant responding and that may cause un-referenced "demand" data to be misinterpreted. Resources of high motivational value should be provided as part of ideal routine husbandry and should improve animal welfare. A food-based reference scale helps us in assessing and communicating the reward value of resources that satisfy species-specific needs. The development of reference scales in operant studies is strongly encouraged.

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## WILLING TO WORK? THE INFLUENCE OF CIRCULATING GONADAL STEROIDS ON CONTRAFRELOADING IN LAYING HENS

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Ragen M Trudelle-Schwarz McGowan\*, Catherine M Ulibarri,  
Sylvie Cloutier, Ruth C Newberry

Department of Animal Sciences and Department of VCAPP, Center for the Study of Animal Well-Being,  
Washington State University, USA.

\*ragents@vetmed.wsu.edu

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Contrafreeloading occurs when animals choose to “work” for food when more easily exploited food of the same nutritional value is freely available. Previous studies with domestic fowl suggest that there are sex differences in the performance of contrafreeloading, with males preferring food that can be quickly consumed and females of egg-type strains showing greater contrafreeloading. We hypothesized that sex differences in contrafreeloading arise from differences in circulating gonadal steroids. We conducted foraging choice tests with female (n=40) Lohmann Brown hens implanted with testosterone, estradiol, progesterone, estradiol+progesterone, or blank silastic tubes. We predicted that contrafreeloading would be lowest in hens treated with testosterone. Individual birds were presented with a choice of whole and ground pellets in two phases: 1) 24-h choice, and 2) 5-min choice following 2 hours of food deprivation. During the 24-h tests, hens consumed more ground (mean  $\pm$  SE, 104  $\pm$  6 g) than whole (62  $\pm$  6 g) pellets (t=3.71, P=0.004), indicating that they were contrafreeloading since more effort is required to consume the same quantity of ground than whole pellets. During the 5-min choice tests, hens consumed more whole (6  $\pm$  0.7 g) than ground (4  $\pm$  0.3 g) pellets (t=2.49, P=0.015) which may reflect a preference for large particles after a short period of deprivation. Nevertheless, in the 5-min tests, hens directed more pecks at ground (median=147) than whole (median=47) pellets (S=733, P=0.0002), thereby expending greater effort to consume ground (median=36 pecks/g) than whole (median=10 pecks/g) pellets (S=1192, P<0.0001). Contrary to our prediction, there was no effect of gonadal steroid treatment on the amount of each food type consumed during the 24-h or 5-min (P>0.49) tests, suggesting that the brain may need to be masculinized during embryonic development to provide a substrate for activational effects of circulating testosterone on adult contrafreeloading behavior.

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## TESTING TWO ASSUMPTIONS OF THE ECONOMIC APPROACH TO MEASURING MOTIVATIONAL STRENGTH

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Lucy Asher\*, Melissa Bateson

School of Biology and Psychology, Newcastle University, UK.

\*[Lucy.asher@ncl.ac.uk](mailto:Lucy.asher@ncl.ac.uk)

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Economic measures of motivational strength are a popular method of measuring animal preferences, but the validity of such techniques is much debated. The basic premise is that an animal pays a cost (e.g. pushing through a weighted door) which is increased over time, in order to gain access to a resource they want or need. As in human economics, the animal is viewed as having an available budget which can affect the relative impact of a given price. We tested two assumptions often made by those using preference testing that animals have an energy budget to 'spend' on access to resources, and that the effect of price on demand is not an artefact of the escalating cost of entry. Sixteen European starlings (*Sturnus vulgaris*) were trained to use push-doors, to gain access to two highly valued resources, turf and cover. A breakpoint was established for each bird using an increasing scale of forces (one per day) until the bird no longer accessed the resource. Then five different forces were presented on a random schedule, under two levels of food availability. We found that birds' demand for resources was positively affected by food rationing (GLM,  $F=4.43$ ,  $p=0.009$ ), suggesting energy wasn't a relevant currency for this preference test. Birds' willingness to pay for a resource was also dependent upon the order in which the forces were presented (GLM,  $F= 4.79$ ,  $p=0.008$ ) and the contrast from the force presented the previous day (GLM,  $F= 3.77$ ,  $p=0.010$ ), but that price was still the most important determinant of demand (GLM,  $F=6.50$ ,  $p<0.001$ ). Whilst economic measures of motivational strength remain a valuable tool for measuring the preferences of captive animals, we add to a growing body of literature suggesting that experimenters need to take care when designing such tests and interpreting any results.

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## INVESTIGATING SOCIAL DISCRIMINATION OF FLOCK-MATES BY LAYING HENS: A COMPARISON OF TWO OPERANT METHODS

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Morven A McLeman\*, Siobhan M Abeyesinghe, Rachael Owen, Christopher M Wathes

The Royal Veterinary College, University of London, UK.

\*[mmcleman@rvc.ac.uk](mailto:mmcleman@rvc.ac.uk)

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Laying hens are frequently housed in conditions that may compromise species-typical social interactions and welfare. Our aims were to identify a reliable method of testing flock-mate discrimination for use in future studies on the impact of environmental interference, thereby improving understanding of the importance of the social environment for hens. We compared the efficacy of two learning discrimination tasks under good environmental conditions. Two groups of Hy-line pullets were kept under good environmental conditions (stable groups of  $N = 15-16$ , minimum light intensity 200 lux, background noise  $< 50\text{dB}$  and  $\leq 5\text{ppm NH}_3$ ) and tested daily on a discrimination between individual flock-mates, with bi-directional exchange of social cues, in a Y-maze choice task and an operant pecking task, respectively. The criterion for successful discrimination of the experimenter-designated positive stimulus bird from amongst a pair was: Y-maze - entering the arm containing the target bird in at least 8/10 trials in two consecutive sessions ( $P < 0.003$ ); and operant chamber - pecking the key nearest that bird in at least 17/24 trials in two consecutive sessions ( $P < 0.001$ ), respectively. Both methods used pre-training with the positive stimulus vs. an empty chamber to facilitate task acquisition. Hens discriminated a positive stimulus from an empty cage in both tasks (mean number of trials to criterion  $\pm$  sd = Y-maze:  $315 \pm 108$  trials,  $N=8$ ; Operant chamber:  $226 \pm 98$  trials,  $N=10$ ). However, success differed between methods for the group-mate discrimination (Y-maze: mean  $\pm$  sd =  $83 \pm 72$  trials,  $N=7$ ; Operant chamber: 432 trials,  $N=1$ ). Thus, hens can demonstrate flock-mate discrimination in both tasks; however, more hens learnt, and learned much faster, in the Y-maze. Differences in performance are likely to be due to context and attention to stimuli and indicate the Y-maze task is more appropriate to demonstrate discrimination of conspecifics.



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## VALIDATION OF THE “APPROACH-AVOIDANCE” BEHAVIOUR TO ASSESS FEAR IN PIGS

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**Antoni Dalmau\*, Emma Fàbrega, Antonio Velarde**

IRTA, Monells, España.

\*[antoni.dalmau@irta.es](mailto:antoni.dalmau@irta.es)

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Fear is an emotional state induced by the perception of a threatening situation. Anxiolytic agents, such as benzodiazepines, have been found to reduce anxiety and fear in pigs. The hypothesis of the study is that differences in behaviour between pigs treated with anxiolytics and control pigs would be related to behavioural indicators of fear. Thirty female of 35 kg liveweight and 30 female pigs of 90 kg liveweight were used in two separate trials. The fear test was carried out in a test pen where a trough containing apple in pieces was installed. Before the trials, pigs were trained to enter individually to the test pen and eat the apples of the trough during 6 consecutive days. Afterwards, 15 pigs of each group received an intramuscularly injection of 0.15-0.2 mg/kg midazolam and the other 15 the equivalent volume of saline. After 20 minutes, the pigs were exposed during 2 minutes to three different stimuli when eating the apples: visual stimulus (a hung ball from a rope on the trough), auditory stimulus (a horn, behind the trough) and olfactory stimulus (90%CO<sub>2</sub> inside the trough). The incidence of feeding behaviour, distance and position respect to the trough, general activity and avoidance behaviours (reluctant to move, turning back and retreat attempt) were analysed using the Proc GENMOD of SAS. The treatment with midazolam increased feeding behaviour, and reduced the distance of the animals to the trough, their general activity and the number of reluctant to move, turning back and retreat attempt movements ( $P < 0.05$ ). The avoidance behaviours were also affected by the age and type of fear stimulus ( $P < 0.05$ ). It is concluded that the reluctant to move behaviour is the most common response of general fear in pigs, because no differences were found between ages neither stimulus type in their presentation.

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## MEASUREMENT OF TEMPERAMENT ON-FARM AS A PREDICTOR OF STRESS RESPONSE AT SLAUGHTER

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**<sup>1</sup>Jennifer A Brown\*,<sup>1</sup>Cornelius FM De Lange, <sup>1</sup>Ira B Mandell, <sup>1</sup>Andrew B Robinson,  
<sup>1</sup>James Squires, <sup>2</sup>Peter P Purslow, <sup>1</sup>Tina M Widowski**

<sup>1</sup> Department of Animal and Poultry Science, University of Guelph, Canada.

<sup>2</sup> Department of Food Science, University of Guelph, Canada.

*\*Jennifer@uoguelph.ca*

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Pigs show large individual variation in stress response at slaughter, and this affects both welfare and subsequent meat quality. Temperament can influence the stress response, and is determined by a combination of genetic and environmental factors. This study compared an on-farm measure of temperament with behavioural and physiological responses of pigs at the abattoir, and meat quality. Twenty-four animals were sampled from 20 commercial hog farms and 6 university-reared groups, with a total of 624 pigs sampled over 20 months. Temperament was assessed as 'bold', 'shy' or 'other' using the open door test (ODT). Handling at the slaughter plant was video recorded and sampled continuously for pig behaviour and human interactions. Stress parameters were measured in blood collected at exsanguination. Acidity was measured at 1 and 24 hours post-slaughter, and meat quality (colour, drip loss, tenderness) was evaluated in samples of ham and loin. Scratch scores were collected on 274 animals as a measure of aggression. Associations between measures were evaluated by principal components analysis, following varimax rotation, in SAS. In a model containing 14 variables, four principal components accounted for 52.5% of observed variance. Factor loading >0.30 was considered significant. Factors 1-3 showed association with blood and meat quality measures related to sympathetic and adrenocortical stress responses (Factors 1 and 3, accounting for 19.1 and 11.3% of variance, respectively), and with behavioural responses and human interference in the crowd pen (Factor 2, 14.0% of variance). Temperament was associated with Factor 4 (8.1% of variance) along with blood lactate, cpk, ham pH (final) and drip loss. GLM analysis scratch scores with temperament and farm as dependent variables showed farm as significant effect ( $p < 0.0001$ ), with temperament as a trend ( $p = 0.06$ ). These differences could be helpful in developing management techniques to reduce stress, or for selection of pigs with calmer temperaments.

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## FACIAL CUES AND PERSONALITY TRAITS IN DOGS, MONKEYS AND HUMANS

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**Marco M Rigamonti**

Centro di Primatologia HSR, Università Milano Bicocca, IBFM CNR, Milan, Italy.

*marco.rigamonti@hsr.it*

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Animals are conscious and capable of experiencing emotions. However, cognitions, consciousness and emotions, as well as personality, have been attributed to animals only in recent years. We think that individual differences within species should not be neglected when dealing with animal welfare. In this study we investigated whether facial cues provide reliable information about personality dimensions, within and across species. In the first phase of this experiment we compared the result of the Big Five Personality Test – Five-Factor Model (FFM), performed by 10 human subjects who offered the image of their face, with the opinion given by the 100 observers. In the second phase the subjects were 10 pig-tailed macaques and 10 dogs. Frontal, high-resolution pictures of monkey faces were obtained using an apparatus expressly designed to study facial expressions in pig-tailed macaques. In order to measure personality dimensions we designed a set of tasks to elicit the subjects to exhibit behaviors that could be easily rated. For each individual four personality traits, analogs of four out of the five FFM factors, were scored: Neuroticism, Extraversion, Openness and Agreeableness. As for humans we compared the scores obtained for the personality traits with the opinion given by the 100 human observers. In order to assess whether the personality tests agreed with the observers' judgments, we performed the Wilcoxon signed-ranks test ( $p < 0.05$ ). Correct judgments of the personality traits were 40.3% for humans, 35.8% for macaques and 29.6% for dogs. Moreover, Extraversion and Conscientiousness were more easily detected in humans, whereas Extraversion and Agreeableness were more easily detected in dogs and monkeys. The Spearman rank correlation coefficient showed that the performance of the observers was consistent across different species ( $p < 0.05$ ). In conclusion, some humans display a talent for detecting personality traits in animals.

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## PERIPARTURIENT NEST BUILDING: DOES IT MATTER TO FARMED MINK?

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Jens Malmkvist

University of Aarhus, Dept. of Animal Health, Welfare and Nutrition, Denmark.

*Jens.Malmkvist@agrsci.dk*

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Several types of nesting material with different capacity as substrate for nest building behaviour are currently supplied to farmed mink. We investigated whether different opportunities for performing periparturient nest-building behaviour influenced (a) the parturition, (b) the vitality and survival of neonates, and (c) maternal stress and the behaviour. Individually housed female mink had either (1) restricted possibility of nest building (NON; N=60), (2) restricted possibility of nest building, but an artificial nest available (ART; N=60), (3) full possibility of nest building using straw (STR; N=60), or (4) full possibility of nest building and an artificial nest (ART+STR; N=60). The possibility to perform nest building reduced the variation in inter-birth intervals between kits ( $F_{2,39}=3.4$ ,  $P=0.044$ ; s.d. STR: 36 vs. NON: 58 and ART: 53 min), but did not affect the total duration of parturition ( $P=0.98$ ). The average body weight of kits was significantly reduced in NON litters after seven days ( $F_{3,176}=3.2$ ,  $P=0.025$ ), with no differences Day 1 after delivery ( $P=0.21$ ). In addition, the mortality of live-born kits was highest in the NON-litters ( $F_{3,192}=5.9$ ,  $P<0.001$ ). Stress hormone (cortisol) metabolites measured non-invasively in faeces tended to differ between treatment groups ( $F_{1,171}=2.5$ ,  $P=0.064$ ), with a lower concentration in ART and ART+STR than in NON-females after delivery. In a maternal reactivity test, ART+STR were quicker than NON-females to retrieve a kit into the nest ( $\chi^2_1=4.9$ ,  $P=0.027$ ). In conclusion, an artificial nest alone or in combination with nest building substrate tended to reduce maternal stress postpartum, and the combination significantly improved maternal reactivity. For kit vitality, an artificial nest appeared as good as a nest created by the mink female. However, access to substrate for nest building resulted in a smoother, less variable delivery in farmed mink, whereas the feed-back from an artificial nest had no such effect.

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## BREEDING FOR IMPROVED PRE-WEANING PIGLET SURVIVAL IN ALTERNATIVE FARROWING SYSTEMS

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<sup>1</sup>Emma M Baxter\*, <sup>2</sup>Sandra A Edwards, <sup>1</sup>Loma Sherwood, <sup>1</sup>Marianne Farish, <sup>1</sup>Susan Jarvis

<sup>1</sup> Scottish Agricultural College/University of Newcastle, Edinburgh.

<sup>2</sup> Department of Agriculture, University of Newcastle, UK.

\*[Emma.Baxter@sac.ac.uk](mailto:Emma.Baxter@sac.ac.uk)

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Current estimates of pre-weaning live-born mortality in the UK are 11.2% indoors and 10.5% outdoors, with the majority of deaths arising from crushing by the sow, constituting a major welfare and production problem. Farrowing crates, considered to decrease crushing, are physically and behaviourally restrictive for the sow. There is impetus to move away from restrictive environments without augmenting piglet mortality. We measured behavioural and physiological indicators of pre-weaning survival in a treatment group bred for High piglet Survival (HS) and a Control group (C) in Indoor loose-housed and Outdoor farrowing systems, using 65 primiparous sows in a 2 x 2 design. In the outdoor environment live-born mortality (LBM) was higher in C litters (C=14% vs. HS=9%  $\text{Chi}^2_{1,1} = 3.163$   $p=0.07$ ). With still-births added, total mortality (TM) was significantly higher in C litters (C=20% vs. HS=11%  $\text{Chi}^2_{1,1} = 5.849$   $p=0.02$ ). In the indoor environment there were no differences between treatments in mortality (LBM C=9% vs. HS=9%  $\text{Chi}^2_{1,1} = 0.033$   $p=0.855$  and TM C=13% vs. HS=13%  $\text{Chi}^2_{1,1} = 0.032$   $p=0.857$ ). Piglet shape and size were the most significant predictors of piglet survival. For example, disproportionately long and thin piglets were more likely to be born dead (Ponderal index  $F_{1,679} = 39.13$   $p<0.001$ , body mass index  $F_{1,679} = 38.70$   $p<0.001$ ). Other important predictors included placental efficiency ( $F_{1,654} = 4.84$   $p=0.03$ ), and latency to suckle ( $F_{1,700} = 4.21$   $p=0.04$ ). Adequate thermoregulation was also important and at 2h post-partum was significantly better in C litters ( $F_{1,665} = 4.42$ ,  $p=0.02$ ), yet at 24h was significantly better in HS litters ( $F_{1,652} = 4.21$ ,  $p=0.04$ ). In conclusion, there are numerous factors critical for pre-weaning survival, particularly piglet shape and size. Relatively low levels of mortality were seen in both alternative systems, however interactive effects of genotype and environment on mortality demonstrate the potential to further improve survival.

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## FREQUENT BLOOD SAMPLING THROUGH CATHETERS DOES NOT APPEAR TO AFFECT FARROWING BEHAVIOUR IN SOWS

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<sup>1</sup>Anna E Valros\*, <sup>2</sup>Mari Heinonen, <sup>2</sup>Outi Hälli, <sup>2</sup>Olli Peltoniemi

<sup>1</sup> Research Centre for Animal Welfare, Department of Production Animal Medicine, University of Helsinki, Finland.

<sup>2</sup> Department of Production Animal Medicine, Faculty of Veterinary Medicine, University of Helsinki, Finland.

\*[anna.valros@helsinki.fi](mailto:anna.valros@helsinki.fi)

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In order to obtain frequent blood samples from pigs, many studies use catheterization, a technique thought to cause minimum disturbance of the animals. However, farrowing is a sensitive period and might be easily disturbed by sampling. The aim of this study was to evaluate whether frequent blood sampling via a catheter disturbs farrowing behaviour in sows. An indwelling jugular catheter was inserted non-surgically via the ear vein in 18 sows (CA) 7 days before expected farrowing. An additional 16 sows served as controls (C). Sows in both groups were housed either in farrowing pens or crates for the purpose of another study. After the expulsion of each piglet, three blood samples were taken at two-minute intervals. Video recordings of 9 of the CA sows and 10 of the C sows were analysed for farrowing duration as well as for frequency of posture changes and duration and number of activity bouts during farrowing. Four saliva samples were taken between 09:00 and 15:00 and number of live-born and stillborn piglets was recorded. Differences between C and CA sows were compared using the Mann-Whitney U-test (SPSS software). We found no difference between the groups in any of the measured behavioural variables or in cortisol level ( $P > 0.1$ ). Sows with catheters tended to have fewer stillborn piglets ( $p = 0.09$ ) than sows without catheters. It appears that frequent blood sampling using catheters does not disturb farrowing behaviour in sows. The reason for a lower number of stillborn piglets in sows with catheters might be due to the fact that farrowings were more easily assisted in these sows, as researchers were always present. It is also possible that the recording of stillbirths was more accurate in these sows. We conclude that blood sampling via catheters really does cause minimal disturbance to farrowing sows.

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## THE EFFECT OF IMMUNOCASTRATION ON THE BEHAVIOUR OF PIGS

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**Antonio Velarde\*, Marina Gispert, Maria Angels Oliver, Joaquim Soler,  
Joan Tibau, Emma Fàbrega**

IRTA, Spain.

*Antonio.Velarde@irta.es*

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Male pigs are surgically castrated to prevent boar taint. However, this procedure is painful, and other alternatives are currently being studied. This experiment aimed to study the effect of immunocastration on the behaviour and welfare of male pigs. Four treatments were compared: entire males (EM), immunocastrated males treated with Improvac® (IM) at week 11 and 21 of age, surgical castrated males (CM) and females (FE). Twelve group-housed pigs for each treatment were video recorded during 2 consecutive days at weeks 9, 11, 20, 21, 23 and 25. The number of active pigs (with a standing posture) in each treatment group was scored by scan sampling at 5 min interval during 3 sessions (9-11h, 14-16h and 18-20h). Aggressive behaviour in the feeder and outside the feeder, and mounting behaviour was also scored during the last 10 min of each hour. After slaughter, the number of skin lesions in the left half carcass caused by fighting was scored. The four treatments were compared with a GLM analysis of SAS for each studied week. Before the immunocastration, the incidence of active pigs was higher ( $p < 0.05$ ) in IM and EM than in CM, although not different to FE. Nevertheless the number of aggressions was similar among treatments. From two weeks after the second administration of Improvac®, the incidence of active pigs was similar and significantly lower ( $p < 0.05$ ) in IM, CM and FE groups compared to EM. Furthermore, EM performed more aggressions ( $p < 0.05$ ) than CM, IM and FE in the feeder, and than IM and FE outside the feeder. The number of mounting events in IM was significantly lower than EM ( $p < 0.05$ ) and similar to the other groups. In the carcass, the number of skin lesions was also lower ( $p < 0.05$ ) in IM and FE compared to EM. It is concluded that the inhibition of testicular function by immunological neutralisation of the GnRH, reduces the general activity and social behaviour during sexual maturity, and therefore improves pig welfare.

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## DOES THE COMPETITION BETWEEN HIGH AND LOW HIERARCHICAL RAMS EXPOSED TO ESTROUS EWES AFFECT THEIR MATING BEHAVIOR?

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Silvana P González\*, Rodolfo Ungerfeld

Departamento de Fisiología, Facultad de Veterinaria, Uruguay.

\*silgp21@adinet.com.uy

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Hierarchical relationships may affect mating performance in groups of rams, as dominant individuals have preferential access to receptive females. In the present work we determined if the competition between high and low hierarchical rams exposed to estrous ewes affects the number of mounts and mates. The hierarchical index in a stable group of 19 Merino rams was determined during the breeding season using the food competition test. In this test, after locking up the rams for a whole night without access to food, we allowed each dyad of rams to compete for feed in a bucket only large enough for one of them, being the IJ the proportion of rams in the group which the tested ram displaced in the competition (rank from 0 to 1). The five rams with higher (DR) and the 5 with lower (SR) rank were individually exposed to one estrous ewe for 30 min in three occasions, and the number of mounts and mates was registered. The same test was repeated with two rams at the same time: each DR ram competed once with each SR ram. The number of mounts was not affected by rams' hierarchical category, but tended to be affected by the type of test (SR alone=5.6 ± 1.3, SR competence=3.0 ± 0.6, P= 0.06; DR alone=5.7 ± 1.9, DR=competente 3.0 ± 1.7). There were significant effect of the rams' category and the type of test, as well as of the interaction between them on the number of mates (SR alone=3.4 ± 0.4 vs. SR competence=1.8 ± 0.4, DR alone=1.5 ± 0.3 and DR competence=1.6 ± 0.3: P<0.05). We observed that in competition tests subordinate rams were more affected by the presence of dominant rams than dominant rams were by the presence of subordinate rams.



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# POSTER PRESENTATIONS

## GROUP 1

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# THE RELATIONSHIP BETWEEN TONGUE-PLAYING BEHAVIOUR AND VISCERA DISEASE AFTER THE SLAUGHTER OF BEEF CATTLE

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**Naoshige Abe\*, Takahiro Morita, Shuraro Noguchi, Tuvoshi Tanaka**

College of Agriculture, Department of Bioenvironmental Systems, Tamagawa University, Japan.

\*[naoabe@agr.tamagawa.ac.jp](mailto:naoabe@agr.tamagawa.ac.jp)

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Beef cattle develop frequent tongue-playing behaviour under intensive husbandry systems. Calves could perform inclusive tongue-playing behaviour under long-term frustration by suppressed suckling, feeding and boring environment (Seo 1997). These behaviours as a factor of stress are problems for well being of cattle. Our study investigated and analyzed the relationship between tongue-playing behaviour and internal viscera disease of group rearing beef cattle. Pen (n=11 and 12) consisted of a feeding alley for grain feed, a trough for dry hay, a water bowl and a resting space. For this study 333 beef steers (aged of 14-24 months, crossbred, Japanese black cattle x Holstein) were used. For feeding, concentrate was given twice a day (morning and evening). Consumption of hay and water were freely allowed. Behavioural observations were made by scan sampling for 2 hours after feeding on two successive days in the month. The visceral disease was identified in laboratory results by a veterinarian after the slaughter. The chi-square for independence test was used to determine the relationship between tongue-playing behaviour and the visceral disease. Much visceral disease was identified in the liver, stomach, intestines, kidney, and lungs. Tongue-playing behaviour occurred in 63 (18.9%) of the 333 cattle. Of the 63 cattle which demonstrated tongue play behaviour, 14 (22.2%) contracted the visceral disease, and 49 (77.7%) did not. Of the 270 cattle which did not display tongue-playing behaviour, 25 (9.3%) contracted visceral disease and 245 (90.7%) did not. The cattle which displayed tongue play behaviour had significantly more occurrence visceral disease ( $P < 0.05$ ) versus the cattle which did not display tongue play behaviour. These results indicated that cattle with tongue-playing behaviour have higher possibilities of visceral disease in beef cattle.

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## THE EFFECT OF PARITY NUMBER AND TIME OF SEPARATION FROM THE CALF ON BEHAVIOR, MILK PRODUCTION AND FERTILITY OF THE COW

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<sup>1</sup>Isidro Alejos, <sup>1</sup>María Esther Ortega\*, <sup>2</sup>Francisco Galindo, <sup>1</sup>Luis L Landois,  
<sup>1</sup>Alfonso Hernández, <sup>1</sup>Maria G Torres

<sup>1</sup> Colegio de Postgraduados, México.

<sup>2</sup> Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México.

\**meoc@colpos.mx*

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Separation of the cow from the calf just after calving causes stress, which might affect milk production and fertility in the cow. The objective of this study was to evaluate if time of separation and cow's parity number affect cow's behavior, milk production and its reproductive performance. Thirty two Holstein cows (1-4 parities P1, P2, P3, P4; 8 for each parity) with their calves were kept together for 24 h. Cow's behavior was registered at calving time, 12 and 22 h after calving, using scan sampling with continuous recording for 2 h, at 3 minutes interval. Daily milk production at 10 and 90 days after calving, first estrus after calving, interval from calving to first insemination, interval from calving to conception and number of inseminations per conception were evaluated in cows separated from their calves after 24 h and in another group of 32 Holstein cows (1-4 parities, 8 for each parity), which were separated from their calves immediately after calving. Behavioral data were analyzed by the CORR procedure. Reproductive and productive data were analyzed for a completely randomized design with factorial arrangement. Cows from all parities spent more time ( $P < 0.0001$ ) licking their calves during the first 12 h after calving (P1: 47.9, 11.5, 2.8%, CC -0.71), (P2: 47.2, 4.7, 1.6%, CC -0.82), P3 (48.1, 3.4, 0.9%, CC -0.85), (P4: 44.7, 2.2, 1.6%, CC -0.74) for 0, 12 and 22 h, respectively. No differences ( $P < 0.05$ ) were found for other behaviors or productive and reproductive variables, except for the number of inseminations per conception, which was lower ( $P < 0.03$ ) for all the cows which were kept with their calves for 24 h (2.00) than those separated immediately from them (3.19; CV 53.90).

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## EFFECT OF THE INCREASE OF FORAGING OPPORTUNITIES ON BEHAVIOUR, WELFARE AND REPRODUCTION EFFICIENCY OF GROUP-HOUSED ARAB BREEDING MARES

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<sup>1,2</sup>Haifa Benhajali\*, <sup>2</sup>Marie-Annick Richard-Yris, <sup>3</sup>Mohammed Ezzaouia,  
<sup>1</sup>Faouzia Charfi, <sup>2</sup>Martine Hausberger

<sup>1</sup> Université Tunis-ElManar, «Unité de biologie animale et de systématique évolutive», Tunisia.

<sup>2</sup> Université de Rennes I, «Ethologie-Evolution-Ecologie», France.

<sup>3</sup> Haras national de Sidi Thabet 2020, Tunisia.

\*Haifa@medscape.com

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The present study aimed to determine the effect of the increase of foraging opportunities on behaviour, welfare and reproduction efficiency of breeding mares housed in individual boxes but allowed outside 6 hours a day in a bare paddock. One hundred Arab breeding mares (29 maiden and 71 barren) were randomly divided into 2 groups: the experimental and the control groups and separated during the day in 2 bare paddocks at the same density. In the experimental group (N = 50), Hay was provided in nylon haynets. These were filled with hay and hung up in the experimental paddock every morning before the arrival of the mares. In the control group (N = 50), no hay was provided in the paddock. All mares were kept in individual boxes for the night, where hay was provided in the evening for the experimental mares, in order to keep the amount ingested similar in both groups. Twenty-minute animal focal samplings and scan samplings were used to determine the time budget of the mares during the period from 9 a. m. to 3 p. m. and study their social behaviour. The body weight and fat mass of mares were predicted using linear measurements and body conditions scores (BCS). Mares were tested for oestrous detection by teasing with a stallion and were then examined clinically by rectal palpations and ultrasound before being mated naturally or inseminated by fresh or frozen semen. 300 focal sampling (6000 min), 3300 individual scan sampling (6000 min) and 62 group observations (1240 min) corresponding to 100 mares were recorded. ANOVA, GLM and non parametric tests were used to analyse data. The experimental group showed a broader behavioural repertoire than that of the control one. Experimental mares' time budgets were closer to the natural state with more time spent feeding ( $65.12\% \pm 2.40\%$  vs.  $29.75\% \pm 2.45\%$ ,  $p < 0,01$ ), less time spent in locomotion ( $11.70 \pm 1.31\%$  vs.  $23.56 \pm 1.34\%$ ,  $p < 0,01$ ), stand resting ( $11.76 \pm 2.57\%$  vs.  $27.52 \pm 2.62\%$ ,  $p < 0,01$ ) and alert standing ( $5.23 \pm 1.2\%$  vs.  $14.71 \pm 1.23\%$ ,  $p < 0,01$ ). There were more preferential bonds among experimental mares than control ones (26 vs. 14,  $p < 0.05$ ). Experimental mares showed more positive social interactions ( $p < 0.01$ ) and less aggressions ( $p < 0.01$ ). Body weight and body conditions scores were significantly higher in the experimental group ( $p < 0.05$ ). The treatment affects significantly the conception rate of the mares (81% vs. 55%,  $p < 0.01$ ) and oestrus abnormalities were significantly less frequent (2 vs. 16,  $p < 0.01$ ). This study shows that the increase of foraging opportunities enhances the welfare and the reproduction efficiency of the mares.

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## AN EXPLORATION OF THE PRACTICE OF 'BOX-RESTING' HORSES IN THE UK

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**<sup>1</sup>Charlotte D Bettley\*, <sup>1</sup>Christine J Nicol, <sup>2</sup>Pat A Harris**

<sup>1</sup> University of Bristol, UK.

<sup>2</sup> Equine Studies Group, WALTHAM Center for Pet Nutrition, UK.

\*[cbettley@rvc.ac.uk](mailto:cbettley@rvc.ac.uk)

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Sudden confinement of a horse to its stable can adversely affect its behaviour and well-being. However this situation is common for many reasons, for example due to limited grazing resources, poor weather or on the advice of a veterinarian due to health reasons ('box-rest'). The questionnaire used in this study aimed to determine the basic details of current box-resting practice and was sent to 500 recipients involved in horse care in the UK. Information was collected on the experience of respondents and their opinions relating to box-rest. Data on the number of confined horses, duration of and reason for confinement and any changes made to the horses' environment or management whilst on box-rest were also gathered. The useable response rate was 46.2% providing information on nearly 12000 horses in a variety of work. It showed 86.7% of people made changes to a box-resting horse's management, for example increasing the amount of contact a horse has with people (38.7% of respondents who make changes) or providing a form of stable enrichment (46.7%). The proportion of horses confined varied from zero horses on 39.3% of yards and 1-10% of horses on 37.4% of yards to >10% on 13.6% of yards. 28.9% of all respondents generally confine horses for less than a week, however the next most frequent period was 2 weeks to 1 month (23.5% of all respondents). 21.0% of people thought confinement should be used less on their yard but 77.1% felt it should be used the same amount. Few (2.0%) felt it should be used more. This study demonstrates that although common practice, there is great variation and contrast in attitudes towards keeping horses on box-rest and the management of such horses. As confinement can have profound implications for the welfare of a horse, this practice should be further examined.

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# VOCALISATIONS AND ACOUSTIC PARAMETERS OF FLOCK NOISE FROM FEATHER AND NON-FEATHER PECKING COMMERCIAL LAYING FLOCKS

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**Ashleigh Bright**

University of Oxford/FAI farms, Department of Zoology Field Station, UK

*ashleigh.bright@zoo.ox.ac.uk*

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One hour of flock noise (background machinery, hen vocalisations) was recorded from 21 commercial free-range laying hen flocks,  $\geq 35$  weeks. Ten of the flocks were feather pecking (based on a plumage condition score) and 11 were non-feather pecking. Despite the fact that feather pecking is a well known welfare problem in laying hens and hens are highly vocal animals, there is little information available as to vocalisation differences between feather and non-feather pecking birds. The aim of this study was to quantify the calling rates of vocalisations known to indicate stress and/or alarm (Alarm calls, Squawks) and acoustic parameters of flock noise from feather and non-feather pecking flocks. Recordings were made using a DAT recorder and omni-directional microphone, in the centre of the house (~1.5m above ground). Avisoft-SASlab Pro was used to create and analyse audio spectrograms. Nine, 60s spectrograms were created from each recording. The number of Alarm calls, Squawks and Total vocalisations/s were determined by visual and audio examination of spectrograms. Power spectrums calculated the intensity of sound (dB), frequency (Hz) at maximum intensity, mean frequency, inter-quartile frequency range and frequency bandwidth of the 60s spectrograms. GLM's tested for effects of flock size, strain, farm and feather pecking on calls/s, intensity and frequency measures of flock noise. There was no effect of flock size or farm on calls/s or acoustic parameters of flock noise. However, strain had a significant ( $P = 0.021$ ) effect on the number of Total vocalisations/s; Hebden Black flocks made more calls than Lohmann flocks. Feather pecking flocks made significantly more Squawks/s ( $P = 0.010$ ) and more Total vocalisations/s ( $P = 0.005$ ) than non-feather pecking flocks. Feather pecking did not explain variation in alarm call rate, or intensity and frequency measures of flock noise. The differences between Squawk and Total vocalisation call rates of feather and non-feather pecking flocks are a new finding. An increase or change in calling rate of feather pecking or 'at risk' flocks may be evident before other conventional measures such as increasing mortality rate or worsening feather condition and enable farmers to take avoiding action before the welfare of birds is impaired.

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## THE EFFECT OF ARENA SIZE, SHAPE AND COMPLEXITY ON MOVEMENT AND USE OF SPACE IN THE HOUSE MOUSE (*Mus musculus*)

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Ray M. Brooks\*, William R. Stricklin

Department of Animal and Avian Sciences, University of Maryland, College Park, USA.

\*rabrooks@umd.edu

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In open field observations, the house mouse (*Mus musculus*) typically demonstrates a cautious and repetitive pattern of movement. This pattern suggests a degree of anxiety associated with the vulnerability to predation while occupying unprotected environments. As such, open-field behavior has been used as a test of fear and emotionality in mice. Measures of mouse activity, use of space and behavior may give an accurate representation of animal's 'willingness' to travel within and perception of a given space. We used 40 female Swiss Webster mice to investigate how movement and behavior within an enclosed space changed as a function of the characteristics of that space. Three separate experiments tested the effects of an arena's size, shape and complexity on path length, floor area usage, proximity to walls and frequency of behaviors commonly attributed to fearfulness. Observations were carried out in a dimly lit room. Each recorded observation was 3 minutes in length, commencing upon an individual's release into the center of the arena. At the end of each observation, fecal boli were counted and the arena was cleaned with a water/acetic acid solution to remove odor cues. Videotaped observations were digitized and animal paths were translated into x,y coordinates at a sampling rate of 12-15 samples/second. From the coordinate data we calculated distance traveled, mean distance to nearest wall, and angular dispersion (path complexity). The distance individuals traveled increased ( $p < 0.05$ ) as the pen size increased (31.7m, 38.8m, 48.1m and 44.3m for 0.5m<sup>2</sup>, 1m<sup>2</sup>, 2m<sup>2</sup> and 4m<sup>2</sup> respectively). The mean distance to the nearest wall also increased as pen size increased (6cm, 9cm, 12cm and 20cm). Pen size had no significant effect on angular dispersion. Our results have implications regarding how housing design influences freedom of movement among confined animals.



