PROCEEDINGS OF THE
37th INTERNATIONAL CONGRESS
OF THE ISAE

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25 - 1990 Mappaggio del genoma bovino
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27 - 1990 La nube di Chernobyl sul territorio bresciano
28 - 1991 Le immunodeficienze da retrovirus e le encefalopatie spongiformi
29 - 1991 La sindrome chetosica nel bovino
30 - 1991 Atti del convegno annuale del gruppo di lavoro delle regioni Alpine per la profilassi delle mastiti
31 - 1991 Allevamento delle piccole specie
32 - 1992 Gestione e protezione del patrimonio faunistico
33 - 1992 Allevamento e malattie del visone
34 - 1993 Atti del XIX Meeting annuale della S.I.P.A.S., e del Convegno su Malattie dismetaboliche del Suino
35 - 1993 Stato dell'arte delle ricerche italiane nel settore delle biotecnologie applicate alle scienze veterinarie e zootecniche - Atti 1ª conferenza nazionale
36 - 1993 Argomenti di patologia veterinaria
37 - 1994 Stato dell'arte delle ricerche italiane sul settore delle biotecnologie applicate alle scienze veterinarie e zootecniche
38 - 1995 Atti del XIX corso in patologia suina e tecnica dell'allevamento
39 - 1995 Quale bioetica in campo animale? Le frontiere dell'ingegneria genetica
40 - 1996 Principi e metodi di tossicologia in vitro
41 - 1996 Diagnostica istologica dei tumori degli animali
42 - 1998 Umanesimo ed animalismo
43 - 1998 Atti del Convegno scientifico sulle enteropatie del Coniglio
44 - 1998 Lezioni di citologia diagnostica veterinaria
45 - 2000 Metodi di analisi microbiologica degli alimenti
46 - 2000 Animali, terapia dell'anima
47 - 2001 Quarantacinquesimo della Fondazione Iniziative Zooprofilattiche e Zootecniche di Brescia, 1955- 2000
48 - 2001 Atti III Convegno Nazionale di Storia della Medicina Veterinaria
49 - 2001 Tipizzare le salmonelle
50 - 2002 Atti della giornata di studio in Cardiologia Veterinaria
51 - 2002 La valutazione del benessere nella specie bovina
52 - 2003 La ipofertilità della bovina da latte
53 - 2003 Il benessere dei suini e delle bovine da latte: punti critici e valutazione in allevamento

UNIVERSITY OF MILAN
ITALY

FONDAZIONE INIZIATIVE
ZOOPROFILATTICHE E ZOOTECNICHE

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CREDITS

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Since 1955, the Foundation has been promoting, encouraging and financially supporting research and teaching initiatives in the fields of animal husbandry and animal health.

Proceedings

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PROGRAMME

TUESDAY, JUNE, 24th

08.30-12.00 **Registration and poster set up**
(poster session n. 1, from poster n.1.1 to poster n. 1.51)

14.00-19.00 **Registration and poster set up**
(poster session n. 1, from poster n.1.1 to poster n. 1.51)

9.30-17.30 **Satellite Symposium: "Horse welfare"** - Rovigo Hall

10.00-17.00 **ISAE Council meeting** - Vicenza Hall

18.30 **Welcome cocktail** - Hotel Central Hall

WEDNESDAY, JUNE, 25th

08.00-09.00 **Registration and poster set up**
(poster session n.1, from poster n.1.1 to poster n. 1.51)

09.00-09.30 **Congress opening** - Padova Hall

09.30-10.30 **Wood-Gush Memorial Lecture**
Padova Hall (chair: H.J. BLOKHUIS)
J.L. Ladewig. "Of mice and men: improved welfare through clinical ethology"

10.30-11.00 **Coffee break** (authors of odd-numbered posters stay at their posters)

11.00 **Oral sessions**

	ROVIGO HALL	PADOVA HALL
	Behavioural tests Chair: J. LADEWIG	**Free Communications** Chair: H.J. BLOKHUIS
11.00	**M. Braem**. Comparison of five selected methods for evaluating the aggressive behavior of dogs.	**F.C. Flower**, A. M. de Passillé, J. Rushen & D. M. Weary. Do alternative flooring surfaces improve dairy cow gait?
11.15	**N.J. Rooney**, S.A. Gaines & J.W.S. Bradshaw. How predictive are puppy tests?: evidence from a puppy walking programme for military search dogs.	**L. Hänninen**, P. Løvendahl, A.M. de Passillé & J. Rushen. Does relocation or flooring material affect calves`activity, or pulsatile cortisol and gh secretions?
11.30	**F. Wemelsfelder**, C. Batchelor, S. Jarvis, M. Farish & S. Calvert. The relationship between qualitative and quantitative assessments of pig behaviour.	**F.A.M. Tuyttens** & B. Sonck. The importance of straw for the health and welfare of pigs and cattle.
11.45	**S.M. Hayne** & H.W. Gonyou. Regrouping strategies based on the behavioural characteristics of pigs.	**J. Berk**, T. Hinz & S. Linke. Acceptance of elevated platforms by tom turkeys and effects on air quality.
12.00	**E. van Erp-van der Kooij**, A.H. Kuijpers, F.J.C.M. van Eerdenburg & M.J.M. Tielen. Group composition can influence coping behaviour in pigs.	**C.J. Hewson** & J.I. Wojciechowska. Is she suffering? A theoretical approach to assessing quality of life in companion animals.
12.15		**K. M. D. Rutherford**, M. J. Haskell, C. Glasbey, R. B. Jones & A. B. Lawrence. Measuring behavioural complexity using fractal analysis: implications for the assessment of welfare.

12.30-13.30 **Lunch**

13.30-14.30 **Poster session n. 1** - Hotel Central Hall

14.30 **Oral sessions**

	ROVIGO HALL	PADOVA HALL
	Human-Animal Chair: M. VERGA	**Behavioural tests** Chair: M.C. APPLEBY
14.30	**K.R. Hawkins**, J.W.S. Bradshaw & R.A. Casey. Correlating behavioural and physiological measures of stress in domestic cats in a rescue shelter.	**T.B. Rodenburg**, P. Koene & B.M. Spruijt. Effect of rearing conditions on feather pecking and reaction to frustration in laying hens.
14.45	**S.A. Gaines**, N.J. Rooney & J.W.S. Bradshaw. Physiological and behavioural responses of dogs to kennelling.	**K. Odén**, S. Gunnarsson, C. Berg & B. Algers. Male influence on fear measured by tonic immobility and vigilance behaviour in large flocks of laying hens.
15.00	**M. Minero**, M. Dassi, A. Martelli & E. Canali. Behaviour and heart rate of therapeutic riding horses interacting with patients.	**E.A.M. Bokkers**, P. Koene, T.B. Rodenburg, P.H. Zimmerman & B.M. Spruijt. The price broilers want to pay for food under different motivations.
15.15	**E. Søndergaard** & J. Ladewig. Training of young horses in relation to social environment.	**H.H. Kristensen**, N.B. Prescott, G.C. Perry, J.L. Ladewig & C.M. Wathes. Light quality and the behaviour of broiler chickens.
15.30	**M. Zetterqvist**, C.G. van Reenen, E.K. Visser, P. Hassmén, K. Morgan, M. Rundgren & H.J. Blokhuis. Assessment of co-operation between the rider and the horse: the relationship between ratings assigned by riders and those assigned by an external judge.	**V. Sandilands**, R. McGovern & C. J. Savory. Objectively measuring broiler walking style using a force plate.
15.45		**B. Huber-Eicher**. The influence of colour on nest choice in laying hens.

16.00-16.30 **Coffee break**

17.00-19.30 **Workshops**

Workshop 1	QUALITATIVE ASSESSMENT OF BEHAVIOUR	Padova Hall
Workshop 2	BEHAVIOURAL PROBLEMS IN RABBIT PRODUCTION	Vicenza Hall
Workshop 3	WELFARE OF SHELTERED DOGS	Rovigo Hall

THURSDAY, JUNE 26th

08.30-09.15 **Plenary talk** (Chair: I. DUNCAN) Padova Hall
A.M. de Passillé "Man-animal interactions: can we measure fear of people on the farm?".

09.15 **Oral sessions**

	ROVIGO HALL	PADOVA HALL
	Behavioural tests Chair: L. MUNKSGAARD	**Free Communications** Chair: J. MENCH
09.15	**L. Désiré**, A. Boissy, I. Veissier & G. Després. Novelty enhances the emotional response triggered by suddenness.	**J. Väisänen**, J. Håkansson & P. Jensen. Aggressive activity in red junglefowl (*Gallus gallus*) and white leghorn layers after re-grouping.
09.30	**B.J. Lensink**, I. Veissier & A. Boissy. The effects of weaning of suckler calves on their behaviour and stress physiology during separation.	**P. Jensen**, L. Keeling, K.Schütz, L. Andersson, S. Kerje, Ö. Carlborg & L. Jacobsson. Feather pecking in poultry – phenotypic correlations and qtl-analysis in an f2-intercross between red jungle fowl and white leghorn layers.
09.45	**C.G. van Reenen**, J.T.N. van der Werf, L.F.M. Ruis-Heutinck, R.B. Jones & H.J. Blokhuis. Responsiveness of heifer calves to behavioural tests may predict adult reactivity to machine milking.	**B.A. Forkman**. Feather -pecking and feather eating in laying hens.
10.00	**S. Raussi**, A. Boissy, E. Delval, S. Andanson & I. Veissier. Do changes of pen and penmate affect the behaviour of heifers?	**L. Koštál**, M. Sedlačková, B. Bilčik, L. Kubíková & L.J. Keeling. The effects of dopamine d_1 and d_2 agonists and antagonists on feather-pecking behaviour in laying hens.
10.15		**Y. M. van Hierden**, S. M. Korte, S. F. de Boer & J.M. Koolhaas. The role of the serotonergic system in feather pecking behaviour.

10.30-11.00 **Coffee break**
(authors of even-numbered posters stay at their posters)

11.00 **Oral sessions**

	ROVIGO HALL	PADOVA HALL
	Behavioural tests Chair: U. KNIERIM	**Free Communications** Chair: B. NIELSEN
11.00	**O.H.P. Burman** & M.T. Mendl. Can pre-experimental social experience affect the reliability of behavioural tests?	**J. Malmkvist** & S.W. Hansen. Genetic and pre- and post-natal effects on development of fearful behaviour towards humans in farm mink.
11.15	**S. Yue**, R.D. Moccia & I.J.H. Duncan. Investigating fear in domestic rainbow trout, *Oncorhynchus mykiss*, using an avoidance learning task .	**T. Rousing** & S.Waiblinger. Evaluation of on-farm methods for testing the human-animal relationship in dairy herds with cubicle loose housing systems - reliability and validity.
11.30	**H.J. Warburton** & G.J. Mason. The effect of resource cues on motivation in the mink (*Mustela vison*).	**M. Bonde**, T. Rousing & J. T. Sørensen. Human approach test for on-farm use in loose-housed pregnant sows: relation between behaviour and health.
11.45	**J. P. Garner**, C.M. Wayne, H. Würbel & J. A. Mench. Barbering (whisker trimming) in laboratory mice involves the same brain systems as compulsive behaviors in trichotillomania, autism and other obsessive-compulsive spectrum disorders.	**I.L. Andersen**, S. Berg, K.E. Bøe & S. Edwards. Effect of short-term handling on fear of humans and the consequences for maternal abilities of sows.
12.00	**K. A. Miller**, J. A. Mench & J. P. Garner. The test-retest reliability of behavioral tests: a critical evaluation based on tests of fearfulness in quail.	**G.J. Coleman**, M. McGregor, P.H. Hemsworth, J. Boyce & S. Dowling. The relationship between beliefs, attitudes and observed behaviours of abattoir personnel in the pig industry.

12.15-12.45 **Set down poster session n. 1**
Set up poster session n. 2 (from poster n. 2.1 to poster n. 2.52)

12.45 **Excursions**

FRIDAY, JUNE 27th

08.30-09.15 **Plenary talk** (Chair: E. VON BORELL) Padova Hall
J. Rushen & A. M. de Passillé "Using behavioural tests to assess the effects of housing on animal welfare: examples from cow comfort"

9.15 **Oral sessions**

	ROVIGO HALL	PADOVA HALL
	Behavioural tests Chair: J. RUSHEN	**Free Communications** Chair: E. VON BORELL
09.15	**G. Færevik**, I.L. Andersen & K.E. Bøe. Preferences of sheep for different types of pen flooring.	**S. Macrí**, G.J. Mason & H. Würbel. Effects of postnatal maternal separations on maternal care and hpa-responses to stress in rats.
09.30	**S. Sumita**, N. B. Prescott, C. M. Wathes & C. J. C. Phillips. Visual discrimination learning and critical spatial acuity in lambs.	**P.C. Schön**, B. Puppe & G. Manteuffel. Automatic monitoring of acute stress in pigs by vocalization analysis.
09.45	**S. Roussel**, C. Duvaux-Ponter, D. Montigny, P.H. Hemsworth & A. Boissy. Effect of prenatal stress or acth injection during foetal development on the response to novelty and startling stimulus of kids.	**T. M. Widowski**, Y. Yuan & J. M. Gardner. The effect of accommodating sucking and massage on the behaviour of artificially-reared piglets.
10.00	**S.M. Abeyesinghe**, S.J. Hartnell, C.J. Nicol & C.M. Wathes. Can domestic fowl show self-control?	**H.W. van der Mheen**, H.A.M. Spoolder & M.C. Kiezebrink. Stable versus dynamic group housing systems for pregnant sows and the moment of introduction.
10.15	**P. Koene**, E.A.M. Bokkers, J.E. Bolhuis, T.B. Rodenburg, E.M. Urff & P.H. Zimmerman. The open-field: test of emotionality or an approach-avoidance conflict?	