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## TAIL-BASE LESIONS IN DONKEYS CARRYING TOURISTS IN JORDAN: RISK FACTORS AND TOURIST ATTITUDES TO DONKEY WELFARE

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<sup>1</sup>Charlotte C Burn, <sup>1,2</sup>Joy C Pritchard, <sup>2</sup>Murad Farajat, <sup>2</sup>Ali Twaissi, <sup>1</sup>Helen R Whay

<sup>1</sup> Department of Clinical Veterinary Sciences, University of Bristol, UK.

<sup>2</sup> The Brooke, Jordan.

\*Charlotte.burn@bris.ac.uk

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Risk factor analysis is increasingly being used in animal welfare research. Here this approach is applied to a problem in working donkeys: of the 86 donkeys used to carry tourists at Petra in Jordan, 63 had lesions beneath their tails. The lesions were apparently associated with using improvised rump straps, but interventions by an equine charity, the Brooke, to improve the straps, had limited success. Therefore, they commissioned the current assessment to explore risk factors for the lesions. The exploratory nature of the study means that findings will be used to generate hypotheses, rather than to test them, but they will also help inform new intervention strategies. Observations and questionnaires were used to collect data, ranging from those directly related to the strap, to those concerning donkey health and the attitudes of tourists and of each donkey's attendant. Analyses included logistic regressions and descriptive statistics. Padded straps were associated with more severe lesions than unpadded ones, but only if they were tightly fitted (Odds ratio = 1.50;  $n = 84$ ;  $P = 0.028$ ). Questionnaire results suggested that padding caused the lesions, rather than being a response to them, because only 5/86 donkey attendants suggested using padding for treating lesions. Unclean straps were also associated with worse lesions than clean ones (Odds ratio = 0.19;  $n = 84$ ;  $P = <0.001$ ). Questionnaires suggested that most tourists did not consider donkey welfare when choosing which animal to hire. Padding is often recommended to prevent straps from rubbing, but when straps overlay soft tissue (like the rump) rather than bony prominences, it can harm the skin, rather than protecting it. Removing padding and regularly cleaning straps could be an effective, low-cost, sustainable intervention at Petra and elsewhere.

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## SEROTONIN AND AGGRESSIVENESS IN CHICKENS

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**<sup>1</sup>Heng-wei Cheng\*, <sup>1,2</sup>Rachel L Dennis**

<sup>1</sup> Livestock Behavior Research Unit, USDA-ARS, USA.

<sup>2</sup> Dept of Animal Science, Purdue University, USA.

\*[hwcheng@purdue.edu](mailto:hwcheng@purdue.edu)

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Serotonin (5-HT) regulates aggressive behavior in animals. This study examined if 5-HT regulating aggressiveness has a heritable component in chickens. Chickens from two divergently selected lines KGB and MBB (Kind Gentle Birds and Mean Bad Birds displaying low and high aggressiveness, respectively) and DXL (Dekalb XL, an aggressive out-group) were used in the study. Hens were paired within the same strain. At 24 wk of age, the subordinate of each pair received i.p. injection of either NAN-190 (1mg/kg, a 5-HT (1A) antagonist, NAN), GR-127935 (1mg/kg, a 5-HT (1B) antagonist, GR) or saline (control) for 5 days ( $n = 10$  per treatment). Results showed that frequency of aggressive behaviors were increased in the hens of DXL and MBB treated with NAN ( $P < 0.05$ ) and in the KGB hens treated with GR ( $P < 0.05$ ), respectively. GR treated KGB hens and NAN treated MBB hens also displayed an increased feather pecking (FP) ( $P < 0.05$ ), respectively; but neither antagonist had an effect on FP of DXL hens ( $P > 0.05$ ). Among the controls, MBB hens have higher epinephrine (EP) levels than KGB or DXL hens, indicative of the inferior stress coping ability of MBB hens. Treatment with GR significantly reduced EP levels in MBB hens ( $P < 0.05$ ), but not in DXL or KGB hens, suggesting a role of 5-HT(1B) in stress regulation in MBB hens. Hens of all strains treated with GR but not NAN exhibited reduced weight gain and increased plasma 5-HT concentrations compared to controls ( $P < 0.05$ ), suggesting a negative feedback system altering stress coping ability. The results provide evidence for genetic basis of different serotonergic mediations of aggression in chickens. The data also indicates that, similar to humans and rodents, 5-HT(1A) and 5-HT(1B) have different functions in the regulation of aggressive behaviors in chickens.

## COMMUNITY-BASED NEUTERING PROGRAM TO CONTROL DOG AND CAT POPULATIONS AND PREDATORY BEHAVIOR IN THE GALAPAGOS

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**Emma L Clifford**

Animal Balance, San Francisco, CA, USA.

*clifford@animalbalance.org*

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Non-native plant and animal species are believed to be the greatest threat to the biodiversity of the Galapagos via predation, competition, infectious diseases, and habitat destruction. The purpose of this study was to evaluate the feasibility of reducing invasive dog and cat populations via neutering and the impact of the program on behavior of both pet owners and participating animals. Supplies were imported to establish temporary neutering clinics on 4 islands. Animals were treated for parasites, neutered, provided collars and leashes, and microchipped for identification. Owners were provided education in responsible pet ownership. Neutering campaigns were carried out on Isabela, Floreana, San Cristobal, and Santa Cruz islands. The number of animals sterilized was 1,021 in 2004, 999 in 2005, and 716 in 2006 for a total of 2,736. The animal census prior to the sterilization campaign was 3,311 and decreased to 3,240 in 2005. This 2% decrease reversed the previous trend of increasing dog and cat numbers. The final census for 2006 is not yet completed, but it appears that >75% of the dogs and cats in the Galapagos have been sterilized. A recent trend which threatens the success of the program is the illegal smuggling of purebred dogs into the islands. Annual follow-up visits to the islands revealed that after neutering a higher percentage of animals, particularly dogs, were allowed to sleep in the house instead of being kept outside and were restrained from roaming freely in the streets or in environmentally sensitive areas. Owners reported dogs were cleaner, more social with people, and less destructive following neutering. The neutering and education project was embraced by officials and residents, which have since established permanent neutering facilities to sustain the project. The program was effective in reducing the population, improving the human-animal bond, and reducing opportunity for predatory behavior.

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## WATER TROUGH LOCATION, AVAILABILITY OF SHADE AND DRINKING BEHAVIOUR OF CATTLE ON PASTURE

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**Paula AD Coimbra\*, Pablo A Nunes, Luis Carlos P Machado, Maria Jose Hötzel**

Universidade Federal de Santa Catarina, Brasil.

\*paulaadc@gmail.com

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Availability of shade and drinking water is a major welfare concern for animals on pasture. Thus the effects of water trough location and shade presence on the behaviour of cows on pasture were tested. Thirty two non-pregnant cows were randomly divided in four groups in a 4x4 Latin square design. Each period had 21 days (14 habituation and 7 data collection). The treatments were: T1: shade and water trough inside the paddock. T2: shade and water trough in the corridor. T3: no shade and water trough in the paddock. T4: no shade and water trough in the corridor. The animals were under rotational grazing. Water troughs consisted of 500 L round PVC containers, 0.6m high, positioned either at the corner of the paddock (T1 and T3) or in a 4m wide access corridor, 150m from the grazing paddock (T2 and T4). Shade consisted of a 24m<sup>2</sup> cover, 2.5m high, inside the paddock. In each period, animals were observed twice from 6am to 6pm. Group scans were made every 10min, and all drinking events, defecations and urinations were recorded. Water consumption was registered daily. Data were analysed by ANOVA. Shade did not affect drinking behaviour. However, cows drank more often (events/day/cow: T1: 3.1; T2: 1.0; T3: 3.6; T4: 0.7;  $P < 0.001$ ), for longer periods (time/day/cow: T1: 111s; T2: 56s; T3: 121s; T4: 48s;  $P < 0.01$ ) and a larger amount (amount/day/group: T1: 189L; T2: 130L; T3: 197L; T4: 139L;  $P < 0.02$ ) when the water trough was inside the paddock than in the corridor. Treatments did not affect other behaviours, except for urinating, which was lower in T2 (2.4 events/d) than in other treatments (3.3 events/d;  $P < 0.005$ ). Location of water trough influences drinking behaviour and consumption, thus possibly affecting both animal productivity and welfare.

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## PRODUCTIVE AND ETHOLOGIC BEHAVIOR OF SHEEP GRAZING WEEDS OF COFFEE PLANTATION, COMPARED WITH GRASSES WITH AND WITHOUT COMPLEMENTACIÓN, AND ITS EFFECT IN THE DRY MATTER *IN SITU* DISAPPEARANCE

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Paulina Davila, Leonor Sangines\*, Antoni Acevedo, Fernando Perez-Gil

Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán. México.

\*[Isangine@quetzal.innsz.mx](mailto:Isangine@quetzal.innsz.mx)

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The aim of this research was to identify the taxonomic of weeds in coffee plantation as well as to evaluate the productive and ethologic behavior of sheep grazing weeds of coffee plantation, compared with grasses (*Cynodon plectoslachyus* and *Pennisetum clandestinum*) with and without complementation and dry matter *in situ* disappearance. The research was conducted over a period of 40 days prior to the harvesting of the coffee crop. The chemical composition, *in vitro* and *in situ* digestibility of the weeds, was determined. The biological test was carried out in, Veracruz (México), being utilized 32 Pelibuey sheep male entire of 16 Kg of body weight average. In the coffee plantation 78 species were found, mainly of the families Fabaceae, Mimosaceae, Caesalpinaseae, Gramineae and Asteraceae. It was greater the food consumption frequency in the animals that grazing in coffee plantation. Minimal damage to leaves, branches, stems and fruits were produced by the animals. Sheep that consumed complement and weeds of coffee plantation had the greater profit of daily weight (113 g). The results indicated that selected weeds had higher CP, GE, ME, soluble fraction (a), Potential digestible fraction (b) and less ADF and NDF; The weeds selected they presented: 14.4 CP; 21.1 ADF; 45.9 NDF; 3.26Mcal/Kg GE; 2.83Mcal/Kg ME; a = 9.3, b= 74.33 and c= 61.1, respectively; while the collected weeds: 14.1 CP; 34.1 ADF; 51.9 NDF; 3.2Mcal/Kg GE; 2.81Mcal/Kg ME; a= 9.2, b= 73.2 and c= 60.4; and the grasses: 7.8 CP; 26.6 ADF; 47.7 FND; 2.61Mcal/Kg GE; 2.61Mcal/Kg ME; a= 8.8; b= 74.6 and c= 60.4. The complement had 27.03% CP and 2.5Mcal/Kg ME. The economic analysis of the farm coffee pot presented an index of negative profit value while in the systems of grazing in grasses without and with nutritional complementation was of 34% and 52.1%, respectively, and in the systems coffee plantation-sheep without and with nutritional complementation was of 68.59% and 81.02%, respectively. In conclusion, the production of sheep grazing weeds of coffee plantation with nutritional complementation is the most profitable option of the systems studied. With the grazing of sheep in the coffee plantations, the animal becomes an important generator of additional economic resources to the production of coffee.

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## EFFECT OF CO-MINGLING PIGLETS DURING LACTATION ON SOW MATERNAL BEHAVIOUR

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Nicolas Devillers\*, Stephanie Torrey, Chantal Farmer

Dairy and Swine Research & Development Centre, Agriculture and Agri-Food Canada

\*devillersn@agr.gc.ca

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Co-mingling piglets before weaning is suggested to reduce aggression at weaning. The objective of this experiment was to determine if mixing piglets and/or sows during lactation is detrimental to their performances and behaviour. Twenty-four sows were housed in standard farrowing crates with an extended back area (2 m x 2 m) equipped with rubber mat in which sow and piglets could enter from day 3 of lactation. From day 10 of lactation to weaning (d21), three treatments were applied. Sows and litters from control treatment (C) remained in individual pens. In the co-mingling treatment (M), only piglets were allowed to mix between two litters. In the group treatment (G), both sows and piglets from two litters were allowed to co-mingle. Direct observations of sow activity, nursings and piglets-directed behaviours were performed during and between three productive nursings on days 5, 10 and 18 of lactation. Maternal behaviour was also assessed using crushing simulation and intruder tests on days 6 and 19 of lactation. Data were analysed using a mixed model including treatment as the main effect with days of lactation as repeated measure. On the day of mixing, C sows tended to have longer nursing bouts, (C=6.2±0.6; M=4.4±0.6; G=4.4±0.6 min; P=0.07), terminated less nursings (C=46%; M=71%; G=67%) and spent less time eating (C=12.0±1.9%; M=6.5±2.1%; G=3.8±1.9%; P=0.03). Treatment had no effect on feed intake or weight of sows or piglets. No differences between treatments were observed in sow's reaction to a simulated crushing. However, M sows presented more piglets-directed exploratory behaviours on d18 (C=22±6; M=40±6; G=15±6 contacts/h; P=0.03) and tended to be more reactive in the intruder test on d19, with more locomotion (P=0.1), exploration of intruder (P=0.12) and resident piglets (P=0.13) and more time spent standing (P=0.005). Therefore, mixing sows and piglets during lactation could be used without detrimental effect on sow maternal behaviour.

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## CHARACTERISATION OF OBJECTIVE BEHAVIOURAL INDICES FOR THE ASSESSMENT OF CHRONIC AND ACUTE PAIN STATES IN HORSES

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<sup>1</sup>Rachel A Eager\*, <sup>1</sup>Emma Jones, <sup>2</sup>Natalie K Waran, <sup>3</sup>Jill Price, <sup>1</sup>Ian G Mayhew, <sup>4</sup>Susan M Fleetwood-Walker

<sup>1</sup>Royal (Dick) School of Veterinary Studies, The University of Edinburgh, Easter Bush Veterinary Centre, Scotland

<sup>2</sup>Unitec New Zealand, New Zealand

<sup>3</sup>Saint George's University, Department of Veterinary Clinical Studies, USA

<sup>4</sup>Centre for Neuroscience Research, The University of Edinburgh, Summerhall, Scotland

\*R.A.Eager@sms.ed.ac.uk

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Accurate pain assessment is fundamental to optimal pain management, representing a major welfare concern. Pain assessment has received considerable attention in farm, laboratory and companion animals, however, there is little objective equine pain research. This study aimed to objectively identify behavioural indicators of pain, examining both acute post-operative (castration) and chronic (laminitis) pain. Male thoroughbred horses (n=10/group) underwent castration or sham castration (control) performed under either standing surgical sedation (SS) or general anaesthesia (GA). Horses were monitored for 24 hours pre-operatively and 48 hours post-operatively. Additionally, seven acute laminitic horses and paired age, sex and breed-matched controls were monitored for up to five days. Assessments were made using time-lapse video recording and direct observation of undisturbed spontaneous behaviour and evoked human interaction behaviours. Data were acquired using The Observer™ and analysed using generalised mixed effects (GME) and discriminant analysis (DA). GA and SS castrates spent more time with their ears back and displayed a higher frequency of stepping away than controls in interactive tests ( $P < 0.017$ , GME). Head level with withers increased post-operatively in SS castrate, but not control horses ( $P < 0.001$ , GME). Additionally, sham GA resulted in increased inattentive behaviour and hindlimb resting and reduced 'head up' and recumbency ( $P < 0.039$ , GME). Laminitic horses showed reduced hindlimb resting and walking with increased lying, 'head level' and forelimb lifting compared to controls ( $P < 0.046$ , GME). Accuracy of discrimination (DA) between 'painful' and 'pain-free' horses was  $>78.6\%$  in acute and chronic pain. We identified behavioural parameters indicative of pain and discomfort in acute and chronic pain states. Acute pain may be most accurately identified through the examination of evoked behaviour, whilst changes in spontaneous behaviour appear more altered in chronic pain. The development and validation of objective pain assessment protocols will optimise management; allow identification of 'best practice' and improve evaluation of new analgesic agents.

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## DOES ATTACHMENT BEHAVIOR EXIST IN OWNED CATS?

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**Claudia Edwards\*, Moisés Heiblum, Alberto Tejada, Francisco Galindo**

Facultad de Medicina Veterinaria y Zootecnia, UNAM, Mexico.

*cedwardsp@yahoo.com.mx*

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Attachment is a normal behavior which is necessary for the survival of all species of mammals; animals that are kept in homes as pets also need to show attachment to their owners in order to survive or to simply have a higher quality of life particularly in a city. The general objective of this study was to identify attachment behaviors, directed towards their owners, in cats of different racial types, age groups and sexes in an experimental situation. 28 cat individuals ranging from one to seven years of age and belonging to different racial types were used in the study, without taking into account sex or reproductive status. These cats underwent an Ainsworth's Adapted Strange Situation Test. Event frequencies and behavioral state durations in individual type behaviors such as exploration/locomotion, alertness and inactivity were registered using a direct focal sampling observation. For data analysis, cats were divided by racial type; sex and reproductive status. Regarding the locomotion/exploration behavioral state, a highly significant ANOVA difference was found ( $N=28$ ,  $F=13.55$ ,  $p<0.001$ ) between the episodes with the owner, alone and with a stranger, in which cats spent more time in the locomotion/exploration state while accompanied by their owner. On the alert behavior event frequency an ANOVA difference ( $F=7.44$ ,  $p<0.05$ ) was found which showed a higher frequency while in company of the stranger. Lastly, in the inactivity time ratio, a highly significant ANOVA difference was found ( $F=18.55$ ,  $p<0.001$ ), where the time spent on this behavior was considerably higher when the animal was alone. These results are consistent with the ones obtained by Ainsworth in children attached to their mothers; therefore, it can be said that cats can manifest attachment behaviors towards their owners and can show signs related to separation anxiety when their owners are absent.



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## BEHAVIOR OF DAIRY COWS IN AN ALTERNATIVE BEDDED PACK HOUSING SYSTEM

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**Marcia I Endres\*, Abby E Barberg**

University of Minnesota, USA

*miendres@umn.edu*

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The objectives of this study were to measure lying behavior and social interactions of lactating cows housed in an alternative bedded pack housing system commonly referred to as a compost dairy barn, and to investigate the association between temperature-humidity index and lying behavior of cows housed in this system. Lying, standing and walking behavior of 147 focal cows in 12 farms was measured using automatic activity monitors. The average daily lying time for all cows was 9.34 h (range of 2.37 h to 16.80 h). The average number of daily lying bouts was 11.0 (range of 2 to 29) and the average lying bout length was 50.8 min. Cows in the compost barns lay down for less amount of time, increased the number of steps taken, and reduced the length of lying bouts as the temperature-humidity index increased. Social interactions and lying positions of all cows in the bedded pack area (total of 796 cows in the 12 dairies) were recorded using visual observations during two 4-hr periods on 2 separate days. All 4 natural lying positions (head back, head up, flat on side and head on ground) were observed in 9 of the bedded packs during the direct visual observation periods. Observations of social interactions on the bedded pack area showed that, on average, 0.94 incidents of chasing away, 0.94 of pushing, 1.4 of head butting, and 2.3 of allogrooming occurred each hour. Observations on lying behavior, social interactions, and natural lying positions indicate that compost dairy barns can be an adequate housing system for dairy cows as these observations were not substantially different than previously reported with other types of housing.

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# THE EFFECTS OF REARING BROILER CHICKENS UNDER DIFFERENT LIGHT INTENSITIES ON FEAR RESPONSES

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**Gena Fagerberg, Joy A Mench, Gregory S Archer\***

Department of Animal Science, University of California, Davis, USA.

\*[gsarcher@ucdavis.edu](mailto:gsarcher@ucdavis.edu)

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It has been suggested that welfare of commercial broilers could be improved by increasing the ambient light intensity during growout. However, there is also concern that broilers reared under high light intensities may be more fearful and difficult to catch at market age. Male and female Cobb broiler chickens (N=240) were housed in environmental chambers providing either 5 (LOW), 50 (MED) or 200 (HIGH) lux illumination during the 16-hour photophase. Nighttime illumination was 1 lux in all treatments. There were 4 chambers of chickens/treatment. Beginning at week 4 of age, four tests were used to evaluate fearfulness: 1) induction of tonic immobility; 2) response to novel object placed in the home pen; 3) response to novel human entering the home pen; 4) response to inverted handling after catching. Data were analyzed using the GLM. There was a trend ( $F=3.69$ ;  $p=0.068$ ) for a difference in the novel human test, with the latency for the last, but not the first, bird in the pen to approach the novel human being greater in HIGH ( $120.07\pm 41.63$ ) than in either MED ( $17.40\pm 3.40$ ) or LOW ( $54.40\pm 21.37$ ), with the difference between HIGH and MED being statistically significant. However, there were no significant treatment differences for the three other tests, with the number of attempts to induce tonic immobility and tonic immobility duration; number of vocalizations and number, intensity and duration of wing flaps during inverted handling; and latencies to approach the novel object; being similar among the treatment groups. These results suggest that rearing broilers at higher light intensities has little effect on fearfulness or on responses to catching and handling at market age.

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## A COMPARISON OF DOG KEEPING PRACTICES IN THE CARIBBEAN AND NORTH AMERICA: A DEVELOPMENTAL ISSUE?

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**William J Fielding**

The College of The Bahamas, The Bahamas

*wfielding@cob.edu.bs*

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Unlike North America, it is only in recent years that studies have been undertaken in the Caribbean to investigate the care of dogs. This paper compares and contrasts the results from recent studies in three Caribbean territories (The Bahamas, Dominica, St Maarten) with dog keeping practices in the USA (four territories with very different levels of development) to highlight areas in which caregivers could benefit from education. Reasons for keeping dogs varied greatly between the USA and the Caribbean, with less than 10% of Americans keeping dogs for protection compared with 40-50% of Caribbean owners. While the neutering rate is over 60% in America, it is between 10-40% in the Caribbean territories. The fact that many owners in the Caribbean keep their dogs outside and allow them to roam is probably responsible for the higher chances of a solitary household dog breeding in the Caribbean than in America. The reason why Caribbean caregivers allow their dogs to roam is that, in some instances, (37-44%), they considered it "cruel" to confine dogs, as opposed to 66% of Americans who said that it was cruel to let dogs roam. These differences and the fact that many Caribbean dog carers are "passive" (carers who have limited interaction with their pets) rather than "active" owners of their dogs, combined with their lack of education on animal welfare and economic limits, are probably the root cause of the differences between dog care between Caribbean and American caregivers. If the American model of animal care is taken to be responsible for the reduction in number of unwanted pets in America, the differences between care in America and the Caribbean point to the areas in which Caribbean caregivers may benefit from education if the number of unwanted Caribbean dogs is to be reduced.

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## MEASURING THE STEEPNESS OF THE DOMINANCE HIERARCHY IN GROUPS OF NORTHERN ELEPHANT SEAL FEMALES

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**María C García Aguilar**

Centro de Investigación Científica y de Educación Superior de Ensenada, Depto. Biología de la Conservación, Ensenada, B.C., México.

*gaguilar@cicese.mx*

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During the breeding season, females of northern elephant seal (*Mirounga angustirostris*) group to give birth, rear and mate. Some studies suggest the existence of a despotic dominance hierarchy among females where those with highest social ranks are more successful at pup rearing than females with lower ranks. However, methods used in these studies to evaluate the dominance hierarchy were qualitative. I tested the dominance hierarchy in groups of *M. angustirostris* females using a quantitative attribute, the steepness of the dominance. Field work was carried out during the 2001 and 2002 breeding seasons at the Islas San Benito rookery, the second largest Mexican colony. Behavioural observations were done on two middle sized harems where most females were individually marked on both flanks. Because females are not all ashore at once, agonistic interactions were recorded near to the local peak. In 2001, group size was 23 and 481 interactions were recorded; in 2002 group size was 37 and 741 interactions were recorded. David score (DS) was calculated based on the dyadic dominance index. The DS was converted into a normalized DS (NormDS) and females were ranked according to their NormDS values. A least-square linear regression was used to find the best-fit straight line, where the slope's absolute value is the measure of steepness. The significance of the steepness value was evaluated by testing 2000 randomizations, under the null hypothesis of random win chances. The degree of the steepness was not significant in either case. In 2001 steepness value was 0.206 ( $P = 0.961$ ), and in 2002 the steepness value was 0.152 ( $P = 0.992$ ). These results suggest that the northern elephant seal female's dominance system in the San Benito colony is more egalitarian than despotic, and it could be reflected in the highest relative and individual female's reproductive success.

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## THE RELATIONSHIP BETWEEN PREGNANT COWS' BEHAVIOR, CALF WEIGHT AND POSTPARTUM LEVELS OF PROGESTERONE

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<sup>1</sup>Alejandro A Gomez\*, <sup>1</sup>María Esther Ortega, <sup>1</sup>Maria T Sanchez,  
<sup>1</sup>Jose G Herrera, <sup>2</sup>Francisco Galindo

<sup>1</sup> Colegio de Postgraduados, Mexico.

<sup>2</sup> Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autonoma de Mexico.

\*alagod@nayar.uan.mx

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During handling in the stockyard cattle suffer stress when mixed with other animals which might affect reproduction. In this study social behavior in two genetic types of cows and its relation to calf birth weight and ovarian function 70 days after calving was evaluated. Twelve cows were used, Brahman x Simmental (N=5, G1) and Brown Swiss x Braham (N=7, G2) (550-610 kg BW), 4-5 years old, 2 to 3 parities, 6-7 months pregnant. Cows' behavior was observed during 24 consecutive days, making 12 observations every other day to determine the number of times a cow displaced others (index of displacement, ID) and number of animals a cow could displace (index of success, IS), as well as agonistic and non agonistic behaviors. Each day behavioral observations and scan sampling with continuous recording were made for 4 h, at 5 minutes intervals. Calves' birth weight was recorded. Progesterone test was performed 70 days after parturition. Ten blood samples were taken during a 19 day period. The GLM procedure was used to analyze agonistic and non-agonistic interactions, also ID and IS. Calves' birth weight was correlated with ID and IS using the Spearman correlation. Progesterone data concentration was analyzed by PROC MIXED. ID and IS were different ( $P<0.05$ ) for G1 ( $0.17\pm 0.36$ ,  $0.36\pm 0.30$ ) and G2 ( $0.54\pm 0.13$ ,  $0.66\pm 0.13$ ), G2 showed less ( $P<0.05$ ) non-agonistic interactions (42) than G1 (174). G1 showed a higher correlation between calf's birth weight and ID (0.64), IS (0.57) than G2 (ID 0.58, IS 0.26). Progesterone concentration was different for G2 only for samples 3 and 8 ( $P<0.01$ ,  $1.8 \text{ ng mL}^{-1}$ ,  $P<0.05$ ,  $1.4 \text{ ng mL}^{-1}$ , respectively). No differences ( $P<0.05$ ) were found for G1, with progesterone concentrations below  $1 \text{ ng mL}^{-1}$ . There was a greater relationship between dominant behavior and ovarian activity in genetic type G2, and a higher correlation between calf's weight and ID, IS in G1.

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## NON INVASIVE EVALUATION OF COPING STRATEGIES IN FOUR WILD CARNIVORES SPECIES (MEXICAN GREY WOLF, COYOTE, OCELOT AND AFRICAN LION), AFTER THEIR RELOCATION IN NEW ENCLOSURES

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<sup>1</sup>Sandra Hernández\*, <sup>1</sup>Fernando S Gual, <sup>2</sup>Marta Romano, <sup>1</sup>Francisco Galindo,  
<sup>2</sup>Ricardo Valdez, <sup>3</sup>Jose Pablos, <sup>1</sup>Arturo Rivera

<sup>1</sup> Etología Fauna Silvestre y Animales de laboratorio, FMVZ. UNAM, Mexico

<sup>2</sup> Fisiología y Patología Experimental CINVESTAV, IPN, Mexico

<sup>3</sup> Genética y Bioestadística, FMVZ. UNAM, Mexico

\*sahm30@hotmail.com

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The aim of the present study was to assess the relationships between individual behavior and fecal cortisol as response to a new enclosure in 6 canids (4 *Lupus baileyi* and 2 *Canis latrans*) and 4 felids (2 *Leopardus pardalis* and 2 *Panthera leo*). All individuals were observed for 50 hours distributed in one week, and 150 hours distributed in 5 weeks, before and after relocation, respectively to obtain information on maintenance behaviors. Fecal samples were collected daily during the six weeks for cortisol determination. A multivariate profile analysis and a Pearson's correlation test were used. The results showed differences between sexes and families in the recovery time of fecal cortisol levels ( $P \leq 0.05$ ), as well as in the time to return to the initial (prior to relocation) proportion of time of individual behaviors ( $P \leq 0.05$ ). Fecal cortisol levels were higher in females than in males and in felids than in canids ( $P \leq 0.05$ ) suggesting that habituation to a new enclosure is probably more gradual in females than in males and in felids than in canids. Cortisol levels and time spent in stereotyped behavior were lower in the new enclosures ( $P \leq 0.05$ ). In addition, significant relationship was seen between fecal cortisol levels and surveillance behaviors ( $R_s \geq 0.8$ ,  $P \leq 0.05$ ) and between fecal cortisol and stereotyped behaviors in canids ( $R_s \geq -0.8$ ,  $P \leq 0.05$ ). Surveillance behaviors could be use as an indirect assessment of the habituation to a new enclosure.

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## EFFECTS OF PASTURE ON LAMENESS IN DAIRY COWS

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**<sup>1</sup>Omar Hernandez-Mendo\*, <sup>2</sup>Marina AG von Keyserlingk,  
<sup>3</sup>Douglas M Veira, <sup>2</sup>Daniel M Weary**

<sup>1</sup>Programa de Ganadería. Colegio de Postgraduados, Mexico, <sup>2</sup>The University of British Columbia, Canada,  
<sup>3</sup>Agriculture and Agri-Food Canada, Pacific Agri-Food Research Centre

*\*ohmendo@colpos.mx*

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This study tested if providing cows a 4-wk period on pasture improved gait and changed lying behavior. Eighteen groups, each of 4 lactating Holstein cows initially housed in a freestall barn, were assigned to either continued housing in the same barn, or to pasture that provided a change in both the physical environment and diet. To assess lameness, gait scores (1 to 5) were recorded weekly for 4 wk. Because housing treatments were assigned to replicate groups, effect of housing (1df) was tested using group as the error term (8df) in a generalized linear model for all dependent variables. Gait improved ( $P < 0.001$ ) for those animals kept on pasture by on average 0.22/wk. We also recorded 4 specific gait attributes (head bob, back arch, tracking up and reluctance to bear weight evenly across the 4 hooves), and found that the latter two attributes also improved ( $P \leq 0.05$ ;  $P \leq 0.001$ ) over the period on pasture. The improved gait for cows on pasture was not because of increased lying times in this condition; cows on pasture actually spent less ( $P < 0.01$ ) time lying down than cows kept indoors (10.9 h/d versus 12.3 h/d), although this lying time was spread over a larger number of bouts (15.3 versus 12.2 bouts). Cows housed pasture also lost ( $P = 0.014$ ) weight and reduced ( $P < 0.001$ ) milk production relative to the freestall cows, likely because of reduced nutrient intake. These results indicate that a period on pasture can be used to help lame cattle recover probably because pasture provides a more comfortable surface upon which cows stand, helping them to recover from hoof and leg injuries.

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## CHARACTERISTICS OF ANIMAL WELFARE IN THE EXTENSIVE CATTLE SYSTEMS OF URUGUAY

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**<sup>1</sup>Stella M Huertas\*, <sup>2</sup>Deborah Cesar, <sup>3</sup>Andres D Gil**

<sup>1</sup> Facultad de Veterinaria, Montevideo, Uruguay.

<sup>2</sup> Instituto Plan Agropecuario, Montevideo, Uruguay.

<sup>3</sup> Ministerio de Ganadería Agricultura y Pesca, Montevideo, Uruguay.

\*stellamaris@adinet.com.uy

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Uruguay is located in the American Continent, latitude 33° south. Its mild weather allows extensive cattle production in natural pastures. The total bovine herd is of 12 million beef cattle, each farm has an average of 150-450 bovine heads. Water sources are natural thanks to the rich hydrographic network of the country. The objective of this study was to research about animal management actually practiced in Uruguay and how is the facilities quality based on the opinion of rural workers. We ask ourselves: how do cattle management practices influence the Animal Welfare? Can we reduce or eliminate some of the factors with negative influence? Can we modify some of them? Is it economically possible and sustainable? Are there apt human resources? Some surveys (n=96) were done to the rural stockpersons that attended the Good Management Practices Diffusion Conferences in Uruguay (2004). Dehorning and castration are performed in 50% of the cases together with the weaning. Almost half of the times (47%) the injections are applied by the intramuscular route in the round of the animal. Devices used to move animals were: sticks (62%), whip (32%), electric prod (21%), dogs (32%) together or separately. Half of the farmers provide water to the animals before the loading and 27% provides some food. Moreover, 39% of the farms send their animals to slaughter houses located less than 150 km away, whereas 33% sends them between 150 and 400 km and 28% further than 400 km. Although many of these answers are already known as well as the necessary changes to improve the animal welfare, the improvement of the stockpersons skills has the greatest importance. It is necessary to generate information to backup this changes, based on scientific evidence. An economic evaluation will also be of use to evaluate all these changes.



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## DOES CAREFULNESS OF SOW'S LYING-DOWN BEHAVIOUR INFLUENCE CRUSHING OF NEWBORN PIGLETS?

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Gudrun Illmann\*, Zuzanna Pokorná, Kristýna Neuhauserová,  
Helena Chaloupková, Marie Šimečková

Research Institute of Animal Science, Prague, Czech Republic.

\*Illmannova@vuzv.cz

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Crushing is one of the main causes of mortality in newborn piglets when a sow moves from standing to lying. A carefulness score of the lying down behaviour (SCORE) has been calculated later in lactation. Almost nothing is known (i) whether this SCORE changes during the first 24 h and (ii) whether crushing is influenced by the SCORE and /or the time after birth? The behaviour of 18 sows was video taped for 24 h after birth. Four time periods were distinguished based on the different activity of sows within the first 24 h: Birth (first 2 h p.p.), 3-8 h p.p., 8-14 h p.p. and 15-24 h p.p. For every lying-down event a SCORE (max. 4 points) was calculated as a sum of one point: for sniffing the floor before lying down, for rooting, if the sow descended in vertical plane, and if there were no piglets on the side on which she lies down. (i) The SCORE was significantly influenced by the time period (GLMM,  $F_{3,338}=7.50$ ,  $p=0.0001$ ). This SCORE increased between 3-8 h (3.1 points) and 9-14 h (3.5 points). (ii) Crushing of a piglet was observed in 38 cases out of 359 sow's lying down behaviour. The probability of crushing was influenced by the SCORE (NLMIXED,  $T_{17}=-4.96$ ,  $p=0.0001$ ) but not by the time period (NLMIXED,  $L_{3}=4.0$ ,  $p=0.26$ ). However, only one part of the SCORE influenced significantly the probability of crushing. The part of the SCORE 'no piglet on the side on which the sow lied down' decreased the probability of crushing (NLMIXED,  $T_{17}=-5.53$ ,  $p=0.0001$ ). In conclusion, the SCORE increase 8 h after birth and remains than stable within 24 h. The probability of crushing is not depended from the time after birth –but more whether piglets are on the side on which she lies down. It seems that it is more important to assess factors which prevent that piglets are on the side on which the sows lay down than the calculation of a SCORE.

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## THE USE OF ROOTING MATERIAL BY GROWING PIGS IN RELATION TO TIME OF FEEDING

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**Margit Bak Jensen\*, Lene J Pedersen**

Institute of Animal Health, Welfare and Nutrition, Faculty of Agricultural Sciences,  
University of Aarhus, Denmark.