10.30-11.00 **Coffee break** (authors of odd-numbered posters stay at their posters)

11.00 **Oral sessions**

	ROVIGO HALL	PADOVA HALL
	Behavioural tests Chair: C.MEUNIER-SALAUN	**Free Communications** Chair: A. ZANELLA
11.00	**H.A. Van de Weerd**, C. Docking, J.E.L. Day & S.A. Edwards. Behaviour of pigs with different early life enrichment in a free exploration test.	**K. Hagen**, D. Lexer, R. Palme, J. Troxler & S. Waiblinger. Behaviour, heart rate and milk cortisol of simmental and brown swiss cows during milking in a robotic system compared to a herringbone parlour.
11.15	**K. Laughlin** & A.J. Zanella. Influence of weaning age on stress-induced deficits of spatial learning in pigs.	**A. Sevi**, M. Caroprese, G. Annicchiarico, M. Albenzio, L. Taibi & A. Muscio. A gradual separation from the mother induces behavioral, immune and endocrine alterations in artificially reared lambs.
11.30	**J.E. Bolhuis,** W.G.P. Schouten, J.W. Schrama & V.M. Wiegant. Relationship between aggressive behaviour at weaning and social rank of pigs with different coping characteristics.	**D. Goodwin**, H.P.B Davidson & P. Harris. Promoting sensory variety in concentrate diets for stabled horses: effects on behaviour and selection.
11.45	**C. Mülleder**, R. Palme, C. Menke & S.Waiblinger. Differences in stress reactions of beef-suckler cows with different social strategies.	**J. B. Thorne**, D. Goodwin, M. J. Kennedy, H.P.B. Davidson & P. Harris. The practicality of foraging enrichment for stabled horses and its effect on behaviour.
12.00	**S.D. McBride** & B. Wolf. Repeatability of factor analysis; a study of ovine temperament.	**G. Illmann**, Z. Smazalová, M. Špinka & J. Maletínská. Do individual differences in maternal behaviour influence the early suckling behaviour in domestic pigs?
12.15	**H.W. Erhard**, A. Boissy, M.T. Rae & S.M. Rhind. Environment and personality: effects of prenatal undernutrition on emotional reactivity in adult sheep.	**H.A.M. Spoolder**, J. de Bree, H.W. van der Mheen & M.B.M. Bracke. Not animal related but housing parameters determine an expert's intuitive welfare assessment of pig farms.

12.30-13.30 **Lunch**

13.30-14.30 **Poster session n. 2** - Hotel Central Hall

14.30 **Oral sessions**

	ROVIGO HALL	PADOVA HALL
	Free communications Chair: F. Odberg	**Free communications** Chair: H.W. Gonyou
14.30	**D.G. Pritchard**, C.H. Clarke, H.L. Dear & P.C. Honeyman. Statutory monitoring of animal welfare on UK farms and the influence of farm assurance schemes.	**A. Valros**, S. Ahlström, H. Rintala, T. Häkkinen & H. Saloniemi. Prevalence of tail biting in pigs and associations to carcass condemnations – a finnish pilot study.
14.45	**J.C. Talling**, M. Robson & J. Lane. Seasonal differences in behaviour and physiology of performing and exhibit macaws kept at a zoo open to the public.	**J. Maletínská**, B. Algers, M. Špinka, R. Šárová & K. Slámová. Sow influence on the weaning in two different housing environments.
15.00	**I.A.S. Olsson** & C.M. Sherwin. Self-administration of anxiolytic in laboratory mice in different housing conditions.	**S. Torrey** & T.M. Widowski. Effect of water drinker type on oral-nasal behaviour in early-weaned pigs.
15.15	**C.M. Sherwin.** Social context affects the motivation of laboratory mice to gain access to resources.	**J.A. de Leeuw** & A.W. Jongbloed. Some potential indicators for satiety in empty sows.
15.30	**I. Estevez** & M. Christman. Analysis of the movement and use of space by animals in confinement.	**C.M. Docking**, H.A. Van de Weerd, J.E.L. Day & S.A. Edwards. Do pigs of different ages synchronise their behaviour in enriched pens?
15.45		**G. Manteuffel**, P.C. Schön & B. Puppe. Vocalization analysis as a tool for welfare assessment in farm animals. Where are we and where do we go?

16.00-16.30 **Coffee break**
(authors of even-numbered posters stay at their posters)

16.30-18.00 **Annual General Meeting** - Padova Hall

19.00 **Cruising and banquet**

SATURDAY, JUNE 28th

08.45-09.30 **Plenary talk** (chair: R.C. Newberry) Padova Hall
J.C. Petherick "Welfare issues associated with extensive livestock production"

09.30 **Oral sessions**

	ROVIGO HALL	PADOVA HALL
	Free Communications Chair: M.T. Mendl	**Free Communications** Chair: R.C. Newberry
09.30	**H.W. Gonyou** & C.J. Bench. Effects of environmental enrichment at two phases of development on the incidence of belly nosing behaviour in early weaned pigs.	**C.B. Tucker** & D.M. Weary. Agreement and disagreement between multiple measures of dairy cattle welfare.
09.45	**D.L. Schrøder-Petersen**, H.B. Simonsen, A.K. Ersbøll & L.G. Lawson. Ontogeny of tail-in-mouth behaviour in piglets reared in barren or enriched environments.	**C. Moinard**, P. Statham, M.J. Haskell, R.B. Jones & P. R. Green. Laying-hens have difficulty jumping downward between perches.
10.00	**A.J. Zanella**, H. Hodges, & R. Palme. Glucocorticoids and their metabolites in the hippocampus of weaned and unweaned piglets.	**D. Val-Laillet** & R. Nowak. Gastric distension triggers preference for the mother in sheep.
10.15	**I. Horrell.** Is stonechewing the outdoor pig's oral stereotypy?	**M.A.W. Ruis**, P. Lenskens & E. Coenen. Welfare of Peking-ducks increases when freely accessible open water is provided.

10.30-11.00 **Coffee break**

11.00 **Oral sessions**

	ROVIGO HALL	PADOVA HALL
	Extensive Chair: J.C. PETHERICK	**Free Communications** Chair: W. R.STRICKLIN
11.00	**B.L. Nielsen**. The relationship between breast blisters and the availability and use of perches by organic broilers.	**C.R. Heleski** & A.J. Zanella. Development and implementation of a survey assessing attitudes of U.S. animal science faculty toward farm animal welfare: results from a sample group.
11.15	**M.W.P. Bestman** & J.P. Wagenaar. Farm level factors associated with feather pecking in organic laying hens.	**S. Neveux**, H. Oostra, A.M. de Passillé & J. Rushen. Validating on-farm tools for their ability to detect lameness in dairy cows.
11.30	**M. Studnitz**, J. Eriksen & K. Strudsholm. Does nose ringing make any sense?	**C. Winckler**, C.B. Tucker & D. Weary. Effects of stall availability on time budgets and agonistic interactions in dairy cattle.
11.45	**H. Vervaecke**, C. Roden, F. Schwarzenberger, R. Palme & L. Van Elsacker. A functional approach of female homosexual behaviour in american bison (*Bison bison bison*).	**B. Earley**, A.D. Fisher, D.J. Prendiville & E.G. O'Riordan. Effects of pre-journey fasting on the physiological responses of young cattle to 8-hour road transport.
12.00	**S. Mattiello,** A. Mosini, C. Movalli, G.A. Lorenzoni, L. Bartos & C. Carenzi. Preliminary observations on the behaviour of chamois (*Rupicapra rupicapra*) in disturbed and undisturbed alpine areas.	**M.S. Cockram**, E.M. Baxter, L.A. Smith, S. Bell & M.A. Mitchell. Effect of driver behaviour on the behaviour of sheep in transit.
12.15	**C. M. Dwyer** & A. B. Lawrence. Survival of the fittest: a review of the behavioural and physiological adaptations of extensively managed sheep breeds favouring lamb survival.	**J. Jansen**, Y. Yuan & A.J. Zanella. The influence of weaning age on post-mixing agonistic interactions in growing pigs.

12.30-12.45 **Closing of congress** - Padova Hall

POSTER SESSION n. 1 - June, 25th-26th - Hotel Central Hall

Poster number	AUTHORS AND TITLE
	BEHAVIOURAL TESTS
1.1	**M. Bak Jensen**, L. Tuomisto & L. J. Pedersen. Does pauses in testing affect the demand function for locomotor activity in dairy calves?
1.2	**C. L. Barber**, N. B. Prescott, C. M. Wathes, M. Potter & G. C. Perry. The spectral sensitivity of domestic turkeys and ducks determined by a behavioural test.
1.3	**M-F. Bouissou.** Is fear of a potential predator (dog) "innate" in sheep?
1.4	**M. Budzynska**, M. Sapula, J. Kamieniak, L. Soltys. Memorisation ability of Holstein horses in maze test considering their reactivity to optic stimulus.
1.5	**H. Chaloupková**, G. Illmann & M. Špinka. Effect of housing systems of lactating sows on the piglets' behaviour during behavioural tests.
1.6	**J.W. Christensen** & B.L. Nielsen. Enrichment affects behaviour in young ostrich chicks.
1.7	**S. Cloutier** & R.C. Newberry. Worm running behaviour in domestic fowl.
1.8	**M.D. Cooper,** C.J.C. Phillips & D.R. Arney. The motivation of high and low yielding dairy cows for supplementary concentrate feed.
1.9	**L. Coutellier** & M.C. Meunier-Salaün. Emotional reactivity to sudden and novel events in pigs submitted to repeated social regrouping during the growing-finishing period.
1.10	**E. Creighton**. Matching horses for courses: development of robust tests of equine temperament to address equine welfare.
1.11	**G. De Rosa,** F. Napolitano, F. Grasso, A. Bordi & F. Wemelsfelder. The qualitative assessment of water buffalo (*Bubalus bubalis*) behaviour.
1.12	**C. Diederich** & J.M. Giffroy. What is behavioural testing in dogs ? A bibliographic review.
1.13	**K.R. Elliker** & D.M. Broom. Social anxiety and transfer of information in sheep.
1.14	**E. Fàbrega-Romans**, J.Font, D. Carrión, A. Diestre & X. Manteca. Differences in open field behaviour between gilts of two genotypes segregating at the halothane (ryr1) locus.
1.15	**T. Fuchs,** S. Gebhardt-Henrich, C. Gaillard. The validity and reproducibility of a behavior test in German Shepherd dogs.
1.16	**S. Gunnarsson**, A. Högberg, M. Neil, J. Pickova, A. Wichman, I. Wigren, K. Uvnäs-Moberg & L. Rydhmer. Effects of polyunsaturated fatty acid content in sow feed on the behavioural development of piglets.
1.17	**J. Kamieniak**, M. Budzynski, M. Sapula, M. Budzynska. Characteristics of equine colour perception.
1.18	**L. Lansade**, M-F Bouissou, G. Le Pape. Caracterisation of temperament in young horses.
1.19	**S. Ligout** & R.H. Porter. Social discrimination among lambs: a comparison of two behavioural tests.

1.20	**C. Lindqvist** & P. Jensen. Contrafreeloading decreases with age and social isolation in red jungle fowl and white leghorn layers.
1.21	**M.A. McLeman**, M. Mendl, R.B. Jones & C.M.Wathes. Individual discrimination of conspecifics by juvenile domestic pigs (*Sus scrofa*).
1.22	**A.J. Rook**, J.E. Cook, R.A. Champion, K.L. Young & S.M.Rutter. Use of an operant method to study preference for perennial ryegrass or white clover by sheep.
1.23	**A. Silveira de Souza** & A.J. Zanella. A novel approach to testing social recognition in pigs and the modulating effects of relocation.
1.24	**I. Stěhulová**, L. Lidfors & M. Špinka. Response of dairy cows to separation from calves: effects of calves' age and visual/auditory contact.
1.25	**W. Sung**, J.W. Weeks & G. Heusner. The effect of clicker training on the latency to approach novel objects in young horses (*Equus caballus*).
1.26	**N.R. Taylor,** G. Perry, M. Potter, N.B. Prescott & C.M. Wathes. Preference of pigs for illuminance.
1.27	**J.E. van der Harst**, J.M. Baars & B.M. Spruijt. Standard housing for rats is stressful as shown by enhanced sensitivity to rewards
1.28	**J.W. Weeks**, W. Sung & G. Heusner. Effectiveness of clicker-training on teaching trailer loading to weanling horses.
1.29	**K. Yayou**, S. Ito & M. Nakamura. The response of calves to isolation in familiar surrounding.
1.30	**P.H. Zimmerman** & C.J. Nicol. A test of social recognition in the domestic laying hen.

EXTENSIVE	
1.31	**S.B. Atwood**, F.D. Provenza, J.J. Villalba & R.D. Wiedmeier. Dietary variety and animal welfare: enhancing performance in production agriculture.
1.32	**Y. Eguchi**, K. Nagata, K. Uetake & T. Tanaka. How japanese wild boars overcome obstacles to obtain food.
1.33	**M. Kawai,** Y. Masuda, N. Yabu, S. Kuzuoka, C. Yayota, K. Deguchi & S. Matsuoka. Voluntary intake and grazing behavior of Hokkaido native horses and thoroughbred on improved pasture.
1.34	**U. Knierim**. Can the provision of temporarily accessible extra areas improve animal welfare in broilers?
1.35	**C. Roden**, H. Vervaecke & L. Van Elsacker. Homosexual interactions in male american bison (*Bison bison bison*) under semi-natural conditions.
1.36	**Z. Smazalová**, G. Illmann & M. Špinka. Benefits and costs of allo-suckling in piglets.
1.37	**K. Takeda,** R. Imai, T. Shibuya & K. Matsui. Affiliative group size in grazing dairy cows.
1.38	**G. Trei**, M. Höfner, B. Hörning & D.W. Fölsch. Use of outdoor run by laying hens: effect of cocks and of vegetation.
1.39	**B. Wechsler**, M. Zähner, R. Hauser, W. Langhans & L. Schrader. Assessment of the welfare of dairy cows kept in open buildings.
1.40	**T.L. Zharkikh.** Play ethogram and the onset of play behaviour in Przewalski horses at Askania Nova Reserve.