\*[MargitBak.Jensen@agrsci.dk](mailto:MargitBak.Jensen@agrsci.dk)

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Rooting materials reduce the occurrence of abnormal behaviour such as manipulation of pen mates and pen fixtures in growing pigs. The abnormal behavioural patterns are due to a redirection of the pigs' explorative and foraging behaviour. Therefore, the availability of a rooting material may be especially important in connection with the allocation of feed, and especially if the pigs are fed restrictively. Seventy-two pigs, housed in groups of four, were allocated to either (1) ad lib feeding/with wood-chips, (2) restrictive feeding/with wood-chips and (3) restrictive feeding/without wood-chips. In the analysis relevant comparisons investigated the effects of feeding level and provision of wood-chips, respectively. Behaviour recorded using 5-min scan sampling during 24-h showed that the provision of wood-chips reduced manipulation of the floor among restrictively fed pigs (38 and 114 min/24 h;  $P < 0.001$ ), but there were no effect on the manipulation of pen mates (4 min/24 h). There was no effect of feeding level on manipulation of wood-chips (100 min/24 h). Behaviour recorded using continuous recording for 1-h after allocation of feed showed that the provision of wood-chips reduced the manipulation of pen mates (0.03 and 0.11 min/1 h;  $P < 0.05$ ) and the manipulation of floor among restrictively fed pigs (0.03 and 3.00 min/1 h;  $P < 0.001$ ). There was no effect of feeding level on manipulation of wood-chips (7 min/1 h). Wood-chips reduced abnormal behaviour directed towards pen mates in restrictively fed pigs during the first hour after the allocation of feed. Thus the provision of a rooting material may be especially important in connection with allocation of feed in order to reduce this abnormal behaviour.

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## DIURNAL BEHAVIOUR, IMPACT OF WEATHER AND USE OF SHADOW TREES IN WILDEBEEST, ZEBRAS, AND THOMSON'S GAZELLES

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Jens Jung\*, Per Eriksson

Swedish University of Agricultural Sciences, Sweden.

\*jens.jung@hmh.slu.se

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The study area in Masai Mara, Kenya, consists of open grass savannah with about one solitary tree per hectare. We investigated how these trees, which are diminishing in the study area, are used as shadow trees by the three main herbivore species in the area, i.e. blue wildebeest (*Connochaetes taurinus*), plains zebra (*Equus burchelli*), Thomson's gazelle (*Gazella thomsonii*). We took 668 pictures of trees and 668 ones of nearby control areas without trees and recorded all animals within a radius of 20 m of the picture centre. Zebras and wildebeest preferred areas with trees whereas Thomson's gazelles did the opposite (Kruskal-Wallis test, as well as in all following results). Wildebeest used the tree areas mainly for resting and treeless areas for grazing. To assess impact of weather on the focal species, we drove transects of 1 km length once per hour from 6:30 to 18:30, in total 1,008 km. We recorded the first seen behaviour of each encountered animal (N= 36,818 wildebeests, 13,010 zebras, 7,910 Thomson's) as well as temperature and sunshine. Behaviour was recorded as grazing, standing, walking, and lying. All three focal species had a clear diurnal pattern with grazing in early morning and late afternoon and increased standing or lying at mid-day. Reasons for this might be a daily rhythm independent of weather, or it might be an adaptation to changing weather throughout the day. To assess this, we analysed impact of temperature and sunshine independent of time of the day. Wildebeest reduced grazing and lying in hot and sunny conditions and increased walking, possibly to reach water. Zebras and Thomson's did not show any reaction on weather. We conclude that wildebeest more than the other focal species adapted grazing to weather factors. Shadow trees are most important for wildebeests and zebras; Thomson's gazelles might have avoided the trees because of other herbivores or predators.

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## HOW FARMED BLUE FOXES VALUE VARIOUS CAGE ENRICHMENTS

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**Tarja Koistinen\*, Jaakko Mononen, Hannu T Korhonen**

University of Kuopio, Department of Biosciences, Finland.

*\*Tarja.Koistinen@uku.fi*

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We studied farmed blue foxes' motivation for access to earth floor (EF), platform (PF), and empty cage (EC) by applying the maximum price method. Eight trained blue fox males were housed in cage systems that consisted of three fox cages. One-way doors led from the middle cage (MC) to the resource cage (RC) and the control cage, and other doors back to MC. The force needed to open the door leading from MC to RC could be altered. The resource, i.e. EF, PF or EC, was available in RC only. The foxes worked for each resource on workloads increasing every 24h (from 0.5 up to 8kg), until they ceased to enter RC, i.e. reached the maximum price. The maximum price for the resource, and the time spent and the number of visits in RC were analysed using Linear Mixed Model. There was no difference ( $P>0.05$ ) between the resources in the maximum price (EF:  $7.3\pm 0.8$ , PF:  $6.7\pm 0.5$ , EC:  $6.7\pm 0.7$  kg; mean $\pm$ SE), number of visits (EF:  $20\pm 1$ , PF:  $18\pm 2$ , EC:  $16\pm 2$  visits) or time spent in RC (EF:  $26\pm 3$ , PF:  $29\pm 5$ , EC:  $29\pm 5\%$  of 24h). The number of visits (slopes: EF:  $-0.09$ , PF:  $-0.16$ , EC:  $-0.09$ ) and the time spent in RC decreased ( $P<0.001$ ) with increasing door weight. The time spent in RC decreased ( $-0.01$ ) least when the resource was EF (vs. PF:  $-0.18$ , EC:  $-0.11$ ,  $P<0.01$ ). The maximum price did not distinguish between the resources, possibly because three foxes, unexpectedly, entered the maximum possible door weight (8kg) for all resources. The better-defended time on the earth floor does not indicate that the foxes valued the earth floor more than the other resources, but rather that satiation on low workloads occurred most rapidly on the earth floor, i.e. the foxes avoided staying on the earth floor for longer than 20-30% of time.

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## IS CARPROFEN, A NON-STEROIDAL ANTI-INFLAMMATORY ANALGESIC, SAFE FOR USE IN PEKIN DUCKS?

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<sup>1</sup>Tsumugi A Kurosawa\*, <sup>2</sup>Heng-wei Cheng, <sup>2</sup>Ruth M Marchant-Forde

<sup>1</sup> Department of Animal Sciences, Purdue University, West Lafayette, Indiana, USA.

<sup>2</sup> Livestock Behavior Research Unit, USDA-ARS, West Lafayette, Indiana, USA.

\*tkurosaw@purdue.edu

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Carprofen (Rymadyl) is a common systemic analgesic used to relieve chronic pain states in dogs, such as osteoarthritis. There is no comparable drug recommended to treat pain, such as that originating from bill trimming procedures, in ducks. The aim of this study was to evaluate if carprofen could be chronically administered to Pekin ducks without adverse effects. Thirty-two, 1-day-old, Pekin ducks were pair-housed in bedded floor pens and randomly assigned to a control (C) or drug (D) treatment. They had *ad libitum* access to appropriate feed and water. At 2 weeks of age, the D ducks received carprofen (10 mg/kg/d) in their drinking water daily for 14 days. C ducks continued to receive regular, untreated, water. Behavior, body weight (BW) and blood samples were monitored at fixed intervals to evaluate any effect of the drug over time. Blood was analyzed to determine if treatment affected liver, kidney or immune function. There was a significant effect of age on most parameters ( $P < 0.05$ ). However, there were no effects of treatment on behavior, body weight, or the proportion of circulating heterophils, lymphocytes, eosinophils, monocytes, basophils or H:L ratios (all  $P > 0.05$ ). Preliminary analysis of chemical panel data failed to highlight any effects of treatment on either liver or kidney function. Overall, there seems to be no apparent toxic effects of chronic carprofen administration in Pekin ducks. Any significant differences present were age related and considered a normal part of growth and development. Carprofen may now be safely incorporated into future studies for evaluating the emergence and persistence of pain states due to bill trimming methods in Pekin ducks.

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## INVESTIGATING THE EFFECT OF FEEDING SPACE ON AGGRESSION AND FEEDING BEHAVIOUR OF DAIRY COWS

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Fiona C Lang\*, Marie J Haskell, Dave J Roberts

Scottish Agricultural College, Scotland.

\*[Fiona.Lang@sac.ac.uk](mailto:Fiona.Lang@sac.ac.uk)

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Promoting feed intake of lactating dairy cattle (particularly those in early lactation) is critical in terms of improving milk production, health, body condition and welfare of the animals (Grant and Albright, 1995). Limiting feeding space increases competition among cows at the feed-face and may lead to some cows modifying their feeding times to avoid aggressive interactions (Miller and Wood-Gush, 1991). The study investigated the effect of three different feeding space allowances on aggression and feeding behaviour in lactating dairy cows. Forty-five multiparous lactating Holstein Friesian cows were used in the study and cows were divided into 3 groups of 15 animals (balanced for stage of lactation and age). Each of the 3 groups experienced 3 different feeding space allowances, following a Latin square design. The space allowances were chosen to represent low (0.35m), standard (0.69m), and high (1.04m) allowances. Behaviours were continuously monitored using video cameras, specifically length of feed bouts, number of feed bouts and all aggressive interactions. Daily feed intake per group was also recorded. The number of displacements per cow was used to assess the aggressiveness of individuals at the feed face. It was found that there was a significant difference ( $p=0.016$ ;  $F=60.42$ ;  $d.f. =2$ ) between feed intakes at the different space allowances, however, these differences did not confirm what was expected from the hypothesis. Feeding bouts were longer at the lowest feed-face space allowance ( $p=0.035$ ) and the number of feeding bouts was significantly different between the lowest and highest space allowances ( $p<0.001$ ). The number of aggressive interactions increased as the space allowance was reduced ( $p<0.001$ ). Specifically, the number of displacements from the feed-face increased as the space allowance decreased ( $p=0.037$ ). These results indicate that increased competition may adversely affect optimum feeding conditions. Subordinate animals may be more compromised than dominant animals at smaller space allowances.

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## EFFECT OF THE TYPE OF REARING ON THE ESTABLISHMENT OF SOCIAL STRUCTURE IN FEMALE GOAT KIDS AT WEANING

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**<sup>1</sup>Emmanuel A Lara\*, <sup>1</sup>Anne A Sisto, <sup>1</sup>Andrés E Ducoing, <sup>2</sup>Angélica Terrazas**

<sup>1</sup> Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México.

<sup>2</sup> Facultad de Estudios Superiores - Cuautitlan, Universidad Nacional Autónoma de México.

\*[elcpuma41@yahoo.com.mx](mailto:elcpuma41@yahoo.com.mx)

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The objective of this study was to see if the loss of social contact with the herd and the lack of intraspecific social behavior transmission can affect learning and later behavioral development of female goat kids artificially reared. The ability of kids from natural rearing (NR) and artificial rearing (AR) to establish social relationships was measured at weaning. Forty one crossbreed goats, 75 days old, from pre-weaning natural (n=21) and artificial rearing (n=20) were randomly assigned to three treatments NR, AR and combined (C), with two replicates each. Behavioral sampling of agonistic interactions were made daily for 15 days. The frequency of aggression, duration of aggressive sequences (very short (Vs), Short (Sh), medium (Md), large (Lg) and very long (Vl)) and consequences of each agonistic encounter (displacement without contact (DoC), displacement with contact (DwC) and No displacement (Nd)) were recorded. Data were analyzed by ANOVA (using group means values) and the Landau's index (h) for dominance hierarchy linearity was determined. Results showed a higher number of emitted aggressions in NR than AR ( $p=0.0294$ ), the Vs sequences were different in three groups, higher in C and lower in AR ( $p=0.0001$ ); in the social consequences of interactions, DwC did not show significant differences between groups ( $p=0.082$ ); DoC was higher in C ( $p=0.0033$ ), and Nd on NR ( $p=0.0001$ ). The Landau's indexes of linearity by treatment were AR  $h=0.7$ , NR  $h=1$ , M  $h=1$ . These results suggest that individuals from AR performed lower social responses than NR and C, and it could be related with a low value in the Landau's index. Results show that there was higher social instability in the combined group, which suggests it could be due to the grouping of individuals from natural and artificial rearing, since individuals from artificial rearing performed lower social responses when establishing their social structure.

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## BEHAVIORAL AND PHYSIOLOGICAL INDICATORS AS PREDICTORS OF PIGLET VIABILITY DURING THE SUCKLING PERIOD

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Georgios E Maglaras\*, Ioannis Skoufos, Evangelia Giza, Elias Filos,  
Georgios Vatzias, Athina Tzora

Department of Animal Production, T.E.I. of Epirus, Arta, Greece.

\*[gmag@teiep.gr](mailto:gmag@teiep.gr)

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The aim of the present study was to identify behavioral and physiological characteristics of piglets that could be related to piglet survival. Data from 104 multiparous sows and their 1178 piglets were analyzed. Piglets were weaned at 24 days. Behavioral indicators (BI) of piglet vitality at three days of age were time until first upright standing (BI-1), time until first contact with the udder (BI-2), time until first colostrum uptake (BI-3) and total farrowing time (BI-4). Piglet weights on day three were divided into three scales, lower three day weights [LBW-3- ( $\leq 1.6$ kg)], average three day weights [ABW-3- (1.6–2.2kg)] and higher three day weights [HBW-3- ( $\geq 2.2$ kg)]. Physiological indicators (PhI) involved birth weight (BW), rectal temperature at birth (RT-B) and 60 min after birth (RT-60), type of presentation at birth (TPB) and presence of stillbirths (PS). A large percentage of piglets (72%) in the LBW-3 group were positively influenced by late farrowing time ( $\geq 160$  min). Time until first colostrum uptake (BI-3) and total farrowing time (BI-4) didn't influence LBW-3, ABW-3 or HBW-3. LBW-3 and ABW-3 were positively correlated to late BI-1 ( $> 8$  min), late BI-2 ( $> 16$  min) and late BI-3 ( $> 25$  min). Furthermore, HBW-3 were positively influenced by BI-1 ( $< 5$  min), BI-2 ( $< 16$  min) and BI-3 ( $< 22$  min). Piglet birth weights influenced RT-B, RT-60 and HBW-3 ( $P < 0.058$ ). RT-60 was strongly related to LBW-3 and ABW-3 ( $P < 0.01$ ). Type of presentation in unassisted farrowings didn't influence the differentiation in the piglet body weights at day 3. The presence of stillbirths ( $\geq 10\%$ ) positively affected ( $P < 0.039$ ) the number of piglets in LBW-3 and ABW-3. Survival rate at three days was significantly ( $P < 0.069$ ) affected by BW, BI-2, BI-3, RT-60 and TPB. These results indicate that there is no simple relationship between piglet viability, early postnatal survival and subsequent performance.

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## RATS SHOW AVERSION TO ARGON OVER A RANGE OF FLOW RATES

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<sup>1</sup>Joanna Makowska\*, <sup>2</sup>Lee Niel, <sup>3</sup>Richard D Kirkden, <sup>1</sup>Daniel Weary

<sup>1</sup> University of British Columbia, Vancouver, Canada.

<sup>2</sup> University of Toronto at Mississauga, Canada.

<sup>3</sup> Linköping University, Linköping, Sweden.

\*[makowska@interchange.ubc.ca](mailto:makowska@interchange.ubc.ca)

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Rats and mice are commonly euthanized using carbon dioxide (CO<sub>2</sub>) gas. However, recent studies have shown that rodents find this gas aversive. Argon is a tasteless and odourless gas that may be a suitable alternative. The aim of our study was to use approach-avoidance testing to evaluate rat responses to argon and air (as a control) over a range of flow rates. The experiment was run in two phases: the first tested low flow rates (36, 61, 85, and 109% of the test cage volume per minute) and the second tested higher flow rates (109, 146, 182, and 219%). Rats (n=8) were trained to enter the bottom cage of a two-cage apparatus for a reward of 20 Cheerios™. Air or argon was turned on at the assigned flow rate as soon as rats started eating. The effect of flow rate was analyzed using a mixed model with rat specified as a random effect. During control trials with air, rats stayed in the test cage for an average ( $\pm$ SE) of 4:01  $\pm$  0:01 min, with no effect of flow rate. In contrast, rats remained in the cage only 1:46  $\pm$  0:04 min when tested at even the slowest argon flow rate, and this time decreased with increasing flow rates in both Phase 1 ( $F_{1,19} = 388.51, P < 0.0001$ ) and Phase 2 ( $F_{1,16} = 62.88, P < 0.0001$ ). The argon concentration at which rats left the test cage increased from 55.5 to 66.9% with increasing flow rates in Phase 1 ( $F_{1,19} = 17.53, P = 0.0005$ ) but showed no further increase ( $F_{1,16} = 0.44, P = 0.5164$ ) with the higher flow rates tested in Phase 2. We conclude that rats find argon aversive over the entire range of flow rates tested and that alternative methods of euthanasia are still required.

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## MOVEMENT AND USE OF SPACE IN CONFINEMENT; THE EFFECTS OF GROUP SIZE AND PEN SIZE IN BROILERS (*Gallus gallus domesticus*)

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<sup>1</sup>Avanti Mallapur\*, <sup>1</sup>Inma Estevez, <sup>2</sup>Curtis Miller, <sup>2</sup>Mary Christman

<sup>1</sup> Department of Animal & Avian Sciences, University Of Maryland, College Park, USA

<sup>2</sup> Department of Statistics, Institute of Food and Agriculture Science, University of Florida, USA

\*mallapur@umd.edu

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Movement of captive animals is restricted by the enclosure walls which could lead to 'rebounding' and 'edge' effects. In addition, group size and density are factors commonly manipulated in agriculture, but how changes in these variables affect the movement patterns and space use of animals is largely unknown. We investigated the effects of group size (GS), and pen size (PS) on the movement and use of space of the domestic fowl. We used eight groups of 40 male broilers, each of which was temporarily divided in three GS (5, 10 and 20 birds) and tested in three different PS (5, 10 and 20 m<sup>2</sup>). Location (X, Y) of focal birds were collected through instantaneous scan sampling. We calculated net and total distance moved, mean, maximum and minimum step-lengths, and angular dispersion of the path of movement. To estimate long-term space use, three replications for each of three experimental GS were placed into 10 m<sup>2</sup> arenas for one week. Locations of focal birds in a group were collected by one hour of *ad libitum* scan sampling. Collected data were used to calculate core areas. Mixed Model ANOVA was used to determine the effects of GS and PS on movement, while one-way ANOVA was used for core areas. Birds in larger GS had longer net distances ( $P < 0.05$ ) and larger 90<sup>th</sup> percentile core areas ( $P < 0.01$ ). Birds in larger PS had longer net distances ( $P < 0.01$ ), total distances ( $P = 0.05$ ), mean ( $P < 0.01$ ) and maximum step-lengths ( $P < 0.01$ ). We show that GS affects mostly long-term space use, whereas PS has greater effect on short-term movement patterns.

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## OVERALL WELFARE IMPROVEMENT BY IMPLEMENTATION OF LAMENESS INTERVENTION MEASURES IN DAIRY CATTLE

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<sup>1</sup>Solveig March\*, <sup>2</sup>Jan Brinkmann, <sup>3</sup>Christoph Winckler

<sup>1</sup> Georg-August-University of Goettingen, Germany.

<sup>2</sup> Research Centre for Animal Production and Technology, Georg-August-University of Goettingen, Germany.

<sup>3</sup> Department of Sustainable Agricultural Systems, University of Natural Resources and Applied Life Sciences (BOKU).

\*[solveig.march@agr.uni-goettingen.de](mailto:solveig.march@agr.uni-goettingen.de)

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Within an intervention study on lameness in German organic dairy farming, it was the aim of this study to investigate how intervention measures directed at improvement of the lameness situation affect other animal-related welfare parameters. 43 organic cubicle housed Holstein-Friesian herds were regularly visited for two years. Lameness prevalence was assessed using a 5-category locomotion scoring system. Cow comfort (proportion of cows in stalls which are lying down) and rumination indices (proportion of cows lying down that are ruminating) as well as behaviours around resting such as the duration of lying down movements were additionally recorded during the winter housing period at the start of the project (baseline) and one year thereafter. After the initial data collection, farms were allocated to either control or intervention group according to their willingness to implement intervention measures. Intervention measures were individually defined in accordance with the farm managers. The average baseline lameness prevalence was 26%. After one year, intervention farms showed a greater reduction in lameness prevalence (median  $\Delta$  13.3%, n=21) than control farms (median  $\Delta$  4.7%, n=22; p=0.001, Mann-Whitney-U). On intervention farms (n=13) which improved the lying area, moderate and severe swellings of the carpal joints decreased (median  $\Delta$  7.7% vs. 0.0%, n=13/30; p=0.021, Mann-Whitney-U). Although not significantly, the rumination index was also improved (median  $\Delta$  9.3% vs. 0.0%, n=11/27; p=0.124, Mann-Whitney-U). The total duration of lying down movements as well as the duration of the carpal stance phase of the lying down sequence were longer in the second year, but the increase was less pronounced in intervention farms (e.g. total duration: median  $\Delta$  0.4s vs. 0.8s, n=11/27; p=0.150, Mann-Whitney-U). Lying positions and cow comfort index were not affected. The present results of the first year of this intervention study indicate that changes in housing conditions which address improvements in the lameness situation are also reflected in some changes in behaviour.

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## USING OBEDIENCE TRAINING IN ANIMAL ASSISTED ACTIVITIES

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<sup>1</sup>Valentina Mariotti\*, <sup>1</sup>S Tejedor\*, <sup>2</sup>L Anzizu\*\*, <sup>1</sup>Marta Amat,  
<sup>1</sup>Xavier Manteca, <sup>1</sup>Jaume Fatjó

<sup>1</sup> Department of Cell Biology, Physiology and Immunology Barcelona School of Veterinary Medicine. Spain.

<sup>2</sup> Residència per gent gran Parc Serentill, Badalona, Spain.

\*[valentina.mariotti@uab.es](mailto:valentina.mariotti@uab.es)

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The therapeutic benefits of using companion animals as a social enrichment in homes for the ageing is well known. Animals participating in animal assisted therapy and animal assisted activity programs for the elderly are often kept in the residency at all times and managed exclusively by the residents and the staff, with little participation of dog trainers and other professionals from the field of applied animal behaviour. A study was designed to assess the long term effects of a short training program in the behaviour of two 2-year-old female golden retrievers living in a public home for the elderly. Both bitches showed a very friendly and playful attitude towards all residents and staff. However, there was a very poor control on both bitches behaviour, especially during walks. Also, since they were adopted both animals showed a strong tendency to jump on people, a behaviour totally unacceptable in that particular environment. An 8 weeks basic obedience training program was performed. A dog trainer working through reward-based training went to the centre once a week for the duration of the program. In each session a selected group of staff members were taught how to train dogs. Staff members were advised to repeat the exercises once per day and to teach residents the basic rules of canine education. Two months after the end of the program, questionnaires filled by staff and residents were used to evaluate the efficacy of the program. Dogs showed a significant improvement in the commands of *sit* and *heel* ( $p < 0.05$ ). According to the staff members that improvement resulted in more residents taking the dogs out for a walk. No significant differences were found for *come* and *stay* commands. A particularly marked reduction in the tendency of both animals to jump on people was observed. At the beginning of the program 50% of residents reported jumping on people as being a very frequent behaviour, whereas that percentage dropped to 4% by the end of the program ( $p < 0.05$ ). Also, questionnaires pointed out that the relationship between residents and dogs was improved, as it was the quality and duration of the interactions. The results of the present study suggest the efficacy of a short training program for dogs involved in animal assisted therapy and animal assisted activity programs for the elderly.

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## ENVIRONMENTAL ENRICHMENT FOR GRAZING FEMALE GOATS

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<sup>1</sup>Midori Martínez, <sup>1</sup>Abel M Trujillo, <sup>2</sup>Andrés E Ducoing,  
<sup>2</sup>Anne M Sisto\*, <sup>2</sup>Alicia Soberón

<sup>1</sup> Centro de Enseñanza, Investigación y Extensión en Producción Animal en Altiplano, FMVZ, UNAM, Mexico  
<sup>2</sup> FMVZ-UNAM, México

\*sisto@servidor.unam.mx

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The objective of this study was to observe the effect of environmental enrichment on the behavior and productivity of grazing female goats that had just been weaned. Two groups of 4 boer goats and 2 groups with 5 alpinas each, from 2 to 4 months of age, were used. The goats were kept on a restricted mixed pasture and were supplemented with 100 gr of balanced feed every day. Two of the groups were enriched and the others 2 were not. Enrichment consisted of a tractor wheel, a wide wooden stair and a hanging wooden box filled with alfalfa. The experiment lasted 9 weeks, until they reached 8.5 kg. Direct behavioral observations were made for 2 hours in the morning and 2 hours in the evening, for a total of 100 hours. The goats were weighed every week. A complete randomized design and multivariate analyses for repeated measures was used to assess the effect of enrichment on the variables studied. The results show that the enriched goats were more active and gained less weight ( $P < .05$ ) than the non-enriched goats. The enriched goats had fewer agonistic encounters ( $P < .05$ ). Grazing goats don't pay as much attention to the enrichment as do confined goats, but they had fewer agonistic encounters, which could be an indication of good welfare.

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## AMMONIA EXPOSURE FOR 24 HOURS REDUCES AGGRESSIVE BEHAVIOR IN NEWLY WEANED PIGS

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**Matthew A Massey, Nadège Krebs, John J McGlone\***

Texas Tech University, Lubbock, TX, USA.

\*[John.mcglone@ttu.edu](mailto:John.mcglone@ttu.edu)

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At weaning, newly-mixed pigs fight to establish a social hierarchy. Aggressive behavior is stressful. Preliminary studies in our lab showed that newly-weaned pigs spent more ( $p < 0.05$ ) time towards androstenone (ANDRO, the boar pheromone), n-butanol (NBUT, present in urine) and ammonia (NH<sub>3</sub>, present in urine) than towards water. The objective of this study was to assess the efficiency of NH<sub>3</sub>, NBUT and ANDRO in reducing aggressive behavior in newly-weaned pigs. Each pen ( $n = 5$  / treatment) contained four pigs which were randomly assigned to one of the three treatments. The odor (NBUT, ANDRO, or NH<sub>3</sub>) was blown from one side of the pen, and the control (water) was blown from the other. Behavior was recorded with cameras and scan samples were taken every 5 min for 24 h to determine the number of fights per hour. Pigs exposed to ANDRO fought more ( $p < 0.05$ ) than pigs exposed to NH<sub>3</sub> and NBUT: (ANDRO:  $5.17\% \pm 0.289$ ; NBUT:  $2.71\% \pm 0.289$ ; and NH<sub>3</sub>:  $1.98\% \pm 0.289$ ), but there was no significant difference ( $p > 0.05$ ) between NBUT and NH<sub>3</sub> treated pigs. Overall, time affected ( $p < 0.05$ ) fighting regardless of the treatment. Pigs fought more ( $p < 0.05$ ) between the 16th and 17th hour and between the 23rd and 24th hour after weaning ( $5.83\% \pm 0.82$ ) than in the first 16 hours post weaning. Pigs fought the least ( $1.67\% \pm 0.82$ ) between the 1st and 2nd hour after weaning. Previous data showed that pigs spent more time towards NH<sub>3</sub> than towards water and that weight loss was decreased in pigs exposed to NH<sub>3</sub> compared to other treatments. The reduction of aggressive behavior obtained with a 24 hour exposure to NH<sub>3</sub> may confirm that NH<sub>3</sub> (present in the sow urine) can reduce stress at weaning.

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## CORRELATIONS BETWEEN SOW TEMPERAMENT AND PIGLET WEIGHT IN MEXICAN CREOLE PIGS

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**<sup>1</sup>Daniel Mota-Rojas\*, <sup>1</sup>María Alonso-Spilsbury, <sup>2</sup>Lilian Mayagoitia-Novales,  
<sup>1</sup>Ramiro Ramírez-Necochea**

<sup>1</sup> Laboratorio de Etología, Producción Porcina y Fauna Silvestre, Universidad Autónoma Metropolitana Unidad Xochimilco, México.

<sup>2</sup> Depto. de Etología, Psicobiología y Conducta, Instituto Nacional de Psiquiatría "Ramón de la Fuente Muñiz", México.

\*[dmota40@yahoo.com.mx](mailto:dmota40@yahoo.com.mx)

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The aim of the study was to assess temperament in peri-parturient sows and correlate it to the reproductive performance during lactation. Thirty-four Creole Mexican hairless pigs in threat of extinction were monitored. Temperament tests were: rubbing teats for milk sampling (MS) and litter withdrawn (LW), both were performed by the same person throughout the study. Reaction to MS was tested within the 8 previous hours to the onset of parturition, intra-partum, and 24, 48 and 72 hours post-partum; three subjective scores were used to categorize mother temperament: docile, nervous and aggressive, in terms of the time taken to give the massage without a reaction from the sow. LW was done on days 1, 3, 7, 14, 21 and 28 post-partum; scores were similar: docile, nervous and aggressive depending on time taken to react defending the litter. Kendall rank concordance coefficient was used to evaluate concordance between MS and LW. Wilcoxon rank test was used to evaluate temperament changes over time. In order to look for correlation among temperament and the different productive traits, Kendall rank correlation test was run. Both temperament tests used in the study were highly correlated in the first post-partum day (0.586,  $p < 0.0001$ ) and there was concordance between both tests throughout the lactation period ( $p < 0.0001$ ). A slight negative correlation between piglet weaning weight and LW was found on days 1 ( $T = -0.342$ ,  $p < 0.01$ ), 21 ( $T = -0.299$ ,  $p < 0.02$ ) and 28 ( $T = -0.301$ ,  $p < 0.03$ ). The greater the piglet weight, the docile temperament was observed in the dam; ANOVA test confirmed this: the docile the sows are, the heavier their piglets are, although dams loose more body weight and backfat during lactation, compared with the nervous and aggressive sows (NS). Two common husbandry procedures frequently used in pig farms were used as temperament tests and were highly correlated showing concordance throughout lactation.

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## FAST AND SLOW GROWING BROILER STRAINS DIFFER IN THEIR FREE CHOICE OF WHOLE WHEAT PROPORTION IN DIET

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Birte L Nielsen\*, Sanna Steinfeldt

Research Centre Foulum, Faculty of Agricultural Sciences, University of Aarhus, Denmark.

\*[Birte.Nielsen@agrsci.dk](mailto:Birte.Nielsen@agrsci.dk)

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Whole wheat is often added to pelleted diets of growing broilers. What proportion of wheat do broilers eat when given the choice and does this choice differ between strains? Is wheat eaten at different times of day compared to pelleted feed? Groups of day-old broilers (N=64) were housed as-hatched in 24 pens (3.9 m<sup>2</sup>) each with wood-chip litter, and access to two identical feed troughs. Within groups chicks were from either a fast- or a slow-growing strain. Within strain half of the groups had access to pelleted feed pre-mixed with increasing proportion of whole wheat, whereas the remaining groups had access to pelleted feed and whole wheat in separate troughs. live weight and weekly intake from each feed trough were measured on a pen basis. Video recording across 24-hr periods on days 12 and 39 were carried out, and the number of chicks feeding from each trough registered every 10 minutes. The fast-growing strain choose a proportion of whole wheat in their diet which corresponded well with the pre-mixed inclusion of 5, 10, 20, 25 and 30% wheat in weeks 2-6 (choice of fast-growing: 3, 8, 27, 20 and 27% in weeks 2-6 respectively). The slow-growing strain differed from the fast-growing strain in their choice in weeks 2, 5 and 6, with a smaller ( $p < 0.0007$ ) wheat proportion in week 2, and a higher ( $p < 0.0001$ ) wheat-proportion in weeks 5 and 6 (choice of slow-growing: 1, 9, 24, 45 and 56% in weeks 2-6 respectively). Although there was an increase in the number of chicks feeding prior to the lights being turned off at night, this was not reflected in the ultradian timing of wheat intake. Slow-growing strains appear to show more flexibility in their foraging behaviour than fast-growing strains, which in turn shape dietary intake to suit growth.



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## GRAZING BEHAVIOUR AND MILK PRODUCTION FROM F1 (HOLSTEIN-ZEBU) COWS IN AN ELEPHANT GRASS (*Pennisetum purpureum*) PASTURE IN VERACRUZ, MEXICO

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<sup>1</sup>Guillermo Nochebuena, <sup>2</sup>Braulio Valles\*

<sup>1</sup>Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Guerrero, Mexico

<sup>2</sup>CEIEGT, FMVZ, Universidad Nacional Autónoma de México, Mexico

\*braulio\_36@hotmail.com

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The study was conducted in a hot ( $23.9 \pm 3.2$  °C from 1980 to 2000) and humid climate ( $1917 \pm 356$  mm from 1980 to 1997) in the state of Veracruz, Mexico ( $20^{\circ} 02' N$  and  $97^{\circ} 06' W$ , at 112 m.a.s.l.), in order to evaluate milk production and grazing behaviour of cows grazing a tropical forage pasture. Botanical composition (BC), forage allowance (FA) and crude protein (CP) of Elephant grass (*Pennisetum purpureum*) were measured during two grazing periods (GP1, 9 days and GP2, 11 days) on January and March 1982, respectively. F1 (Holstein-Zebu) cows on different stages of lactation were used. The milk production (MP, kg/cow/day, kg/ha/day), grazing time (GT, h/day) and biting rate (BR, bites/min) were recorded, as also was the distribution of GT over the length of the day. Seventeen cows grazed on GP1, while on GP2 grazing started with 12 cows and ended with 15. Data were analyzed by regression to relate: MP vs grazing day (GD), BC vs GD, CP vs GD. The highest daily MP per ha was obtained on the fourth (44.9 kg) and tenth day (69.8 kg) of grazing for GP1 and GP2, respectively, followed by a decrease due to a reduction in FA. Equations were:  $Y = 39.6 + 2.5x - 0.31x^2$  ( $R^2 = 0.75$ ) and  $Y = 51.6 + 3.46x - 0.17x^2$  ( $R^2 = 0.94$ ). On GP1, cows grazed 10.75 h/d (29 bites/min) on the first day, but by the end GT diminished to 9.2 h/d (25 bites/min). On GP2, cows grazed 8 hr (32 bites/min) the first day, and by the end GT was of 7.8 hr (38 bites/min). Cows invested 68% and 64% of the day in grazing activities for GP1 and GP2, respectively. The decrease in GT as the GP advanced was due to a forage allowance reduction in GP1, but in GP2 an increase in BR compensated GT reduction.

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## CHANGES IN FEEDING AND LYING BEHAVIOUR OF DAIRY COWS BETWEEN PASTURE AND WINTER ACCOMMODATION

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<sup>1,2</sup>Keelin KM O'Driscoll\*, <sup>1</sup>Laura Boyle, <sup>1</sup>Padraig French, <sup>2</sup>Alison J Hanlon

<sup>1</sup> Moorepark Dairy Production Research Centre, Ireland

<sup>2</sup> University College Dublin, Ireland

\*keelin.odriscoll@teagasc.ie

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Wood-chip out-wintering pads (OWPs) are growing in popularity in Ireland to accommodate dairy cows during winter. This study compared feeding and lying behaviour between cows at pasture (PAS) and in winter accommodation (WIN). Cows (n=48) were managed as one herd while lactating at PAS, then dried off on entering WIN on 17 November 2005 and assigned to one of 4 treatments using a randomised complete block design: (1) indoor matted cubicles [IC]; (2) unsheltered OWP [UP]; (3) sheltered OWP [SP] (feed system for IC, UP, SP: concrete feedface), and (4) unsheltered OWP with a self-feed [SF] silage pit on the woodchips. Feeding behaviour was recorded for 1X24h during PAS and WIN using IGER grazing behaviour recorders. Standing/lying was recorded every 5 min for 2X24h at PAS and 1X24h during WIN using modified voltage dataloggers (Tinytag Plus, Chichester, UK). Cows spent more time feeding at PAS (536.6±12.7 and 466.6±12.9 min respectively; P<0.001) due to longer feeding bouts (51.8 and 39.7; P<0.001). However, the number of feeding bouts was higher in WIN (8.1±0.39 and 10.9±0.39; P<0.001). Reduction in duration and increase in number of feeding bouts were greatest in UP (P<0.01) and SF (P=0.06). In WIN cows had fewer bites/min than at PAS (29.3±1.12 and 57.2±0.74; P<0.001). They also lay longer in WIN than PAS (no. lying datapoints=135.2±3.54 and 115.3±3.16; P<0.001), in OWPs due to longer lying bouts (P<0.05) and in IC through increased number of bouts (P<0.001). Susceptibility to environmental stressors may have caused unsheltered cows to modify feeding behaviour more than sheltered cows. Shorter eating times and fewer bites/min at WIN are likely due to reduced nutritional need as cows were no longer lactating. This could have facilitated increased lying time during WIN. Long lying bouts are indicative of comfort while lying, implying OWPs provide a highly acceptable lying surface.

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## ARE THERE PREFERENCES BETWEEN ANIMALS OF THE SAME BREED WHEN THEY ARE TOGETHER IN THE SAME FLOCK?

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**Carmen Ortiz, José De Lucas\*, Ernesto Fausto**

Facultad de Estudios Superiores Cuautitlán, Universidad Nacional Autónoma de México, México.