	HUMAN-ANIMAL
1.41	**G. Fallani**, P. Valsecchi, E. Prato Previde. Owner-dog interactions after a short separation: an observational study
1.42	**A. Gazzano**, E. Granatelli, A. Mariani, C. Villani, M. Ducci, C. Sighieri & G. Guidi. Survey of today's human-dog relationship in Tuscany and correlated canine behavioural problems.
1.43	**Y. Koba**, A. Miura & H.Tanida. Interactions between Japanese primary school children and animals kept as aids for teaching social responsibility.
1.44	**R.A. Ledger.** Aggressive behaviour in dog breeds re-homed from rescue shelters.
1.45	**N. Mascoli**, E. Prato Previde & M.Verga. "Cat lovers" : a questionnaire study in Milan, Italy.
1.46	**J.L. Panamá Arias** & M. Špinka. Influence of personality traits on performance of the dairy herd.
1.47	**B. Schrickel**, M. Doherr & A. Steiger. Evaluation of practical and future keeping of small domestic animals in swiss pet shops.
1.48	**C. Stefanini**, S. Normando, L. Meers, S. Adamelli & G. Bono. A temporary adoption program for sheltered dogs: effects on the possibility of successfully re-homing dogs and their welfare.
1.49	**J. M. Stephen** & R. A. Ledger. Owners are reliable observers of their own dog's behaviour.
1.50	**C. Volpini**, D. Tarricone, M. Lebboroni & G. Chelazzi. Development of techniques for successfully managing urban cats colonies: an ongoing case study in Florence, Italy.
1.51	**R. Zanella**, C. Heleski & A.J. Zanella. Assessment of the Michigan State University Equine Welfare Intervention Strategy (MSU-©Eqwis-Action) using Brazilian draught horses as a case study.

POSTER SESSION n. 2 - June, 27th-28th - Hotel Central Hall

Poster number	AUTHORS AND TITLE
	FREE
2.1	**M.C. Appleby**. What causes crowding? Modelling behaviour at high stocking density.
2.2	**L. Bergamasco**, E. Macchi, C. Facello, G. Re, P. Badino, R. Odore, S. Pagliasso, C. Bellino & M.C. Osella. Separation distress in neonatal goats: analysis of quantitative electroencephalography and biochemical peripheral markers.
2.3	**D. Bizeray**, P. Constantin, J.M. Faure & C. Leterrier. Relation between the typology of activity bouts and the first events in the bouts in broiler chickens**.**
2.4	**L. Botto**, V. Brestensky, P. Kisac & S. Mihina. Behaviour of sows and piglets in different types of farrowing pen.
2.5	**L.A. Boyle** & S. Llamas Moya. Effect of covering slatted floors with mats on the behaviour and welfare of loose housed sows at mixing.
2.6	**M. Bulheller**, P. Modler, G. Weissengruber, G. Forstenpointner & U. Knierim. First steps in the evaluation of fluctuating asymmetry (fa) as a potential animal welfare indicator: reliability testing.
2.7	**J.L. Christie**, C.J. Hewson, C.R. Riley, I.R. Dohoo, M.A. McNiven & L.A. Bate. Factors affecting the welfare of non-racing horses in prince edward island, Canada.
2.8	**V. Colson,** V. Courboulay, S. Dantec & P. Orgeur. Agonistic behaviour of piglets reduced by single-sex grouping at weaning.
2.9	**E. Cottin** & J. Berk. Usage frequency und activity of male turkeys from six strains in an enriched environment.
2.10	**A.M. de Passillé** & J. Rushen. Cross-sucking before and after weaning by calves fed with a computerized milk feeding system.
2.11	**G. Dixon**, L.E. Green & C.J.Nicol. The effect of diet change on the behaviour of chicks.
2.12	**E. Fazio**, P. Medica, D. Alberghina, S. Cavalieri & A. Ferlazzo. Effects of short and long distance road transport on plasma B-endorphin of limousin calves.
2.13	**K. Fuhrer** & S. Matthes. Raising ostriches in Germany – mortality of ostrich chicks on four farms throughout one year.
2.14	**S. G. Gebhardt-Henrich**, E. M. Vonlanthen & A. Steiger. Is the running wheel beneficial or harmful for golden hamsters kept as pets?
2.15	**F. Gottardo**, G. Cozzi & I. Andrighetto. On-farm assessment of beef cattle welfare for certification purpose.
2.16	**E. Hillmann**, C. Mayer & L. Schrader. Which temperatures do pigs in different weight classes need in the lying area?
2.17	**B. Hörning** & C. Krämer. Behaviour of dairy cows in the lying area of three loose housing systems.

2.18	**I.D. Ivanov** & M.K. Djorbineva. Shearing effect on welfare and milk yield at machine milking of dairy sheep with different temperament.
2.19	**N.M. Keil**, U. Zwicky & L. Schrader. Environmental complexity influences exploratory behaviour and intersucking in group-housed dairy calves.
2.20	**P. Keller**, S.G. Gebhardt-Henrich & A. Steiger. How does the housing condition influence morphological, ethological and physiological parameters of budgerigars (*Melopsittacus undulatus*)?
2.21	**J. B. Kjaer**. Rearing pheasant chickens under various stocking densities and group sizes: which is better in reducing feather pecking?
2.22	**S. Kondo**, Y.Shingu, Y.Nishimichi & H.Nakatsuji. Eating and moving behavior of grazing cows on feeding station for different pasture-conditions and grazing-systems.
2.23	**G. Kranendonk**, C.G. van Reenen, M. Fillerup, L. Meijerink, M.A.M. Taverne & H. Hopster. Effect of increased plasma cortisol concentrations in pregnant sows on body weight and behaviour of their piglets.
2.24	**M. Laitat**, M. Vandenheede, A. Désiron, B. Canart & B. Nicks. Feeding behaviour of weaned pigs fed either pellets or meal: effects of the number of animals per feeding place.
2.25	**E. Lepron**, S. Robert, L. Faucitano , C. Pomar, J.F. Bernier & R. Bergeron. Effect of genetic line on activity and ease of handling of growing pigs.
2.26	**E. Lewis**, L.A. Boyle, P.B. Lynch, P. Brophy & J.V. O' Doherty. The effect of providing manipulable substrates to piglets in the farrowing crate on their welfare and that of their dam.
2.27	**D. Lexer,** K. Hagen, J. Troxler & S. Waiblinger. Social interactions of dairy cows in a robotic milking system compared to cows milked in a herringbone parlour.
2.28	**P. Medica**, E. Fazio, V. Aronica, G. Calabrò & A. Ferlazzo. Effects of transport stress on circulating B-endorphin, acth and cortisol levels of donkeys.
2.29	**C.M. Mejdell** & K.E. Bøe. The use of shelter by horses kept outdoors under nordic winter conditions.
2.30	**F. Mondelli**, P.A. Schiml-Webb, M.B. Hennessy, V.L. Voith, F. Linden & G.M. Davenport. The use of saliva sampling as a stress assessment method in sheltered dogs.
2.31	**J. R. Morris**. The effect of an innovative farrowing crate device on piglet survival.
2.32	**L. Munksgaard**, M.S. Herskin & P. Løvendahl. Reactivity of the hypothalamo-pituitary-adrenal-axis in dairy cows – effects of frequency of milking and energy level in the feed ration.
2.33	**L. Niel**, D.M. Weary, D. Fraser & J. Love. Mice and rats show different behavioural responses to carbon dioxide euthanasia.
2.34	**S.S.C. Nogueira** & S.L.G. Nogueira-Filho. Comparative enclosure facilities used by wild and captivity-born capybaras.
2.35	**S.L.G. Nogueira-Filho** & S.S.C. Nogueira. The social organization of peccaries (mammalia, *tayassuidae*) in captivity.
2.36	**P. Orgeur,** V. Rigaud & J. Le Dividich. Liquid feeding to improve welfare and performance of piglets at weaning.

2.37	**M.C. Osella,** R. Odore, A. D'Angelo, S. Pagliasso, P. Badino, L. Bergamasco, B. Cuniberti & G. Re. Large animal and welfare: physiological markers of transportation stress in calves.
2.38	**F.A. Rossi**, L. Di Gennaro & S. Mattiello. Cognitive disfunction in elderly dogs.
2.39	**L.F.M. Ruis-Heutinck**, M.C.J. Smits, A.C. Smits & J.J. Heeres-van der Tol. Lying-down behaviour of beef bulls in different group-housing systems.
2.40	**H. Schulze Westerath**, S. Gutermann & C. Mayer. Lying behaviour of breeding bulls kept in cubicle housing systems and pens with a straw-bedded lying area.
2.41	**T. Seo**, T.S Samarakone, T. Miyata & F. Kashiwamura. Elimination behaviour of dairy cows in deep-bedded barns.
2.42	**S.J. Shields**, J.P. Garner & J.A. Mench. A comparison of broiler chicken behavior on two different bedding types.
2.43	**Y. Shingu**, S. Kondo, A. Kitagaki, K. Umemura, H. Hata & M. Okubo. Cattle grazing behavior in feeding patches on bamboo- grass pastures of different nutritional quality.
2.44	**E. Suárez**, A. Orihuela & R. Vázquez. Effect of restricting suckling on the social bond between ewes and their 10-week-old lambs.
2.45	**T. Tanaka**, T. Anzo, M. Shimoya, K. Uetake & A. Takahashi. Behavioural characteristics of the dystrophic dogs as animal model for muscular dystrophy.
2.46	**H. Tanida**, Y. Fujita & Y. Koba. Behaviour oj Japanese wild boars on Kamagari island of the inland sea of Japan.
2.47	**K. Taylor**, D.S. Mills & N.T. Longford. A field trial to evaluate the efficacy of a bitless bridle in alleviating headshaking syndrome in the horse.
2.48	**M.V. Tosi,** S. Mattiello, M. Pavan, E. Canali, V. Ferrante & C. Carenzi. The development of a ranking system for commercial dairy farms.
2.49	**C.A. Tsourgiannis**, V. Demečková, J. Eddison & P.H. Brooks. Effect of dietary salt (NaCl) level on biting by liquid fed growing-finishing pigs.
2.50	**M. Uhrincat**, S. Mihina, P. Kisac, V. Tancin & J. Broucek. Different rearing of dairy heifers and their postpartum behaviour.
2.51	**K.S. van Driel** & J.C. Talling. Comparisons between wild and laboratory rats.
2.52	**M. Vandenheede** & D. Halloy. Influence of social and non-social environmental enrichment on the behaviour of caged rabbits.

DAVID WOOD-GUSH
MEMORIAL LECTURE

OF MICE AND MEN: IMPROVED WELFARE THROUGH CLINICAL ETHOLOGY

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Health is characterized by the absence of disease, just like welfare is characterized by the absence of behavior problems. Consequently, just like treatment and prevention of disease improves health, treatment and prevention of behavior problems improves welfare. The purpose of developing a discipline termed 'clinical ethology' is to apply the same procedures and principles used in medicine to the area of ethology. Briefly, these procedures consist of searching for specific symptoms of a disease, partly through a clinical examination and partly by conducting specific diagnostic tests, the results of which point to a specific diagnosis. Based on the diagnosis, suggestions for a treatment as well as preventive measures are given.

Application of clinical procedures to the treatment and prevention of behavior problems reveals some areas that need improvement. One such area concerns the diagnostic process, i.e. the search for specific symptoms through behavior observations and behavior tests. Another area concerns the treatment of behavior problems, something that primarily is done in companion animals and horses. A third area concerns the prevention of behavior problems, an area that despite much attention still needs refinement.

Since many behavior problems are related to the way people house and handle domestic animals, possibly the most important aspect of clinical ethology is its focus on the man-animal interaction, to subject this interaction to systematic investigation and to include it both in the diagnostic, the therapeutic, and the preventive part of the clinical process.

Developing a discipline 'clinical ethology' could (I) improve the welfare of domestic animals in a way that is perceived by animal owners as a professional help based on scientific knowledge; (II) stimulate ongoing research by emphasizing the therapeutic and preventive aspects of solving behavior problems in farm and companion animals; and (III) create new jobs for 'behavior practitioners'.

PLENARY TALKS

MAN-ANIMAL INTERACTIONS: CAN WE MEASURE FEAR OF PEOPLE ON THE FARM

A. M. DE PASSILLÉ

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It is now widely recognised that the way we treat animals can lead to a comfortable or a fearful relationship with the handler. We know more about which human behaviours are aversive to animals but little about the ones that are pleasant. We know how to make animals *tamer* and that this improves handling and care. Research has shown how fear of humans can lead to production losses in fearful animals. Animals have been shown to be able to differentiate between handlers and recognise the feared ones. Consequently it is accepted that animal handling can lead to good or bad welfare. Since the way animals are handled is of great concern to the consumer, there is pressure to examine the situation on farms. There has been a lot of interest in developing on farm tests to evaluate the level of fear that animals have developed towards people. It is hoped that such tests could be done rapidly and be interpreted simply to give us a measure of the welfare of the herd/flock on individual farms. In this presentation a critical review of some of the scientific data demonstrating why animals become fearful of handlers will be presented. On farm assessment methods will be discussed to identify interpretation and validity issues in the hope that these ideas can help us develop better tools for on farm assessment of animals' fear of people as well as the quality of stockmanship with regards to animal handling.

USING BEHAVIOURAL TESTS TO ASSESS THE EFFECTS OF HOUSING ON ANIMAL WELFARE: EXAMPLES FROM COW COMFORT

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Behavioural tests can allow a greater experimental control over variables and greater precision of measurements. However, a disadvantage is that we cannot assume that the results can be generalized to real situations. I discuss these issues referring to the work that has assessed the comfort of dairy cows, specifically the design of stalls and walking surfaces. Dairy cows increasingly stand and walk on concrete but their hooves were adapted to softer pasture and lameness is more common among cows standing on concrete. We examined if cows prefer to stand on softer floors by individually housing Holstein cows (n=23) in special pens for 14d. Half the cows had Animats (soft, high traction rubber) in front of the feeder, while the other half had concrete. After 14d, treatments were reversed. We observed the cows for 3X24h-periods (d8, d11, d14), noting position in the pen and whether standing or lying. Repeated-measures GLM showed that, with Animats in front of the feeders, cows stood near the feeder for longer (5.5h vs 4.8h SE=0.25h $p<.05$) and spent less time standing in stalls (2.2h vs 4.9h SE=0.62h; $p<0.05$). We examined whether cows walk faster and more securely on softer floors with better traction. Holstein cows (n=16) were filmed walking down specially-constructed corridors that had either concrete floors or Animats, and which allowed precise assessment of walking times. Walking speed was 7% higher and cows slipped less often (27%) on Animat ($p<0.05$). We separately examined the effects of traction and softness. Increasing floor traction by adding a high traction mat increased mean stride length by 3.5% ($p<0.05$) and tended ($p<0.10$) to increase walking speed by 6%, especially speed crossing a gutter ($p<0.05$). Increasing the floor softness (by adding PastureMat under the high traction mat) increased walking speed by 11% ($p<0.05$). Cows prefer to stand on softer floors and cows may stand in their stalls because it is uncomfortable to stand anywhere else. Cows= locomotion is improved by increasing both softness and the traction of flooring. Our understanding of cow comfort has similarly benefited from small-scale behavioural tests that have examined stall dimensions and stall flooring

WELFARE ISSUES ASSOCIATED WITH EXTENSIVE LIVESTOCK PRODUCTION

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This paper focuses on the welfare issues associated with beef cattle production in northern Australia, but the welfare principles and issues are similar in other extensive grazing livestock production systems throughout the world. As in any animal production system, good stockmanship is the key to minimising animal welfare problems. The use of animals that are 'adapted' to the environment, and are, thus, more tolerant to the climate, parasites and diseases further reduces welfare issues. Furthermore, behavioural restriction, and any adverse consequences of it for welfare, rarely occurs.