\*[tronj@servidor.unam.mx](mailto:tronj@servidor.unam.mx)

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In México it is usual to mix breeds in the same flock and it is not known if this affects production. The objective was to evaluate if two sheep breeds kept together show behavioral differences. The flock was composed of 89 Suffolk adult ewes and 250 Columbia ewes and 45 males. During the day the animals were in the pasture, for every hour the flock was allowed to feed during 20 min and then moved for 40 min to a small paddock near the grassing area. In the afternoon, they were taken to the night pen. This had 3 divisions, all of them connected. The animals were observed during 4 months, 4 times a day, when the animals: 1) left the pen, 2) were moved to and from the grassing area and the small paddocks, 3) returned to- and 4) were resting in- the night pen. Observations, video-recordings and photographs were made to evaluate the following behavior: integration or dominance between breeds, the order in moving to the grassing area and to a specific place in the night pen. For the analysis PROC GLM and PROC FREQ from SAS, and Chi<sup>2</sup> test were used. The Suffolk (more than 30 animals) were first in leaving from- (93.7% of the times) and in returning to- the night pen (64.7%) ( $P < 0.05$ ), and 35% returned together with the Columbia. The Suffolk were first to move to the grassing area (90%) and 10% moved together ( $P < 0.05$ ). When returning to the rest area, 54% of the times the Columbia were first, 29% together with, and 16.6% the Suffolk were alone ( $P < 0.05$ ). To drink, 50% of the times both breeds were together, 27.8% the Columbia- and 22.2% the Suffolk- were first ( $P > 0.05$ ). At night, most of the Suffolk had a preference for one of the divisions ( $P < 0.05$ ). It was concluded that most animals of each breed maintained activities together. Suffolk were dominant when moving to the grassing area and when selecting where to rest. This study shows that mixing 2 breeds in the same flock could affect other conducts such as mating, and therefore, production.

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## THE INFLUENCE OF SOLE ULCER AND DIGITAL DERMATITIS ON DAIRY COW BEHAVIOUR AND PRODUCTION

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<sup>1</sup>Anne Pavlenko\*, <sup>2</sup>Tomas Thierfelder, <sup>3</sup>Christer Bergsten, <sup>3</sup>Ingvar Ekesbo, <sup>3</sup>Lena Lidfors

<sup>1</sup> Department of Animal Health and Environment, Estonian University of Life Sciences, Estonia.

<sup>2</sup> Department of Biometry and Informatics, Swedish University of Agricultural Sciences, Sweden.

<sup>3</sup> Department of Animal Environment and Health, Swedish University of Agricultural Sciences, Sweden.

\*anne.pavlenko@emu.ee

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The aim was to investigate if sole ulcer (SU) and digital dermatitis (DD) in high producing dairy cows were associated with changes in behaviour and milk production. The study was carried out on a commercial 300 dairy cow herd with an average milk production of 11 624 kg ECM (energy corrected milk, 2006). Clinical examination of the claws was made at claw trimming. Cows scored for medium to severe lesions of SU or DD were listed, and ten cows of each claw disorder were selected. For each diseased cow a paired healthy control cow of the same breed, age, parity and lactation stage was selected. Behavioural observations were made on paired cows during four two weeks periods with a 0-1 sampling method. Control milking data were collected monthly. For statistical analyses generalised linear models were used (Proc GENMOD, SAS). Cows with SU were lying less than healthy cows during period one ( $p < 0.01$ ). Cows with DD were lying less than healthy cows during period one ( $p < 0.05$ ), but not during other periods. Cows with SU walked more than healthy cows during period one ( $p < 0.05$ ) and less than healthy cows during period three ( $p < 0.001$ ). Healthy cows stood and ruminated less than cows with SU ( $p < 0.05$ ) and DD ( $p < 0.05$ ) during period one, and had a tendency to stand and ruminate less than cows with DD in period two ( $p < 0.1$ ). Cows with SU had a tendency to produce less ECM than healthy cows during period two ( $p < 0.1$ ). Cows with DD produced significantly less ECM than healthy cows in period one and two ( $p < 0.05$ ), and tended to produce less ECM milk during period four ( $p < 0.1$ ). The study emphasizes the benefit of early detection and treatment of claw diseases as well as the importance of prevention measures in order to minimize the influence on behaviour and production.

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## AEROSOL INTAKE IN ONE DAY OLD BROILER CHICKS

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**M Pérez de Villarreal, José L Ruiz de la Torre, Xavier Manteca**

Departamento de Biología celular, fisiología e inmunología. Facultad de Veterinaria.  
Universidad Autónoma de Barcelona. Barcelona.

\*Maider.Perezdevillarreal@uab.es

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Aerosol delivery systems have become a method of choice for the administration of pharmacological agents, such as vaccines, in one day old chicks. The effectiveness of the vaccination process depends on the ingestive behaviours of the birds, which may be influenced by the environmental conditions and the colour of the aerosol. Most broiler chickens are reared commercially in artificial light environments, which differ from the environment in which they evolved. However, it is not well known how light affects their behaviour. Also their preference for a particular visible spectrum colour under certain light intensity conditions is unknown. Our experiment aimed at assessing how different light intensities and aerosol colours influenced the ingestion behaviour of one day old chicks. Eight hundred one day old broiler chicks of the ROS strain were obtained from a commercial supplier on four different days. Chicks were kept in hatchery orange coloured plastic cages inside a room at a constant temperature of 29°C. Four combinations of light intensities during waiting and spraying were considered for the trial (W200-S200, W200-S100, W200-S10 and W100-S100) and four different treatment colour (control PBS, red colour, blue colour and blue colour with an odorant). Each day sixteen groups of fifty chicks were observed during 6 minutes, which were divided in three 2-min subperiods. Spraying was after the first subperiod. A total of four different ingestion attitudes such as ground-pecking, wall-pecking, body-pecking and preening were observed and considered for the statistical analysis. ANOVA test was used (SPSS 14.0). Results showed that spraying increased in 74% ingestive behaviours at least during 4 minutes. Light intensity showed no effect on behaviour, indicating that neither intensity previous to spraying nor difference between 100 and 200 lux influences on ingestive behaviours. Coloured aerosol increased animals' behaviour, this increment being higher for blue than for red coloured ( $p < 0,05$ ). Odorant did not show any effect.

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## THE EFFECT OF MATERNAL SIRE ON TEMPERAMENT AND MOTHERING ABILITY OF MAIDEN MERINO EWES

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Ashley D Porter, Sarah J Chaplin\*, Chris Laird

University of Melbourne, Australia.

\*schaplin@unimelb.edu.au

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Lamb mortality is a serious issue in the Australian wool industry and most deaths are caused directly or indirectly by poor mothering ability. To determine whether maternal sire affects temperament and mothering ability of maiden Merino ewes, we compared the maternal behaviour of 116 ewes from 10 sires (A-J, n=7-17). The ewes were managed as one mob during joining (joined in the paddock to six rams) and gestation. They were temperament tested using a modified arena test 6 weeks pre-lambing, assessing the response to restraint in a crush (1, stayed still; 2, moved from end to end; 3, distressed; 4, jumped out). Two weeks pre-lambing sire groups were moved to individual, similar 2.5ha paddocks. On the day of lambing maternal behaviour in response to human pressure was scored (1, stayed with lamb; 2, moved away but called and waited for lamb; 3, left lamb but returned when observer left; 4, left lamb. Lamb/ewe recognition time, the speed with which lambs re-join their mothers after a forced separation, was recorded 2 weeks post-lambing. Lamb/ewe recognition time was  $\log_{10}$  transformed and analysed for effect of sire group by one-way ANOVA, temperament and maternal behaviour scores by Kruskal-Wallis. Maternal sire had marked effects on recognition time but not on temperament or maternal behaviour in response to human pressure. There were no significant correlations between the variables. There was wide variation in recognition times and significant differences between groups (mean(secs) $\pm$ SEM: A=27 $\pm$ 1.7, B=51 $\pm$ 1.4, C=29 $\pm$ 1.4, D=86 $\pm$ 1.4, E=8 $\pm$ 1.5, F=43 $\pm$ 1.5, G=11 $\pm$ 1.5, H=12 $\pm$ 1.5, I=20 $\pm$ 1.6, J=36 $\pm$ 1.4,  $P < 0.001$ ). Six maternal sire groups with recognition times  $> 27$ secs were not significantly different to each other; four groups with recognition times  $< 25$ secs were not significantly different to each other and there were varying degrees of overlap between the two groups. The implications of this behaviour need to be further explored but it may be a useful trait for use in progeny test programs.

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## REGROUPING IN DOMESTIC GOATS: HOW LONG DOES IT TAKE TO BE UNFAMILIAR?

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**<sup>1</sup>América Ramírez\*, <sup>2</sup>Francisco Galindo, <sup>1</sup>Lorenzo Alvarez**

<sup>1</sup> Centro de enseñanza Práctica e Investigación en Producción y Salud Animal (CEPIPSA)

<sup>2</sup> Departamento de Etología y Fauna Silvestre

Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México.

\*[alorenzo@servidor.unam.mx](mailto:alorenzo@servidor.unam.mx)

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Regrouping according to age, nutrient requirements, body condition, lactation period and level of milk yield, is a common practice of management to enhance productivity and profitability. The practice may temporally disturb social structure of the herd, which may distress animals and have adverse effects on milk production. The issue has not been studied in goats. With the aim of determining the necessary interval for the goats to recognize themselves as strangers, 5 females were removed from their original group (n=40) and returned immediately (IMM), 3, 24, 48 and 72h (hours), 7, 11, 17 and 25d (days) later. Five goats of another pen were also introduced in a different moment to register the reaction with strange individuals (ST). Aggressive behaviour was registered using a behavioural study during 100 min before and after each regrouping. Wilcoxon and Friedman tests were used to analyze the data. In regroupings IMM, 3, 24, 48h, 7 and 11d, slight increases in the aggression were generated, but only regroupings 17 and 25d generated similar aggression as ST. Grooming behaviour were also slightly increased in their frequency after all regroupings, except ST. These results suggest that after 48h of separation, regrouping in goats generates increasing aggression and that goats take about 17-25 days to detect ex-members of the herd as strangers.

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## ANIMAL WELFARE EVALUATION IN ZOOLOGICAL PARKS

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**<sup>1</sup>Ariadna Rangel-Negrín\*, <sup>1</sup>Ana IM Cue, <sup>2</sup>Juan Arturo R Rivera, <sup>2</sup>Fernando S Gual**

<sup>1</sup> Departamento de Psicobiología, Universitat de Barcelona, España.

<sup>2</sup> Dirección General de Zoológicos de la Ciudad de México, México

\*ari\_rangel@hotmail.com

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Animal welfare it's the state of an individual in relation with the form that it's facing changes in their environmental, it's a measurable state and any measure can be done with independence to ethics considerations. It's common to make opinions about the general state of the zoo animals without a technical evaluation that supports these opinions. Such evaluation must integrate environmental, management, physical and psychological aspects that surround animals in captivity. Therefore, we propose a methodology that brings a tool and a base for the welfare evaluation in a practice manner in a zoo. We design a format that considers the following indicators of welfare: using their clinical history we obtain data about diseases, clinical and hematological studies, lesions, trauma or any other data related with the health or reproductive status of the animal. We perform ten hours of behavioral sampling to determine if the animal has pathological behaviors and their frequency and make a supervision of the enclosure conditions like humidity, temperature, hygiene, comfort, environmental enrichment and social conditions. Finally all this information it's compared with the literature. Once that all the information was obtained and determined the level of animal welfare, all the information it's commented with the veterinary doctor in charge of the animal, analyzing everyone of the welfare indicators, discussing the feasibility to resolve the specific deficiency in a short time, and the relation of this with the others welfare indicators in the way of identify the original problem. Finally, the recommendations can involve different technical areas in the zoo, like the nutritional, environmental enrichment, medical, or keeper's area for example.



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## INFLUENCE OF AN UPREDICTABLE STRESSOR ON BEHAVIOURAL AND PHYSIOLOGICAL RESPONSES OF EXPERIENCED OR NAÏVE HOLSTEIN HEIFERS

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<sup>1</sup>Karim Rigalma\*, <sup>1</sup>Sabine Roussel, <sup>1</sup>Andreia Oliveira, <sup>2</sup>Thomas Louyot, <sup>1</sup>Christine Duvaux-Ponter

<sup>1</sup>AgroParisTech, Paris, France.

<sup>2</sup>Réseau de Transport d'Electricité, CNER, Paris, France.

*karim.rigalma@agroparistech.fr*

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A stressor occurring in an unpredictable manner may induce more negative effects than when it is experienced on a regular basis. Moreover, past experience can modulate the response and adaptation of an animal to a stressor. Over a 3-week period, twenty electricity-naïve (NAIV) and twenty electricity-aware heifers (EXP, previously exposed to electricity for 3 weeks and left undisturbed thereafter for one month) learned to eat concentrate from two metallic feeders during 2-min daily tests. Electricity (3.3V) was then applied every day for 2 min over 11 consecutive days to the feeder in which the heifer initially started to eat (PERM) for half of the naïve (NAIV-PERM) and half of the electricity-aware (EXP-PERM) heifers. The second half of the naïve (NAIV-UNP) and electricity-aware heifers (EXP-UNP) were exposed to electricity (3.3V) in an unpredictable manner on 4 out of 11 days (UNP). All heifers were allowed to change to the non-electrified feeder. Chi-square analysis and the MIXED model procedure of SAS® were used on the days when electricity was applied to all the heifers. UNP heifers tended to spend more time eating in the electrified feeder than PERM heifers ( $p=0.07$ ). More UNP heifers made abrupt head movements ( $p=0.02$ ) and muzzle-grooming ( $p=0.09$ ) than PERM heifers. Although no behavioural differences were observed between NAIV and EXP heifers, NAIV heifers had higher cortisol concentrations on the first day when the voltage was applied than EXP heifers ( $p=0.03$ ). An interaction was observed between past-experience and unpredictability: NAIV-PERM heifers ate more ( $p=0.05$ ) and changed feeder quicker ( $p=0.02$ ) than NAIV-UNP heifers. Heifers exposed to unpredictable stressors have more difficulty in adapting to the stressor compared to heifers exposed to the same stressor in a predictable manner. Moreover, past-experience can modulate the response to the stressor and seems to reduce its negative impact the first time it is experienced.

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## SEXUAL BEHAVIOUR MEASUREMENT AND FECAL PROGESTERONE DETERMINATION IN CAPTIVE BIGHORN SHEEP (*Ovis canadensis*) FEMALE GROUP

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<sup>1</sup>Claudia Rodríguez\*, <sup>1</sup>Luis Felipe Rodarte, <sup>1</sup>Juan Rivera, <sup>2</sup>Octavio Mejía

<sup>1</sup> Departamento de Etología, Fauna Silvestre y Animales de Laboratorio, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México.

<sup>2</sup> Centro de Enseñanza, investigación y Extensión en Producción Ovina, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México.

\*cnadiezhd@yahoo.com.mx

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In Mexico there are several endangered species including the bighorn sheep (*Ovis canadensis*). Many aspects of their reproductive biology and particularly, their sexual behavior are unknown. In this study behavioral observations of a captive group composed of four males and four females were made during 76 days inside their breeding season. Total time of observation was 182 hours. Fecal progesterone levels of the females were measured using a radioimmunoanalysis (RIA) technique. Spearman correlation and ANOVA analysis were used. Sexual behaviors measured in males were: follow female (3%), lick repeatedly (2.07%), genital smelling (2.015%), flehmen (0.76%), mounting (0.16%) and mounting request (0.11%) resulting in 8.1% of active total time. In females: allow following (3.1%), allow genital smelling (2.02%), lick repeatedly (0.27%), permit mounting (0.11%), genital smelling (0.05%) and flehmen (0.05%) resulting in 5.6% of active total time. One male (M1) showed more sexual activity ( $p < 0.5$ ) in respect to the others; one female (H1) also showed more sexual activity ( $p < 0.05$ ) than the rest. The sexual interaction from one young male (M3) was higher only with a particular female (H2). In terms of fecal progesterone values, three females showed no different ( $p > 0.05$ ), H1 (18.07 ng/g  $\pm$  2.7), H2 (37.87 ng/g  $\pm$  6.8) y H3 (20.15 ng/g  $\pm$  3.1), but were difference ( $p < 0.05$ ) with respect to the youngest female of the group H4 (6.6 ng/g  $\pm$  1.0). In all females a sudden decrease in progesterone levels during the day of receptivity of the male were observed. Measuring fecal progesterone levels from females and evaluating the correspondence with their behavior inside their group, could suggest that there are behavioral patterns that have correspondence with hormone levels. This could help in the future to implement more detailed studies about sexual behavior of this specie, as well as to help in their conservation.

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## EFFECT OF THE ENVIRONMENTAL ENRICHMENT (EE) ON THE WELFARE AND PRODUCTIVE BEHAVIOR IN DAIRY GOATS IN SUCKLING AND DEVELOPMENT STAGES IN CONFINEMENT

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**Alma P Rosas\*, Anne M Sisto, Andres E Ducoing**

Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, México.

\*mvz\_rosas@yahoo.com.mx

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Objectives: 1)evaluate the effect of EE on welfare and productive behavior, 2)find alternatives of handling through the EE in French Alpine suckling dairy goat kids and in female goats in development stage under confinement in two stages. Stage 1, two treatments (enriched and non-enriched) were randomly assigned (n=34), with two replicas each. Direct observations were carried out (100 h), cortisol was measured, daily gain of weight (DGW), incidence and duration of illnesses and days to reach the desired weight (10 Kg). The enriched kids carried out more locomotion behaviors and exploration ( $P < 0.05$ ), while non-enriched kids carried out more behaviors related to aggression ( $P=0.09$ ). Stage 2, two treatments were randomly assigned (n=34), (enriched and non-enriched), with two replicas each. Direct observations were carried out (150 h) from the weaning (10 kg) until the age to the first estrus. Variables related to behavior, cortisol, DGW, incidence and duration of illnesses were evaluated. The age to the first estrus, escape distance and time of capture were measured. The goats of the non-enriched group carried out a higher proportion of aggression activities and presented higher incidence and duration of illnesses ( $P < 0.05$ ). The enriched goats presented longer escape distance and time of capture ( $P < 0.05$ ). Exploration in non-enriched goats was directed to the elements of the pens, affecting facilities. This study suggests that simple and low cost changes in the environment have significant effects in the welfare of kids under confinement.

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## HIGH STOKING DENSITY ROTATIONAL GRAZING: THE RELATIONSHIP BETWEEN SOCIAL HIERARCHY AND GRAZING PATTERNS OF HOLSTEIN COWS

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<sup>1,2</sup>Abdon L Schmitt\*, <sup>1</sup>William M Murphy, <sup>1</sup>Joshua Silman, <sup>1</sup>Farouk Abdul-wahid

<sup>1</sup> Pasture Outreach Program, The University of Vermont, Burlington, USA

<sup>2</sup> Voisin Grazing Group, Federal University of Santa Catarina, Brazil

\*abdonfilho@hotmail.com

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Under intensive grazing, forage allowance is closely dependent on stocking density, pre-grazing pasture mass and paddock area. Stoking density represents the concentrated numbers of animals grazing a paddock at a given moment. It influences pasture-depleting patterns, forage regrowth, and feeding behavior. High stocking density is recognized as a tool to improve herd overall pasture utilization, minimize pasture leftover and patchiness. However, it may limit space needed by each cow and inhibit grazing of submissive animals. High stocking density has proved to impair "the freedom" to select forages. The relationship between social hierarchy and grazing patterns (time and place) under high stocking density rotational grazing was investigated. After every milking, a 53-cow herd was moved to a 0.3 ha fresh paddock (176 cows/ha) with a target pre and postgrazing masses (2700 and 1600 kgDM/ha). Daily grazing activity and place were recorded every 15 minutes during nine days. Two grazing places were characterized, first meter next to fences-paddock edges (8%) and middle of the paddock (92%). Every social interaction between pairs of cows was recorded during 5 days. For each animal, an index of success in agonistic interaction was calculated. Average daily grazing time was  $164.8 \pm 18.7$  minutes/cow. A total of 617 interactions were recorded during five days, 96% during the initial 2.5 grazing hours. Grazing times had no relationship with dominance value ( $R=0.04$ ). The average daily grazing time per cow near the fences was  $39.7 \pm 8.2$  minutes (24.1% of total grazing). Cows grazed on paddock outer edges three times more than expected ( $P<0.05$ ), however it has no correlation with dominance hierarchy ( $R=0.03$ ).

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## CHANGES OF RATION FORM WITH THE EATING ACTIVITY OF COWS

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Taihei Shimada\*, Kousuke Mouri, Shigeru Morita, Shinji Hoshiba

Rakuno Gakuen University, Japan.

\*s20531006@stu.rakuno.ac.jp

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Cow management in a loose housing system is based on the free access to ration (TMR). In this situation, the ration should be in a space that a cow can reach. The objective of this study was to examine the change of ration form just after feeding, and the relationship between the amount of change and the eating behavior of cows. Nineteen cows were kept in a three-row free-stall barn with a 15 m trough (flat type). There were 20 feeding positions. The experimental period started at feeding time (around 10:45), and ended just before pushing up (around 11:30). The length from the trough wall to the edge of the ration (LER) and the length from the trough wall to the top of ration (LTR) were measured. The Wilcoxon-Mann-Whitney two-sample test was used for comparison of the average. The LER was 1.0 m on average at the start of experimental period, and at the end of the experimental period it was 1.5 m. The edge of ration moved 0.2-0.6 m outward due to the eating activity of cows ( $P<0.05$ ). The LTR was 0.5 m on average at the start of the experimental period, and at the end of the experimental period it was 1.0 m. The top of ration moved 0.4-0.6 m outward due to the eating activity of cows ( $P<0.05$ ). There was no relationship between the time spent on eating and the amount of ration form change. The frequency of tossing behavior of cows was related to the change of LER ( $r=0.999$ ,  $P<0.05$ ). It was concluded that the form of ration was changed during the experimental period, and the amount of change of the ration was related to the eating behavior of cows.

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## THE HORMONAL TREATMENTS TO INDUCE MATERNAL BEHAVIOUR DOES NOT REPRODUCE THE NORMAL ABSENCE OF SEXUAL RECEPTIVITY IN THE PERIPARTURIENT EWES

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<sup>1</sup>Rosalba Soto\*, <sup>2</sup>Alain Romeyer, <sup>1</sup>Angélica Terrazas, <sup>3</sup>Norma Serafín, <sup>2</sup>Pascal Poindron

<sup>1</sup> Facultad de Estudios Superiores – Cuautitlán, Universidad Nacional Autónoma de México.

<sup>2</sup> UMR 6175, PCR – INRA, Nouzilly, France.

<sup>3</sup> Departamento de Neurobiología Conductual y Cognitiva, Instituto de Neurobiología, Universidad Nacional Autónoma de México.

\*rosaneopri@yahoo.com.mx

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The present experiment was carried out to assess whether the best hormonal treatments coupled with vaginocervical stimulation (VCS), known to induce maternal behaviour in ewe, could also replicate the normal absence of sexual receptivity (which is part of the repertoire of maternal behaviour in ewes) in periparturient mothers. Forty multiparous Columbia ewes were divided in three groups: 1) Control ewes (n=14), they were left intact and subjected to a treatment designed to stimulate a luteal phase (vaginal sponges containing a progestagen for six days); 2) Ovariectomized ewes (n=13), they were ovariectomized and received a short treatment with a progestagen (vaginal sponge for 14 days) and an injection of oestradiol 12 h after sponge removal; 3) Ewes (n=13) were left intact and received a large treatment combining progesterone and oestradiol in vaginal sponges for six weeks. In addition, parturient ewes (n=36) were used to provide newborn lambs. In order to induce maternal behaviour, ewes from treatments 1 and 3 were exposed to a newborn lamb (2 to 6 hrs old) at the moment of sponge removal. Ewes from treatment 2 were tested with a lamb at 24 to 36 hrs after oestradiol injection. After 30 min of initial observation, all ewes received a VCS for 5 min and were further observed for 30 min, in this period maternal behaviour tests were carried out. Two mature males equipped with a marker harness were used to measure the presence of sexual receptivity in experimental and postparturient ewes; rams remained with females during 5 days after birth. Proportions of ewes showing maternal behaviour of treatments 2 and 3 were higher than that of treatment 1 (Control). None of postparturient ewes showed sexual receptivity (0/36). Frequency of ewes displaying sexual receptivity in treatment 2 was higher than that of control ewes (12/13 vs. 1/14. Chi square,  $P < 0.001$ ) and that of treatment 3 (12/13 vs. 4/13.  $P = 0.005$ ). This data suggest hormonal treatments used to induce maternal behaviour do not reproduce every aspect of normal maternity in ewes.

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## THE EFFECT OF SPACE ALLOWANCE ON BEHAVIOR OF WEANED PIGS DURING TRANSPORTATION

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Mhairi A Sutherland\*, Nadège Krebs, John J McGlone

Department of Animal and Food Sciences, Texas Tech University, Lubbock, USA.

\**Mhairi.sutherland@ttu.edu.*

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The optimum space allowance required for weaned pigs during transport is currently unknown. The objective of this research was to establish a first estimate of the space requirements of weaned pigs based on measures of animal well-being. A commercial semi-trailer was divided into compartments that provided 0.05, 0.06 and 0.07 m<sup>2</sup> per pig (5.2 ± 0.10 kg) with a constant 100 pigs per compartment on both the upper and lower decks. At weaning, pigs (n = 800 per treatment) were transported for 105 min to the wean-to-finish site. The frequencies of Standing, Lying, Sitting, Standing on another pig (SP) and lying/huddling on top of another pig (HP) were recorded by 1 min scan samples (based on pictures taken with digital cameras in each compartment) during the entire duration of transport. Data were analyzed using the MIXED procedure of SAS. Pigs transported at 0.06 m<sup>2</sup>/pig lay down more (p < 0.05) than pigs transported at 0.05 and 0.07 m<sup>2</sup>/pig. Pigs transported at 0.07 m<sup>2</sup>/pig displayed less (p < 0.005) SP behavior compared with pigs transported at 0.05 and 0.06 m<sup>2</sup>/pig. Standing and HP behaviors in pigs were influenced by space allowance and time. Pigs stood up more (p < 0.05) between 0 and 75 min after departure than in the last 30 min of transport. Conversely, pigs spent more (p < 0.05) time HP in the last 30 min of transport compared with the first 75 min. Pigs transported on the bottom deck spent more (p < 0.01) time performing SP and HP than pigs transported on the lower deck. Barrows spent more (p < 0.05) time HP compared with gilts. Space allowance, deck and gender influenced the behavior of weaned pigs during a 105 min transport experience.

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## BEHAVIOURAL APPROACH OF OESTROUS BEEF COWS TOWARD A BULL ON A PASTURE

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**<sup>1</sup>Ken-ichi Takeda\*, <sup>1</sup>Hiroshi Kondo, <sup>1</sup>Kanae Shimizu, <sup>2</sup>Shusuke Sato, <sup>3</sup>Shigeo Takahashi**

<sup>1</sup> Faculty of Agriculture, Shinshu University, Japan.

<sup>2</sup> Graduate School of Agricultural Science, Tohoku University, Japan.

<sup>3</sup> Nasu Research Station, National Institute of Livestock and Grassland Science, Japan.

\*[ktakeda@shinshu-u.ac.jp](mailto:ktakeda@shinshu-u.ac.jp)

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It is difficult to capture oestrous cows for artificial insemination on extensive pastures. Oestrous cows may, however, be captured easily in the presence of a bull if courtship behaviour of oestrous cows is evident. This study investigated the courtship behaviour of oestrous cows in a herd towards a bull on the pasture. Twenty-three Japanese Black cows grazed with a bull on the pasture. Nine oestrous cows were selected as focal animals and observed from the appearance of sexual behaviour to the end of it on separate days. The sexual behaviours of oestrous cows towards the bull were recorded by continuous sampling of the focal animal. The sexual behaviour was classified into 10 categories (following, sniffing, licking, chin-resting, mounting, rubbing, pushing, looking, leaving and other which were all behaviour except those above). A cell-by-cell chi-square test ( $10 \times 10$ ) was performed to determine whether the number of observed transitions differed significantly from the expected value at which a transition was estimated by chance occurrence. The statistically significant transitions of oestrous cows' behavioural approach in courtship behaviour towards the bull were observed. Following had three significantly positive transitions to sniffing ( $P < 0.05$ ), mounting ( $P < 0.01$ ) and pushing ( $P < 0.001$ ). Licking, pushing, leaving and other behaviours had one positive transition ( $P < 0.05$ ). There were fewer negative transitions than the positive ones. Recording the results in a flow diagram, two major sequences of oestrous cows' behavioural approach toward the bull were evident. The first sequence was other, following, pushing and leaving. The second sequence was other, following and mounting. Following, which was the behavioural approach toward the bull, was located in the centre of the flow diagram. These results indicated that following was the main courtship behaviour of oestrous cows, and it was considered that oestrous cows could be enticed by the presence of a bull.



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## MELOXICAM THERAPY FOR CALVES WITH NEONATAL CALF DIARRHEA COMPLEX

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**<sup>1</sup>Cynthia G Todd, <sup>2</sup>Dennis R McKnight, <sup>1</sup>Suzanne T Millman\*,  
<sup>1</sup>Todd F Duffield, <sup>1</sup>Kenneth E Leslie**

<sup>1</sup> Department of Population Medicine, University of Guelph, Canada.

<sup>2</sup> Kemptville Campus, University of Guelph, Canada.

\*[smillman@uoguelph.ca](mailto:smillman@uoguelph.ca)

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Disease is recognized as an important cause of animal suffering. Thus, it was hypothesized that neonatal calf diarrhea complex is associated with negative affective experiences, such as pain and malaise. Non-steroidal anti-inflammatory drug therapy and its role in alleviating pain and promoting recovery of neonatal calves with diarrhea has not been studied. The aim of this research was to examine the efficacy of meloxicam as an adjunctive therapy for calves with diarrhea, as determined by measures of calf performance, behaviour and health. For this double-blind controlled trial, 62 Holstein bull calves were purchased at birth. At the naturally occurring onset of diarrhea, calves were enrolled in the study, and randomly assigned to receive a single subcutaneous injection of meloxicam (0.5 mg/kg BW) or an equal volume of placebo. Daily milk, water and starter ration intakes, as well as weekly body weight measurements were determined for each study calf. Following the onset of diarrhea, calf feeding behaviour and general activity were monitored. Additionally, calf lying and standing postures were evaluated as indicators of discomfort. During this trial, 56 calves developed diarrhea and were treated with meloxicam (n=28) or placebo (n=28). Meloxicam-treated calves were more likely to consume their milk meals ( $p<0.05$ ), required less assistance during milk feedings ( $p<0.05$ ), began consuming starter ration significantly earlier ( $p<0.05$ ) and at a faster rate ( $p<0.05$ ) than placebo calves. Furthermore, meloxicam calves were more sedentary for the first two days after developing diarrhea and then became considerably more active ( $p<0.05$ ). The study calves did not differ for the occurrence of abnormal lying postures ( $p>0.05$ ) or back arch ( $p>0.05$ ). However, placebo calves were more frequently observed with raised ( $p<0.05$ ) or tucked ( $p<0.05$ ) tail positions. These results provide evidence of improved calf well-being and indicate that meloxicam may be an appropriate adjunctive therapy for calves with diarrhea.

## GAIT ANALYSIS OF PIGS WALKING ON DRY, WET OR GREASY CONCRETE FLOOR

<sup>1,2</sup>Vivi M Thorup\*, <sup>3</sup>Frede Aa Tøgersen, <sup>1</sup>Bente Jørgensen, <sup>2</sup>Bente R Jensen

<sup>1</sup> Dept. of Animal Health, Welfare and Nutrition, Faculty of Agricultural Sciences, Aarhus University, Denmark.

<sup>2</sup> Dept. of Exercise and Sport Sciences, Faculty of Science, Copenhagen University, Denmark.

<sup>3</sup> Dept. of Genetics and Biotechnology, Faculty of Agricultural Sciences, Aarhus University, Denmark.

\*ViviM.Thorup@agrsci.dk

In modern pig production clinical leg and claw disorders, joint diseases and locomotion disturbances are frequent and may reduce animal welfare severely. Inappropriate floors in pig pens and slippery floor conditions contribute to these leg problems. This study aimed to quantify the walk of pigs on dry concrete solid floor and to evaluate whether pigs modify their gait according to floor condition. Kinematic (50Hz sagittal plane video recordings) and kinetic (1KHz force plate measuring ground reaction forces) data were collected from four strides of both the fore- and hindlimbs of healthy pigs walking on dry, wet (water) or greasy (rape seed oil) floors. Each floor condition was tested with 10 pigs weighing  $75\text{kg}\pm 6$ . Significant differences were tested in a two-way ANOVA. The pigs adapted their gait to potentially slippery floors by lowering their walking speed on greasy and wet floors ( $0.74\text{m/s}\pm 0.03$ ;  $0.79\text{m/s}\pm 0.03$ , respectively) compared to dry floor ( $0.88\text{m/s}\pm 0.03$ ;  $p < 0.01$ ); and by reducing their peak utilized coefficient of friction on wet floor ( $0.42\mu\pm 0.02$ ) and even more so on greasy ( $0.32\mu\pm 0.02$ ) compared to dry floor ( $0.48\mu\pm 0.02$ ;  $p < 0.001$ ). The pigs also shortened their progression length on greasy ( $0.70\text{m}\pm 0.01$ ) compared to dry floor ( $0.75\text{m}\pm 0.01$ ;  $p < 0.01$ ). Furthermore, they prolonged their stance phase duration on greasy ( $0.69\text{s}\pm 0.02$ ) compared to dry and wet floors ( $0.60\text{s}\pm 0.02$ ;  $0.63\text{s}\pm 0.02$ , respectively;  $p < 0.01$ ). Thus the greasy floor appeared the most slippery condition to the pigs, whereas wet condition was intermediate. The pigs' limbs differed biomechanically, as the forelimbs carried more load ( $3.76\text{N/kg}\pm 0.04$ ) than the hindlimbs ( $3.22\text{N/kg}\pm 0.04$ ;  $p < 0.001$ ). Moreover the forelimbs received higher peak vertical forces ( $5.63\text{N/kg}\pm 0.06$ ) and had longer stance phases ( $0.69\text{s}\pm 0.02$ ) compared to the hindlimbs ( $4.43\text{N/kg}\pm 0.06$  and  $0.59\text{s}\pm 0.02$ , respectively;  $p < 0.001$ ). In conclusion, pigs do modify their gait according to floor condition and pigs' forelimbs carry more weight than their hindlimbs when walking. The gait modifications emphasize the importance of floors that, regardless of condition, allow unrestricted locomotion for pigs.

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## MAINTENANCE BEHAVIOUR OF OWNED AND UNOWNED DOGS IN COZUMEL ISLAND

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**Paola Torres\*, Francisco Galindo, Dulce M. Brousset, Alfredo Cuaron**

<sup>1</sup>Departamento de Etología, Fauna Silvestre y Animales de Laboratorio,  
Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, México D.F.

\*[claupa\\_tournesol@yahoo.com](mailto:claupa_tournesol@yahoo.com)

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Introduced species to natural habitats, such as dogs, can put in risk the conservation of the local biodiversity, transmit diseases to other animals and humans, pollute the environment with feces and urine, and can spread rubbish in urban areas. In Cozumel there are estimates of the distribution and abundance of dogs but scarce information on their behaviour. A study on the maintenance behaviour of four groups of dogs under different conditions (urban, suburban and rural areas) was carried out during four months (April, May, June, and July of 2005, before Emily hurricane). The behaviors recorded were locomotion, resting, standing, body care, feeding, and eliminative behaviour using focal and scan sampling. Simultaneously, the distance covered by focal dogs was estimated. Data were analyzed with Kruskal-Wallis and Mann-Whitney test by groups and by age groups (adult, juvenile). The proportion of time in locomotion was greater in dogs in rural areas than in the other two groups ( $H=10.67$ ,  $df=3$ ,  $p<0.05$ ), and had a tendency to be higher in juveniles ( $H=5.42$ ,  $df=2$ ,  $p=0.06$ ). The dogs that covered a larger area were those living near the beach and the dump yard ( $p<0.05$ ), possibly attributable to the availability of food and tolerance to the human disturbance, among others. It is necessary to make more studies to know more about possible interactions with wildlife. As well as to implement an immediate control program to monitor free roaming animal populations (stray-dogs, semi-feral and feral dogs).

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## THIS DRINKER SUCKS! DRINKER PREFERENCES IN YOUNG PIGLETS

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<sup>1</sup>Stephanie Torrey, <sup>2</sup>Emily LM Toth\*, <sup>2</sup>Tina M Widowski

<sup>1</sup> Agriculture and Agri-Food Canada, Dairy and Swine Research and Development Centre, Canada.

<sup>2</sup> Department of Animal and Poultry Science, University of Guelph, Canada.

\*[etoth@uoguelph.ca](mailto:etoth@uoguelph.ca)

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Weaning age influences feeding, drinking and oral behaviour problems. In 15d weaned piglets, push-lever bowls reduce water usage and belly nosing, and increase initial feed intake compared to nipple drinkers. This suggests that either the motor patterns involved in drinking or the satisfaction derived from performing these motor patterns, differ between drinker devices. Piglets weaned at different ages may prefer to drink from a specific type of drinker. The objective of this experiment was to determine piglets' preferred drinker type at two weaning ages. Twenty-one litters were split-weaned at 20 and 28 days into pens of 8 piglets (n=104). Each pen contained three drinkers: push-lever bowl (PL), float bowl (F) and nipple drinker (N). Water usage, wastage and consumption were measured daily for 10d. Drinking behaviour was scan sampled every 5 minutes on days 9 and 10. Piglets spent a negligible amount of their drinking time at F. Piglets weaned at 20d consumed equal amounts of water from N and PL (N: 338±32ml/pig/d; PL: 323±29ml/pig/d) but wasted more water from N ( $P<0.001$ ; N: 587±69ml/pig/d; PL: 10±2ml/pig/d). Those weaned at 28d consumed and wasted more water from N ( $P<0.001$ ; Consumed, N: 799±56ml/pig/d; PL: 238±28ml/pig/d; Wasted, N: 1029±89ml/pig/d; PL: 22±3ml/pig/d). On days 9 and 10, piglets at both weaning ages spent the same amount of time drinking. However, piglets weaned at 20d spent twice as much time at PL as 28d weaned piglets ( $P=0.03$ ). While piglets weaned at 20d consume equally from the N and PL drinkers, they are less efficient in their use of the nipple drinker, wasting 64% of water used (versus 53% for piglets weaned at 28d;  $P<0.01$ ). Preferences for drinker types and efficiency of drinking from different drinkers are affected by weaning age, suggesting that drinking as a form of ingestive behaviour is still developing in young piglets.

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## GRAZING BEHAVIOR OF ALPINE AND $\frac{3}{4}$ ALPINE - $\frac{1}{4}$ BOER KIDS

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**Abel Trujillo\*, Adriana Alarcón, Claudia E Vargas, Alicia Soberón**

Centro de Enseñanza, Investigación y Extensión en Producción Animal en Altiplano, FMVZ, UNAM, Mexico.

*\*abelm@servidor.unam.mx*

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Studying the grazing behavior of goats under different ecological environments will help to design more efficient production systems and better ecosystem management. Grazing behaviors of Alpine (9males and 7 females) and  $\frac{3}{4}$  Alpine-  $\frac{1}{4}$  Boer kids (7 males and 9 females) were evaluated. Three kids of each breed and sex were randomly selected and observed during 6 periods of 30 minutes, three times a day (morning, noon and afternoon). Grazing, rest and rumination times, bite and drinking frequencies were analyzed using a linear model and including the effects of sex, genotype, time of day and season as independent variables. Aggression toward another kid and feed selection were analyzed using a Pearson and  $Ji^2$  for crosstabs analysis. No differences were found ( $P>0.05$ ) in grazing behavior, which suggests that this variable is genetically programmed. All kids changed their grazing behavior depending on the time of day, increasing eating frequency in the morning, with a larger number of bites compared to their ruminating and resting times. At noon and during the afternoon their resting and ruminating times were higher ( $P>0.05$ ). Biting frequency was higher ( $P>0.05$ ) for the Alpine kids. Differences were found for season, with a higher biting frequency during winter and a lower biting frequency during summer. Rain did not affect grazing behavior, but it affected dry matter content of the intake, which modified drinking frequency for period ( $P<0.001$ ) and time of day ( $P<0.065$ ). In the Alpine group, aggression was higher in the afternoon, but no differences were found for breed, time of day or sex ( $P>0.05$ ). An inverse relationship between dry matter content and the season and the frequency of aggression was found ( $P>0.05$ ). Feed selection had a direct relationship with dry matter ( $P<0.01$ ). In conclusion, the inclusion of  $\frac{1}{4}$  Boer genotype in Alpine goats does not affect grazing behavior.

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## PATTERNS OF MATERNAL - OFFSPRING BEHAVIOUR OF DAIRY SHEEP AND POTENTIAL ASSOCIATIONS WITH MAMMARY HEALTH

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Athina S Tzora\*, Ioannis A Skoufos

Department of Animal Production, T.E.I. of Epirus, Greece.

\*tzora@teiep.gr

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We studied behaviour of dairy sheep and associations with mammary health. We used 12 ewes (6 with single, 6 with twins) of Karagouniko-breed (dairy sheep) and performed behavioural recordings throughout lactation, by using video cameras; we also collected milk samples for bacteriological examination. Trial lasted for 42 days after lambing. We employed established ethological methods for describing behaviours. Findings were compared to those literature-results related to sheep for meat production. No negative maternal behaviours were observed. Experimental ewes showed reduced "Grooming", "Sniffing" immediately post-partum, compared to those reported for meat-breeds. Of 480 duct or secretion samples, 39 and 3, respectively, yielded bacteria. There was no difference in frequency of bacterial isolation from ewes sucking singles or twins: 46% and 54% of isolates, respectively ( $P=0.637$ ); there was greater frequency of bacterial isolation during 1st stage of lactation (D0-D3): 0.125, vs 2nd (D4-D11): 0.083, 3rd (D12-D30): 0.063, 4th (D31-D42): 0.069 ( $P<0.001$ ) and of positive CMT scores during 1st stage of lactation: 0.917, vs 2nd: 0.550, 3rd: 0.140, 4th: 0.181 ( $P<0.001$ ). There was decreasing duration of "Sucking attempt", "Successful suck" throughout lactation ( $P<0.05$ ). There was increasing frequency of "Hindering sucking", "Head up posture" from 1st to subsequent stages of lactation ( $P=0.038$  and  $P<0.001$ ), whilst "Hindering sucking" coincided with end of "Sucking bouts" of lambs. We conclude: i. dairy ewes cannot be considered as poor mothers; reduced attention to lambs during neonatal life may contribute to smaller incidence of respiratory disorders observed in Greek flocks; ii. termination of sucking activity by the ewe when her mammary glands have been emptied, prevents damage to teat and likely development of mastitis; iii. frequent and longer sucking events of lambs during early lactation, may contribute to increased bacterial recoveries from mammary glands of ewes.

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## A SURVEY OF DEHORNING PRACTICES AND PAIN MANAGEMENT IN GOATS

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**Lizete A Valdmanis, Paula I Menzies, Suzanne T Millman\***

Department of Population Medicine, Ontario Veterinary College, University of Guelph, Canada.

*\*smillman@uoguelph.ca*

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The goat industries of North America are experiencing strong and prolonged growth. Within the goat dairy industry dehorning and disbudding are common procedures, and to a lesser extent are also routinely performed in goats raised for meat, fibre, and companion purposes. The procedure is painful, and currently there is a paucity of credible information on dehorning techniques and pain management for goats. The objectives of this study are to determine the methods currently used for goat disbudding and dehorning as well as pain management interventions. Two online surveys were conducted for small ruminant veterinarians and for goat producers in the US and Canada. A total of 40 veterinarians and 229 producers completed the survey during the summer of 2006, resulting in a response rate of 15%. Disbudding kids was performed using cauterization by 97% of veterinarians and 95% of producers. Caustic paste was not used. Analgesic drugs were included in the disbudding procedures by 69% of veterinarians and 33% of producers. Producers dehorned their goats using wire saw (39%), elastic bands (36%) or gouge (7%), whereas veterinarians used wire saw (77%), gouge (16%) and elastic bands (3%). All veterinarians and 23% of producers use analgesic drugs for dehorning. For producers that provide analgesia, 91% cite welfare benefits as one of their reasons, whereas 75% of producers who do not provide analgesia consider it unnecessary. Forty two percent of veterinarians provide training to clients who choose to perform disbudding and dehorning themselves. Results from this survey indicate a need for further research and dissemination of information about best dehorning practices to address pain associated with this procedure. In particular, the method of dehorning with elastic bands requires scientific scrutiny due to potential for pain, discomfort and medical complications that are likely to arise from this prolonged intervention.

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## INFLUENCE OF VARIOUS ODOURS ON THE FORAGING BEHAVIOUR OF BANK VOLES (*Clethrionomys Glareolus*)

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Géraldine Verplancke\*, Nicolas Vandestrade, Éric Le Boulengé

Ecology and Biogeography Unit, UCL, Belgium.

\*[verplancke@ecol.ucl.ac.be](mailto:verplancke@ecol.ucl.ac.be)

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Bank voles (*Clethrionomys glareolus*) are small forest rodents, widely distributed in Europe. They represent a potential prey for many predators including mustelids, canids, raptors and snakes. They rely on early detection of predators to avoid predation as their escape speed is relatively slow. We carried out an experiment to test whether bank voles modify their foraging behaviour in response to olfactory cues of predation. Olfaction in bank voles is highly developed and known to play a major role in their intraspecific relationships. Eight males and eight females were placed in an outdoor 5x5m enclosure in a prime bank vole habitat. 40g of food were placed in a feeding tray impregnated with a test odour. Tested odours came from faeces of predators (fox, weasel, cat, dog and ferret), from pellets of raptors (tawny owl and peregrine falcon), from bank voles (conspecifics) and methanol as control as it's the extracting substance. After 24h, food consumption was measured and the tray was refilled. The whole set of odours was replicated three times in random order (during fall, spring and summer). Comparison of food consumption from test trays revealed 3 groupings of odour types relative to the control odour. 1. "Neutral" including familiar bank voles (25.2%), tawny owl (29.82%), peregrine falcon (37.8%) and dog (39.73%) ( $F= 0.05$ ;  $p=0.8178$ ). 2. "Strongly repulsive" including weasel (1.3%), foxes (2.42%), cat (3.54%) and ferret (8.07%) ( $F= 30.84$ ;  $p < 0.0001$ ). 3. The "attractive" consisting of the odour of unfamiliar bank voles (56.98%) ( $F= 5.10$ ;  $p=0.032$ ). Results show that bank voles strongly modify their foraging behaviour depending on the cues of predation risk. They avoid risky foraging places marked by odours of major predators, particularly the weasel and fox. Moreover, odours extracted from pellets didn't modify the foraging behaviour indicating that pellets may not provide effective olfactory cues. The strong aversion of bank voles to certain predator cues indicates that olfactory cues may provide a means of preventing over-dispersion.



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# POSTER PRESENTATIONS

## GROUP 2

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## STABILITY IN RESOURCE HOLDING POWER (RHP) OVER YEARS IN FARMED SILVER FOX VIXENS (*Vulpes vulpes*) AND THE RESOURCE VALUES IMPACT ON THE CONTENTS OF FIGHTS

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Anne K Akre\*, Anne L Hovland, Inger Lise Andersen, Morten Bakken

UMB (Norwegian University of Life Sciences), IHA (Department of Animal and  
Aquacultural Sciences), Norway.

\*Anne.akre@umb.no

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Little is known about stability in RHP and how resource value affects competition in farm animals, and this should be emphasised when grouping farm animals. The main aim of this study was to investigate stability in RHP over several years in silver fox vixens. We also examined fighting variability between winners and losers as well as fighting intensity in relation to expected resource value in food competition tests. Forty-two 5-6 months old vixens were tested in pairs in a total of seven food competition tests and were given a score from zero to seven according to fights won. Two years later eight high score (HS) and eight low score (LS) vixens were retested in a single food competition test (HS versus LS). Prior to testing vixens were starved for 24h. During the competition test the animals were introduced to a wire mesh cage unfamiliar to both animals and food paste (equivalent to approximately 50% of their daily ration) was deposited in the middle of a food tray. The foxes' behaviour was video recorded for 30 minutes and then separated. None of the vixens were injured during the test. The results showed that RHP was consistent in seven of eight pairs (87.5%). HS vixens consumed more food in total ( $P < 0.001$ ) and the biggest difference in consumption rate was found during the first 10 minutes ( $P < 0.001$ ). Intensity and variability of fights was highest during the first phase when food was most available. In conclusion there was stability in the probability of winning in a food competition test over years and the fighting behaviour varied according to expected resource value.

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## ASSESSMENT OF BEHAVIORAL SYNCHRONY OF BROILER CHICKENS UNDER VARYING LIGHT INTENSITIES

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Gina Alvino, Gregory S Archer, Joy A Mench\*

Department of Animal Science, University of California, Davis, USA.

\*[jamench@ucdavis.edu](mailto:jamench@ucdavis.edu)

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Broiler chickens are often raised commercially under near-continuous dim illumination. It has been suggested that welfare could be improved by increasing the daytime illumination and providing a more normal photoperiod. However, producers are concerned that this might increase synchrony of behaviors such as eating, drinking, or resting, resulting in competition for resources. We investigated this by randomly assigning 250 Cobb broilers to environmental chambers at LOW (5 lux, typical of commercial conditions), MODERATE (50 lux), or HIGH (200 lux) daytime illumination levels. The photoperiod was 16L:8D, with a nighttime illumination of 1 lux. Digital recordings were made for 24 hours during week 4 of life, and scan samples taken of 11 behaviors at 15-minute intervals. Z scores for the amount of synchronization were calculated as follows:  $Z = K/\sqrt{\text{var}(K)}$ , with K (the kappa coefficient of agreement) derived using the formula:  $K = P(A) - P(E)/1 - P(E)$ , where  $P(A)$  = proportion of synchrony across all time periods and  $P(E)$  = proportion of synchronization corrected for chance across all time periods. Sleeping was either significantly synchronized ( $P < 0.05$ ) or showed a strong trend ( $P < 0.10$ ) towards synchronization in all 4 replicates of HIGH ( $K = .03, .04, .04, .02$ ;  $Z = 2.64, 2.84, 2.49, 1.39$ ). It was also significantly synchronized ( $P < 0.05$ ) in LOW and MODERATE ( $K = .03$  and  $.02$ ;  $Z = 2.04$ ) but only in one replicate. No other behaviors, except sitting in one replicate of LOW ( $K = .03, Z = 2.52$ ) were synchronized, and the Kruskal-Wallis test revealed no between-treatment differences in degree of synchrony. We conclude that broilers synchronize sleeping behavior and that this effect is strongest under HIGH daytime illumination, but that daytime illumination level generally does not appear to affect degree of behavioral synchrony.

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## EFFECT OF *Taenia pisiformis* INFECTION ON THE BEHAVIOR AND HEALTH OF DOMESTIC RABBITS (*Oryctolagus cuniculus*)

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<sup>1</sup>Miguel A Betancourt, <sup>2</sup>Agustín Orihuela, <sup>2</sup>V Aguirre, <sup>2</sup>R Vázquez, <sup>2</sup>Iván Flores–Pérez\*

<sup>1</sup>Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, Mexico

<sup>2</sup>Facultad de Ciencias Agropecuarias, Universidad Autónoma del Estado de Morelos, Mexico

\*ivanfloresperez@yahoo.com.mx

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To determine the effect of *Taenia pisiformis* infection on the behavior and health of rabbits, twenty adult female New Zealand rabbits were assigned to two groups. Treated animals were orally infected with 3,000 eggs of *T. pisiformis*, while the controls only received saline solution. Animals were housed in pairs using one rabbit from each group. Behavioral activity was recorded daily from 19:00 to 21:00 h starting one day post infection (dpi). Food competition tests were conducted between pairs one day before infection (dbi) and 25 dpi to determine whether change can be induced in social dominance. In addition, blood samples were collected at seven, 14 and 25 dpi, for hematological and hepatic function determinations. All animals were euthanized at 25 dpi after last sampling. A “proportion test” was used to compare individual behaviors between groups while a sign test was used for dominance-subordination analysis. Hematological and hepatic parameters were compared using a “t” test. Treated animals spent more ( $p < 0.01$ ) time lying down (87 vs. 17%) and less ( $p < 0.05$ ) time grooming (43 vs. 57%) and drinking (26 vs. 74%) than controls. These differences were noticeable ( $p < 0.05$ ) seven dpi and remained until the end of the experiment. No changes ( $p > 0.05$ ) were observed in the time spent eating and in the dominance-subordination relation between pairs. Leukocyte, heterophil and lymphocyte concentrations were larger ( $p < 0.05$ ) in treated than in controls ( $5.2 \pm 0.3$  vs.  $7.3 \pm 0.5 \times 10^9/l$ ,  $53.3 \pm 2.6$  vs.  $33.3 \pm 3.4\%$  and  $41.2 \pm 2.3$  vs.  $57.5 \pm 4.6 \mu\text{mol/l}$ , respectively). Furthermore, at 25 dpi, infected animals had larger concentrations of bilirubin than controls. Necropsy findings corroborate hepatic lesions and presence of the parasite in all infected animals. It was concluded that an infection of *T. pisiformis* induced changes in behavior, and hematological and hepatic parameters. These behavioral changes may contribute to diagnosis of the disease.

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## LAMENESS PREVALENCE AND BEHAVIOURAL TRAITS IN CUBICLE HOUSED ORGANIC DAIRY HERDS

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<sup>1</sup>Jan Brinkmann\*, <sup>1</sup>Solveig March, <sup>2</sup>Christoph Winckler

<sup>1</sup> Research Centre for Animal Production and Technology, Georg-August-University of Goettingen, Germany.

<sup>2</sup> Department of Sustainable Agricultural Systems, University of Natural Resources and Applied Life Sciences (BOKU), Austria.

\*[jan.brinkmann@agr.uni-goettingen.de](mailto:jan.brinkmann@agr.uni-goettingen.de)

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Behaviours patterns such as lying behaviour may play an important role in the development of claw lesions and lameness in dairy cattle. It was the aim of this study to investigate the relationships between selected behaviours/behavioural indices and the lameness prevalence in organic dairy farms which participated in an intervention study. 43 organic cubicle housed Holstein-Friesian herds were regularly visited for two years. Lameness prevalence was assessed using a 5-category locomotion scoring system. Cow-comfort (proportion of cows in stalls which are lying down) and rumination indices (proportion of cows lying down that are ruminating) as well as behaviours around resting such as the duration of lying down movements were additionally recorded during the winter housing period at the start of the project (baseline) and one year thereafter. The average baseline lameness prevalence was 26% (2-50%); 12% (0-38%) of the animals were judged moderately or severely lame. After the first year, prevalence decreased to 17% (2-51%) and 8% (0-35%) respectively. In both years significant negative correlations were found between rumination index and lameness prevalence (Spearman correlation coefficient;  $r_s = -0.58$ ,  $p = 0.000$ ,  $n = 42$  (year 1) and  $r_s = -0.42$  (year 2), respectively,  $p = 0.009$ ,  $n = 38$ ). The total duration of lying down movements ( $r_s = 0.36$ ,  $p = 0.020$ ,  $n = 42$  and  $r_s = 0.35$ ,  $p = 0.029$ ,  $n = 38$ ) as well as the carpal stance phase of these movements ( $r_s = 0.36$ ,  $p = 0.020$ ,  $n = 42$ , and  $r_s = 0.40$ ,  $p = 0.012$ ,  $n = 38$ ) also correlated with lameness prevalence. In the first year only, the proportion of cows lying with at least one leg stretched was related to lameness prevalence ( $r_s = -0.50$ ,  $p = 0.001$ ,  $n = 42$ ). The Cow-comfort index did not show relationships with lameness prevalence. Lameness prevalence is therefore linked to several behaviours including feed-related and lying behaviours. Causal relationships regarding the development of lameness however may not be simply deduced from such relationships.

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## ANIMAL SHELTER DEMOGRAPHY IN CATALONIA, SPAIN

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**Raquel Castellort\*, Jose L Ruiz de la Torre, Jaume Fatjó, Marta Amat, Valentina Mariotti, Xavier Manteca**

Clinical Ethology Service, School of Veterinary Science. Universitat Autònoma de Barcelona, Spain.

*\*Raquel.Castellort@uab.es*

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In many countries including Spain, proper management of animal shelters is hampered by a lack of reliable and up-to-date studies on the actual population of animals kept in shelters. In Spain, the most reliable and up-to-date sources of information on this issue are the annual survey of dog abandonment made by the Affinity Foundation and the annual statistics of the Spanish Association of Pet's Food Manufacturers. They estimated that more than 96.000 dogs were abandoned in Spain during 2005 out of a total population of about 5.5 millions of dogs. However, further information on whether the animals are finally adopted or otherwise is lacking. The objective of this study was to describe the current situation of shelter demography in Catalonia and to make a prediction of how many animals will be kept in shelters in the next five years. The situation of 37 shelters during 2005 was analyzed, with a total figure of 12.280 dogs and 4.080 cats admitted. A questionnaire was sent to each shelter to collect general information about the shelter and its demographical data. Results showed that most shelters are public (45,9%), with most of their staff belonging to animal protection societies (64,9%) and that shelters are overpopulated throughout the year, with a peak in summer. It was found that 53,7% of the dogs and 37,2% of the cats were eventually adopted; 20,5% of dogs and 1,4% of cats were reclaimed by their owners; 17,1% of dogs and 32,1% of cats were euthanased for varied reasons, and 1,7% of dogs and 3,1% of cats were dead on arrival to the shelter. This means that over a period of five years and given the current situation, the total number of dogs and cats in shelters in Catalonia could reach a figure of about 19.900 individuals.

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## ARE COWS ABLE TO ORGASM?

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**Stine B Christiansen\*, Björn Forkman**

University of Copenhagen, Faculty of Life Sciences, Denmark.

*\*sbc@life.ku.dk*

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One element of promoting good animal welfare is to allow animals to express normal behaviour. The underlying rationale is that animals may be frustrated if denied such opportunities, and that usually performing these behaviours is associated with a positive experience. A wide variety of behaviours have been addressed in animal welfare research, e.g. nest building, dust bathing, play, and social interactions. However, although animals' sexual behaviour may be a behavioural need and associated with pleasure, little research seems to address the welfare related aspects, e.g. the welfare of sexually mature and intact animals being denied the opportunity to perform sexual behaviour or of being sexually stimulated. There are probably several reasons for this. One might be that sex is viewed as reproductive behaviour and thus the focus of research is the end result or function rather than motivation or subjective experiences. Another could be that until recently welfare research has focused on indicators of poor rather than good welfare. Furthermore, the issue of sexuality and in particular animal sexuality seems to be somewhat a taboo. An overview will be presented of relevant research and anecdotal information. This suggests that animals are motivated to perform sexual behaviour and that performing this behaviour may be associated with a positive experience. Also, an overview of possible research potentials is offered. These include questions relating to basic research on animal sexuality, research on applied animal welfare and the development of behavioural and physiological parameters for assessing experiences of positive welfare. It will be argued that the knowledge gained could have implications for the perception of what behaviours animals should be allowed or ensured the option to perform.



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## IMPACT OF VISUAL CONTACT WITH THE SURROUNDING ENVIRONMENT AND HUMAN ACTIVITY ON GROWTH RATE, CHROMODACRYORRHEA SECRETION AND BEHAVIOUR OF LABORATORY RATS

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Sylvie Cloutier\*, Ruth C Newberry

Center for the Study of Animal Well-being, Washington State University, Pullman, USA.

\*[scloutie@vetmed.wsu.edu](mailto:scloutie@vetmed.wsu.edu)

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Laboratory rats are typically housed in clear or opaque cages on racks with multiple shelves. Depending on location, clear cages allow a view of the room and facilitate visual social contact with neighbouring rats, but may also induce anxiety due to lack of visual cover. Our goal was to evaluate effects of visual cover and tier height on physiological and behavioural responses of rats during routine handling and behaviour testing. We hypothesized that partial visual cover would be most beneficial for rat welfare. We assessed effects of cage visual cover and tier level on adult male Sprague-Dawley rats (N=54 pairs housed in adjacent cages with the same visual cover) using a 3 x 3 factorial design with three cage cover types: (1) No cover; (2) Solid; (3) Partial (walls covered with vertical opaque bands), and three tier levels: (1) Top (143 cm high); (2) Middle (82 cm high); (3) Bottom (21 cm high). Chromodacryorrhea was recorded following weekly body weight measurement and cage cleaning. Behaviour during an Elevated Plus Maze test was assessed during weeks 4 (EPM1) and 8 (EPM2). Growth rate, chromodacryorrhea and behaviour in EPM1 were not affected by the treatments. In EPM2, rats housed in Partial cover spent the most time in the open arms of the maze, suggesting that they were the least anxious (GLM,  $F_{2, 35}=4.76$ ,  $P=0.015$ ). Distance of the cage from human activity at the front of the room resulted in increased chromodacryorrhea secretion after cage cleaning ( $F_{2, 308}=5.8$ ,  $P=0.003$ ) and tended to increase avoidance of the open arms in EPM1 ( $0.6 < P < 0.98$ ). In conclusion, cage distance from human activity and degree of visual contact with the surroundings affect indicators of stress in rats and may have implications for the outcome of behavioural tests used in biomedical research.

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## QUANTIFYING ANIMAL BEHAVIOR: WHY METHODS ARE IMPORTANT

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<sup>1</sup>Jeffery W Dailey\*, <sup>2</sup>Frank M Mitloehner, <sup>1</sup>Jeffery A Carroll

<sup>1</sup> USDA-ARS, Livestock Issues Research Unit, USA.

<sup>2</sup> Department of Animal Science, University of California.

\*[jdailey@lbr.ars.usda.gov](mailto:jdailey@lbr.ars.usda.gov)

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Scientific publications should contain enough information and detail to allow for replication of studies. A review of research articles published in Applied Animal Behavior Science (AABS) was conducted to identify the presence of such details. The percentage of articles published in AABS during the years 2000, (Y00, 116 articles), and 2005, (Y05, 127 articles) that provided information needed for replication of the study were quantified. Three major topic areas; general methodology, behavioral observation methods, and video materials and methods, were examined. For general methodology, manuscripts were reviewed to assess if the location and time frame of the study could be determined, (3 sub-topic areas). Information about general methodology was found in 43% of Y00 articles, while 51% of Y05 articles had the selected information. For behavioral observation, manuscripts quantifying animal behavior were evaluated according to 7 sub-topic areas which included citation of methodology. The selected criteria were found in 33% of the Y00 articles evaluated, (107/116), and 47% of Y05 articles, (112/127), that contained the behavioral data. With regard to the video materials and methods, manuscripts were evaluated for information on the equipment and settings used during a project, (6 sub-topic areas). Only 60 of the Y00 and 49 of the Y05 papers which used video were evaluated, of these 10% of Y00 articles, and 23% of Y05 articles contained the selected criteria. As with other scientific methods, behavioral "assays" should be validated and adequately described to allow for replication by other researchers. The results of our review emphasize the need for a consist format when describing materials and methods for studies utilizing video recording of animal behavior.

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## INTER-OBSERVER VARIABILITY OF APPROACH-AVOIDANCE BEHAVIOURS TO ASSESS FEAR AT SLAUGHTERHOUSE

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<sup>1</sup>Antoni Dalmau\*, Veerle Hautekiet, Liesbet van Steenberg, Pedro Rodriguez,  
Rony Geers, <sup>1</sup>Antonio Velarde

<sup>1</sup>IRTA, Spain

\**Antoni.dalmau@irta.es*

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The approach-avoidance behaviour has been used to assess fear in animals. On a practical context of loading/unloading a truck, the avoidance behaviour could be translated into behaviours like number of pigs turning back, are reluctant to move or attempting to retreat. These parameters were validated as fear indicators in a previous study. The objective of the present work was to assess the inter-observer variability of the indicators of fear during unloading at slaughterhouse to study the validity of these measures on a practical ground. Observations were assessed at group level (13-29 individuals). Twenty observers scored by video clips the approach-avoidance behaviours in 50 pig groups. Seven observers scored 100 groups by direct observation at 4 slaughterhouses. Proc Genmod of SAS and Spearman correlations were used. Nine percent of the pigs were reluctant to move, 4% were turning back and 2% showed the retreat attempt behaviour. The percentage of animals reluctant to move and turning back were higher ( $P < 0.01$ ) in the second and third tiers compared to the first one. In addition, the reluctant to move behaviours tended ( $P = 0.0858$ ) to be higher in the third than in the second tier. The highest correlations between observers were obtained for the reluctant to move behaviour scored by video clips (0.54) and the turning back behaviour by direct observation at slaughterhouse (0.54). In the video recordings, the highest correlation concerning the reluctant to move behaviour and the retreat attempts, was obtained for animals coming from the first tier. In the case of direct observations, the higher correlation between observers was found on the turning back behaviour in animals coming from the second tier. It was concluded that the reluctant to move and turning back behaviours can be good indicators of fear during unloading at slaughterhouses in pigs, although a proper training of the observers should be taken into account.

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## BREEDING BEHAVIOR IN SHEEP WHIT SPECIAL EMPHASIS IN SERVICE CAPACITY, SELECTIVITY AND HAREM CONFORMATION

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José De Lucas\*, Ernesto Fausto, Gonzálo Valenzuela, Roberto Gómez

Facultad de Estudios Superiores Cuautitlán, Universidad Nacional Autónoma de México, México.

\*tronj@servidor.unam.mx

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The reproductive rate can be affected by the ram's breeding behavior, especially when there is more than one ram in the flock. The objective was to establish breeding behavior with emphasis in service capacity, selectivity and harem conformation. Three Columbia and 3 Suffolk rams (2 adults and one yearling in each case) were placed in 2 flocks with ewes in estrus. At the beginning of breeding period, there were 2-one hour observations at 8 and 16 hrs, with one person observing and video-recording each male. This methodology was used to establish harem conformation (2 or more ewes marked by each ram and staying around him for more than 10 min) and male activity (mounts and services). To establish female preferences for males, each ram was tied in the paddock for 4 hrs, with a 4 m rope and a distance between rams of 15 m. The analysis in this summary only included descriptive statistics in adult males during the first hour post introduction to the flock, because yearlings had alterations in it's behaviour. Male service capacity was 3.6 services (range 3 to 5). The relationship mount to service was 2.5 (range 1.6 to 3). Time spent to the first service was 6'36" for Columbia and 5'12" for Suffolk. The second service was 7'36" and 22'36 later for both breeds, respectively. Suffolk rams conformed more harems than Columbia (6 vs 1.5). Fights for ewes among males were observed especially in adults (mean 20 in the first hour), and aggression from adults to yearlings was observed. When ewes had an option to select a male, they conformed 3 harems selecting the Columbia yearling. Only one Columbia adult formed one harem. The Suffolk males did not conform harems. This study shows that when 3 rams were present in the flock at breeding, the reproductive behavior could be affected by the activity and age of the males.

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## MODELING THE EFFECT OF STERILIZATION RATE ON OWNED DOG POPULATION SIZE IN CENTRAL ITALY

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**<sup>1</sup>Antonio Di Nardo\***, **<sup>1</sup>Luca Candeloro**, **<sup>2</sup>Christine M Budke**, **<sup>2</sup>Margaret R Slater**

<sup>1</sup> Reparto Relazione Uomo-Animale, Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale", Italy

<sup>2</sup> Department of Veterinary Integrative Biosciences, College of Veterinary Medicine and Biomedical Sciences, USA

*\*a.dinardo@izs.it*

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Population dynamics models are often used to evaluate wildlife populations. However, there have been very few studies evaluating the population dynamics associated with owned dogs. This is unfortunate since information regarding owned dog populations not only allows for a better appreciation of the role of dogs in a society, but can also be used to achieve better insight into the local free-roaming dog population since the two are invariably linked. A spreadsheet population dynamics model was constructed to evaluate the impact of female dog sterilization on the domestic dog population for the province of Teramo, Italy. Baseline owned dog population structure as well as the annual number of births, adoptions, abandonments, and purchases were estimated based on regional managed kennel data in addition to a telephone questionnaire administered to members of the local population. Age and gender dependent death rates were based on domestic dog life tables. The model predicts that at the current female dog sterilization rate of 30%, the owned dog population will most probably continue to increase. After twenty years, a mean annual increase of 2.6% (median: 2.5%, 95% CI: -3.2% – 8.8%) is projected assuming that the average age at sterilization is 3 years. A sterilization rate of at least 55% is estimated to be needed to halt population growth if the current age structure for female dog sterilization is maintained. However, if the province of Teramo were to focus on sterilizing female dogs less than 1 year of age, the required sterilization rate to arrest population growth could be reduced to as low as 26%.

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# INFLUENCES OF PREDATOR PRESENCE AND HANDLING ON BODY TEMPERATURE AND RUNNING WHEEL ACTIVITY IN GOLDEN HAMSTERS

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Patrizia Eberli\*, Sabine G. Gebhardt-Henrich, Andreas Steiger

Vetsuisse Faculty Berne, Berne, Switzerland.

\*[patrizia.eberli@itz.unibe.ch](mailto:patrizia.eberli@itz.unibe.ch)

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Emotional fever and changes in running wheel activity can be good indicators of acute stress. Emotional fever is caused by stressful situations and leads to an increase in body temperature within a few minutes. This study investigated if predator exposition and handling were both similarly stressful and if a running wheel helped to decrease stress. In order to investigate those questions, two groups of twenty golden hamsters each were either exposed to a predator (ferret) or handled for ten minutes. It was the animal's first time of either being handled or meeting a predator. Before and after the treatment, body temperature was telemetrically measured (Transponders and Wireless Reader System by PLEXX, The Netherlands). The hamsters were kept singly in cages with either a functional or a non-functional running wheel. Wheel running activity was continuously recorded (The Chronobiology Kit, Stanford Software Syst.). The body temperature in hamsters exposed to the ferret ( $2.36 \pm 0.77^\circ\text{C}$  higher than before exposure) was  $1.4^\circ\text{C}$  ( $\pm 1.13^\circ\text{C}$ ) higher compared with the animals that were handled ( $0.95 \pm 0.68^\circ\text{C}$  higher than before handling,  $z=3.59$ ,  $p=0.0004$ ,  $n=20$ ). After exposure to the ferret, hamsters had 9100 ( $\pm 2765$ ) turns in the running wheel more than during the preceding day and control hamsters had 1518 ( $\pm 5195$ ) turns more than during the preceding day. The increase in revolutions was significantly different for exposed and control hamsters (Wilcoxon signed-rank test,  $z=2.24$ ,  $p=0.025$ ,  $n=17$ ). Those results show that the exposition to a predator is more stressful than handling. The hamsters seemed to be able to distinct between predators and humans and to realize that the predator is more dangerous. The presence of a functional running wheel had no impact on the body temperature. Video analysis on the behaviour will be done to find out if post-stress behaviour is influenced by the presence of a functional running wheel.

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# EFFECTS OF DURATION AND PROXIMITY OF HUMANS ON FEAR OF HUMANS IN LAYING HENS (*Gallus gallus domesticus*)

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<sup>1</sup>Lauren Edwards\*, <sup>2</sup>Grahame Coleman, <sup>1</sup>Paul Hemsforth

<sup>1</sup>Animal Welfare Science Centre, Faculty of Land and Food Resources, University of Melbourne, Australia.

<sup>2</sup>Animal Welfare Science Centre, School of Psychology, Psychiatry and Psychological Medicine, Monash University, Australia.

\*[l.edwards2@pgrad.unimelb.edu.au](mailto:l.edwards2@pgrad.unimelb.edu.au)

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Fear responses to humans in the domestic laying hen (*Gallus gallus domesticus*) may reduce both bird welfare and productivity through stress. This experiment examined the effects of human contact on fear of humans in hens. Four sheds (with 216 cages as the experimental unit, 6 – 9 birds/cage) at a commercial egg farm were used. Two independent treatments, proximity of a stationary experimenter (distance from cages of 0m, 0.75m, or 1.5m) and duration of contact with a stationary experimenter (daily contact of 2s, 30s or 90s) and one repeated measure (day of behavioural testing) were studied in a 3x3x3 repeated measures design over 28 days. Fear of humans was assessed on three occasions: 0, 14 and 28 days. This assessment involved the experimenter approaching the cage in a standard manner and recording the following variables at 5 s intervals for 20 s; maximum number of birds with their heads at the cagefront, a point count of birds at the cagefront and the number of heads out of the cage. Two components of behaviour, labelled 'Forward Score' and 'Heads Out Score', were identified using a Principal Components Analysis. These components accounted for 81 % of the total variation in bird behaviour. The components for each cage were compiled and a repeated measures analysis conducted. No significant main effects were found, but there was a significant ( $P = 0.016$ ) interaction between Proximity and Test Day for the Heads Out score. The score for birds in the 0 m Proximity treatment increased over the test days relative to the other treatments, indicating a reduction in fear of humans and highlighting opportunities to reduce fear in hens.