Seasonal effects on pasture can result in cycles of nutrient shortages and deprivations that can adversely affect welfare through excessive liveweight loss and specific disease/health problems. Supplementary feeding minimises such issues. Thermal stress is, generally, not a problem for adapted animals, but welfare can be jeopardised during mustering, handling and transportation. Problems can be minimising by moving animals at times of low thermal stress, selecting appropriate stocking densities and providing protection from climatic extremes.

Distance exacerbates welfare problems because animals may be inspected infrequently, and sick or injured animals cannot be treated or euthanased promptly. Mustering and handling are generally conducted once or twice yearly, which means that animals have limited exposure to humans and, for young animals in particular, the first experience of handling is often associated with 'surgical' procedures. Also, these surgical procedures may be performed on animals older than the optimal age, with wounds being larger on older animals. The use of watering and supplementation yards and devices for "self-mustering and sorting" associated with these yards have the potential to provide greater flexibility in the frequency of handling animals, and the timing of weaning and 'surgical' procedures. Providing young animals with positive experiences of humans (eg through yarding and hand-feeding weaners) may further enhance welfare.

ORAL PRESENTATIONS

ABSTRACT WITHDRAWN

COMPARISON OF FIVE SELECTED METHODS FOR EVALUATING THE AGGRESSIVE BEHAVIOR OF DOGS

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Introduction: This paper presents the results of a comparison of the aggressive behavior of 60 dogs evaluated by five selected methods.
Materials, Methods: Eight criteria related to aggression in dogs (including intraspecific aggression, interspecific aggression and attachment to owner) were defined. Sixty dogs were tested in three behavioral tests currently used in Switzerland. Additionally, a veterinary behaviorist and an ethologist evaluated 12 of these 60 dogs.
The results were compared descriptively and with a kappa test in the categories "aggressive behavior", "relationship dog – owner", "test passed" and "measures recommended (to the dog/owner)". Using the Fisher's exact test in the program NCSS, a possible correlation of certain criteria within the tests (e.g. the influence of the expert on the results) was analyzed.
Results: Within the three tests, a significant agreement was found for the criteria "intraspecific aggression" (Kappa = 0.1334, p = 0.0143) and "interspecific aggression" (Kappa = 0.1351, p = 0. 0140). The veterinary behaviorist consistently evaluated the dogs higher in the aggression scale than did the tests. (No statistical test was possible for this comparison). Several significant intra-test correlations were found with the Fisher's exact test, e.g. of the categories "expert" and "hierarchy" (p = 0.0037) , "attachment" (p = 0.0114) and "measures" (p = 0.0003) in one test, or of the categories "interspecific aggression" and "measures" (p = 0.0351) in another test.
Discussion and Conclusion: The agreement of the three tests in the criteria "intraspecific aggression" and "interspecific aggression" is an important fact for public security. The difference between the results of the tests and of the evaluations of the veterinary behaviorist and ethologist suggest a closer look be made at possible "false negatives" which might pose a "latent danger" for the public.

HOW PREDICTIVE ARE PUPPY TESTS?: EVIDENCE FROM A PUPPY WALKING PROGRAMME FOR MILITARY SEARCH DOGS

N.J. Rooney[1], S.A. Gaines[2], J.W.S. Bradshaw[1]

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Given the rising demand for search dogs, and the substantial cost of training, it would be beneficial if working ability could be predicted as early as possible. We present a study examining the validity of a "puppy test" for dogs intended for specialist search work.

Subjects were two male siblings from each of sixteen litters of Labrador retrievers. Their behaviour was assessed at the age of eight weeks using a novel temperament test, comprising 13 sub-tests, including those aimed at measuring olfactory ability, playfulness and fear of novel experiences from which 31 behavioural measures were taken.

All puppies were then «puppy-walked» in separate households, for nine months. Each litter was allocated to one of four treatment groups, all combinations of; a single- or multi-dog household, and, raised as a house dog or introduced to kennelling via a gradual habituation protocol.

At 11 months of age, 31 of these dogs underwent a second temperament test, examining the same aspects of behaviour as at eight weeks. The two tests were compared by analysis of covariance, correcting for any effect of treatment. Although there was substantial variability between individual dogs, only one of the 61 covariances performed between tests at 8 weeks and 11 months was significant at $P<0.05$ (Bonferroni-corrected), and this was in the opposite direction to prediction.

In order to test for the effects of rearing conditions, the adult test scores were combined to form eleven scales. "Confidence", "Independence", and "Toy Interest" were significantly higher in dogs from households with no other dog. "Activity" was significantly lower in dogs kennelled outdoors. We conclude that, at least in this breed, rearing conditions during the first year of life affect subsequent behaviour, but that puppy tests are unlikely to be useful predictors of adult behaviour.

THE RELATIONSHIP BETWEEN QUALITATIVE AND QUANTITATIVE ASSESSMENTS OF PIG BEHAVIOUR

F. Wemelsfelder[1], C. Batchelor[2], S. Jarvis[1], M. Farish[1], S. Calvert[1]

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Qualitative ('whole animal') assessment is based upon the integration by observers of perceived details of how animals behave, using descriptors such as 'calm', 'anxious' or 'tense'. Such terms have an experiential connotation relevant to welfare, and could potentially facilitate the interpretation of quantitative behaviour measurements. Previous experimental work, using a Free-Choice-Profiling (FCP) methodology that leaves observers free to develop their own terminology, has demonstrated qualitative assessments of pig behaviour to show high inter- and intra-observer reliability, and to be unaffected by the surroundings in which animals were observed. The present study's aim was to investigate the relationship of such assessments with conventional quantitative measurements of pig behaviour. 48 female 12-week old Large WhitexLandrace pigs were housed in litter groups in straw-bedded pens. Following training each pig was let singly into a 4x4m straw-bedded test pen, where it could interact for 4 minutes with an unfamiliar human. The interaction of each pig was filmed, resulting in 48 video clips, and 12 experienced animal behaviour observers were instructed to provide FCP-assessment of these clips. Data were analysed using Generalized Procrustes Analysis. The results showed significant agreement between observers ($p<0.001$) and good distribution of individual pig scores along the 2 main expressive dimensions of the consensus profile. The same 48 clips were analysed quantitatively using a detailed ethogram of the pigs' behaviour. Using Principal Component Analysis (PCA) 2 main dimensions of behaviour were distinguished, also showing good distribution of individual pig scores. There was a significant Pearson correlation between pig scores on qualitative and quantitative dimensions of behaviour (r ranging from 0.61-0.87; $n=48$, $p<0.001$), while combined PCA analysis of qualitative and quantitative data indicated a strong and meaningful coherence between these dimensions. In light of these results the benefits of a combined qualitative/quantitative approach to the study of animal welfare will be discussed.

REGROUPING STRATEGIES BASED ON THE BEHAVIOURAL CHARACTERISTICS OF PIGS

S.M. HAYNE[1,2], H.W. GONYOU[1]

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The vigorous fighting that occurs when unfamiliar pigs are grouped together is a welfare concern. We studied the concept of pre-forming a stable hierarchy based on behavioural characteristics. We used a novel arena test (NAT) to initially distinguish among individuals, such that we could form groups based on behavioural uniformity or diversity. While housed with littermates in the nursery, 240 pigs were individually tested in two NAT and classified as either being fast (1/3), medium (1/3) or slow (1/3) to approach a novel person. At 8 weeks old, upon their move into grow-finish, the pigs were sorted into either a Uniform Slow (US), Uniform Fast (UF) or Diverse (D) group of 12 (consisting of all slow; all fast; or slow, medium and fast pigs, respectively). The proportion of familiar dyads did not exceed 10% within each treatment. Intact litters (IL) served as the control. Each treatment was replicated four times. Aggression was recorded for three hours following regrouping. The pigs were re-tested twice and weighed while in grow-finish. A factor analysis indicated that pigs have consistent responses in the NAT over time. An analysis of variance indicated that there was less fighting per pig ($P<0.05$) in the IL compared to D, US and UF (0.5 versus 3.6, 4.4 and 4.5, respectively). Pigs in the IL grew faster ($P<0.1$) than the UF (863 and 805 g/pig/day, respectively). The D and US were intermediate in growth rate (835 and 816 g/pig/day, respectively). These results suggest that the NAT distinguishes pigs based on a personality trait, as their responses were consistent over time. Behaviourally uniform groups tended to result in more aggression, which may have caused the reduction in weight gain. This suggests that initially, uniformity results in a less stable hierarchy. Behavioural diversity may be more advantageous if regrouping is necessary.

GROUP COMPOSITION CAN INFLUENCE COPING BEHAVIOUR IN PIGS

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This study aimed to determine if coping behaviour in pigs is a stable individual characteristic, or might be influenced by the social environment. Individual variation in coping behaviour can be measured with the backtest, where a piglet is put on its back and the escape attempts are counted during one minute. The population's extremes can be defined as 'active' and 'reactive'.
To determine the effect of group composition on backtest responses, 814 pigs were backtested at 3, 10 and 17 days of age. After the first backtest, groups of 10 piglets with a sow were formed by cross-fostering some of the piglets, groups being HR (animals with backtest results>3), LR (backtest results<3), MISC (high, intermediate and low responses) and OR (original litters, no cross-fostering) as controls. Pearson correlation coefficients with confidence intervals were calculated for individual Bt results, and correlations were compared between groups using a general linear model (PROC GLM, SAS), the piglet being the experimental unit and correcting for pen(group).
Mean backtest results on day 3, 10 and 17 were 3.26 ± 0.06, 2.76 ± 0.06 and 2.97 ± 0.07, and per group 4.74 ± 0.24 (HR), 3.07 ± 0.18 (MISC), 1.52 ± 0.25 (LR) and 3.53 ± 0.24 (OR). Mean backtest responses decreased after cross-fostering in HR groups and increased in LR groups, and individual backtest responses before and after cross-fostering were not correlated (HR: r=0.08, P=0.26; LR: r=0.06, P=0.40). In MISC and OR groups, backtest scores before and after cross-fostering were correlated (MISC: r=0.23, P<0.0001; OR: r=0.25, P<0.001). In all groups, Bt results between d10 and d17 were correlated (r≥025, P<0.001)
We conclude that backtest behaviour changed before d10 according to the (extreme) social environment. This could be intentional, because varied groups might be beneficial, or social stress might have caused HPA function to change.

DO ALTERNATIVE FLOORING SURFACES IMPROVE DAIRY COW GAIT?

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A variety of flooring surfaces are used on dairy farms, but little is known about their impact on cow gait. We examined the walking behaviour of thirty-five Holstein dairy cows on two flooring surfaces: concrete and a three-layer composite surface (felt, rubber sponge and a ridged rubber surface), which was softer and provided better traction than the concrete. Each cow was assigned an overall gait score by a single observer who reviewed video recordings from posterior and lateral views. The score was based on a five-point numerical scale, where 1 represented a sound animal and 5 represented a severely lame animal. Seven gait-associated behaviours were recorded using visual analogue scales: abduction-adduction, spinal arch, head-bob, tracking up, joint flexion, asymmetric steps and reluctance to bear weight. Scores for the two surfaces were compared within cows using a paired t-test. Mean (± least-square s.e.m.) gait scores were higher on concrete than on the composite surface (2.73 vs. 2.47 ± 0.04; $t_{33} = 4.25$, $P < 0.001$). Cows walking on the composite surface showed less abduction-adduction (1.04 vs. 0.85 ± 0.06; $t_{33} = 2.19$, $P < 0.05$), better tracking up (0.93 vs. 0.64 ± 0.05; $t_{33} = 3.78$, $P < 0.001$), improved joint flexion (1.34 vs. 1.10 ± 0.06, $t_{33} = 2.74$, $P < 0.01$), more symmetric gait (1.51 vs. 1.08 ± 0.08, $t_{33} = 3.99$, $P < 0.001$) and bore weight more evenly (0.66 vs. 0.45 ± 0.06, $t_{33} = 2.35$, $P < 0.05$) compared to concrete. In conclusion, the gait of dairy cows is affected by flooring surface, with softer and more slip-resistant flooring reducing various measures of gait abnormality.

DOES RELOCATION OR FLOORING MATERIAL AFFECT CALVES' ACTIVITY, OR PULSATILE CORTISOL AND GH SECRETIONS?

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Measures of physiological signs of stress have focussed on the hypothalamo-adreno-corticol axis (HPA) but other endocrine systems e.g. growth hormone (GH) also respond to stress. However, the optimum way of measuring stress-induced change is not known: cortisol and growth hormone (GH) both have pulsatile secretion patterns, with circadian variations related to sleep. To study how two potential stressors for cattle (hard floor or relocation to a new room) affect calves` pulsatile GH and cortisol secretion and behavioural activity, we housed 24 calves individually for two months: 12 on concrete (CONCRETE) and 12 on rubber mats (MAT). Jugular blood samples were taken through indwelling catheters and 6 calves per treatment were filmed continuously during a 24 hr baseline and for 24 hr following relocation. Pulses in plasma concentrations of cortisol and GH were detected and described in terms of number and amplitude. Plasma concentrations and pulse variables were analyzed with a repeated measures split-splot mixed model. Treatment effects on bout lengths, total durations and frequencies of resting on brisket, on side or standing were tested with the t- and Mann-Whitney U- tests.