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## INTERSPECIFIC EMPATHY AND BEHAVIOUR RECORDING: THE CASE OF MEXICAN GRAY WOLF (*Canis lupus baileyi*) IN CAPTIVITY

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<sup>1</sup>Isabel Escobar-Ibarra\*, <sup>2</sup>Lilian Mayagoitia-Navales, <sup>2</sup>Pilar Chiappa, <sup>3</sup>Carlos González Rebeles, <sup>1</sup>Ramiro Ramírez-Necoechea, <sup>1</sup>Daniel Mota-Rojas, María Alonso-Spilsbury

<sup>1</sup> Laboratorio de Etología, Producción Porcina y Fauna Silvestre, Universidad Autónoma Metropolitana Unidad Xochimilco, DF, México.

<sup>2</sup> Departamento de Etología, Psicobiología y Conducta, Instituto Nacional de Psiquiatría "Ramón de la Fuente Muñiz", DF, México.

<sup>3</sup> Departamento de Etología, Fauna Silvestre y Animales de Laboratorio, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, DF, México.

\*escisabel@terra.com.mx

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There is a methodological need for systematic behaviour study record standarization. The most important tools required to achieve said standarization in the behavioural discipline are: 1) The operative definition of behaviour, 2) The observer training and 3) The systematization of behaviour records. However, heterogeneity criteria are common among behaviour studies that are used to define behaviour. Even the most capable observers, print a series of aprioristic attributes in their conduct definitions, such as function specification or in determining age category of the individual. In this case the researcher must adjust operative terms of the definition with each new topic. This is a very old problem. However, the proposed solutions are only partial, which causes the same problem continually, for example when regarding animals with plastic behaviour, like social mammals, and a comparative analysis is attempted in different conditions for example in a large scale conservation outline or to draw a line that determines cognitive capacity. This work is divided in two parts. First problems are identified in submissive wolf behaviour (*Canis lupus*) definitions in previous studies. Later, a way to avoid objective attributes in wolf behaviour is suggested. This is based on the analysis of 3,000 hours of video recording using 2 pairs of Mexican grey wolves (*Canis lupus baileyi*) captive in two Mexican zoos. Sixty-nine behavioural definitions were obtained, as well as 25 qualifying definitions grouped in 4 modules (attitude, intention, context and emotion) that the observer can use to systematically shape emphatic interpretation of the observed conduct.



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## DIFFERENT PIG BREEDS, DIFFERENT BEHAVIOURAL STRATEGIES?

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Xavier Fernàndez\*, Joan Tibau, Jesus Piedrahita, Emma Fàbrega

IRTA, Spain

\*[Tmp301@irta.es](mailto:Tmp301@irta.es)

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According to the behavioural strategies theory, individual animals show a clear consistency when they have to adapt to environmental challenges, being likely to predict their behaviour in different situations and throughout time. The main objective of this study was to evaluate if consistent individual differences could be detected between pure breed Large White (LW) and Landrace (LD) pigs by means of behavioural tests. A total of 119 male pigs were subjected to a backtest at 4 weeks of age and classified as active or passive according to their response. Afterwards, the pigs were subjected to 4 individual tests more: a novel environment test and a novel object test (bucket) at 13 weeks and 2 human tests (moving in a race and approach) at 16 weeks. Pigs were weighed and backfat and lean depth measured. Spearman correlations between behavioural tests were calculated and the effect of breed and behavioural strategy analysed by Kruskal-Wallis test using SAS. Significant differences between breeds were found in the back test, presenting LW pigs a higher percentage of passive than active individuals (69.09 vs. 45.31,  $P < 0.05$ ). Some of the predicted correlations between back test and the other behavioural tests were found, being these correlations stronger in the LW breed. Passive individuals of both breeds showed a higher growth rate compared to active individuals ( $P < 0.05$ ). Moreover, LD active pigs tended to be leaner compared to LD passive pigs ( $P < 0.1$ ). The correlations found between the backtest and the other behavioural tests suggest the existence of different behavioural strategies between LW and LD pigs, being the differences in robustness between these breeds a potential explanation for the stronger correlations found in LW pigs. Moreover, the relationship between behavioural strategies and productive traits found in the present study suggests that individual responses could be considered in future breeding programs directed to improve both performance and animal welfare.

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## MANAGEMENT FACTORS ASSOCIATED TO DFD MEAT IN BOVINE ON DESERTIC CLIMATE

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**<sup>1</sup>Fernando Figueroa-Saavedra\*, C Pérez-Linares, <sup>1</sup>A Barreras-Serrano**

<sup>1</sup> Instituto de Investigaciones en Ciencias Veterinarias, Universidad Autónoma de Baja California.

\*[fernando\\_figueroa@uabc.mx](mailto:fernando_figueroa@uabc.mx)

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Using data from a questionnaire applied each one of five randomly selected days visits to one commercial feedyard, a total of 27 management factors were studied to assess the association of them with DFD meat in feedlot cattle. This study was conducted from June to September. Management factors were grouped in four sections: feedlot, transportation, preslaughter and slaughter plant. After chilling for 18 to 24 hrs, 175 carcasses were randomly selected and pH and color (L\*, a\*, b\*, C\*, and h\*) measurements obtained for normal, dark or DFD meat classification. Descriptive statistics to pH and color variables were estimated. The association was evaluated through odds ratio (OR) from 2 x 2 tables. The frequency of DFD meat was 15.43%. The factors with significant association were: a time of trailing to transportation higher than 40 min (OR=24.23; p<0.01), a time of transportation higher than 35 min (OR=69.31; p<0.01), a relative humidity in the abattoir resting corral higher than 30% (OR=31.60; p<0.01), and a time higher than 1.5 min among each animal entering to slaughter anesthetized area (OR=24.59; p<0.01). The study shows that changes in management practices are necessary in order to minimize heat stress and the presence of DFD meat.

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## ON-FARM EVALUATION OF GROUP-HOUSING FOR SOWS

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**Nicoline A Geverink\*, Frank A M Tuytens**

Institute for Agricultural and Fisheries research, Belgium.

\*[nicoline.geverink@ilvo.vlaanderen.be](mailto:nicoline.geverink@ilvo.vlaanderen.be)

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EU-legislation stipulates that from 2013 onwards (and from 2003 onwards for new farm buildings), pregnant sows should be kept in groups. A survey held in 2005 among 296 farmers showed that sows are still individually confined on 84% of the farms in Flanders. To support the transition from individual to group-housing, a cross-sectional observational study was started in 2005 to identify factors associated with welfare, health and zootechnical performance of group-housed sows. Thirty-five pig farms with diverse group-housing systems were visited. Pen floor area, air ammonia concentrations, inhalable and respirable dust were measured. Percentage of sows having saliva foam around their mouth as an indicator of sham chewing was scored. Skin damage of 20 sows per farm was scored on 9 parts of the body using a 0-4 scale and summed in a cumulative score. Data were analysed in SAS with a mixed linear model with farm as random effect. Results obtained so far indicate that legal demands for minimum total and solid floor area per sow (2.5 m<sup>2</sup> and 1.3 m<sup>2</sup>, respectively) were not met at 7 and 19 farms respectively. Systems without bedding had higher ( $p < 0.001$ ) ammonia concentrations (24.0±2.0 ppm) than systems with bedding (4.1±1.6 ppm). Average total and respirable dust concentrations were 3.13±0.39 mg/m<sup>3</sup> and 1.06±0.15 mg/m<sup>3</sup>. In systems with free-access stalls or trickle-feeding, more sows ( $p < 0.05$ ) showed sham chewing (34.7%±3.2 and 44.4%±13.7, resp.) than in systems with electronic sow feeders (ESF, 16.1%±3.1), trough feeding (10±14.1 %), ad libitum feeding (6.9%±1.7) or Vario-mix (3.2%±2.2). Sows in systems with ESF had more ( $p < 0.001$ ) skin injuries than sows kept in free-access stalls (10.9±1.3 vs. 6.11±0.8). Overall, the results indicated a large variation between farms in environmental and animal-related variables, and several points of concern for the transition from individual to group-housing systems in Flanders have been identified.

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## SUBCLINICAL MASTITIS CHANGES THE PATTERNS OF MATERNAL-OFFSPRING BEHAVIOUR IN SHEEP

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Dimitris Gougoulis\*, Ilias Kyriazakis, George Fthenakis

University of Thessaly, Greece

\*gcf@vet.uth.gr

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Objective was to study whether ovine subclinical mastitis affects sucking patterns. We induced subclinical mastitis in 8 ewes, each with one lamb, by inoculating on 8th day of lactation one mammary gland with *Staphylococcus simulans*; we included 4 controls. We carried out conventional bacteriological and cytological (California Mastitis Test) examinations of milk and we measured milk yield. We recorded behaviours by video cameras using continuous focal observations. Daily schedule was 100 min for each ewe, equally spaced within a period of 12 h daily. We recorded following behaviours; ewes: lie, hindering sucking, head up posture, vocalization, eating; lambs: lie, sucking attempt, successful suck, sucking bout, vocalization, eating. For continuous data, we used analysis of co-variance with repeated measures taken as mean over time; the pre-challenge measurements were used as co-variate. Data were modelled using the general linear model. Inoculated mammary glands developed subclinical mastitis, confirmed by bacteriological and cytological evidence. Bacteria were isolated from secretion; CMT scores increased. Milk yield of challenged glands ( $x=148$  ml) was smaller than of contralateral ( $x=529$  ml) or of control ewes' glands ( $x=593$  ml) ( $P<0.001$ ). Subclinical mastitis affected behaviours of ewes and lambs. Frequency of "Hindering sucking" and "Head up posture" decreased ( $P<0.05$ ), whilst of "Vocalisation" increased ( $P<0.02$ ). There was difference in frequency of "Sucking attempt" (group I lambs: 10.0, group C: 13.4) and "Successful suck" (group I lambs: 8.7, group C: 11.2) ( $P<0.05$ ). In group I lamb behaviours were observed on 28:72 proportion between inoculated:control glands, whilst in group C on 42:58 proportion among left:right glands, respectively ( $P<0.05$ ). During subclinical mastitis sucking behaviour of lambs is altered; the findings underline the need for confirmation of mammary health in future studies of lactational behaviour.

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## DECREASE OF THE TIME IN THE CLINICAL TREATMENT OF THE SCHIZOPHRENIC PATIENT WITH THE PRESENCE OF DOGS AS A SUPPORT WITHIN THERAPY: STUDY OF 3 CASES

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<sup>1</sup>Sabrina L Hernández, <sup>2</sup>Luis Felipe Rodarte\*, <sup>3</sup>Blanca E Mancilla

<sup>1</sup> Ejercicio Privado en Medicina Veterinaria.

<sup>2</sup> Departamento de Etología, Fauna Silvestre y Animales de Laboratorio, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México.

<sup>3</sup> Coordinación de Psicología Clínica, Facultad de Psicología, Universidad Nacional Autónoma de México.

\*rodarte@servidor.unam.mx

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The schizophrenia is a personality disorder, an acute psychosis (delirious ideas and manifest hallucinations) that causes an alteration in the ideational processes and several manifestations of the affective and conductual type. It is possible that the introduction of a dog within therapy sessions as a support, helps to diminish the duration of the treatment. This one study was carried out in 3 cases of diagnosed adult patients with schizophrenia; each one had a dog included within therapy, initiating in the second session. A perception questionnaire was applied to them, as well as the psychological test MMPI-2, and an interview. Based on the results of the questionnaire, the indicated dog was assigned to each patient. Each case was divided in 2 stages, first from the beginning to half, and second from half to the end of the treatment. A video recording of all the sessions of each patient was obtained and a comparison was made between the active interactions (IA), passive interactions (IP), and noninteraction (NI) between patient and dog. Also, the latency, frequency and proportion of the interactions between stages was compared. In addition, the physiological constants from the patients were taken at the beginning and at the end of each session, comparing it through time. It was observed in the second application of the MMPI-2 that there was a diminution of signs and symptoms related to the schizophrenia. In case 3, a difference ( $P < 0.05$ ) was found in the latency of the initial sequence of interactions. In cases 2 and 3 the IA was increased, and the NI ( $P < 0.05$ ) was diminished. The three cases presented a diminution of cardiac and respiratory frequency ( $P < 0.05$ ). Case 1 presented a diminution in systolic pressure and temperature ( $P < 0.05$ ), and case 3 in temperature ( $P < 0.05$ ). The presence of the dogs as a support within the sessions can reduce the time of the therapy, to help the patients to feel more relaxed, safe, and to establish a social bonding, which is a therapeutic success within the treatment of the schizophrenia.

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## EFFECT OF FLOORING SYSTEMS ON LOCOMOTION BEHAVIOUR IN DAIRY CATTLE

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**Leonie Heutinck\*, Hendrik van Dooren, Ouweltjes Wijbrand**

Animal Sciences Group of Wageningen UR– Division Animal Production, The Netherlands.

\*[Leonie.heutinck@wur.nl](mailto:Leonie.heutinck@wur.nl)

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Reducing locomotion problems in dairy cattle is one of the major issues at this moment in the dairy industry in The Netherlands. An important factor contributing to locomotion behaviour is the type of flooring used in cubicle housing systems. This study focuses on the effect of different flooring systems on free movement of the cattle. In the dairy research farm of the Animal Sciences Group (The Waiboerhoeve, Lelystad) four different types of flooring system were implemented in separate but comparable barn units, each housing about 60 cows: a concrete slatted floor (CSL), a slatted floor with a rubber top layer (RSL), a concrete solid floor with profiled surface (CSO) and a solid floor with a rubber top layer (RSO). In each barn 25 cows were observed under free movement conditions and step-length was scored. Scoring was based on the claw print of the hind leg compared to that of the front leg, ranging from -2 (> 2 claw lengths behind) to +2 (>2 claw lengths before). Frequencies of slipping during specific behaviours (i.e. cubicle entrance/exit, agonistic behaviour) were scored during randomly assigned observation periods. Data were analysed in Genstat (step-length: regression and slipping: GLMM-procedure). Step-length was significantly larger ( $P < 0.05$ ) in cows on RSL (mean: -0.92) than in cows on RSO (-1.68) and CSO (-1.64), but not compared to cows on CSL (-1.36,  $P < 0.10$ ). Differences between other floors were not significant. In 16 hours of observation 36 slips were counted. On RSO the chance of slipping was higher than on both slatted floors (5.1% vs. 1.0% (RSL) and 1.1% (CSL),  $P < 0.05$ ,  $\chi^2 = 16$ , d.f.=3), but not compared to CSO (2.1%). The results indicate that RSL may give cows better opportunities for free movement than the solid flooring types. Further research is necessary to optimize claw health and locomotion behaviour in dairy cattle.

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## FISH WELFARE: AN AREA FOR CONCERN? FIN EROSION CURRENTLY FOUND IN UK FARMED RAINBOW TROUT (*Oncorhynchus mykiss*)

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<sup>1</sup>Imogen Hoyle\*, <sup>2</sup>Birgit Oidtman, <sup>2</sup>Tim Ellis, <sup>3</sup>James F Turnbull, <sup>3</sup>Ben P North,  
<sup>3</sup>John Nikolaidis, <sup>1</sup>Toby G Knowles

<sup>1</sup> Dept of Clinical Veterinary Science, University of Bristol, UK.

<sup>2</sup> CEFAS, The Nothe, Barrack Road, UK.

<sup>3</sup> Institute of Aquaculture, University of Stirling, Scotland, UK.

\*[Imogen.hoyle@bristol.ac.uk](mailto:Imogen.hoyle@bristol.ac.uk)

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The welfare of fish is developing a higher profile due to recent research indicating that fish may have the capacity to suffer. Farming practices have yet to be examined closely to determine the levels of welfare provided. There are currently no standard, easily applied tools for on-farm assessment of fish welfare. Fin “erosion” is an injury to fins causing a reduction in size, which may be caused by fin nipping. It has been highlighted as a key welfare issue. This study assessed the prevalence and severity of fin damage in 4200 rainbow trout from 40 commercial UK farms. Rayed fins were assessed using a novel, validated key: using a photographic classification chart, with 6 categories classing damage from intact (0) to complete loss (5). This study also recorded water quality data (ammonia, DO, alkalinity, pH), husbandry conditions, including stocking density, to identify risk factors for fin erosion. A wide range in the severity of fin damage was found, with farm average scores for individual fins ranging widely from 1.0 ( $\pm 0.1$ ) to 4.8 ( $\pm 0.8$ ) representing almost complete fin loss. Increasing stocking density, from 2kg/m<sup>3</sup> to 120kg/ m<sup>3</sup>, was not correlated with an increase in fin damage. Dorsal fin damage was significantly lower (ANOVA  $P < 0.001$ ) when fish were kept inside ( $1.1 \pm 0.3$ ). Fish kept outside with shade had better dorsal fins than fish kept outside without shade, although not significant. This suggests that fish kept inside, or outside with access to shade, suffer less fin damage. Damage to pectoral and pelvic fins significantly decreases (ANOVA  $P < 0.001$ ) as number of times fish are fed per day increases from 1 to 5, suggesting that less fin nipping occurs on specific fins when there is ample food. This study shows fin damage as ubiquitous within the industry, and severe fin loss occurs.

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## NURSERY PIG PREFERENCE TO FLOOR TYPES

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**<sup>1</sup>Lindsey E Hulbert\*, <sup>1</sup>Nadège Krebs, <sup>2</sup>Jeffery W Dailey,  
<sup>1</sup>Mhairi A Sutherland, <sup>1</sup>John J McGlone**

<sup>1</sup> Pork Industry Institute at Texas Tech University, USA.

<sup>2</sup> USDA-ARS, Livestock Issues Research Unit, USA.

\*[Lindsey.hulbert@ttu.edu](mailto:Lindsey.hulbert@ttu.edu)

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Nursery pig flooring has been designed for animal health, production purposes while being low cost. Few studies have examined which flooring pigs actually prefer. The objectives of this study were to determine nursery pig preference for either 1) black, polypropylene antimicrobial flooring (ANTI) or white polypropylene non-antimicrobial plastic flooring (control, CON) and 2) Steel woven wire flooring (WOV) or CON flooring. Nursery pigs (8-week-old, n=48) were randomly placed in groups of four (two gilts and two barrows, six replicates per study) in (1.22 x 2.44 m) pens with 4.88 m<sup>2</sup> of each floor type, a feeder, and a water nipple on each side. Floor side was randomly assigned within each treatment. The position of the 4 pigs relative to the flooring was recorded and analyzed continuously with the Observer 5.0. A preference index (PI) was calculated for the group of pigs (PI=50% indicates no preference). After a 12 h acclimatization period, preference behaviors were observed for 24 h. Pigs spent more ( $p<0.05$ ) time ( $73.87\pm 6.3\%$ ) on CON than on ANTI plastic flooring. Pigs spent similar ( $p>0.10$ ) times ( $53.5\pm 17.7\%$ ) on CON and WOV flooring. This study indicates that housing systems designed to increase animal health may potentially conflict with animal preference hence potentially animal well-being.



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# STOCKING RATE EFFECTS ON CATTLE INGESTIVE BEHAVIOUR, LEAF AVAILABILITY AND BOTANICAL COMPOSITION OF NATIVE GRAMMA PASTURES IN THE HUMID TROPICS OF MÉXICO

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<sup>1,2</sup>Jesús R Jarillo\*, <sup>1</sup>Epigmenio G Castillo, <sup>3</sup>Luis A Ramírez

<sup>1</sup> CEIEGT, FMVZ, Universidad Nacional Autónoma de México.

<sup>2</sup> Estudiante, Doctorado en Ciencias Agropecuarias, FMVZ, UADY

<sup>3</sup> Facultad de Medicina, Veterinaria y Zootecnia, Universidad Autónoma de Yucatán.

\*[jjarillo@correo.unam.mx](mailto:jjarillo@correo.unam.mx)

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Grazing of native gramma (NG) pastures is the main source of nutrients for cattle in the Mexican tropics. Stocking rate (SR, cows/ha) affects ingestive behaviour of the grazing ruminant by modifying pasture structure, mainly leaf content. The objective of this study was to estimate the effect of SR on ingestive behaviour (grazing time [GT, min/day], ruminating time [RT, min/day] and biting rate [BR, bites/min]) of grazing Holstein x Zebu cows. Pasture leaf dry matter availability (LDMA, kg/ha) and botanical composition (BC, %) were also measured. The evaluated SR levels were: 2, 3 and 4 cows/ha (10 cows/level). A rotational grazing was used with periods of 3 and 27 days of grazing and recovery, respectively. Each cow was observed for 24 h, recording every 10 min whether it was grazing or ruminating, and in the last 10 min of each hour the time each cow spent to undertake 20 grazing bites; this procedure was followed during four days per season (S): rainy (RS), nothern-wind (NS) and dry (DS) in 2005-06. The analysis of variance included the effects of SR, S and SRxS, with animals as replicates;  $P < 0.05$  was used for statistical significance. LDMA was affected by SR:  $2423 \pm 743$ ,  $2495 \pm 922$  and  $2079 \pm 817$  for 2, 3 and 4 cows/ha, respectively; it was also affected by S:  $3388 \pm 1001$ ,  $1784 \pm 735$  and  $1825 \pm 660$  kg/ha, for RS, NS and DS, respectively. As SR increased, NG species increased, while introduced grasses decreased. GT was affected by SR:  $428 \pm 71$ ,  $462 \pm 55$  and  $400 \pm 83$  min/day for 2, 3 and 4 cows/ha. S did not affect GT. RT was affected by SR, decreasing as SR increased:  $372 \pm 104$ ,  $364 \pm 96$  and  $315 \pm 90$  min/day for 2, 3 and 4 cows/ha. The SR effect was significant on BR:  $50 \pm 6$ ,  $48 \pm 6$  and  $50 \pm 7$  bites/min for 2, 3 and 4 cows/ha. While SR affected ingestive behaviour variables, a clear-cut association with LDMA could not be established.

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## INTAKE AND GRAZING BEHAVIOR OF HOKKAIDO NATIVE HORSES FED SUPPLEMENTARY HAY IN WINTER WOODLAND

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**<sup>1</sup>Masahito Kawai\*, <sup>1</sup>Yaeko Miyoshi, <sup>2</sup>Hironao Houkiyama, <sup>1</sup>Sakae Matsuoka**

<sup>1</sup> Obihiro University of Agriculture and Veterinary Medicine, Hokkaido, Japan.

<sup>2</sup> Hokkaido Animal Husbandry Experiment Station, Hokkaido, Japan.

\*kawaim@obihiro.ac.jp

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In our previous study, fallen snow, even with a depth of 20cm, inhibited the grazing behavior and intake by horses in winter woodland, and there was quite a large effect with over 40cm of snowfall. The objective of this research was to investigate the intake and grazing behavior of the horses fed supplementary hay in winter woodland on snowfall condition. Fifteen Hokkaido native horses were grazed on a woodland pasture with a snow-depth of 60cm in January. The experimental pasture was almost flatlands and consisted of 8.5ha of broadleaf trees and underlying vegetation composed mainly of sasa. The horses could ingest round-baled timothy hay *ad libitum* at the neighboring paddock. Five mares were used to determine the intake and grazing behavior. The feces of each mare were collected for 3 days and intake was determined with the double-indicator method. Behavior was observed simultaneously, and grazing, resting and other behaviors were recorded at 1-min intervals. The location point, behavior phase at that point, and the route of movement of each mare were recorded on a map at 10-min intervals. Total dry matter intake was 7.5kg/d, which was 2.2% of their body weight, and that of sasa and hay was 2.3 and 5.2kg/d, respectively. Digestible energy intake was 122% of their maintenance requirements. Grazing time of sasa was 252min/d and eating time of hay was 327min/d. Total distance covered was 4.9km/d, which was included the distance covered of 3.3km in woodland. Daily grazing area in woodland was 1.1 ha and the horses only used 12.9% of total area of the woodland. Supplementary feeding of hay could improve the nutritional condition of grazing horses in winter woodland. However the horses used small area for grazing and it was considered quite a large effect to vegetation of sasa at the definite area are there.

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## INCREASED STOCKING DENSITY AFFECTS THE BEHAVIOUR OF LACTATING DAIRY CATTLE

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**<sup>1</sup>Peter D Krawczel\*, <sup>1</sup>Christopher T Hill, <sup>1</sup>Heather M Dann, <sup>1</sup>Catherine S Ballard, <sup>2</sup>Russell C Hovey, <sup>1</sup>Rick J Grant**

<sup>1</sup> W.H. Miner Agricultural Research Institute, Chazy, USA.

<sup>2</sup> The University of Vermont, Burlington, USA.

\*[krawczel@whminer.com](mailto:krawczel@whminer.com)

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The objective of this study was to determine the effect of increased stocking density on the short-term behavior of dairy cows. Holstein cows ( $n = 136$ ) were assigned to four pens with stocking densities (100, 113, 131, and 142%) imposed in a  $4 \times 4$  Latin square for 7 d. One stall and headlock were available for each cow at 100% stocking density, while the greater stocking densities were achieved by denying access to each. The mean percentage of cows lying and standing during a 24-h period and the mean percentage of cows feeding and the number of displacements from the feed bunk during the 30 min post-milking period were determined from 10-min scan samples of video data collected during the final 2 d at each stock density. Inferential statistics were conducted using a mixed model; the behaviors with a significant F-test ( $P \leq 0.05$ ) were analyzed further using a regression model. A linear decrease in the percentage of cows lying (50.8 at 100% stocking density to 47.4 at 142%;  $y = -0.08x + 59.18$ ;  $R^2 = 0.49$ ) and a linear increase in the percentage of cows standing idly in alleyways (7.8 at 100% stocking density to 12.6 at 142% stocking density;  $y = 0.11x - 3.72$ ;  $R^2 = 0.66$ ) were observed. Although increased stocking density reduced the percentage of cows feeding post-milking from 67.2 at 100% stocking density to 54.8 at 142% stocking density ( $P = 0.009$ ), the decrease was not linear. The number of displacements from the feed bunk and the subsequent behavior of the displaced cow were not affected by stocking density ( $P > 0.20$ ). The decreased percentage of cows feeding and lying and the increased percentage of cows standing indicate that increased stocking densities may compromise welfare.

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## INFLUENCE OF GENOTYPE ON AGGRESSION OF PIGLETS DURING WEANING AND MIXING

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**<sup>1</sup>Philippa Lait\*, <sup>2</sup>Michael Toscano, <sup>2</sup>Suzanne Held, <sup>1</sup>Tom Humphrey,  
<sup>1</sup>Michael Bailey, <sup>2</sup>Mike T Mendl**

<sup>1</sup>University of Bristol, Division of Veterinary Pathology, Infection and Immunity, School of Clinical Veterinary Science, Langford, Bristol, UK.

<sup>2</sup>University of Bristol, Division of Farm Animal Science, School of Clinical Veterinary Science, Langford, Bristol, UK.

\*[pip.lait@bristol.ac.uk](mailto:pip.lait@bristol.ac.uk)

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Piglets vary in levels of aggression towards unfamiliar conspecifics. This may reflect individual differences in aggressiveness, and also be affected by how easily pigs can detect unfamiliarity. Inbred animals may find it particularly difficult to discriminate familiar from unfamiliar individuals because they lack the genetic variation (e.g. in MHC haplotype) that may underlie cues used in social discrimination. We therefore investigated whether fully inbred pigs differed to outbred pigs in measures of aggression when mixed, and in individual aggressiveness (assessed by a proxy measure of 'coping style' using a 1 minute 'back test'). Fully inbred Babraham and outbred Large White piglets were back-tested at 10 and 17 days old. At 4 weeks, piglets were weaned and mixed into groups of 4 consisting of 2 pigs from each of two litters. Fresh lesion scores were recorded at day -1, day 0 (mixing day) and day +1. More struggling in the back test may indicate a more aggressive pig. Preliminary analyses show that Babrahams and Large Whites did not differ significantly in struggle frequency ( $P=0.128$ ) over the two back-tests, but that Babrahams struggled for significantly longer ( $P<0.005$ ). There was a significant effect of day on lesion score ( $F=6.376$ ,  $df=1.05, 8.44$ ,  $P=0.033$ ) due to a rise in lesions on day 0 relative to the other days. There was also a tendency for Babraham pigs to show a smaller rise in lesions on day 0 than Large Whites (day \* strain interaction:  $F=3.645$ ,  $df=1.05, 8.44$ ,  $P=0.09$ ). Babraham and Large White pigs may thus show some differences in 'coping style' as assessed in the back test, and both respond to unfamiliar conspecifics by inflicting skin lesions during fighting. Initial results indicate that the inbred Babrahams may inflict fewer lesions, possibly because they fight less intensely in contrast to what might be predicted from the back test results.

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## SENSORY SENSITIVITY: A HORSE'S TEMPERAMENTAL DIMENSION

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**Léa Lansade\*, Mathilde Lecomte, Gaele Pichard**

National Institute for Agricultural Research, Laboratoire de Comportement, Neurobiologie et Adaptation, PRC, Nouzilly, France.

**\*Lansade@tours.inra.fr**

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Temperament is an important factor when working with horses. Behavioural tests have already been developed to measure certain dimensions of a horse's temperament (fearfulness, etc.). In order to measure the temperament more precisely, our work aimed to identify a dimension which has already been described in several species but not yet in horses, namely sensory sensitivity. Our study was based on the definition of a dimension as "a behavioural characteristic stable across situations and over time". We designed several tests for each sense and then determined whether the responses observed were correlated in time and between situations. The principle of the tests was to generate two stimuli of different intensities for each sense (e.g. two different sounds) and to measure the intensity of the horse's response (N=26). Using Spearman rank correlations, we tested whether the responses to these different stimuli were inter-correlated. We repeated the same tests 6 months later to determine whether the responses were correlated over time. For each sense, results show that the greater the horses' response to one stimulus, the greater their response to the other. For example, the reaction to the odor of cinnamon (time spent near the source of the odor) was significantly correlated to the reaction to lavender ( $R=0.53$ ,  $p=0.004$ ). The reactions to two different tactile stimuli (von Frey filaments, or contact of a brush on the body) were also correlated ( $R=0.38$ ,  $p=0.029$ ). However, there was no significant correlation between the responses to stimuli relating to different senses. Finally, these responses showed stability over a 6-month period (e.g. tactile stimulation:  $R=0.71$ ;  $p<0.0001$ ). In conclusion, our study revealed characteristics which were stable across situations and over time. The absence of links between the characteristics measured for the different senses suggest that a dimension for each sense exists (e.g. tactile sensitivity) rather than a general sensory sensitivity dimension.

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## FUNCTIONAL TEST OF THE HYPOTHALAMIC- PITUITARY-ADRENAL AXIS OF SOWS HOUSED IN VARIOUS ENVIRONMENTS

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**Donald C Lay**

Agricultural Research Service -USDA, Lafayette IN, USA.

*layd@purdue.edu*

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The objective of this study was to assess the behavioral state of sows housed in various housing systems and determine if regulation of their hypothalamic-pituitary-adrenal axis had been altered. In Experiment 1, 33 sows were housed in either gestation stalls, group housed with no bedding, or group housed with bedding. A 10 mL blood sample was collected at 1800 h. Immediately following blood collection, 2 mg of dexamethasone was administered i.v. Twelve hours later, a second blood sample was collected. In Experiment 2, all 14 sows were stall housed. Behavioral data was collected weekly on 3 separate days. At 0830, 1 h after sows were fed, behavioral assessments were conducted to determine the incidence and type of stereotypic behavior that each sow performed. Dexamethasone was administered as in Experiment 1 with blood collection at 2000 h and 0800 h the following morning. Baseline concentrations of plasma cortisol varied among treatments in Experiment 1, with stall housed sows having greater baseline ( $P < .05$ ) than grouped sows without bedding. Sows in all three treatments showed a similar decrease in plasma cortisol. Ten sows from Experiment 2 performed stereotypic behaviors during 50 % or more of the observations. Dexamethasone suppressed plasma cortisol in 11 sows who exhibited base concentrations of  $37.4 \pm 4.9$  ng/mL which were decreased to  $9.9 \pm 1.2$  ng/mL by 12 h later. Three sows proved to be resistant to the dexamethasone. These sows exhibited base concentrations of  $44.6 \pm 14.7$  ng/mL which increased to  $57.8 \pm 13.4$  ng/mL by 12 h later. The incidence of oral stereotypic behaviors were not associated with suppression of cortisol ( $P > .10$ ). Sows were responsive to the suppression of cortisol by dexamethasone. Some sows were not responsive, but this characteristic does not appear to be related to the performance of stereotypic behavior.

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## VALIDATION OF AN AUTOMATIC SYSTEM TO DETECT POSITION CHANGES IN PUERPERAL SOWS

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**<sup>1</sup>Eva Mainau\*, <sup>2</sup>Antoni Dalmau, <sup>1</sup>José L Ruiz de la Torre, <sup>1</sup>Xavier Manteca**

<sup>1</sup> Universidad Autónoma de Barcelona, Departamento Biología Celular, Inmunología y Fisiología, Barcelona, España.

<sup>2</sup> Instituto de Recerca y Tecnología Agroalimentarias (IRTA), Girona, España.

\*[eva\\_mainau@hotmail.com](mailto:eva_mainau@hotmail.com)

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Piglet crushing by the sow is one of the main causes of piglet mortality during the first 48h after birth. Most piglets are crushed when the sow moves from standing to lying or sitting position. The frequency of these movements may be partially related to the pain caused by farrowing. The aim of this study was to develop and validate an automatic system to register changes between standing and lying position in farrowing sows. Forty hybrid (Large White x Landrace) sows from first to eighth parity housed in individual crates were used. Position changes were automatically recorded using Standing Lying Sensors (SLS), which consisted of a photoelectric cell located near the hindquarters of each sow at a height of 72cm from the floor and connected to a laptop for continuous recording. Sow behaviour were registered continuously for 3 days before and 3 days after farrowing. To validate the SLS, video recordings were used and compared with "false" recordings of the SLS. Using a 40 second filter that eliminated all SLS recordings shorter than 40 seconds, an 80% of coincidence between video and SLS recordings was obtained. When total time lying down versus total time standing or sitting was considered, a 98% of coincidence was obtained. According to video recordings, changes from lying to standing and from standing to lying accounted for 5.32% and 19.05% respectively of the total number of position changes, whereas changes from lying to sitting and from sitting to lying accounted for 37.79% and 23.46% respectively. The main problem of the automatic system was that it could not detect the sitting position. However, it was found that the changes from sitting to standing accounted for 14.07% of the total number of position changes and changes from standing to sitting –which are position changes potentially dangerous to the piglets- accounted for only 0.30% of the total number of position changes. The SLS appears to be a reliable method to record position changes in farrowing sows and could be used to assess the relationship between management and husbandry factors, sow behaviour and piglet crushing.

This research work has been developed under the financial support of Boehringer-Spain enterprise.

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## FORAGING BEHAVIOR OF NECTARIVOROUS BATS IN PRESERVED AND DISTURBATED HABITATS

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Selene Maldonado\*, Kathryn Stoner

Centro de Investigaciones en Ecosistemas, Universidad Nacional Autónoma de México, Michoacán, México.

\*[azul30\\_6@hotmail.com](mailto:azul30_6@hotmail.com)

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*Leptonycteris curasoae* and *Glossophaga soricina*, are two pollinator bat species which are threatened by habitat disturbance that diminishes available food resources, this may drive behavioral changes and thus may alter the reproductive success of bat pollinated plants. In the dry forest at the Mexican pacific coast, *Crescentia alata* is an important food resource for bats. We compared the foraging behavior of *L. curasoae* and *G. soricina* in relation with *C. alata* in disturbed and preserved habitats. We hypothesized differences in resource availability of *C. alata* among habitats and therefore, disturbed sites should have fewer visits and less pollen in the stigmas than preserved habitat sites. Bats activity was recorded by infrared digital videotaping starting at sunset and 4.5 hours after in 4 disturbed and 6 preserved sites, where 98 and 86 flowers were recorded, a total of 35 *C. alata* individuals. In preserved and disturbed habitat 44 and 42 styles were collected to know the amount of pollen grains present on each stigma. The resource availability was estimated by direct counting (number of open flowers in filming trees and neighboring trees). Reproductive success of *C. alata* was estimated by means of *fruit-set* coefficient. Results depict more resource availability ( $\chi^2=8.22$ ,  $P=0.0042$ ) and visit number ( $\chi^2=5.00$ ,  $P=0.0253$ ) in preserved habitat sites. The visit number correlated with the amount of the resource availability. The visit number did not determine the amount of pollen grains present in the stigmas ( $R=0.05038$ ,  $P=0.64503$ ). Unexpectedly the *fruit-set* was significantly higher in disturbed habitat sites ( $\chi^2=11.58$ ,  $P=0.0007$ ). It seems that the higher number of available flowers within preserved sites provide enough resource to both bat species and enable them to feed longer in the same tree promoting pollen movement within the same tree (geitonogamy), this behavior does not provide an effective pollination, because *C. alata* is a self-incompatible species.