Distinct pulses and circadian variation were detected in both cortisol and GH concentrations. CONCRETE calves had higher mean cortisol concentration (especially at night time) and GH pulses than MAT calves ($p<0.05$ for both). A significant interaction between the time of the day and relocation was found for GH and cortisol concentrations ($p<0.0001$ for both): The episodic secretory patterns of GH and cortisol were more reactive after the relocation. Relocation or flooring did not affect measured behaviours.

We concluded that hard concrete might have stimulated calves`s HPA-axis, which in turn may have stimulated the higher GH pulses. Relocation had an effect on calves` episodic secretory patterns. More detailed registering of sleeping behaviour is needed for detecting differences between treatments.

THE IMPORTANCE OF STRAW FOR THE HEALTH AND WELFARE OF PIGS AND CATTLE

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The provision of straw in animal production systems is widely presumed to be beneficial for the welfare of the animals. The aim of this study is to review the scientific basis of this assumption for pigs and cattle.
It is concluded that straw has a multitude of mainly positive effects on the welfare of pigs. Bedding improves the physical comfort of the floor, and - unless temperatures are high - also the thermal comfort as it enables pigs to somewhat control their microclimate. If the environmental temperature is comfortable straw has mainly a recreational function as a stimulus and outlet for exploration, foraging, rooting and chewing behaviours. Feed-restricted and barren-housed pigs in particular can be strongly motivated to express these behaviours and the inability to do so may cause behavioural problems and anomalies. In addition, it has been demonstrated that sows have a strong need for nesting material just before partum and that straw appears to have a beneficial effect on maternal behaviour after farrowing. Although there may be superior alternative substrates for each of these functions of straw separately, it remains unlikely that these alternatives can adequately replace the total combination of these functions without negatively affecting aspects related to hygiene, environment, labour and economics.
The importance of straw for the welfare of cattle mainly concerns floor-comfort. However, it appears that the provisioning of high quality lying mats, perhaps in combination with soft slatted floors, may provide equal floor-comfort. The recreational function of straw is much less for cattle compared to pigs. Moreover, it should be possible to compose more appropriate roughage-feeds that better fulfil the recreational as well as the dietary needs of cattle.

ACCEPTANCE OF ELEVATED PLATFORMS BY TOM TURKEYS AND EFFECTS ON AIR QUALITY

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Most conventional turkey houses are characterized by a lack of structures. However, environmental enrichment such as elevated platforms inside the compartments or outdoor areas is suggested to improve turkey welfare by enhancing their locomotor activity. On the other hand, such an environmental enrichment may reduce the air quality.
Therefore we evaluated the effects of elevated platforms for perching on the behaviour of turkeys with consideration of the air quality as a health and welfare factor for both the birds and humans.
Two experiments were performed to test the utilisation of the elevated platforms (3.5m?) at two stocking densities (1.5 birds/m?, LD; 3.5 animals/m?, HD). In total, 360 one-day-old male turkeys (BUT Big 6) were kept in 8 compartments (each 4.5 x 3.9m).
The number of animals which used the elevated platforms was video recorded 23 hrs per day twice per week during the experiments. Data obtained were analysed using the GLM-Procedure for analysis of variance (SAS).
For both stocking densities, the use of the elevated platforms was significantly higher in the dark period when averaged over the total observation time ($p<0.05$). The maximum values were 58% (LD, week 7) vs. 48% (HD, week 8) and decreased afterwards. In all, a higher percentage of LD birds was observed on the elevated platforms (21.4 vs. 15.4 %, $p<0.05$). Dust concentrations ranged from 0.25 to 6mg/m? and were affected by stocking density and the lightning. Mean concentrations of gases were with rarely exceptions below the discussed limit values (CO_2 3000 ppm, NH_3 20 ppm) with typical daily averages between 1200 and 1800 ppm respectively 2-9 ppm. SD was higher for ammonia (12-16%) than for CO_2 (4-10%).
The birds accepted the elevated platforms depending on age, stocking density and lightning. We did not find a relevant influence of the structure on the air quality.

IS SHE SUFFERING? A THEORETICAL APPROACH TO ASSESSING QUALITY OF LIFE IN COMPANION ANIMALS

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Using the example of our current research, this presentation outlines some of the theoretical considerations in providing a valid measure of quality of life (QOL) for companion animals. While clinical advancements are improving pets' health and increasing their lifespans, there has been little discussion of what constitutes their QOL. From the literature on human QOL and animal welfare, we propose that animal welfare and animal QOL are synonymous and have subjective and objective components. Thus, QOL comprises the state of the animal's mind and body and the extent to which its nature (genetic traits manifested through breed and temperament) is satisfied.

When a veterinarian or owner evaluates a pet's QOL, their judgement could be biased by their personality-type and values e.g., veterinarians typically focus on health. Therefore, a more objective, systematic method of assessing pets' QOL is required. Objective list theory is an appealing philosophical foundation for such research. The theory argues that particular conditions must be met in order to have a "good life". Drawing from the farm animal welfare literature, we propose the following conditions for a pet to have "good" QOL: predictability of basic needs, environmental control, opportunities for pleasure, absence of fear and distress, and optimal biological functioning. Veterinarians are best equipped to assess biological functioning, and we are currently evaluating a questionnaire that assesses the other areas of QOL in light of the above theoretical considerations. Owners are interviewed and answer questions in each QOL area relevant to their dog e.g., shelter when outside, freedom of access within and without the house, availability of food treats, opportunities to play. Following further research on validity, the QOL assessment might be used with the veterinarian's health assessment to enable owners to make more informed decisions about matters related to pets' QOL e.g., euthanasia, moving house.

MEASURING BEHAVIOURAL COMPLEXITY USING FRACTAL ANALYSIS: IMPLICATIONS FOR THE ASSESSMENT OF WELFARE

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Behavioural analysis provides non-invasive and easily repeatable measures of an animal's state that can be useful in welfare assessment. Generally, measures of ongoing behaviour are limited to durations and frequencies, which provide only a partial description of behaviour. In depth analysis of behavioural patterns may provide additional information. Previous studies have shown that analysis of the temporal patterning of behaviour can differentiate stressed from non-stressed individuals. If this could be quantified in farm animals, it would provide a non-invasive, inexpensive way of assessing stress

The fractal analysis method of Detrended Fluctuation Analysis (DFA) might be one possible novel method for analysing temporal pattern in behaviour. DFA allows the autocorrelation structure of complex processes to be calculated, providing a measure of the randomness (complexity) of a time series. Such methods have been applied in many different areas of science, including ethology where fractal analysis has been used to measure behavioural complexity in a variety of species.

We determined if DFA could extract novel information from behavioural sequences and be used as a potential indicator of animal stress. Using examples from our research we will provide an introduction to the application of DFA to the behavioural patterns of laying hens and pigs. We applied DFA to focal samples of vigilance behaviour in hens and scan samples of activity and feeding behaviour in pigs. Although we found that this analytical method had some limitations it allowed novel dimensions of behavioural organization - not identified during standard analysis - to be measured. These dimensions were independent of total durations of behaviour and they were sensitive to stressful stimuli in some circumstances. In conclusion, fractal analysis of behaviour shows promise as a tool for measuring stress but further validation is required.

CORRELATING BEHAVIOURAL AND PHYSIOLOGICAL MEASURES OF STRESS IN DOMESTIC CATS IN A RESCUE SHELTER

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Admission to a shelter may be stressful to cats. This aim of this study is to refine measures of cat welfare by investigating how behavioural and physiological measures of welfare vary after admission.
Twenty five single-housed domestic cats were studied daily during the first two weeks after admission. Behavioural data collected were: hourly scan sampling; behaviour while being approached by a human; and a cat stress score (CSS, developed by S. McCune, M.R. Kessler and D.C. Turner) which describes seven possible stress levels based upon postural and behaviour elements, ranging from 'very relaxed' to 'terrorized'. Physiological data collected were cortisol to creatinine ratios (CC) measured in urine samples collected from litter trays.
CSS and CC collected over the first 8 days of caging for each cat present throughout that time (N=23) were analysed by curve-fitting regression (SPSS v.11). The model with the highest R^2 (CSS 0.964, CC 0.951) was the logarithmic function: Y=b0 + (b1*ln(day)). Estimates for b0 (day 1) and b1 (slope) were then derived for each cat separately. Both CSS and CC declined significantly over time (2-tail T-tests of b1 against a mean of zero; CSS mean=-0.312, T=-4.34, $p<0.001$; CC mean=-1.54, T=-4.37, $p<0.001$). Two-tail Spearman's rank correlations were then performed between CSS and CC on the estimates (day 1 correlation coefficient -0.327, NS, slope correlation coefficient -0.477, $p<0.05$). The latter negative correlation shows that cats which have fast decreases in CC have slower decreases in CSS, and vice versa. The extremes of this distribution may indicate two different coping strategies to confinement in a shelter.
Assessment of stress in individual cats admitted to shelters may therefore be best achieved by using both behavioural and physiological measures.

ABSTRACT WITHDRAWN

PHYSIOLOGICAL AND BEHAVIOURAL RESPONSES OF DOGS TO KENNELLING

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Dogs with little prior experience of kennelling may need to be housed in kennels for a variety of reasons, for example, on being rescued, or, as in our study, following procurement for substance detection training by the military. Many dogs appear to have difficulty adapting to this environment, and the resulting stress levels may inhibit learning during training as well as affecting the dogs' welfare.

We examined the behaviour and urinary cortisol/creatinine ratios (C/C) of 31 male Labrador Retrievers (aged 11-12 months) whilst in a home environment, and then observed them for ten days after reaching a UK military training establishment. Urine samples were collected daily and behaviour recorded for 30 minutes per day. Half of the dogs had no previous experience of kennels, whilst the others had been exposed to a gradual, controlled kennel habituation programme over 9-10 months.

All dogs showed a pronounced increase in C/C upon reaching the training school (Wilcoxon Signed Rank test; $z=4.60$, $p<0.001$). In dogs that had been previously kennelled, this increase was significantly less (Mann Whitney U test: $U=42$, $p<0.005$). C/C at day 10 had decreased, though not to baseline ($z=3.69$, $p<0.001$). Behavioural measures showed complex patterns of correlation with C/C, indicative of differences in expression of stress between individual dogs. Trainers' rankings of ability following ten weeks of training were negatively correlated with C/C at day 10 (Spearman rank correlation = -0.46, $p=0.01$).

These results suggest that, although prior experience of a kennel helps to decrease stress levels, even habituated dogs experience significant stress, and those dogs which do not adapt to the kennel environment are less successful in training.

BEHAVIOUR AND HEART RATE OF THERAPEUTIC RIDING HORSES INTERACTING WITH PATIENTS

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Temperament of Therapeutic Riding Horses (TRH) and their interactions with patients are very important characteristics as they influence the therapy outcome. The aim of this study was to evaluate behaviour and heart rate of TRH while interacting with patients during therapy. 4 TRH, owning to the Therapeutic Riding Centre of the "Cà Granda" Hospital in Milano, were examined in relation to 7 young patients affected by brain disorders and to 7 control riders (healthy children). For every TRH-patient pair, data were collected during 3 therapy series, of two sessions each, at two month interval. Every TRH-control pair was observed during one therapy simulation. Reactions of horses to children behaviour were video-recorded continuously, simultaneously with heart rate and analysed with the Observer® VideoPro. Heart rate was recorded with Polar® Vantage NV. Proportional duration of each behaviour and mean (SD) heart rate during each behavioural state were calculated. Parametric analysis of variance GLM with repeated measures and the ANOVA Kruskal-Wallis test were used. Horses spent more time chewing the bit and moving the neck up and down (signs of discomfort) when mounted by patients than by controls (ANOVA: $F=7.0$; $p<0.05$ and $F=8.0$; $p<0.05$ respectively). Within each horse, significantly different heart rates were found in response to different riders (GLM: $F=10.87$; $p<0.001$). As time passed and patients became more autonomous riding with reins, TRH obeyed less (GLM: $F=4.32$; $p<0.05$) and showed higher heart rates (GLM: $F=6.41$; $p<0.001$). It can be concluded that TRH showed some discomfort behaviours in response to patients and their reactivity trend became more evident when patients became more independent riding.

TRAINING OF YOUNG HORSES IN RELATION TO SOCIAL ENVIRONMENT

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In an experiment on the effects of social environment and training on the human-animal relationship, 20 horses were handled according to a defined schedule. Eight horses were housed singly and 12 horses were housed in 4 groups of 3 horses. Horses were handled 3 times per week in 10 minutes sessions from an age of 6 months until 2 years of age during two winter periods. A total of 50 and 70 sessions were given in the first and second period, respectively. Five randomly allocated people performed the training. The training schedule consisted of 43 stages, in which the horse had to fulfil the performance criteria of each stage in order to get to the next stage, e.g. a horse had to be able to stand still for one minute without moving a leg. In the first winter period, horses were led to the stable when they had "passed" a stage or after 10 minutes of training. In the second winter period, horses would start off at stage 1 again, and when they "passed" a stage they went on to the next stage within the same training session. Because of the change in training procedure results were analysed separately for the two winter periods. There was a significant difference between trainers in the number of times they made a horse "pass" a stage within each winter period. ($\chi^2_{3,}$ $P<0.05$; χ^2_3 $P<0.001$) for the first and the second winter period, respectively. Group housed horses "passed" more stages than single housed horses (17 vs. 14; 27 vs. 18 in the first and second winter period, respectively; $P<0.05$). Singly housed horses bit the trainer more frequently than did group housed horses ($P<0.01$). The results indicate that group housing exerts a positive effect on the learning ability of young horses.

ASSESSMENT OF CO-OPERATION BETWEEN THE RIDER AND THE HORSE: THE RELATIONSHIP BETWEEN RATINGS ASSIGNED BY RIDERS AND THOSE ASSIGNED BY AN EXTERNAL JUDGE

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The main objective of the current study was to evaluate the relationship between ratings of co-operation between rider and horse as assigned by the riders themselves and as assigned by an external judge. We also examined correlations between ratings and responses of the horses during riding and in two behavioural tests.
Sixteen horses were ridden in a standardised course by sixteen riders (256 rides total). Riders and a judge rated each ride for co-operation, using the same line rating method. During each ride, behaviours of the horse were recorded, including tail and head shaking as well as frequencies of unintended stops and refusals to negotiate obstacles. Behavioural and heart rate responses of the horses to novelty and handling were obtained in earlier tests. Variables recorded during each ride were averaged either across riders or across horses, to produce averages per horse and per rider, respectively. PCA was used to condense multiple correlated variables into principal components.
Average ratings per horse assigned by riders significantly correlated with those assigned by the judge (r_S 0.71; N=16; $P<0.01$), whereas average ratings per rider did not. Averaged per horse, a combined measure of behaviours of the horse during riding was correlated with ratings assigned by riders (with high frequencies of stops, refusals, and tail and head shaking being associated with low ratings for co-operation: r_S -0.52; N=16; $P<0.05$), and with a composite index of reactivity to novelty and handling (r_S 0.46; N=16; $P=0.07$), but not with ratings assigned by the judge.
Results indicate that a group of riders and an external judge agree on the co-operation of each horse with different riders. It is suggested that the perception by riders of their collaboration with the horses differs from observations by the judge, and is more sensitive to behaviours of the horse during riding.

EFFECT OF REARING CONDITIONS ON FEATHER PECKING AND REACTION TO FRUSTRATION IN LAYING HENS

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In laying hens, the fact that chicks are reared in large groups without a mother may affect development of feather pecking. The propensity to develop feather pecking may be related to a bird's reaction to frustration, i.e. omission of expected reward. We studied the effect of rearing conditions on feather pecking and reaction to frustration.

Birds from different rearing conditions from high and low feather pecking lines were obtained. From commercial rearing conditions (large group, no mother hen), seven birds from the high feather pecking line (HC birds) and eight birds from the low feather pecking line (LC birds) were used. From semi-natural rearing conditions (small group, mother hen present) seven birds from the high feather pecking line (HN birds) were used. Feather pecking behaviour of HC, LC, and HN groups was recorded for 30 minutes. After that, each bird was food deprived and trained to peck a key for a food reward in a Skinnerbox. After training, each bird was subjected to three sessions: a pre-control session, where food was available, a frustration session, where the feeder was covered with Perspex and a post-control session, where food was available again.

Three HC birds showed severe feather pecking, compared with one HN bird and zero LC birds. During frustration, an overall decrease was found for the frequency birds put their head in the feeder compared with both control sessions ($F_{1,12}$=168.06; P<0.001). No differences in reaction to frustration were found between birds from different rearing conditions. A Line difference between HC and LC birds was found. LC birds tended to put their head in the feeder more frequently than HC birds over all sessions (331 vs. 268; $F_{1,6}$=4.65; P=0.07), as was found in previous experiments. Although limited, this study indicates that rearing conditions influence feather pecking, but not reaction to frustration.

MALE INFLUENCE ON FEAR MEASURED BY TONIC IMMOBILITY AND VIGILANCE BEHAVIOUR IN LARGE FLOCKS OF LAYING HENS

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Fear reactions in poultry can impair both animal welfare and production. Often the reactions are elicited in situations that can be related to predator-prey defence. As males have a guarding role, mixing the sexes might be a way of reducing fear in large groups of laying hens. The aim of the study was to determine if housing in groups together with males decreases fear in female laying hens, compared to hens housed in single-sexed groups. The duration of tonic immobility (TI) and vigilance, i e scanning the environment, are both connected to predator defence. Therefore the influence of males on these behaviours in female laying hens was studied using focal animal sampling. Eight groups of 1200 LSL white layers each were studied on an egg production farm. In half of the groups one male per 100 females was included. The housing system was a floor system with perches directly on the manure pit and a stocking density of 6.5 birds /m^2 floor area. TI was induced at night in 25 focal birds per group. Vigilance was recorded in these focal birds by direct observations during 30 minutes on the following two days.

The effects of males on TI and vigilance were analysed using Cox regression model and eventual correlations by Spearman's rank test. It was shown that males had a significant effect on TI-duration and frequency and duration of vigilant behaviour ($P< 0.001$); females in the mixed flocks compared to females in the all-female flocks had shorter TI-duration (200.4 ±15.9 seconds vs 322.5 ± 20.5 seconds) and showed less (1.3 ± 0.2/30 minutes vs 3.4 ± 0.4/ 30 min) and shorter vigilance (27.7 ± 3.8 seconds/30 minutes vs 65.6 ± 10.0 seconds). These results indicate that female laying hens show less signs of fear if the flocks also contain males.

THE PRICE BROILERS WANT TO PAY FOR FOOD UNDER DIFFERENT MOTIVATIONS

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The consumer demand approach can be useful to gain insight into behavioural motivations. The aim of this study was to measure the maximum price (number of key pecks) broilers wanted to pay for a food reward under two motivations, realised by feed restriction. Furthermore, the effect of a short-term change in motivation on the price paid was studied.
Two groups of twenty broilers were fed on 50% or 75% of the amount of feed a broiler would eat when fed ad libitum. Birds were trained to peck a key for a 5-s food reward in an automated Skinnerbox. At 6 and 7 weeks of age, seven birds of the 50%-group and five of the 75%-group were subjected to two sessions under the normal feed restriction and to one session under a changed feed restriction, which implied that birds of the 50%-group received 75% feed and birds of the 75%-group received 50% feed the day before testing. Only one session per bird per day (maximum 30 min) was executed. At 6 weeks of age a progressive ratio schedule of +2 (PR2) and at 7 weeks of age a progressive ratio schedule of +4 (PR4) was used.
Birds of the 50%-group paid a significantly higher price for a food reward than the birds of the 75%-group under PR2 and tended to do that under PR4. Birds paid a significantly higher price under PR4 than under PR2. Under both PR schedules, no effect of changing feed restriction was found.
Long-term feed restriction had an influence on the motivation to work for food, but no short-term effect of changing feed restriction was found. The price was dependent on the used progressive ratio schedule. Broilers are sensitive for different levels of feed restriction and they can balance their investments and profits to a certain extent.

LIGHT QUALITY AND THE BEHAVIOUR OF BROILER CHICKENS

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Broiler chickens are commonly reared in a variety of light environments, which may affect their behaviour, welfare and production. We assessed the influence of light quality (light source and illuminance) upon the behaviour of broiler chickens in two experiments.

In the first experiment, four groups of six broilers were given a free choice at one and five weeks of age between four light sources adjusted to the same perceived brightness by the chickens at two illuminances (5 *c*lux or 100 *c*lux). Irrespective of illuminance, five weeks old broilers preferred Biolux (a fluorescent daylight simulant) and a commercially used warm-white fluorescent source over incandescent light and light, whose output matched their spectral sensitivity, (non-parametric ANOVA, $F_{(3,152)}$=4.19, p=0.007).

The second experiment assessed the undisturbed behaviour of larger groups of broilers reared semi-commercially in either Biolux or warm-white light sources at either 5 or 100 *c*lux. At six weeks of age, broilers reared in 100 *c*lux showed higher levels of preening (Logistic analysis, Chi-squared=4.58, p=0.0323) irrespective of light source. Birds reared in warm-white light showed significantly more pecking (Logistic analysis, Chi-squared=5.73, p=0.0264) at both illuminances than birds reared in Biolux light. There was a significant interaction between light source and illuminance on the number of birds sleeping (lying with their head rested) and sitting in the litter (Logistic analysis, Chi-squared=5.66 and 4.70, p=0.0173 and p=0.0301, respectively).

There was no difference between the frequencies of individual behaviour patterns in the two preferred light environments in experiment one, whereas several behaviour patterns were affected by both light source and illuminance in experiment two. Although both experiments assessed the behavioural effects of light quality, their different designs may lead to discrepancy in their conclusions, which should be appreciated when implementing the results to improve broiler welfare.

OBJECTIVELY MEASURING BROILER WALKING STYLE USING A FORCE PLATE

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Broiler chickens commonly suffer from lameness, due to various pathologies in leg bones and joints. Regular assessment of the incidence of lameness in commercial flocks ensures that breeding and management policies to reduce lameness are effective. Currently, assessment is achieved using the Bristol Gait Score (BGS) system, which is subjective and produces inconsistent results. As an alternative, a sensitive force-measuring plate was developed and used to record forces when a bird walked along it, to objectively measure walking style. The force plate was tested using broilers classified as either lame (BGS 1-3, n=29) or not (BGS 0, n=33) when they were 4-6 weeks old. Birds were placed individually at the head of the 1.6m-long force plate and encouraged to walk along it by repeatedly blowing compressed air, clapping sticks, waving a cane and/or rustling a plastic bag, all behind the bird. Although a separate study of which of these methods motivated birds best (in which puffs of air gave the shortest time to cross the race, with the least number of stops), any combination was used as necessary to encourage birds to walk here. Load cells incorporated into the plate recorded forces in three dimensions from about nine footsteps per run. Novel computer software automatically identified and analysed the data (including the time at which each footstep started and ended, and which foot was on the plate at any particular time), and then collated data of relevant factors for each foot placement. Discriminant Analyses revealed that just two descriptors of walking style (step length and standard deviation of vertical force, during foot placement), out of 24 descriptors for which data were obtained, could correctly identify 90% of the birds that walked along the plate as either lame or not lame, based on their previous classification using the BGS method.

THE INFLUENCE OF COLOUR ON NEST CHOICE IN LAYING HENS

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At the start of lay, hens show a strong preference for nests at corners or end of nest rows. This leads to overcrowded nests, more aggression and increases cracked and mislaid eggs. Our aim was to test if nest colour could be a mean to increase nest attractiveness and thereby counter-balance the mentioned positional effects. Based on Hurnik et al. (1973) we tested whether today's hybrids still demonstrate early colour preference, whether this affects nest colour preference and whether nest colour preference could be influenced by exposing chicks to specific colours.
Groups of 15 one-day-old chicks were exposed to blue, green, yellow or red (two groups per colour) for 12 days. In two additional groups of 92 chicks we identified 32 individuals showing high preferences for yellow or red. Not enough chicks to be tested statistically showed preferences for blue or green. We therefore considered individuals preferring yellow and red or showing no preferences instead. In weeks 17-23 sixteen hens of each group were tested for their nest colour preference in mixed groups of four with a choice of 8 nests (2 of each colour).
The distribution of colour preferences at an early age was similar but statistically different from Hurnik et al. (df=3, chi-square=77.9, P=0.001). Hens, showing preferences for yellow at an early age or being exposed to yellow did not prefer any of the four nest colours (df=3, chi-squares=6.5 and 2.0, n.s.), while all other hens showed a significant preference for yellow nests (df=3, chi-squares=16.2 to 70.2, all $P<0.001$.).
To summarise, we found colour preferences at an early age, but these do not correspond to the preferred nest colour later on. The same is true for hens that were exposed to colours as chicks. Possible applications of the results in order to reduce overcrowded nests are discussed.

THE EFFECTS OF WEANING OF SUCKLER CALVES ON THEIR BEHAVIOUR AND STRESS PHYSIOLOGY DURING SEPARATION

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Artificial weaning of calves from suckler herds modifies their social environment. The days following weaning, calves search social contacts and reconstruct their social relations. Calves separated from their pen-mates generally show increased activity and stress responses. The objective of the present study was to determine if the separation from pen-mates affect animals that are reconstructing their social relations more than those in a stable state.

At 8 months of age, ten male and ten female Aubrac calves were weaned from their dams, whilst ten other male and ten other female calves were weaned only one month later. Calves' reactions to being individually introduced in a novel 6x8 m arena were observed for 5 minutes on the day following the last weaning. The calves were equipped with a Polar heart rate monitor to determine heart rate frequency. Locomotion, defecations and vocalisations, and duration of exploration (sniffing the walls, or the floor) were noted. A blood sample for determining cortisol levels was taken by jugular puncture before and after the test.

Compared to calves weaned one month before the test, those weaned one day before had lower heart rates (93.9 ± 6.3 vs. 135.2 ± 8.9 bpm, $F = 11.6$, $P < 0.05$) and explored the arena more (94.1 ± 8.3 vs. 54.5 ± 7.6 s, $F = 14.6$, $P < 0.01$). Female calves had higher cortisol increases compared to male calves (35.3 ± 3.4 vs. 19.6 ± 2.0 ng/ml, $F = 15.9$, $P < 0.01$).

In conclusion, in contradiction to the hypothesis, when separated from their pen-mates in a novel arena, calves that are just weaned are less stressed and explore more their environment. This further indicates that in calves a higher activity during a test does not necessarily mean more stress.

RESPONSIVENESS OF HEIFER CALVES TO BEHAVIOURAL TESTS MAY PREDICT ADULT REACTIVITY TO MACHINE MILKING

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In the present study we assessed the degree of intra-individual consistency in behavioural responses of Friesian heifer calves to three intuitively alarming situations, and we examined the relationships between these responses and later reactivity of the same animals to machine milking.

At 16 and 29 weeks of age, 25 calves were individually subjected to three behavioural tests including exposure to: brief social isolation, a novel object, and human contact. Responsiveness to milking was monitored during milkings on days 2 and 4 of the first lactation. Measurements during milking included behaviour, plasma oxytocin, heart rate, milk yield, milk flow rate and residual milk. Principal component analyses (PCA) were used to identify independent dimensions underlying responsiveness to behavioural tests and milking, respectively.

Both at 16 and 29 weeks of age, PCA revealed four factors that could be labelled: «Locomotion», «Vocalization», «Interaction with a novel object», and «Interaction with a human». Individual differences in scores of all factors except «Interaction with human» were consistent over time (r_S between 0.67 and 0.86; N=25; $P<0.001$). Individual differences in scores of a composite index reflecting inhibition of milk ejection were consistent between days 2 and 4 of lactation ($r_S=0.66$; N=23; $P<0.01$). Scores of this index on day 2 of lactation were correlated with scores of the «Vocalization» factor at 29 weeks ($r_S=0.51$; N=23; $P<0.05$), but not with scores of other factors. Calves with high levels of vocalization during testing at 29 weeks exhibited better milk ejection on day 2 of lactation.

Our results support the existence in dairy cattle of stable underlying characteristics mediating reactivity to challenge, and indicate that calves demonstrate a multidimensional behavioural response to tests of alarm. Since vocalization in bovines during social isolation may reflect underlying sociality, the motivation to reinstate contact with conspecifics might be implicated in inhibition of milk ejection.

DO CHANGES OF PEN AND PENMATE AFFECT THE BEHAVIOUR OF HEIFERS?