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## DO GUANACOS TOLERATE VISITORS IN PROTECTED AREAS? BEHAVIOURAL CHANGES IN RESPONSE TO TOURISTS OF A GUANACO POPULATION IN THE MONTE DESERT

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<sup>1</sup>Juan E Malo\*, <sup>1</sup>Pablo Acebes, <sup>2</sup>Stella M Ginnoni, <sup>2</sup>Carlos E Borghi, <sup>1</sup>Juan Traba

<sup>1</sup>TEG-Department of Ecology, Universidad Autónoma de Madrid, Madrid, Spain.

<sup>2</sup> Museo de Ciencias Naturales, Universidad Nacional de San Juan, San Juan, Argentina.

\*[je.malo@uam.es](mailto:je.malo@uam.es)

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Behavioural changes of large vertebrates due to tourists are a matter of concern for management of Protected Areas as it rises a trade-off: large vertebrates attract visitors, specially when close observation is possible due to animals getting used to people, but induced behavioural changes can reduce animal fitness, increase mortality by poaching or lead to animals hide away from touristic spots. In such context, we analyze the response to tourists shown by the guanaco population of Ischigualasto Provincial Park (San Juan, Argentina), a high conservation priority population thriving in the extreme of aridity occupied by the species. On the one hand, during four fieldwork campaigns in wet- and dry-seasons 2005 and 2006 (N=82 days), the number of guanaco observations by researchers showed differences among campaigns and was significantly smaller the days with larger numbers of tourists entering the park (GLZ-test,  $p < 0.001$ ), specially for days with over 400 visitors. On the other hand, the logit model adjusted for the prediction of alarm response of guanacos encountering a vehicle (N=52) shows that animals tolerate a significantly closer approach when located near the touristic circuit (Wald-statistic=9.09,  $p=0.003$ ), reducing approximately 137 m their response distance. In the same way, flight distance of guanacos encountering a pedestrian is reduced by approximately 40 m inside the area open to tourists (ANCOVA-test,  $p=0.030$ ). Fitting an exponential model shows that this effect disappears at distances over 500 m from the touristic area. We thus conclude that guanacos show a noticeable tolerance to visitors, allowing their watching from closer distances. Moreover, this reaction does not take place in less patrolled areas of the Park where they could suffer illegal poaching. However, our results point to a potential risk of reducing the probability of guanaco encounters if number of visitors to the Park double average present-day features.

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## ANIMAL WELFARE PERCEPTION OF RETAILERS IN SPAIN

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**<sup>1</sup>GA Maria\*, <sup>1</sup>Genaro C Miranda de la Lama, <sup>2</sup>M Villarroel**

<sup>1</sup> Department of Animal & Food Science, Faculty of Veterinary Medicine, Animal Welfare Group.  
University of Zaragoza, Spain.

<sup>2</sup> Department of Animal Science, Politecnia University of Madrid, Spain.

\*[levrino@unizar.es](mailto:levrino@unizar.es)

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The relationship between farm animal welfare and social perception is complex, partly as a result of increasing social demands and the ethical concerns of consumers. In recent years, a subject of increasing interest in the European livestock market is the experience-based consumer view of animal welfare, although less is known about retailers. Retailers connect producers with consumers but there is little information about how retailers perceive animal welfare. The objective of this study was to analyse the perception of retailers regarding the welfare of farm animals in Spain, using a sample of 426 retailers in the city of Zaragoza. The sample was divided by gender (women  $n=208$ , or men  $n=218$ ), age (< 35 years old,  $n=107$ ; 35-50 years old,  $n=235$ ; and > 50 years old,  $n=84$ ) and retail occupation (butcher shop,  $n=154$ ; supermarket,  $n=112$ ; poultry shop,  $n=128$ ; and fur shop  $n=32$ ). The questionnaire had four sections and 15 questions. The first section referred to the general attitude towards animal welfare. The second section asked the retailers to score how much more they thought that clients would pay for a product if it improved animal welfare. The third part referred to whether clients demanded free-range chickens and pigs. The fourth section asked about the demand for fur articles and the influence of animal well-being on perception and purchasing behaviour by consumers. Descriptive statistics were calculated and the fixed effects of retailer class, gender and age class were analyzed. More than 70% of the retailers thought that their clients would not pay more for a product to improve animal welfare. In contrast, a previous study by our group found that 72% of the consumers said they would pay more for a product if the extra-price would improve animal welfare.

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## EFFECTS OF HERBIVORE BROWSING ON THE MORPHOLOGY AND ESSENTIAL OILS CONTENTS OF JUNIPER SHRUBS; A FIELD PHENOMENON

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**<sup>1</sup>Gabor Marko\*, <sup>1</sup>Veronika Gyuricza, <sup>2</sup>Jeno Bernath, <sup>1</sup>Vilmos Altbacker**

<sup>1</sup> Eotvos Lorand University, Budapest, Hungary.

<sup>2</sup> Corvinus University of Budapest, Hungary.

\**magvacska@hotmail.com*

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Browsing pressure has various consequences on plants in different courses of time. There are short-term effects, all affecting the survival of plants through which processes population structures would change in a long-term period. The basic differences among isolated but not remote juniper shrubs are in the browsing herbivores and their browsing traditions. Our assumption –according former observations- is that plant morphology, essential oil yield, quality and population structures reflect different browsing environments. We estimated the short-term effect of herbivores on the morphology (form of canopy) of plants (N=300) on a permanently browsed range (sheep-pen). We analyzed browsing intensity on plant individuals controlled for seasons differences by making essential oil yield assay (N=10). We analyzed quantitative differences in essential oil content between browsed and non-browsed plants using gas-chromatography (GC) at the most intensively browsed part of the sheep-pen area (N=20). To determine differences in age distribution among three places we collected morphological data (stem diameter; N=1500). The distance from browsing centre reflected in the morphology of shrubs ( $p < 0,001$ ). Although seasons have considerable effect on essential oil yield, the effect of browsing is still observable under these circumstances ( $p < 0,001$ ). There is an inverse ratio between browsing level and essential oil yield ( $p < 0,001$ ), however the results of GC assay showed differences in this point in certain components of essential oils. The age distributions of different sites differed from each other ( $p < 0,001$ ). The area, where rabbits browsed the juniper (Bugac) showed senescent age distribution, the other two (Bócsa, Orgovány) showed images of an intensively growing populations. The plant morphology and age distribution are changed according to different intensity of herbivore presence in our three study sites. We found relationship between plant secondary metabolism products and browsing level. The differences in qualitative and quantitative parameters of juniper essential oil may arise by the induced plant defend system - as it well studied in case of Pinales - or the herbivore selective browsing, which adapted for the chemical variance among plant individuals.

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## TRYPTOPHAN SUPPLEMENTATION IN PIGLETS WEANED AT 21 DAYS OF AGE

<sup>1</sup>Guillermina Martínez-Trejo\*, <sup>1</sup>María Esther Ortega, <sup>1</sup>José Luis Figueroa,  
<sup>2</sup>Francisco Galindo, <sup>1</sup>Jose G Herrera, <sup>2</sup>Luis Felipe Rodarte, <sup>3</sup>Alejandro Lara

<sup>1</sup> Colegio de Postgraduados-Ganadería, México.

<sup>2</sup> Departamento de Ecología y Fauna Silvestre, Facultad de Medicina Veterinaria y Zootecnia,  
Universidad Nacional Autónoma de México, México.

<sup>3</sup> Universidad Autónoma Chapingo, México.

\*trejo75@colpos.mx

The present study evaluated the effect of supplementation of tryptophan on individual and social behavior of piglets weaned at 21 d of age. Four levels of dietary tryptophan were used (T1, 0.23% (Control); T2, 0.27%; T3, 0.31% and T4, 0.35%). Tryptophan was orally supplemented to each piglet every day. Treatments were randomly assigned to 136 piglets (averaging  $5.69 \pm 1.14$  kg BW), with 8 repetitions per treatment. Behavioral observations and scan sampling with continuous recording of piglet activity at 10 minutes intervals were made for 4 consecutive months, in periods of 8 days, from 14.00 to 2.00 h. The proportions of time walking (W), feeding (FE), lying (L) grooming (G), defecating and urinating (D), biting bars (B), tail suckling (T), ears suckling (E), belly nosing (N), chewing ears and tail (C), vocalizing (V) and fighting (FI) were registered. Data were analyzed with PROC MIXED according to a completely randomized design with repeated measurements. Piglets from T4 showed less activity ( $p < 0.05$ ;  $24.98\% \pm 0.02$ ,  $8.33\% \pm 0.01$ ,  $0.05\% \pm 0.00$ ,  $0.09\% \pm 0.00$ ,  $0.37\% \pm 0.00$ ) for W, V, T, E and N than T1 ( $31.63\% \pm 0.02$ ,  $14.44\% \pm 0.01$ ,  $0.30\% \pm 0.00$ ,  $0.40\% \pm 0.00$ ,  $1.73\% \pm 0.00$ ), with no differences for T2 ( $29.33\% \pm 0.02$ ,  $12.78\% \pm 0.01$ ,  $0.09\% \pm 0.00$ ,  $0.16\% \pm 0.00$ ,  $0.93\% \pm 0.00$ ) and T3 ( $25.96\% \pm 0.02$ ,  $10.34\% \pm 0.01$ ,  $0.14\% \pm 0.00$ ,  $0.12\% \pm 0.00$ ,  $0.56\% \pm 0.00$ ). Piglets in T4 spent more time lying ( $75.01\% \pm 0.02$ ). FE and G were similar for all treatments. D was lower ( $p < 0.05$ ;  $0.71\% \pm 0.00$ ) in T3 through the 8 days period, while B was lower ( $p < 0.05$ ;  $6.66\% \pm 0.00$ ) for T4 through the 8 days period. C and FI were different among treatments, with less ( $p < 0.05$ ) activity for T3 ( $15.10\% \pm 0.09$ ,  $42.19\% \pm 0.13$ ) and T4 ( $12.25\% \pm 0.09$ ,  $33.33\% \pm 0.13$ ), and through the 8 days period. The results obtained in this study showed that tryptophan supplementation to piglets weaned at 21 d of age decrease W, V, T, E, B, C and FI.

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## DIFFERING ATTITUDES OF STUDENTS IN DIFFERENT CULTURAL BACKGROUND TOWARDS ANIMAL WELFARE AND ETHICS ISSUES

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**Jia Meng\*, Nicola Cross, Clive Phillips**

Centre for Animal Welfare and Ethics, School of Veterinary Science, University of Queensland, Australia

*\*j.meng@uq.edu.au*

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The general hypothesis of this project is that people from different culture background have different attitudes towards animals. As globalization increases, so does the importance of developing a better understanding of the attitudes that people living within different cultures have towards animals. Identification of differences in these attitudes will promote understanding during cross-cultural activities, such as international trade and animal protection campaigns. Furthermore, increasing our knowledge and understanding of welfare related issues should ultimately lead to a global improvement in animal welfare. University students are the target population for this research, and opinions will be investigated by use of an online survey. The reason this research focuses on university students is because 1) they are going to become the backbone of their own society in the next 5-10 years; 2) university students have better computer skills and easier access to facilities for completing the web based survey. Respondents to the survey will be asked to compare different scenarios and practices (in relation to animal welfare and other ethical issues) and provide information on their acceptance of each scenario. Participants will be questioned on a broad variety of animal issues, including welfare challenges, genetic changes, and opinions regarding the rights to freedom of choice and rights to life. Respondents will not be asked to provide opinions on culture-specific practices. Country representatives are sought to assist the data collection in different countries. We will aim to receive thousand responses to the survey from most participating countries. The responses will be statistically analysed and assessed for differences and similarities in different cultures. So far, we have performed a pilot survey. The results support the validity of the basic methods proposed for this project.

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## FACTORS INFLUENCING RESTING BEHAVIOR IN FREE STALLS

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Shigeru Morita\*, Michiko Takeuchi, Arina Kageyama, Tepei Haruta,  
Taihei Shimada, Shinji Hoshiba

Rakuno Gakuen University, Japan.

\*[smorita@rakuno.ac.jp](mailto:smorita@rakuno.ac.jp)

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Allowing cows adequate opportunities to lie down, rest and stand up is important for their comfort. These studies were conducted to recognize the factors influencing resting behavior in free stalls. Firstly, to evaluate the stall utilization of a cow herd, 24-hour observations were done in a three-row free-stall barn (20 cows and 30 stalls). The lying and standing behaviors of cows in the stall were observed for 30 days. Secondary, to evaluate the neck rail position of the stall, the angle and the position of lying cows (230 cows) as well as time spent on stand up activity (123 cows) were measured in three types of stalls. Finally, to evaluate the hardness of a stall surface, the impact force of stalls floored with different materials (7 materials) were measured with a new tool that uses an accelerometer, and the lying behaviors of cows in the differently floored stalls (2 materials) were compared. The average daily lying time was about 12 hours/cow and cows tended to avoid using the end stall in a stall-row (3 hours/stall) as well as the wall-side stall (8 hours/stall) in three-row free-stall barn. By moving the position of the neck rail back and upward, the angle of lying cows (the angle between body axis and the stall axis) decreased (16 and 19 degree) and the pinbone position moved backward (+5 and -2 cm). The cows in the stalls with the neck rail set at the highest position stood up smoothly. The impact forces of the stall surface ranged from 1,800 to 6,500 N with different materials. Even though the new floor materials were installed and the impact force of the stall surface decreased, the daily lying time (11.5 hours) and lying ratio (80 %) did not changed in the same free-stall barn.

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## MAGNETOTHERAPY MAY AMELIORATE THE INCIDENCE OF WEAVING IN STEREOTYPIC HORSES

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**Jack Murphy**

School of Agriculture, Food Science and Veterinary Medicine, Ireland.

*Jack.Murphy@ucd.ie*

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Magnetotherapy is a prophylactic and post-event treatment now commonly used for various musculo-skeletal disorders in the horse. Although used by humans for centuries, the specific mechanisms of action of magnetic fields on biological tissue are unclear but may be associated with the maintenance of electrical conductivity and pH balance of biological cells. Weaving is a stereotypic behaviour performed by approximately 5% of horses. The objective of this study was to investigate if magnetotherapy would ameliorate the incidence of stereotypy in horses that had recently begun to weave. Five TB geldings (mean age=3.4 years) were recruited and housed in adjacent stables without anti-weaving grills on the doors. Observations were recorded (between 07.30 and 08.00) for three days to gain baseline data and the number of discrete episodes and total duration (seconds) of weaving was determined for each horse (controls). Magnetic head pieces were subsequently fitted to nylon head collars worn by the horses for a five-day trial and where data were again recorded (07.30 - 08.00) each day. S-VHS recordings revealed a trend toward a significant reduction in the number of weaving episodes with the magnetotherapy treatment ( $M = 4.16$ ,  $SD = 0.71$ ) compared to controls ( $M = 5.67$ ,  $SD = 1.45$ ) for all five horses ( $t = 2.50$ ,  $df = 4$ , two-tailed  $p = 0.07$ ). There was a significant reduction in the duration of stereotypic weaving ( $M = 498.53$ ,  $SD = 81.05$ ) with magnetotherapy compared to controls ( $M = 593.73$ ,  $SD = 206.76$ ) in the horses ( $t = 3.92$ ,  $df = 4$ , two-tailed  $p = 0.02$ ). The findings suggest that magnetotherapy ameliorated the incidence of weaving among the horses in this study and may be a useful treatment. However, it is unknown what if any effect magnetotherapy might have on more established (emancipated) weavers and further detailed investigations are warranted.

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## THE AVERSIVE EFFECT OF WOLF'S FECES ON SIKA DEER (*Cervus nippon*)

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<sup>1</sup>Shigeru Ninomiya\*, <sup>2</sup>Nami Kaneda, <sup>2</sup>Naoshige Abe, <sup>1</sup>Shusuke Sato

<sup>1</sup> Graduate School of Agricultural Science, Tohoku University, Japan.

<sup>2</sup> Faculty of Agriculture, Tamagawa University, Japan.

\*[2nomiya@bios.tohoku.ac.jp](mailto:2nomiya@bios.tohoku.ac.jp)

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We investigated the aversive effect of wolf's (*Canis lupus*) dry feces (Wf) on Sika Deer (*Cervus nippon*) for the future control of feeding on the agricultural products and trees by deer. In the first experiment, the feeding behaviour of Sika Deer (n=27) in four troughs with bottles including feces or urine, or being empty as a control was investigated for 10 minutes. The troughs each containing 1,000g of hay cube were allocated at random. The amount of hay cube eaten in each trough was analyzed by Kruskal-Wallis test or ANOVA. During the first four trials, 60g of Wf, 40g of domestic cats' feces and 200g of cattle's urine soon after the slaughter were used. The mean amounts of hay cube eaten were different among the troughs ( $P < 0.05$ , Wf:20g, Cat:240g, Cattle:95g, Control:520g). Wf almost inhibited feeding behaviour of deer. In the subsequent trials, we investigated whether the inhibition effect of Wf on feeding behaviour of deer depends on the amount of feces. During the first two trials, 5g, 10g and 60g of Wf were used. During the last two trials, 1g of Wf and empty bottles in which there had been 10g and 60g of Wf just before the trials (Empty10, Empty60) were used. The mean amounts of hay cube eaten were different among the troughs ( $P = 0.07$ , Wf60:0g, Wf10:0g, Wf5:0g, Control:1000g;  $P < 0.05$ , Wf1:30g, Empty60:140g, Empty10:120g, Control:715g). In the next experiment, we investigated physiological responses of female deer (n=5) putting Wf (60g) near to their noses for 1 minute. Wf increased their heart rate ( $P < 0.01$ , increase percentage: 10%) and salivary chromogranin ( $P < 0.10$ , 99%) more compared to control (water, heart rate: 8%, salivary chromogranin: 60%). These results suggested that the wolf's feces would include some substance which induced the physiological and behavioural aversive responses in Sika Deer.



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## EFFECT OF THE TIME OF SEPARATION OF THE KID ON THE BEHAVIOR AND MILK PRODUCTION OF FRENCH ALPINE GOATS

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Jose L Nuñez\*, Javier Gutiérrez, Anne M Sisto

Facultad de Medicina Veterinaria y Zootecnia, UNAM, México.

\*[joseluisnveterin@hotmail.com](mailto:joseluisnveterin@hotmail.com)

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When facing disease, such as Caprine Arthritis-Encephalitis, kids have to be separated from their mothers immediately after birth. In order to determine the effect of the time of separation of the kid before consuming colostrum on the behavior and milk production of French Alpine goats, a behavioral and milk production study was carried out using two groups of goats (n=6). Kids in group one were immediately separated from the mother after birth, without allowing the mother to interact with them. In group two, kids were separated after their first attempt to suckle, letting the mother lick them. Mother behaviors after parturition were analyzed (frequency of vocalizations, visits to the feeder, searching behavior as well as distance traveled). Amount of colostrum (10 minutes after separation of the kids) and weekly milk production during 12 weeks were registered in both groups. Behavior variables were analyzed using a multivariate model for repeated measures and a t-test was used to compare milk production average in both groups. Goats in group two tended to have a higher number of vocalizations ( $P=0.08$ ) and longer distance traveled inside the pen in the first 24 h ( $P=0.08$ ). Also the frequency in search behavior directed towards their kids ( $P < 0.001$ ) in the first 12 h was higher in group 2. Milk production average was similar in both groups ( $P > 0.1$ ). It is concluded that the separation of the kids without letting the mothers have any contact with them reduced behaviors of agitation in the mothers, without affecting milk production.

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## SPIDER MONKEY (*Ateles geoffroyi*) BEHAVIOR STUDY IN TWO DISSIMILAR CAPTIVITY CONDITIONS AT THE “MIGUEL ALVAREZ DEL TORO REGIONAL ZOO”, IN CHIAPAS, MEXICO

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**Katia A Olea y Wagner**

Universidad Nacional Autónoma de México (UNAM), México.

*katiaolea@hotmail.com*

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Animal behaviour has a daily cycle. In captive animals this cycle and the rhythm can be disturbed. In Primates the behaviour change is related with the type of shelter and the period of the day. The main purpose of this work was to compare the behaviour of two groups of spider monkeys (*Ateles geoffroyi*) at the “Miguel Álvarez Del Toro Zoo” in Chiapas, México. We completed an ethogram based on behavioural patterns within the two different types of confinement (island and wire cage), and identified the differences on each one and their variations along the day. We observed and recorded focal individual for about 66 hrs in each confinement, to acquire behavioural categories as well as the traits that conform each one. In the analysis we made use of the Wilcoxon Test, and came across that the different characteristics in the confinements (island and wire cage) had an effect on the categories frequency of: Grooming ( $p=0.012$ ), Locomotion ( $p=0.043$ ) and Play ( $p=0.012$ ). The expression on categories of: Grooming ( $p=0.012$  cage), Feeding ( $p=0.018$  island,  $p=0.012$  cage), and Locomotion ( $0.012$  island,  $0.028$  cage) did have a rhythmic variation along the day (morning-afternoon) for each confinement. Moreover, we found rhythmic variation on many specific conducts. The differences in the Social Behaviour categories like Grooming (at itself,  $p=0.017$ ; to each other,  $p=0.028$ ) had higher frequency at the island, and Playing (conduct 7.1,  $p=0.018$ ) was superior in the cage. These findings suggest that it exist an influence of the conditions and quality of the confinements on social patterns in witch the animals interact with each other. In general the results suggest that the Island with vegetation (soil, pasture, trees) and sufficient space is an adequate confinement for the expression of the natural behaviour pattern and well being in adult spider monkeys.

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## REGROUPING IN DOMESTIC GOATS: ITS EFFECTS ON BLOOD CORTISOL LEVELS

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**<sup>1</sup>Lorenzo Ortiz\*, <sup>1</sup>Leopoldo Alvarez**

<sup>1</sup> Centro de Enseñanza Práctica e Investigación en Producción y Salud Animal. Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, México

\*leo\_goc@yahoo.com.mx

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Changes in the hipotalamus-pituitary-adrenal axis (HPAA) activity have been used as an indicator of animal welfare. Regrouping is a common husbandry practice that disturbs social structure, increasing aggressive interactions and probably affecting the HPAA activity in the goat. With the aim of determining the cortisol levels (RIA) as affected by regrouping, a group of 10 adult goats were bleed during 12 days before and after being mixed with 33 other goats. Cortisol concentrations were also determined four months later in the 12 goats now in the new group. The mean cortisol levels had an increase of six hundred percent after regrouping. After regrouping, cortisol mean concentration was higher than before ( $55.2 \pm 4.6$  vs.  $8.8 \pm 1.0$  nmol/L respectively;  $p < 0.05$ ). Four months after regrouping, the cortisol levels ( $10.9 \pm 0.9$  nmol/L) were similar to the phase before ( $p > 0.05$ ), suggesting a stable group. It is concluded that in the domestic goats, regrouping activates the HPAA activity, causing a significant elevation of plasma cortisol.

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## VALIDATION OF THE OPEN FIELD TEST AND STRESS-INDUCED HYPERTHERMIA TO ASSES FEAR BEHAVIOUR IN EWES

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**<sup>1</sup>Cecilia Pedernera-Romano\*, <sup>1</sup>José Luis Ruiz de la Torre, <sup>2</sup>Llorenç Badiella, <sup>1</sup>Xavier Manteca**

<sup>1</sup> Unitat de Fisiologia Animal, Facultat de Veterinària, Universitat Autònoma de Barcelona, Spain.

<sup>2</sup> Servei d'Estadística, Universitat Autònoma de Barcelona, Spain.

\**cecilia.pedernera@campus.uab.es*

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In sheep and other farm animals, routine management procedures can trigger negative emotions such as fear, which are generally considered to affect animal welfare negatively. Open-field test (OFT) is the most widely used test to measure fearfulness in animals. Also, the induction of psychological stress is often accompanied by an elevation of core body temperature, referred as stress-induced hyperthermia (SIH). Both OFT and SIH were used in this study to measure fearfulness in sheep. Twenty four ewes of two breeds, Lacaune and Ripollesa, were tested in an arena measuring 5 m x 2.5 m. All animals were tested for 10 min and all behaviours were recorded throughout the test. Rectal temperature was measured immediately before the start of the test (T1) and 10 minutes after finishing it (T2). SIH was measured as the difference between T2 and T1. Sheep were tested over three periods of three experimental days each. Principal Component Analysis (PCA) was used to group behaviours observed in the OFT into two main categories: behaviours related to fear, including high locomotion and vocalization, urination, defecation and attempts to escape; and behaviours associated with absence of fear, including exploration, grooming, eating or drinking. SIH showed consistency over time within individuals. Differences between initial (T1) and final (T2) temperatures were found, suggesting that exposure to a novel arena caused SIH (mean  $\pm$  se: 38.942  $\pm$  0.006 for T1 and 39.34  $\pm$  0.007 for T2). SIH showed a significant decrease between experimental periods and days, suggesting a habituation of the animals to the experimental procedure. Breed differences were found in SIH (0.462  $\pm$  0.005 in Ripollesa and 0.341  $\pm$  0.007 in Lacaune). It is suggested that OFT and SIH can be useful to assess temperament in sheep and improve management procedures.

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## EFFECT OF THE NATURAL HORSEMANSHIP TECHNIQUES IN THE HEART RATE AND BEHAVIORAL PARAMETER OF WARM BLOOD HORSES LOADING INTO TRAILER

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<sup>1</sup>Lucía Pérez\*, <sup>2</sup>Katherine Houpt, <sup>1</sup>A Rodriguez, <sup>1</sup>Anne M Sisto, <sup>1</sup>Alberto Tejada, <sup>3</sup>A Aguilar

<sup>1</sup> Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México.

<sup>2</sup> Animal Behavior Clinic, College of Vet. Med., Cornell University

<sup>3</sup> Apdo. Postal 147, Pátzcuaro Michoacán. CP 61600

\*mvzlucia@gmail.com

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Loading horses into a trailer has been reported as the most common transportation problem and one of the most stressful and dangerous events for the horses and handlers. The effect of a training technique based on natural horsemanship concepts was evaluated in 28 jumping horses, all of them came from the same breeding area, living in the same facilities, fed the same diet and infrequently transported. The horses were exposed to a loading test (day 0), and according to the success or failure to load and age, they were divided in groups: 1) apparent good loaders or 3) apparent bad loaders; group 2) was 4 year old horses who only knew to lead and walk with the saddle on. During the loading tests, the animals wore a cardiac monitor and heart rate were recorded every 5 minutes for 15 minutes or until the horse loaded; the animals were videorecorded and all occurrence of avoidance behaviors were recorded. All of the horses were exposed to a training method with natural horsemanship techniques: 4 sessions of round pen work and 6 sessions of obstacle training during 2 weeks. The loading test was repeated after 2, 10 and 30 days after finishing obstacle training, but the horses who did load were asked to do it 3 times by two handlers (under the same criteria): one who did the training and another handler. The same measures were taken as on day 0 and compared by ANOVA. The loading time, heart rate, avoidance behavior frequency and success to load were statistically higher ( $P < 0.05$ ) before ( $223.57 \pm 8.31$ ;  $84.45 \pm 2.82$ ;  $14.75 \pm 0.88$ ;  $0.3798 \pm 0.034$  respectively) than after the training ( $152.05 \pm 5.82$ ;  $65.60 \pm 2.06$ ;  $3.99 \pm 0.88$ ;  $0.8585 \pm 0.0259$  respectively). These results indicate that this training technique is effective for reducing loading time and stress for horses with and without apparent loading problems.

## MOTHER–YOUNG RECOGNITION IN MEXICAN PELIBUEY SHEEP

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<sup>1</sup>Miriam Ramírez, <sup>2</sup>Lorenzo Alvarez, <sup>1</sup>Rosalba Soto, <sup>2</sup>Emmanuel A Lara,  
<sup>3</sup>Norma Serafin, <sup>1</sup>Angélica Terrazas\*

<sup>1</sup> Secretaría de Posgrado, Facultad de Estudios Superiores, Cuautitlán, Universidad Nacional Autónoma de México.

<sup>2</sup> Centro de Enseñanza Práctica e Investigación en Producción y Salud Animal. Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México.

<sup>3</sup> Departamento de Neurobiología Conductual y Cognitiva, Instituto de Neurobiología, Universidad Nacional Autónoma de México.

\* [garciate@servidor.unam.mx](mailto:garciate@servidor.unam.mx)

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Some studies in sheep had shown that both wild and little-selected breeds display better maternal ability: Pelibuey sheep proliferate in tropical areas, is characterized for its rusticity and has not been high - selected. In this study we investigated whether Pelibuey ewes and lambs were able to establish a mutual distal recognition. Multiparous Pelibuey ewes (n=17) and their 32 lambs were used. Mothers were tested in a 5 minutes double choice test at 8 hrs postpartum; here, ewe's ability to recognize its lamb without help of olfactory cues was evaluated. Time spent near their own or alien lamb, time spent watching their own or alien lamb and number of visits to their own or alien lamb were recorded. Lambs were also tested in a double choice test at 12 hrs of age in order to evaluate their ability to recognize their mother from an alien one; this test was similar to that of the mothers. Mothers were able to recognize their lambs since they spent longer near the own than the alien lamb ( $122.6 \pm 22.1$  vs.  $21.2 \pm 6.3$  sec., respectively. Wilcoxon,  $P=0.003$ ). Also, they spent longer watching their own than the alien lamb ( $73.4 \pm 14.3$  vs.  $38.1 \pm 6.2$  sec., respectively.  $P=0.04$ ). Finally, visits were more frequent to their own than to alien lamb ( $4.5 \pm 0.7$  vs.  $1.9 \pm 0.5$  respectively.  $P=0.01$ ). On the other hand, lambs spent longer near their own than the alien dam ( $118.6 \pm 16.3$  vs.  $60.5 \pm 9.5$  sec., respectively.  $P=0.02$ ). Also, there was a tendency regarding time watching their own than the alien dam ( $70.4 \pm 11.8$  vs.  $48.5 \pm 8.5$  sec., respectively.  $P=0.1$ ). There was no significant difference in the number of visits to their own or alien dam. It is concluded that Pelibuey ewes are able to develop a non olfactory recognition of their lambs at 8 hrs after birth, similar to other breeds. Pelibuey lambs did not show a clear preference for their own or alien dam, specially in the number of visits, regardless they spent more time near their own mothers; this suggest poor motor and sensory development.

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# EFFECT OF STRAW BEDDING MAINTENANCE ON THE BEHAVIOUR AND PREFERENCES OF DAIRY COWS KEPT IN CUBICLE SYSTEM WITH STRAW BEDDING AND SOFT LYING MATS

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**Klaus Reiter\*, Miriam Abriel, Franz Freiberger**

Institute for Agricultural Engineering and Animal Husbandry, Bavarian Research  
Centre of Agriculture, Germany.

\*[Klaus.reiter@lfl.bayern.de](mailto:Klaus.reiter@lfl.bayern.de)

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In cubicle houses for dairy cattle are used straw bedding or lying mats, but many farmers have problems with time management. The results are cubicles with less comfortable lying areas. This study aimed at comparing different levels of straw bedding (level 1: straw bedding 20 cm; level 2: bedding 5 cm; level 3: bedding 5 cm, around 3500 cm<sup>2</sup> without bedding) with soft lying mats (Kraiburg KEW PLUS) regarding cow behaviour and preferences. Data were collected in dairy house with 60 cows (Bavarian Fleckvieh) and robotic milking system. The lying behaviour and preferences of animals were observed during 15 days (in winter) by digital video observations. In addition standing up, lying down behaviour and positions of lying were quantified by direct observations. Significances were evaluated by Wilcoxon test. There were found significant differences in preference of straw bedding level 1 and 2 to soft lying mats (Average cubicle usage (24 h) 36.1% vs. 18.6% and 32.1% vs. 17.9%) but in level 3 cows showed preferences for soft lying mats (29.6% vs. 15.5%). The lying time (h/24 h) decreased from level 1 to 3 (13.2; 12.2; 10.9). Mean duration of lying bouts (minutes) was shorter ( $p < 0,01$ ) in straw bedding levels (specially in level 3) compared to soft lying mats (level 1: 72,6 vs. 88,5; level 2: 81,2 vs. 90,7, level 3: 56,6 vs. 90,4). The duration of both lying down and standing up movements did not differ significantly, but great differences were found in preparation of lying down. The percentage of cows in half side lying position was significantly higher in cubicles with soft lying mats and even more higher in straw bedding level 3 compared to level 1 and 2 (6,4%, 6,8%, 13,2%). In conclusion reduced bedding level affects the cows lying behaviour and lying position. Straw bedding maintenance is important for welfare of dairy cattle.

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## SEXUAL EMPATHIC ETHOGRAM OF THE CAPTIVE JAGUAR (*Panthera onca*)

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**Cristobal Rocha-Jaime\*, Isabel Escobar-Ibarra, Daniela Reyes-Aceves,  
Ramiro Ramírez-Necochea, Daniel Mota-Rojas, María Alonso-Spilsbury**

Laboratorio de Etología, Producción Porcina y Fauna Silvestre, Universidad Autónoma  
Metropolitana Unidad Xochimilco, México.

\*mvzcristobalrochajaime@gmail.com

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The jaguar (*Panthera onca*) is in threat of extinction it is one of the least studied large cats in the world, with scarce works on behaviour. As wild populations of large felids decline, the need for captive management programmes and reproductive research is needed. The aim of the present study forms part of a more comprehensive study on the development of an empathic ethogram of the specie in captive conditions. Here we present the sexual behaviour repertoire obtained from 200 hours of video recording of two breeding pairs at a Mexican private zoo (Zoofari, Mor.). Observations were *ad libitum* focal sampling during daylight hours (9:00 to 18:00 h), focusing in particular on sexual interactions between pairs. The ethogram was systematically done with the following format: name of the conduct, detailed description of the conduct by a morphological definition, and function of every conduct in terms of attitude, intention, context and emotionality. The sexual ethogram consists of 16 behaviours and 3 vocalizations clearly defined, these are: approaching, mounting, mounting with pelvic movements, pawing, claspings, head biting, copula, jumping on back, head-kicks, holding, licking, cheek rubbing, kicking, dismounting, biting try, walking away, and purring, copulatory cry and muttering. So far, one pair showed a mean copula duration of  $5.24 \pm 2.54$  sec., with a total of 36 copulas in 2 days; matings occurring mostly during 14:00 to 15:00 hours (58%). Ovulation in the jaguar is not spontaneous, so copulation affects the length of the cycle, an empathic ethogram as the one proposed may help caretakers to identify breeding events and breeding animals.



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## INGESTIVE BEHAVIOUR OF DUAL-PURPOSE COWS GRAZING NATIVE PASTURES WITH AND WITHOUT THE LEGUME *Arachis pintoi*

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<sup>1</sup>Karla H Rodríguez, <sup>1</sup>Epigmenio G Castillo\*, <sup>1</sup>Jesús R Jarillo, <sup>2</sup>Leendert 't Mannetje,  
<sup>3</sup>Andrés S Aluja

<sup>1</sup>CEIEGT, FMVZ, Universidad Nacional Autónoma de México, México.

<sup>2</sup> Wageningen Agricultural University, Netherlands.

<sup>3</sup> Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Yucatán, México.

\*[ecastleg@servidor.unam.mx](mailto:ecastleg@servidor.unam.mx)

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Pasture management aims at changing pasture vegetation structure, in order to affect variables like forage intake and ingestive behaviour that determine grazing ruminant productivity. Our objective was to determine the effect of associating the legume *Arachis pintoi* with a native pasture (NP) on pasture intake and ingestive behaviour of dual-purpose ½ Holstein-½ Zebu cows in the Mexican humid tropics. There were two treatments in the study (Jul-Aug, 2001): The NP and NP associated with *Arachis pintoi* (CIAT 17434) (NPA), each stocked at 2 cows/ha, with a rotation of 1 d grazing/20 d recovery per paddock. Cows were around 2 months in lactation with 4 lactations, and received 1.5 kg/cow/day of sugarcane molasses at milking (once daily, 8:00 AM). Ingestive behaviour was measured continuously for 24 hours, on 7 days of the 21-day grazing cycle (1-day on, 2-day off). Grazing, ruminating and other activities were observed every 10 min on each animal, as was the time to exert 20 bites, this on the last 10 min of each hour. Organic matter intake (OMI, kg OM/100 kg LW) was estimated using-markers: Cr (external) and acid insoluble ash (internal). Cows on NP spent ( $P<0.05$ ) more time grazing than cows on NPA ( $457\pm 13$  vs.  $395\pm 11$  min/d) as well as more time ruminating ( $406\pm 14$  vs.  $376\pm 14$  min/d); time for other activities was the opposite ( $304\pm 14$  vs.  $413\pm 15$  min/d). Biting rate was ( $P<0.05$ ) faster in NP than in NPA ( $51\pm 0.8$  vs.  $41\pm 0.7$  bites/min). OMI (kg/100 kg LW) was different for NP ( $1.49\pm 0.10$ ) than for NPA ( $1.46\pm 0.04$ ). Bite size was lower ( $P<0.05$ ) for NP than for NPA ( $0.34\pm 0.04$  vs.  $0.50\pm 0.04$  g/bite). Ingestive behaviour variables were changed by *A. pintoi* introduction, but pasture intake was not limited by the quality of the pastures. However, the legume would benefit soil fertility with time, leading to a more sustainable system.