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Because the social environment of dairy heifers can change repeatedly, we wanted to investigate if relocation affects their behaviour. In the study 32 Holstein heifers were housed in pairs until they were 13 months old. 16 heifers stayed in the same pen with the same penmate (*control*). The pen and penmates of 16 heifers were changed 16 times between 11 and 13 months of age (*regrouped*). The behaviour of heifers was observed for three hours continuously after the 2nd, 7th, 13th and 16th regrouping. Observations were also made for 24 hours (scan sampling every 5 min) before the 1st and after the 5th, 12th and 16th regrouping. A social confrontation test was run with one control and one regrouped heifer put together into an arena for 8 minutes. Statistical analyses were done using GLM, pen being a random factor against which the treatment effect was assessed.
Three hours after each regrouping, regrouped heifers explored their pen more ($P<0.05$) and had agonistic interactions with their peer more quickly ($P<0.001$) and more frequently ($P<0.01$) than control heifers did. Duration of contact bouts was longer in control heifers compared to regrouped heifers after the 5th regrouping (1.6 vs. 1.0 scans, $P=0.05$). After the 16th regrouping, regrouped heifers tended to have more bouts of contact than controls (7.4 vs. 4.5, $P=0.10$). No differences were observed in the social confrontation test between the two treatments.
Change of pen and penmate clearly increased aggression between heifers right after every regrouping. However, according to the 24 hours observations and to the social confrontation test, regrouping had no long lasting effect on the behaviour of heifers. Therefore, regrouping might not cause long lasting stress to dairy heifers.

NOVELTY ENHANCES THE EMOTIONAL RESPONSE TRIGGERED BY SUDDENNESS

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The welfare of an animal depends on its perception of the environment. Knowledge of the features of situations which are pertinent to farm animals could help understanding their perceived world. Novelty and suddenness are features commonly used for evaluating the individuals' emotional response without taking into account their eventual combining effect. The present study investigates if novelty and suddenness are perceived as separate dimensions and if they interact with each other.
28 lambs were used. Each lamb was trained once daily to enter a pen where it received concentrates and was exposed to the appearance of an object 30s after it began to eat. During habituation sessions, the object (either a scarf or a square) was slowly lifted behind the trough. When the lambs did not respond anymore by a backward movement, after 4 to 11 sessions depending on the lamb, they were passed to test sessions during which the same object vs. a new one (factor 'novelty') was lifted slowly vs. rapidly (factor 'suddenness'). Behaviour and cardiac activity were recorded and analysed for the 30s before and after the appearance of the object.
Eight lambs exposed to the object appearing rapidly startled vs. none of those exposed to the object appearing slowly (Fischer exact probability: $P<0.01$). The lambs spent significantly more time looking at the object when it appeared rapidly and even more when it was novel, with a synergy between the two factors (glm for repeated measures from before to after the appearance of the object: $F(\text{time*suddenness})=19.90$ and $F(\text{time*novelty})=29.27$; $P<0.001$; $F(\text{time*suddenness*novelty})=5.34$; $P<0.05$). The heart rate increased when the object appeared suddenly, this was more marked when the object was novel ($F(\text{time*suddenness})=22.24$; $P<0.001$; $F(\text{time*suddenness*novelty})=6.30$; $P<0.01$).
In conclusion, suddenness and novelty trigger attention from the lambs. Moreover, suddenness initiates an emotional response which is enhanced by novelty.

AGGRESSIVE ACTIVITY IN RED JUNGLEFOWL (*Gallus gallus*) AND WHITE LEGHORN LAYERS AFTER RE-GROUPING

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Social behaviour is a major factor affecting the ability of farmed poultry to cope in commercial production systems involving housing in variable social groups. However, very little is known about how social behaviour features have been affected by intensive selection processes in fowl. We aimed at clarifying selection effects on aggressive responses to re-grouping with unfamiliar birds by comparing high producing White Leghorns to wild type red junglefowl. The experiment was comprised of two identical three-week long replicate parts, in which different individuals were used. Both replicates were preceded by a 21-day social isolation period, when birds were kept in four isolation groups per breed each consisting of 2 cockerels and 2 hens. At the start of the replicates, the birds were 19 and 24 weeks old. Altogether 16 single sex groups of three birds from each breed per replicate were formed by mixing unfamiliar individuals from different isolation groups. Aggressive behaviours were recorded for 75-min starting 0, 5, 24 and 48-h after re-grouping. Aggressiveness changed significantly over time in Leghorn but not in junglefowl groups. Aggressive behaviours were significantly more frequent in Leghorns than junglefowl right after re-grouping, dropping temporarily at the level of junglefowl at 5-h, maybe due to exhaustion. The frequency of aggressive behaviours returned to its initial level after 24-h in Leghorn groups. We suggest that this specific pattern of the dynamics of aggressive activity in Leghorns might be a general indication of a poorer social learning capacity with a weaker ability to cope with group disruptions compared to the ancestral breed. At 48-h, the level of aggressiveness was the same in both breeds indicating stabilisation of a group hierarchy also in Leghorns. A higher and prolonged aggression towards strangers might indicate an increased susceptibility to social stress in Leghorns when encountering changes in group structures.

FEATHER PECKING IN POULTRY - PHENOTYPIC CORRELATIONS AND QTL-ANALYSIS IN AN F2-INTERCROSS BETWEEN RED JUNGLE FOWL AND WHITE LEGHORN LAYERS

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Feather pecking in poultry is a considerable practical and ethical problem, and is generally thought to be a result of redirected pecking for food. The behaviour appears to be under some genetic control. It has been demonstrated that feather pecking depends on characteristics and behaviour of performers and possibly also victims. In this study, we aimed to find possible loci involved by QTL-analysis (Quantitative Trait Loci) of a large scale F2-intercross between Red Jungle Fowl and White Leghorn layers.

One red jungle fowl male and four White Leghorn hens were used to obtain 751 F2-intercross birds (few parentals increase precision in QTL-analyses). For each bird, we mapped 101 DNA-markers. Growth, feed consumption and plumage characteristics (colouration and quality) were recorded, and for females also age at start of egg laying, and measures of egg production. All individuals were placed in groups of ten birds in a neutral arena for 30 min at the age of 27 weeks, and the number of severe feather pecks directed at another bird was recorded. Regression models were used to analyse phenotypic effects on feather-pecking.

Females performed more feather pecking than males ($P<0.01$). Early onset of laying in females was associated with increased number of feather pecks ($P<0.01$). There were no significant effects of egg production in females, or of growth or food intake (neither total intake nor residual intake) in either sex, on feather-pecking. We found no significant QTL for the performance of feather pecking. However, plumage condition (reflecting exposure to the behaviour) was associated with a significant QTL, which coincided with the colour gene *Dominant White*. Animals homozygous for the jungle fowl-allele had significantly poorer feather condition. The results therefore suggest that early sexual maturity predisposes for feather pecking and that there may also be a genetic predisposition for becoming a victim.

FEATHER -PECKING AND FEATHER EATING IN LAYING HENS

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McKeegan and Savory (Appl Anim Behav Sci 65: 73-85, 1999) suggest that feather-pecking is really foraging. The birds learn to eat the feathers on the floor and when these run out they turn to the other place there are feathers - other birds. In order to test this hypothesis laying hens were raised either with (F+) or without (F-) feathers on the floor (removed three times/week). Six rooms with 10 birds per treatment; because of severe cannibalism one box «without feathers» was excluded. At 19 weeks of age the birds were feather scored; no difference between the groups was found (median score for F+ = 1.4, F- = 1.2, P= 0.41 Mann Whitney). Thereafter the sawdust was changed (and feathers removed) for all birds, on the following three days the amount of aggressive pecking, gentle and severe feather pecking was observed.

There was no significant difference in the amount of aggressive pecking between the treatments (mean pecks/hour and hen ± SE, F- = 5.7 ± 1.3, F+ = 5.5 ± 1.4, P=0.92 Student's t), there was no significant difference for the gentle feather pecking (F- = 17.2 ± 5.8, F+ = 22.2 ± 6.6, P=0.59 Student's t). There was however a significant difference in the number of severe feather pecks, with the birds that had previously had feathers on the floor having a higher number of severe feather pecks (24.2 ± 4.2) than those that had not had feathers on the floor (8 ± 1.4; P=0.01 Student's t). For ethical reasons the experiment was terminated after three days of observation. The results support the hypothesis that feather-pecking can be viewed as foraging behaviour in which the birds first learn to peck at loose feathers on the floor and then, when there are no more feathers there develop «proper» feather-pecking.

THE EFFECTS OF DOPAMINE D_1 AND D_2 AGONISTS AND ANTAGONISTS ON FEATHER-PECKING BEHAVIOUR IN LAYING HENS

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The aim of presented experiment was to test the hypothesis on involvement of dopaminergic mechanisms in control of feather-pecking behaviour in laying hens using systemic treatment with dopamine receptor agonists and antagonists.
Based on the results of behavioural tests 24 LSL hens with the high feather-pecking frequency (peckers) and 24 hens with the low feather-pecking frequency (non-peckers) were selected. Each bird was subjected to the following 6 i.p. injection treatments every other day in a balanced way: 1 mg/kg apomorphine (mixed D_1/D_2 agonist), 0.2 mg/kg SCH23390 (D_1 antagonist), 4 mg/kg SKF38393 (D_1 agonist), 7 mg/kg spiperone (D_2 antagonist), 10 mg/kg bromocriptine (D_2 agonist) and saline (control). Following behaviours were recorded for 1 h after injection in a test box in presence of another untreated hen: floor pecking, wall pecking, drinking, gentle and severe feather-pecking, aggressive pecking, head-shaking and preening.
Three-way ANOVA proved highly significant effects of all 3 factors ($p<0.001$) - drug (D), affiliation to peckers or non-peckers group (PN) and time course (T, 12 consecutive 5 min periods). Moreover, there were significant effects ($p<0.001$) of D x PN interaction, meaning that response to drugs differed between peckers and non-peckers, and D x T interaction, implying that the time course of response differed between drugs. While apomorphine stimulated floor pecking and head-shaking in both peckers and non-peckers (compared with their saline controls), preening was stimulated and drinking, gentle and severe feather-pecking and aggressive pecking were suppressed only in peckers. SCH23390 suppressed and SKF38393 caused a non-significant increase of feather-pecking. Both spiperone and bromocriptine suppressed feather-pecking. It is possible that in case of bromocriptine 60 min test was not long enough for the manifestation of its effects, since initial suppression followed by delayed stimulation has been described in this drug. Results prove the involvement of dopaminergic mechanisms in control of feather-pecking.

THE ROLE OF THE SEROTONERGIC SYSTEM IN FEATHER PECKING BEHAVIOUR

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Considerable evidence exists on a pivotal role of the serotonergic (5-HT) system in the development of behavioural pathologies. In contrast to human or rodent studies, in the field of farm animal research considerable less information is available on correlates between abnormal behaviour and the functioning of the 5-HT system. Previously, we found that birds from a high feather pecking line (HFP) are characterised by low 5-HT turnover in the forebrain compared to birds from a low feather pecking line (LFP).

In the present study, the hypothesis was tested that low 5-HT neurotransmission is causally underlying the performance of feather pecking behaviour. We used a pharmacological tool,

S-15535 (a 5-HT somatodendritic autoreceptor agonist), to lower 5-HT turnover in the forebrain of 28-day old LFP and HFP chicks. Thirty minutes after subcutaneous S-15535 injection (0, 0.4, 0.8, 4.0 or 8.0 mg/kg BW), birds were killed by rapid decapitation and brains were removed for 5-HT turnover (i.e. 5-HIAA/5-HT) measurements. Subcutaneous injection with S-15535 dose-dependently (N=12 birds; $F(1,4) = 31.21$; $p<0.001$) lowered 5-HT turnover in the forebrain of both lines. The dose of 4.0 mg was most effective (0.08 ± 0.004 vs 0.06 ± 0.004) in lowering 5-HT turnover, without affecting (i.e. increasing) dopamine turnover.

Therefore, in a behavioural experiment (N = 20 birds per line-treatment) feather pecking was studied for 30 minutes in 56-day old HFP and LFP birds, 30 minutes after injection with this dose. This resulted in an overall increase in gentle (18.20 ± 10.2 vs 55.40 ± 15.3; $F(1,74) = 3.54$; $p=0.06$) and severe feather pecking (1.74 ± 1.70 vs 12.60 ± 4.46; $F(1,74) = 5.67$; $p=0.02$) of treated birds compared to control birds.

The results of the present experiment, confirm our postulation that low 5-HT neurotransmission is underlying the development and performance of feather pecking behaviour.

CAN PRE-EXPERIMENTAL SOCIAL EXPERIENCE AFFECT THE RELIABILITY OF BEHAVIOURAL TESTS?

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Pre-experimental social experience of subjects in applied ethology studies may differ between individuals if animals are either obtained from outside sources (e.g. rodents) or studied on farm (e.g. pigs). If variation in pre-experimental social experience can affect the results of subsequent behavioural tests, then this has implications for test design and interpretation.

We assessed the effect of pre-experimental social experience on a common spontaneous behaviour test, the habituation/discrimination technique. In this test, subjects are repeatedly exposed to the same social stimulus (e.g. soiled bedding) such that their response habituates across exposures. Both the 'habituation' and a 'novel' stimulus are then presented simultaneously, with preference for the 'novel' stimulus taken as evidence for an ability to discriminate between the stimuli. We housed laboratory rats (N=32) in groups of three for five months. Rats acted as both subjects (once) and stimulus donors. Stimuli were allocated so that subjects were either familiar with both 'habituation' and 'novel' stimulus donors (n=8), unfamiliar with both stimulus donors (n=8) or familiar with just one stimulus donor (both n=8). Pre-experimental experience thus depended upon whether the donor rats originated from the same, or a different, group as the subject.

If there were no effect of pre-experimental experience we would expect no difference in the ability to discriminate between the stimuli. However, we observed a strong discrimination - based on a preference to investigate the 'novel' stimulus - if the subjects had different amounts of pre-experimental social experience with the donors of the two stimuli (Paired *t* tests: $T=-3.69$, $N=8$, $P<0.01$) & ($T=-3.54$, $N=8$, $P<0.01$), but only a weak discrimination if the subjects had either equal amounts of pre-experimental experience ($T=-2.12$, $N=8$, $P=0.071$) or no experience of the stimuli donors ($T=-1.95$, $N=8$, $P=0.093$).