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## DETERMINATION OF A STRAY VOLTAGE THRESHOLD USING BEHAVIOURAL MEASUREMENTS IN HOLSTEIN HEIFERS

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<sup>1</sup>Sabine Roussel\*, <sup>1</sup>Karim Rigalma, <sup>1</sup>Andreia Oliveira, <sup>2</sup>Thomas Louyot,  
<sup>1</sup>Christine Duvaux-Ponter

<sup>1</sup>AgroParisTech, France.

<sup>2</sup>Réseau de Transport d'Electricité, CNER, France.

\*[sabine.roussel@agroparistech.fr](mailto:sabine.roussel@agroparistech.fr)

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Stray voltage (less than 10V) often caused by a faulty connection between the electrical circuit and the earth can occur in farms and may impair animal welfare. The aim of this experiment was to determine the threshold level at which heifers perceive the electric shock, as well as their behavioural responses using an avoidance test. Over a 4-week period, forty Holstein heifers (5 to 10 months old) were trained to eat concentrate from two metallic feeders at the end of a 5m long corridor. For 20 heifers (VOLT), a voltage was then applied for 2min to the feeder in which the heifer initially started to eat. This allowed the heifers to change to the non-electrified feeder if they wanted to. The voltage was increased daily in steps of 0.3V from 0V up to 5V. The remaining heifers (CONT) followed the same procedure as the VOLT heifers but without any electricity. The data were analysed by a Khi-square analysis or the MIXED model procedure of SAS® with voltage as a fixed effect, heifer weight as a covariate, the animal as a random effect and taking into account the day effect by using the results obtained with the CONT heifers. For a voltage  $\geq 2.3V$ , the percentage of total feed eaten from the electrified feeder and the time spent eating in the electrified feeder decreased ( $P < 0.05$ ). Above 3V, heifers changed more quickly to the non-electrified feeder ( $P < 0.05$ ). Above 2V, more VOLT heifers performed muzzle-grooming ( $P < 0.01$ ) and head shaking ( $P < 0.01$ ) than CONT heifers. A voltage of 2.3V appears to be the threshold at which avoidance behaviour starts for a large number of heifers. However, large variations in the responsiveness of animals were observed and further research is necessary to study whether individual electrical resistance may explain some of the variability in the voltage threshold.

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## TIGER PREDATION AND CATTLE MANAGEMENT PRACTICES IN AN OIL PALM-LIVESTOCK INTEGRATION SYSTEM

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<sup>1</sup>Reuben Sharma\*, <sup>2</sup>Mohd Azlan Jayasilan, <sup>3</sup>Menon K. Vidyadaran, <sup>4</sup>Dionysius Sharma

<sup>1</sup> Faculty of Veterinary Medicine, Universiti Putra Malaysia, Malaysia.

<sup>2</sup> Faculty of Resource Science and Technology, Universiti Sarawak Malaysia, Malaysia.

<sup>3</sup> Faculty of Medicine, Universiti Putra Malaysia, Malaysia.

<sup>4</sup> WWF Malaysia.

\*[reuben@vet.upm.edu.my](mailto:reuben@vet.upm.edu.my), [rsksharma@hotmail.com](mailto:rsksharma@hotmail.com)

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The predation of tigers on livestock reared in oil palm plantations fringed by forests, and the resulting human-tiger conflict, is of major concern to tiger conservationists in Malaysia. Losses to the smallholder farmers are substantial, inciting attempts to eliminate the predator. This study was undertaken to determine the patterns of tiger predation on cattle in relation to husbandry techniques practiced, and to employ improved livestock management as a tool for reducing predation and resolving the human-tiger conflict. The cattle-oil palm integration system investigated expands an area of 2108.61 ha., is surrounded by mixed dipterocarp forest, and comprised 10 smallholder farms with 800 heads of local-crossed cattle. The animals were free to graze during the day and herded into paddocks at dusk. Patterns of tiger predation were determined via interviews, visits to kill sites, and examination of cattle remains. Camera-trapping was carried out on the plantation, along the forest-plantation fringe and in the surrounding forest, in order to ascertain the tiger population size and movement patterns. Camera-trap data accumulated over a course of 12 months (7613 trap nights), revealed a total of 15 individual tigers including 3 cubs. A resident adult male and female were photographed with the highest frequency, accounting for 48% and 13% of the captures, respectively. The minimum home range for the resident male was 345 km<sup>2</sup> while that of the females ranged from 186 km<sup>2</sup>-229 km<sup>2</sup>, with peak activity levels at dawn and dusk. The calculated tiger density was 7.06 individuals/100 km<sup>2</sup>. The immediate measures taken to reduce predation included relocating isolated paddocks, remodeling existing housing facilities, controlled and timed grazing, herding in before dusk and improved nutritional management. These measures were successful in reducing the predation by 96%. Continued camera-trapping revealed that the resident tigers were still present in the area and were able to thrive on available natural prey.

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## THE INFLUENCE OF MIXING PIGLETS PRE-WEANING ON THEIR PERFORMANCE AND SURVIVAL RATE

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**Ioannis A Skoufos\***, Georgios E Maglaras, Ioannis V Daoutis, Konstantinou K Vasilios, Eustratios A Spanelis, Eleni N Mallisiova, Athina S Tzora

Department of Animal Production, T.E.I. of Epirus, Greece.

\*[jskoufos@teiep.gr](mailto:jskoufos@teiep.gr)

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Two different farrowing systems were evaluated concerning pre-weaning comparison on the effect of mixing piglets or not, on their productive and behavioral parameters. The trial included 104 farrowings and 1178 liveborn piglets, allocated in two groups. The 52 litters were mixed in groups of four sows each, three days after birth (experimental group), whereas the remaining were kept under conventional conditions as littermates in the same pen (control group). All piglets were weaned at 24 days after delivery. Each piglet was weighed at birth, on day 3 and at weaning. No statistical difference ( $p>0.05$ ) was exhibited between the experimental and control groups, regarding the average weight of piglets at birth ( $1.35\pm 0.36$  vs.  $1.37\pm 0.41$ ), on day three ( $1.97\pm 0.29$  vs.  $1.99\pm 0.33$ ) and at weaning ( $6.78\pm 0.74$ kg vs.  $6.72\pm 0.83$ kg). Also, pre-weaning growth rates did not differ significantly ( $p>0.05$ ) in the two treatments ( $229$ g/day vs.  $225$ g/day). Variation of weaning weights exhibited significant differences ( $p<0.05$ ) regarding the lower 10% of weights of each group ( $4.2\pm 0.52$  vs.  $3.8\pm 0.31$ ), but not regarding the higher 10% of them respectively ( $7.6\pm 0.28$  vs.  $7.5\pm 0.38$ ). Crushing rate from day 3 and onwards did not differ significantly ( $2.07\%$  vs.  $2.2\%$  in the experimental and control groups respectively). Diarrhea cases appeared in the 11% of the total number of piglets in the treated groups compared with 7.8% in the controls. Our results showed that in 81% of the piglets in the experimental group, diarrhea ceased in three days time compared to 92% of the piglets in the control group. Finally, the overall survival rate was 87% in the treatment group and 86% in the control one. These results indicate that the influence of mixing piglets during the suckling period has only a positive effect on the growth rate of the lower weight piglets until weaning.

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## EFFECTS OF LOCAL ANAESTHETIC AND A NON- STEROIDAL ANTI-INFLAMMATORY ANALGESIC ON STRESS RESPONSES OF CALVES TO DISBUDDING

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<sup>1</sup>Mairi Stewart\*, <sup>2</sup>Joseph M Stookey, <sup>3</sup>Kevin J Stafford, <sup>4</sup>Cassandra B Tucker,  
<sup>1</sup>Andrea R Rogers, <sup>1</sup>Suzanne K Dowling, <sup>5</sup>Gwyneth A Verkerk, <sup>1</sup>James R Webster

<sup>1</sup> AgResearch Ltd, New Zealand.

<sup>2</sup> University of Saskatchewan, Canada.

<sup>3</sup> Massey University, New Zealand.

<sup>4</sup> University of California, Davis, USA.

<sup>5</sup> Dexcel Ltd, New Zealand.

\*[mairi.stewart@agresearch.co.nz](mailto:mairi.stewart@agresearch.co.nz)

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We examined the effects of local anaesthetic (LA) and a non-steroidal anti-inflammatory agent (NSAID) on physiological and behavioural responses of calves following disbudding (DB). Forty six mixed sex calves (average 4.5 weeks) were randomly assigned to 6 treatments: control, LA, NSAID, DB, DB+LA and DB+LA+NSAID. Eye temperature (measured using infrared thermography) was recorded continuously for 30min before and 15min after cautery disbudding; eye temperature and behaviour (lying, ruminating) were recorded every 5min for a further 3hr post disbudding. Heart rate (HR) and heart rate variability (HRV) were continuously recorded. ANOVA was used to detect treatment differences. During the first 2min after disbudding without LA or NSAID, there was a rapid drop in eye temperature ( $-0.5^{\circ}\text{C}$ ,  $P<0.05$ ) and HRV ( $P<0.001$ ) from baseline and HR was higher ( $P<0.001$ ) than all other groups. HR remained elevated 3hr post-disbudding for the DB group. The simultaneous drops in HRV and eye temperature immediately after disbudding without analgesia suggest an acute sympathetically-mediated reduction in blood flow to the eye in response to pain. Ruminating was lower than other treatments for DB ( $P<0.05$ ), except LADB. Between 2-3hr following disbudding with LA, there was a rapid decrease in eye temperature ( $-0.6^{\circ}\text{C}$ ,  $P<0.001$ ), an increase in HR ( $P<0.05$ ) and decrease in lying behaviour ( $P<0.01$ ). There were no changes in HR, eye temperature or behaviour for calves disbudded with LA and NSAID during this time. Changes found between 2-3hr following disbudding with LA suggest the onset of pain at this time, which coincides with the time that LA effects wear off. The combination of LA+NSAID mitigate the stress response associated with the immediate pain of disbudding and confirms this combination is more effective at alleviating pain than LA alone. Eye temperature measurements may be an additional and useful way to assess the duration and efficacy of pain mitigation by analgesics.

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## FRACTAL ANALYSIS FOR GRAZING PATHS OF COWS - EFFECTS OF GROUP SIZE AND Paddock AREA

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**Shingo Tada, Hajime Kondo, Makoto Takahashi, Koichiro Ueda,  
Hiroki Nakatsuji, Seiji Kondo\***

Graduate School of Agriculture, Hokkaido University, Sapporo, Japan.

\*[skon@anim.agr.hokudai.ac.jp](mailto:skon@anim.agr.hokudai.ac.jp)

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The space use by grazing herbivores on pastures would influence spatial sward heterogeneity and consequently herbage production. Such space use by herbivores could be reflected by their grazing paths. This study investigated the effects of group size and paddock area on grazing paths of cows by fractal analysis. The relationship between grazing paths and space use of cows was also examined. Six dry cows grazing on pastures (mean sward height; 34.7cm) for 5hr/day were observed. Experimental treatments were 6cows/0.93ha (6L), 3cows/0.93ha (3L) and 3cows/0.47ha (3S). During the first 2hr of each grazing, digital photographs of entire pastures were taken at 30sec intervals. X-Y coordinates of cows were calculated from their pixel coordinates. Connected consecutive X-Y coordinates was regarded as the grazing path. Moving velocity (m/30sec) was calculated. Fractal analysis was applied for evaluating hierarchical scales and sinuosity of paths. Pastures were divided into 1m×1m "squares". The number of squares covered by the grazing path was counted. The degree of overlap of used squares (the number of passed squares/the number of covered squares) was calculated. Two-way ANOVA (3replications/treatments) with individuals as block factor and LSD were performed. Moving velocity (m/30sec) was higher for 6L (3.06) than 3L (2.41) and 3S (2.46) ( $P<0.05$ ). Path sinuosity below about 9m scale was lower for 6L than 3L and 3S ( $P<0.05$ ). Path sinuosity above about 9m scale was lower for 6L and 3L than 3S ( $P<0.05$ ). The number of 1m×1m squares covered by the path was greater for 6L (834) than 3L (678) and 3S (652) ( $P<0.05$ ). The degree of overlap of used squares was lower for 6L (1.08) and 3L (1.06) than 3S (1.13) ( $P<0.05$ ). These results suggest that, regardless of space allowance, group size and paddock area could independently affect grazing paths of cows and thus their space use on pastures.

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## PRENATAL MALNUTRITION IMPAIRS VOCAL STRUCTURE IN LAMBS

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**<sup>1</sup>Angélica Terrazas\*, <sup>1</sup>Ulises Hernández, <sup>1</sup>Alan Olazabal, <sup>1</sup>Filiberto Hernández, <sup>1</sup>Hitandewy Sánchez, <sup>2</sup>Alfredo Medrano, <sup>1</sup>Rosalba Soto**

<sup>1</sup> Secretaría de Posgrado, Facultad de Estudios Superiores Cuautitlán, Universidad Nacional Autónoma de México.

<sup>2</sup> Departamento de Ciencias Pecuarias, Facultad de Estudios Superiores Cuautitlán, Universidad Nacional Autónoma de México.

\*[garciate@servidor.unam.mx](mailto:garciate@servidor.unam.mx)

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Previous studies in rats suggest prenatal malnutrition impairs vocal activity and its spectral structure in pups. In sheep, vocal activity during first day postpartum is very important, it is associated with the mother-young recognition. In the present study we investigated whether or not prenatal malnutrition affects vocal activity during the first hour after birth and the spectral structure during the first three days of age in lambs. Columbia lambs coming from two groups were used: 1) control (n=10), mothers were fed according to their nutritional requirements; 2) underfed (n=10), mothers were fed to meet 70% of their protein and energy requirements. Vocal activity (high and low pitch bleats) emitted by lambs during the first hour after birth in company of their mother were recorded. Individual high pitch bleats were recorded each 24 hours until third day of age for spectral analysis the peak frequency, number of harmonics, and the length of the bleat. Non significant differences were found in the vocal activity during the first hour of age between the control and underfed lambs ( $191 \pm 67$  vs.  $270 \pm 104$  respectively.  $P > 0.05$ ). Regarding spectral analysis, underfed lambs had higher peak frequency compared to control group (day 1:  $1.4 \pm 0.01$  vs.  $1.35 \pm 0.02$  kHz respectively.  $P = 0.01$ ), (day 2:  $1.4 \pm 0.01$  vs.  $1.36 \pm 0.02$  kHz respectively.  $P = 0.04$ ), (day 3:  $1.4 \pm 0.01$  vs.  $1.32 \pm 0.02$  kHz respectively.  $P = 0.009$ ). During the second day of age underfed lambs bleats presented more harmonics compared to control group ( $13.7 \pm 1.3$  vs.  $13.3 \pm 0.3$  respectively.  $P = 0.03$ ). Finally, bleat length was significantly higher in underfed lambs compared to control, during each day of the study: (day 1:  $0.9 \pm 0.07$  vs.  $0.7 \pm 0.01$  sec., respectively.  $P = 0.006$ ), (day 2:  $0.8 \pm 0.02$  vs.  $0.7 \pm 0.02$  sec., respectively.  $P = 0.01$ ), (day 3:  $0.8 \pm 0.02$  vs.  $0.7 \pm 0.02$  sec., respectively,  $P = 0.01$ ). We concluded that malnutrition during prenatal life affects vocal structure of lambs.

Supported by PAPIIT IN217205 (UNAM) and IN2-07 (FES-C UNAM).

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## DETERMINING THE OPTIMUM AGE FOR TAIL DOCKING AND EAR NOTCHING NEONATAL PIGS

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Stephanie Torrey\*, Nicolas Devillers, Martin Lessard, Chantal Farmer, Tina Widowski

Agriculture and Agri-Food Canada, Canada.

\*torreys@agr.gc.ca

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Multiple producer groups recommend that piglets be tail docked and ear notched within 24 hours of birth because the procedures are considered less stressful for the piglet at that age. However, there is no research to substantiate this recommendation. Therefore, the objective of this experiment was to determine if age influences piglets' behavioural and vocal responses to these procedures. Six piglets per litter from 20 litters (n=120 piglets) were used in a 3 x 2 complete block design. Each litter comprised a complete block. Piglets were weighed at birth and assigned to one of three treatments (balanced by birth weight): control (C), handled (H) and processed (P) (tail docked and ear notched) at one of two ages (1 or 3 days). During the procedure, vocalizations were recorded and analyzed using the Raven software program. Behaviour was observed for ten minutes following the procedures. Control piglets were not used for vocal analyses. Regardless of age, P vocalized at a significantly higher frequency than H ( $P < 0.001$ ; P:1417±33Hz; H:1037±37Hz). Piglets handled or processed on day 1 tended to vocalize at a higher frequency than those handled or processed on day 3 ( $P = 0.069$ ; 1d:1271±35Hz; 3d:1182±34Hz), and tended to have a greater ratio of high calls (>1kHz) to low calls (<1kHz) ( $P = 0.067$ ; 1d:2.6±0.5 high:low calls; 3d:1.6±0.5 high:low calls). After the procedure, P had a tendency to tremble ( $P = 0.087$ ) and jam their tail more ( $P < 0.0005$ ) than H or C. At 1d of age, piglets spent more time suckling ( $P < 0.001$ ) and trembling ( $P < 0.005$ ) and less time standing ( $P < 0.001$ ) and playing ( $P < 0.001$ ) than piglets at 3d of age, regardless of treatment. There were no interactions between age and treatment on any of the measured variables. Our results indicate that tail docking and ear notching are aversive procedures, regardless of piglet age. However, age may influence piglets' coping strategy.



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## APPETITE IN SWINE FOLLOWING COMBINATIONS OF DEXFENFLURAMINE AND DEPRIVATION LENGTH

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<sup>1</sup>Michael J Toscano\*, <sup>2</sup>Donald C Lay, <sup>3</sup>Bruce Craig, <sup>4</sup>Edmond A Pajor

<sup>1</sup>University of Bristol, UK.

<sup>2</sup>USDA-ARS-LBRU, West Lafayette, USA.

<sup>3</sup>Department of Statistics, Purdue University, West Lafayette, USA.

<sup>4</sup>Department of Animal Sciences, Purdue University, West Lafayette, USA.

\*[j.toscano@bris.ac.uk](mailto:j.toscano@bris.ac.uk)

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Hunger in livestock exists in a variety of production situations as suggested by behavioural and physiological evidence. Despite this understanding, we are unable to objectively quantify how hungry an animal is or determine when the severity of hunger becomes so severe that welfare is compromised. The current study was an effort to provide an objective measure of identifying levels of hunger by characterizing the relationship between the appetite suppressant dexfenfluramine (DEX) and increasing periods of feed deprivation. Sixteen individually housed barrows received one of four injections of vehicle or DEX and vehicle (0.0, 0.1, 0.5, 1.5, mg/kg; i.m.) in combination with one of five deprivation periods (21, 27, 33, 45, or 57 h). Feed was provided 15 min after delivery of DEX treatment or vehicle and feed disappearance, feed bout duration, the number of feed bouts and various behaviours were measured for a 165-min duration. Four trials were conducted in total with 3 d in between each trial to allow for a recovery from the imposed feed deprivation. Dexfenfluramine was found to decrease appetite as suggested by the decreased display of eating behaviours and feed bout numbers ( $P < 0.05$ ) in the 0- to 165-min period following delivery of the drug, but only at the highest concentration and briefest of deprivation periods. Other measures of activity including sternal and lateral lying were increased and decreased by DEX respectively suggesting a drug-induced increase in resting; however a dose-dependent effect was not clear. Our findings do not provide evidence of a dose dependent effect but do suggest that greater concentrations of dexfenfluramine or improved method of delivery may be more effective for quantifying hunger.

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## DENTAL DEVELOPMENT AND MASTICATION IN DOMESTIC SWINE (*Sus scrofa*) – WHAT WE DO AND DO NOT KNOW

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Abel L Tucker\*, Tina M Widowski

Department of Animal & Poultry Science, University of Guelph, Guelph ON, Canada.

\*atucker@uoguelph.ca

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Studies on miniature pigs suggest dentition plays a role in feeding ability at weaning. Teeth eruption has been characterized as occurring in stages. Piglets aged 3-4 weeks are in stage 1 (one molar/quadrant occluding) while piglets of 9-13 weeks are in stage 2 (2-3 cheek molars/quadrant occluding). Stage 1 piglets chew more slowly, require more chewing cycles to process food and have less regular alternation in chewing side than stage 2 piglets. Studies also suggest molar eruption coincides with the initial mastication of solid feed, the consumption of which has been shown to ameliorate post-weaning growth check in large breed pigs, thus reducing time to slaughter. In large breed pigs, no studies have investigated the relationship between tooth development and feed consumption. Also, only two inexact studies (conducted in 1973) have investigated teeth eruption, and these occurred prior to the swine industry's advancements in genetic selection. Therefore the objective of this study was to determine the variation in dental development from birth to 4 weeks of age. 210 piglets (ages 0, 1, 2, 3, 4 wks) had their weight, sex and dental eruption for each tooth recorded on a 3-point scale (0 = no tooth through gingiva, 0.5 = portion of tooth crown through gingiva, 1.0 = entire crown through gingiva). Piglets had their scores added for each tooth and each tooth type. One-tailed t-tests (SPSS) were used to test for differences between our sample and the values published in the earlier literature. Eruption of all molars (i.e. the teeth used for mastication of solid feed) was later than that reported ( $p < 0.001$ ). Anecdotal findings include: (1) impaired enamel development, (2) dental caries in newly erupted teeth, and (3) discolouration of needle teeth. Investigations into the relationship among feeding behaviour, creep consumption and dental development are currently underway.

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## CALF REARING PRACTICES: FIRST STEP IN THE DEVELOPMENT OF A WELFARE MONITORING SYSTEM

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<sup>1</sup>Elsa Vasseur\*, <sup>2</sup>Fernando Borderas, <sup>3</sup>Roger Cue, <sup>4</sup>Daniel Lefebvre, <sup>1</sup>Doris Pellerin,  
<sup>2</sup>Jeffrey P Rushen, <sup>3</sup>Kevin Wade, <sup>2</sup>Anne Marie B de Passillé

<sup>1</sup> Dpt Sciences Animales, Université Laval, Canada.

<sup>2</sup> Agriculture and Agri-Food Canada/Agriculture et Agroalimentaire Canada.

<sup>3</sup> McGill University, Canada.

<sup>4</sup> Valacta, Canada.

\*[elsa.vasseur.1@ulaval.ca](mailto:elsa.vasseur.1@ulaval.ca)

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There is a number of animal welfare issues associated with rearing replacement dairy calves but animal welfare monitoring has focused mainly on lactating cows. To identify which management practices might impact animal welfare, calf rearing practices were surveyed on 114 dairy farms (herd size  $53.7 \pm 21.6$  cows; herd average lactation milk production  $8716 \text{ L} \pm 1206 \text{ L}$ ) in Quebec, via a 2h interview and observations on calves and facilities. Mean calf mortality was 8.1% (range 0-20%). Specific practices were identified as having positive or negative impacts on calf welfare. On 50% of farms calving occurred in a tie-stall while 52% of herds had separate facilities for calving. The level of calving surveillance was low with a median of 4 h between visits during the day and 12 h during the night. The calf's umbilicus was disinfected on 63% of farms, and 92% of farms provided a first meal of colostrum (median 2.5 L; range 0.5-6 L) within 6 h of birth. Only minimally adequate quantities of colostrum were given during the first 24 h (median 5 L; range 2-12 L) with 40% of producers giving 4 L or less. No producers evaluated the quality of colostrum. Of the herds surveyed, 53% fed calves non-pasteurised marketable milk; 42% fed milk replacer; and 47% fed non pasteurised waste milk occasionally to often. Despite frequent recommendations, many dairy producers continue to use management practices that may decrease the welfare of milk-fed calves. In particular, inadequate calving and colostrum management practices need to be improved. This survey is being repeated on 50 farms in Austria and Germany (Welfare Quality European project) where we are also developing a one-day protocol for on farm testing of animal welfare.

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## THE NUMBER OF VISITORS TO THE AQUARIUM INFLUENCES THE BEHAVIOR OF MANATEES

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**<sup>1</sup>Claudia Villanueva-García, <sup>1</sup>Dulce M Brousset, <sup>2</sup>Marta C Romano, <sup>1</sup>Francisco Galindo**

<sup>1</sup> Dpto. de Etología y Fauna Silvestre, Fac. Medicina Veterinaria y Zootecnia, UNAM.

<sup>2</sup>Dpto. de Fisiología, Biofísica y Neurociencias, CINVESTAV, México.

\*[golemc@hotmail.com](mailto:golemc@hotmail.com)

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The Antillean Manatee is an endangered species in many countries. In Mexico, rehabilitation centers do not exist and therefore the orphan animals or those found stranded have to be maintained in aquarium zoos. The knowledge of the physiology and behaviour of these animals is scarce. On the other hand, the number of persons visiting the aquariums varies depending of several factors as holidays, school groups, etc.. We have studied the behaviour of 5 female and 3 male manatees located in the Veracruz Aquarium, Mexico. The animal behaviours in days of high (HV) and low (LV) number of visitors were compared. The animal behaviour was registered using the scanning technique, throughout 244 h of observation (128 h at high visiting vs 116 h at low visiting). The behaviour observation was performed for 4 h/day at the public area of visiting. The first step was to obtain a behaviour catalogue, in which the main representative behaviours found were locomotion, repose and feeding. In addition other behaviours as filiative interactions and coprophagya were present and registered. The manatee behaviour have been calculated as the percentage of time used in each behaviour and analysed by one-way ANOVA. The analysis showed significant statistical differences between the groups included in this study (HV vs LV): Locomotion  $32.92 \pm 7.10$  vs  $67.07 \pm 7.10$ ; feeding  $37.49 \pm 10.80$  vs  $62.50 \pm 10.80$ ; repose  $26.71 \pm 12.17$  vs  $73.28 \pm 12.17$ ; hiding from visitors  $24.01 \pm 7.78$  vs  $60.66 \pm 7.78$ . Results indicated that a high number of visiting significantly affected the behaviour of manatees. Therefore, measures should be implemented to avoid disturbing the animals in days of high concurrence to the aquarium facilities.

(Supported in part by IFAW).

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## EFFECT OF PREPARTUM TRAINING FOR MILKING ON MILKING BEHAVIOR AND PRODUCTIVE PERFORMANCE OF DAIRY COWS

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Vinod K Vishwakarma, Madan L Kamboj\*, Ship Prasad

Dairy Cattle Breeding Division, National Dairy Research Institute, India

\*kamboj66@rediffmail.com

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The study was aimed at finding out effect of prepartum training for milking on milking behavior, productive performance and plasma cortisol concentrations of Sahiwal (*Bos indicus*) and crossbred (*Bos indicus* x *Bos taurus*) primiparous dairy cows. Five Sahiwal heifers each were allotted to control and treatment group whereas 8, 6 and 6 crossbred heifers each were allotted to control and 2 treatments respectively. The treatment groups of heifers were brought into milking parlour at each milking along with other milking cows for 15 days in Sahiwal and 7 and 15 days prepartum for treatment I (T<sub>1</sub>) and II (T<sub>2</sub>) respectively in crossbreds and were allowed to undergo usual milking routine except milking. There was decline ( $p < 0.01$ ) in average milking temperament score (Sahiwal; from  $2.67 \pm 0.19$  to  $1.40 \pm 0.13$ , Crossbreds;  $2.57 \pm 0.16$  to  $1.38 \pm 0.11$  in T<sub>1</sub> and  $1.60 \pm 0.13$  to  $1.20 \pm 0.11$  in T<sub>2</sub> on 5 point scale) and mean plasma cortisol levels after training (Sahiwal; from  $16.11 \pm 1.01$  to  $5.61 \pm 0.38$ , Crossbreds;  $16.00 \pm 1.03$  to  $4.87 \pm 0.40$  in T<sub>1</sub> and  $17.20 \pm 1.18$  to  $4.97 \pm 0.36$  ng/ml in T<sub>2</sub>) in treatment groups. There was decrease ( $p < 0.01$ ) in percent residual milk yield (Sahiwal; 47.76 vs. 85.05, Crossbreds; 9.39 in T<sub>1</sub> and 9.46 in T<sub>2</sub> vs. 16.58) and increase ( $p < 0.01$ ) in daily milk yield (Sahiwal;  $4.25 \pm 0.15$  vs.  $3.68 \pm 0.13$ , Crossbreds;  $16.06 \pm 0.16$  in T<sub>1</sub>,  $16.07 \pm 0.17$  in T<sub>2</sub> vs.  $14.65 \pm 0.21$  kg) during early lactation in treatment groups. The plasma cortisol levels had positive correlations ( $p < 0.01$ ) with milking temperament score (0.77 and 0.29), residual milk yield (0.47 and 0.27) and negative correlations ( $p < 0.05$ ) with milk yield (-0.23 and -0.28) in Sahiwal and crossbreds respectively. The results indicated that one week of prepartum milking training was adequate for adaptation to desirable milking behavior and productive performance in crossbreds, whereas in Sahiwal cows though two weeks of training favorably affected these traits; this duration needed to be further increased.

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## THE INTERACTION BETWEEN ATTENTION AND DOMINANCE STATUS IN THE CAPTIVE GUINEA BABOON

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**Katherine E Wagner**

University of Chicago, USA.

*qwags@uchicago.edu*

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While directing attention to the social environment offers all primate observers significant fitness benefits, the variable access to such advantages conferred by position in a dominance hierarchy suggests that the particular morphology of this attention may be expected to vary with status. However, previous attempts to assess the interaction between status and attention in the primates have failed to demonstrate a robust relationship, as a result of a range of operational definitions of "gaze". In response, the current study assessed with continuous sampling the distinct occurrence of social and environmental gazes in the 3 highest and lowest ranking guinea baboon males in a captive social group. While gaze frequency in general was similar across all subjects, the high and low ranking groups were differentiated when the targets of these gazes were introduced into the analysis. In particular, the high ranking males ( $M=1.63$  gazes per minute,  $SD=0.05$ ) directed significantly more gazes to conspecific females than did the low rank group ( $M=0.83$  gazes per minute,  $SD=0.63$ ),  $t=13.11$ ,  $p=.001$ , while the low ranking males ( $M=2.81$ ,  $SD=0.80$ ) performed a significantly higher frequency of environmental scans than their high-rank counterparts ( $M=1.51$ ,  $SD=0.80$ ),  $t=3.12$ ,  $p=.045$ . These results suggest that 1) high ranking males focus significant attention on group females, presumably to secure mating opportunities; 2) low ranking males display a attentional concern with the landscape in general, which may indicate a predominant concern with anticipating and avoiding conspecific aggression; and 3) males of differing status are distinguished not in gaze rate, but rather in the frequency with which the attention is directed to specific targets. Potentially, these dominance-based differences in gaze behavior offer a concrete empirical tool with which managers of captive primate populations may appraise hierarchical structure for use in maintenance decisions.

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## INTRACEREBROVENTRICULARLY ADMINISTERED OXYTOCIN ATTENUATED CORTISOL SECRETION, BUT NOT BEHAVIOURAL RESPONSES, DURING ISOLATION IN HOLSTEIN STEERS

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<sup>1</sup>Ken-ichi Yayou\*, <sup>2</sup>Shuichi Ito, <sup>1</sup>Etsuko Kasuya, <sup>3</sup>Madoka Sutoh,  
<sup>1</sup>Satoshi Ohkura, <sup>1</sup>Hiroaki Okamura

<sup>1</sup> National Institute of Agrobiological Science, Japan.

<sup>2</sup> Kyusyu Tokai University, Japan.

<sup>3</sup> National Institute of Livestock and Grassland Science, Japan.

\*Ken318@affrc.go.jp

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In response to various stressors, oxytocin is released not only peripherally but also intracerebrally to regulate pituitary-adrenocortical and behavioral stress responses. To elucidate the central roles of oxytocin in cattle, we examined the effects of intracerebroventricularly administered oxytocin on stress responses in steers. Five Holstein steers (199 to 250 days old) were assigned to the following three treatments randomly: T1, no isolation after administration of 200  $\mu$ l of artificial cerebrospinal fluid (aCSF); T2, isolation after aCSF administration; and T3, isolation after 0.5  $\mu$ g of oxytocin administration. The isolation was conducted by leaving the experimental steer alone in its habituated cage for 1 hour while its peers were taken outside. The isolation induced rapid increase in plasma cortisol concentration. The maximum %-changes from pre-isolation value in T2 ( $631.3 \pm 387.1$  %) was significantly attenuated by oxytocin injection (T3:  $386.0 \pm 273.0$  %) ( $p < 0.05$ ). The isolation also induced conflict behaviors i.e. increase in the frequency (number of occurrence / 1 h isolation) of bleating (T1 vs. T2:  $0$  vs.  $62.8 \pm 30.7$ ,  $p < 0.05$ ) and changing body orientation ( $4.2 \pm 1.6$  vs.  $25.0 \pm 11.4$ ,  $p < 0.1$ ), and decrease in the duration (sec / 1 h isolation) of lying ( $2143.0 \pm 753.7$  vs.  $417.2 \pm 388.9$ ,  $p < 0.05$ ) and ruminating ( $1490.2 \pm 705.7$  vs.  $414.0 \pm 925.7$ ). The frequency of head shaking and self-grooming did not change by isolation. The effect of oxytocin on the frequency of bleating (T3:  $53.0 \pm 41.1$ ) and changing body orientation ( $31.2 \pm 9.8$ ), and on the duration of lying ( $785.4 \pm 772.1$ ) and ruminating ( $371.0 \pm 649.1$ ) was not apparent. These results indicate that intracerebroventricularly administered oxytocin attenuated cortisol response to isolation in steers while the effect on behaviour was very little in this experimental condition.

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# INFLUENCE OF AN ARTIFICIAL TEAT CANAL IN A FEEDER TEAT ON INTERSUCKING BEHAVIOUR IN GROUPS OF AUTOMATICALLY MILK FED CALVES

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<sup>1</sup>Frank Zerbe\*, <sup>2</sup>Amélie Fischer

<sup>1</sup> Federal Agricultural Research Centre, Institute of Animal Welfare and Animal Husbandry, Germany.

<sup>2</sup> Schaumann Agri International, Germany.

\*[Frank.Zerbe@fal.de](mailto:Frank.Zerbe@fal.de)

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Intersucking among calves seems to be a result of insufficient satisfaction of the sucking reflexes during milk intake. Therefore a higher sucking resistance is recommended to prolong milk intake. The new idea was to introduce a teat canal (1-2mm diameter, 15mm length) into the tip of a feeder teat. Preliminary studies showed that this 'bionic' teat improved the amplitude modulation of pressure pulses generated in the mouth thus being a sign of normal sucking physiology. The aim of this study was to investigate the influence of such a resistance on the incidence of intersucking behaviour (sucking under the belly with preference to the inguinal region). Investigations were done in 14 dairy and 10 fattening groups on 8 farms feeding milk with automatic devices. Always 2 groups of same size (range 15 to 50) were studied simultaneously (treatment: bionic versus conventional teat). Three video-observations per group (each 48h, at intervals of 14d) were carried out to record the number of intersucking bouts differentiated in those within 15min after a meal and those with no contact to milk before. In-between the 3 video-recordings two measurements of negative pressure during individual milk intake were done followed by direct behavioural observation over 15min after each meal. Total frequencies of intersucking behaviour per calf did not differ between bionic and conventional teat but were higher in fattening groups ( $6.6 \pm 3.2$  and  $2.3 \pm 1.9$ ;  $p < 0.05$ ; multiple-t-test). During the observations there was an increasing tendency of intersucking in all groups, but more stopped again in the treatment groups. Animals which intersuck after a meal showed a higher negative pressure ( $207 \pm 64$  and  $177 \pm 58$  mbar;  $p < 0.001$ ; Mann-Whitney-U-test) resulting in a faster milk intake. They also had a significant higher frequency of their sucking pulses ( $2.25 \pm 1.9$  and  $2.18 \pm 1.9$  Hz;  $p < 0.001$ ; Mann-Whitney-U-test) suggesting a higher state of excitement. It is concluded that housing conditions (e.g. roughage or litter) are of higher importance than changes in the sucking resistance.

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