These results suggest that pre-experimental social experience can affect the reliability of subsequent behavioural tests.

INVESTIGATING FEAR IN DOMESTIC RAINBOW TROUT, *Oncorhynchus mykiss*, USING AN AVOIDANCE LEARNING TASK

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The responses of rainbow trout to noxious stimuli were observed in an avoidance learning task. Each of 13 fish was placed individually into a two-chambered shuttle tank where it could be subjected to the putative frightening stimulus of a plunging dip net in either chamber. The fish could escape from the stimulus by swimming through a doorway to the other chamber. The fish escaped from the plunging net by swimming through the doorway, some on the first occasion and all after a few exposures. Each fish was then presented with a neutral stimulus of a light that went on 10 seconds before the net plunged into the water. Over a 5-day period, all fish learned to avoid the plunging net by swimming through the doorway when the light was illuminated ($F = 29.12$; $df = 4,36$; $P<0.0001$). All fish showed evidence of longer-term memory by showing the learned avoidance response on the first occasion they were tested after 7 days of no testing ($t = -1.72$, $P>0.05$). Whereas the escape responses to the plunging net were immediate and reflexive-like, the avoidance responses to the light going on were delayed a few seconds ($t = -18.49$, $P<0.0001$) and more deliberate in nature. This evidence suggests that trout may experience fear since they can learn to avoid a 'frightening' stimulus and, when avoiding this stimulus, they behave more flexibly than could be explained by a simple reflexive response. This is a preliminary step towards investigating sentience in an intensively-farmed species of domestic salmonid.

THE EFFECT OF RESOURCE CUES ON MOTIVATION IN THE MINK (*Mustela vison*)

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Measuring strength of preference is a powerful tool in welfare research, but animals' preferences may be influenced by cues from the test resources (e.g. olfactory or visual stimuli). These resource cues could act as eliciting stimuli, enhancing motivation; or they could supply information so that working for closer access to a resource becomes redundant. This is important because it could lead to motivations different from those of the 'applied' animals who are not so exposed. The aim of this study was therefore to see whether motivation for resources differed according to availability of resource cues. To do this we assessed the priorities of six mink in both a typical demand set-up ('Cues' – resource cues present when preference is expressed), and one where resource cues were distant and screened at the choice point ('No Cues'). Their motivation to reach four resources (Food, Swimming-water, Unpredictable Social Contact, and Toy) was assessed via their responses to increasing access costs (weighted doors), from which conventional measures of demand could be derived. Cue availability affected the motivation to access some resources but not others: there were significant treatment*resource effects on the baseline visit rate ($F_{3,47}$=3.91 p=0.03), visit elasticity ($F_{3,47}$=3.28, p=0.05), and consumer surplus ($F_{3,47}$ =3.91, p=0.03), plus a similar trend for expenditure rate ($F_{3,47}$=2.56, p=0.09). As a result, the rank order of preferences was also affected by treatment: Food was most preferred in both treatments, but motivation for Toys, and Unpredictable Social Contact, declined in the No Cues treatment. This has implications for the mink welfare debate, and also for the future design of valid preference experiments. We suggest that different set-up designs and measures of motivation vary in their suitability for addressing different applied questions.

BARBERING (WHISKER TRIMMING) IN LABORATORY MICE INVOLVES THE SAME BRAIN SYSTEMS AS COMPULSIVE BEHAVIORS IN TRICHOTILLOMANIA, AUTISM AND OTHER OBSESSIVE-COMPULSIVE SPECTRUM DISORDERS

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Many laboratory mice 'barber' (pluck hair and whiskers) from their cagemates, or themselves. Barbering shows remarkably similar epidemiology and phenomenology to trichotillomania (human compulsive hair plucking) and other compulsive behaviours. We therefore tested cagemate-barbering mice for evidence of the prefrontal cortex dysfunction that underlies compulsive behaviour in humans, using the 'IDED' human neuropsychological task. IDED measures the tendency to repeat inappropriate complex rules that is uniquely characteristic of prefrontal cortex dysfunction.

We trained 11 male and 13 female C57BL/6J mice to dig for a small food reward in cups of wood-shavings. Baited and un-baited cups were then presented, each marked with two of three stimulus dimensions (odour, texture, or digging medium). One of these consistently cued the reward, and one was irrelevant. Over three discriminations using the same stimulus dimensions, but different stimulus-reward contingencies, each mouse learnt to attend to the relevant dimension (e.g. odour), and to ignore the irrelevant dimension (e.g. digging medium). In the control stage (IDS), a new set of stimuli was presented, but the same rule applied (e.g. "attend to odour"). In the final stage (EDS) a new set of stimuli was presented, and the rule was altered (e.g. "attend to texture; ignore odour").

Like healthy humans, control mice took more trials to complete EDS than IDS (17.1±0.720 *versus* 11.1±0.720, Repeated measures GLM: $F_{1,4}$=34.94; p=0.004), indicating the use of abstract rules. Like humans with prefrontal lesions, barbers took more trials to complete EDS than controls (33.8±2.86 *versus* 10.8±1.79, GLM: $F_{1,8}$=29.83; p=0.001), but were unimpaired on IDS. Like human compulsive behaviour, the severity of barbering (the proportion of body area plucked) correlated with trials taken to complete EDS (r=0.28, GLM: $F_{1,9}$=15.18; p=0.005). Thus, like human compulsive behaviours, barbering appears to involve poor prefrontal cortex function. Barbering may therefore represent a 'true' compulsive behaviour in mice.

THE TEST-RETEST RELIABILITY OF BEHAVIORAL TESTS: A CRITICAL EVALUATION BASED ON TESTS OF FEARFULNESS IN QUAIL

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The use of behavioral style or temperament tests to choose breeding stock and to assess animal welfare is gaining popularity. However, rigorous assessment of the test-retest reliability of these tests is relatively uncommon. The importance of such assessment is illustrated by this study of four tests of fearfulness in Japanese quail. Forty-six adult quail were subjected to an emergence test, novel object test, startle test, and novel food test on two consecutive days to assess test-retest reliability. Multiple behavioral measures were made during each test. One test was performed per day. There was discrepancy in the reliability of the various measures made within each test. For example, latency to extend the head into the emergence arena showed very low correlation on two consecutive days (partial r =.12, n=46, p=.29, power>.99), but the number of times the birds extended their heads into the arena was much more reliable (partial r =.52, n=46, p<.001). Similarly, latency to try a novel food was relatively unreliable (partial r =.27, n=46, p<.01) compared with the amount of the novel food eaten (partial r =.53, n=46, p<.001). Furthermore, this study revealed the importance of using a partial correlation coefficient rather than the more commonly-reported Pearson's or Spearman's coefficients. Factors such as sex and pen inflated the latter, but were partialled out by the former, leading to lower coefficients on most measures (for instance, latency to contact a novel object on two consecutive days, partial r = .22, Pearson's r =.75). Finally, the statistically significant but small correlation coefficients for most measures in this study and in the behavioral style literature, often less than 0.3, indicate that many common behavioral tests are not reliable.

GENETIC AND PRE- AND POST-NATAL EFFECTS ON DEVELOPMENT OF FEARFUL BEHAVIOUR TOWARDS HUMANS IN FARM MINK

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Fearfulness implies poor welfare in farm animals and we have proven it possible to reduce the number of fearful mink over generations by behavioural selection. However, not much is known about effects of the pre- and post-natal maternal environment on the development of fear in mink.

We conducted an experiment with adult offspring (n=600, 129 litters) of parents from two genetic lines with either high (F: fearful, n=112 females) or low fear (C: Confident, n=112 females). The parental F-mink consistently withdrew, whereas parental C-mink consistently approached in two different standardised human tests repeated 3 times each. Three factors were investigated: i) the genetic background (mating: CxC, CxF, or FxF), ii) the prenatal environment (in uterus: C or F), and iii) the postnatal maternal environment (foster mother until weaning at 8 weeks: C or F). All litters were transferred from their biological to a foster mother after birth. The behaviour of the adult offspring housed either individually or in pairs towards humans were tested in a) the stick test and b) the Trapezov's hand test.

The genetic background affected behaviour in the adult mink (GLIM, stick test: $c^2_{2,591}$=133.23, p<0.001; Trapezov's hand test: $c^2_{2,591}$=86.38, p<0.001), since CxC were more explorative than FxF offspring, with the CxF group showing intermediate exploration (40.7%), regardless of the genetic line of the foster mother. The crossbreds (CxF, n=323 kits) had either a C- (30 litters) or a F-mother (38 litters). The prenatal environment did not affect the behaviour of the adult crossbreds. In crossbreds born from a fearful mother, fewer animals reacted fearfully when raised by a C-female (46.3%) than when raised by a F-female (67.5%, $c^2_{1,168}$=4.69, p=0.030).

We conclude that the genetic background had a greater impact on fear behaviour in mink, compared to the pre- and postnatal maternal environment.

EVALUATION OF ON-FARM METHODS FOR TESTING THE HUMAN-ANIMAL RELATIONSHIP IN DAIRY HERDS WITH CUBICLE LOOSE HOUSING SYSTEMS - RELIABILITY AND VALIDITY

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The objective of the present study was to evaluate two behavioural tests for on-farm assessment of the human-animal relationship in loose-housed dairy herds. 247 cows from 12 commercial dairy herds in Denmark or Austria responded in a voluntary animal approach test (VAA test) for latency to approach and touch a test person. Further 471 cows from the same herds were tested for flight distance in a forced human approach test (FHA test). On each farm the VAA test was carried out followed by the FHA test. For each test, cows were tested by both a familiar test person (the stockperson) and an unfamiliar test person (dressed in red colour). The order of test person was alternating. 2 observers simultaneously recorded test responses. The procedure was repeated within 4-5 days. Both behavioural tests had a high inter-observer reliability (VAA: approach r=0.98 and touch r=0.97; FHA: k_w 0.848). The cows tended to show a shorter latency to approach the unfamiliar test person on the first day tested (P=0.069). Further, taking into account the prevalence distribution, the FHA test had a high test-retest reliability (k_w 0.513) and results indicated no effect of familiarity of test person (k_w 0.453). The association between the two behavioural tests was further evaluated during 4 visits in each of 10 commercial Danish dairy herds. A total of 443 cows approached within 2.5 m of a familiar test person in the VAA-test and a sample of 900 cows were tested towards the familiar test person in the FHA-test. Results indicated that the VAA and FHA tests were highly correlated (r_s -0.84; P=0.002) at herd level. The results suggest that the two tests are reliable and highly related on-farm measures and therefore mutually strengthen each other in being valid measures for the human-animal relationship at herd level.

EFFECT OF SHORT-TERM HANDLING ON FEAR OF HUMANS AND THE CONSEQUENCES FOR MATERNAL ABILITIES OF SOWS

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The relationship between fear of humans, maternal behaviour and piglet survival for sows receiving either positive handling or minimal handling in late pregnancy was investigated.
52 sows were subjected to a human approach test (HAT) at 2 weeks, and again at 3-4 days, before expected farrowing. Latency to contact and time spent exploring the experimenter, and overall confidence score (1=low to 6=high) were recorded. 50% of the sows received positive handling for 1 minute twice daily, five days a week from first HAT to farrowing, whilst the others were controls without additional handling. Behaviour was video recorded from 2 days before until 4 days after farrowing. In the first HAT, 37% of sows immediately made contact with the experimenter (score 6), whereas 20% withdrew (score 1 and 2). To give the sows a positive association to the handler, tit-bits were given. The sows accepted tit-bits from the hand significantly sooner than petting (2.1 ± 0.5 vs. 4.2 ± 0.8 sessions, paired samples t-test, $P = 0.05$). After two weeks of handling, the confidence score had increased significantly (3.8 ± 0.4 v. 5.5 ± 0.2, paired samples t-test, $P < 0.001$), but a similar tendency occurred for controls (4.1 ± 0.4 v 4.8 ± 0.3, paired samples t-test, $P = 0.06$). For the most fearful sows (score1 and 2), the handling procedure resulted in a major increase in confidence score (test 1: 1.5 ± 0.2, test 2: 5.2 ± 0.5, paired samples t-test, $P < 0.001$).
There were no significant differences in piglet mortality or early lactation weight gain between treatments. For sows with a low confidence score, the percentage of mummified and immature foetuses tended to be higher in the control group than the handled group (6.3 ± 2.8 vs. 1.1 ± 1.1, independent samples t-test, $P = 0.10$).

THE RELATIONSHIP BETWEEN BELIEFS, ATTITUDES AND OBSERVED BEHAVIOURS OF ABATTOIR PERSONNEL IN THE PIG INDUSTRY

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Previous research has indicated that use of aversive pig handling techniques prior to slaughter results in and reduced welfare and meat quality. The aim of this study was to investigate the role of stockperson personality and attitudes in the prediction of their behaviour. Twenty four male stockpeople, working in the lairage area where pigs are slaughtered, participated in the study. Stockperson attitudes and personality were assessed using self-report questionnaires, and behaviour was assessed directly with the use of trained observers. Data were analysed using Pearson product-moment correlations. A key finding of this study was that positive attitudes, both general and behavioural, were associated with use of an electric prod with the power turned off ($r=0.39$, $p<.05$) while negative attitudes were associated with use of the prod with the power on ($r=-0.44$, $p<.05$). This suggests that use of an electric prod with the power turned off is actually intended to be a benign interaction by the stockperson when there is a need to move a pig but the stockperson wishes to avoid aversive interactions. Use of the prod with the power on can be interpreted as an intended negative interaction. It was concluded that a simplified model based Ajzen's Theory of Planned Behaviour applies in this situation because neither the extent to which stockpeople felt that they had control over their actions control nor their beliefs about the expectations of co-workers moderate the relationship between attitudes and behaviour in this context. The investigation of the role of personality factors in predicting abattoir stockperson behaviour yielded one significant factor – tough-mindedness. If it can be shown that modifying stockperson attitudes and behaviour leads to improved meat quality, then there is an opportunity to develop training programs to improve stockperson attitudes and behaviour in abattoirs, with subsequent improved pig welfare and meat quality.

HUMAN APPROACH TEST FOR ON-FARM USE IN LOOSE-HOUSED PREGNANT SOWS: RELATION BETWEEN BEHAVIOUR AND HEALTH

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The purpose of this experiment was to evaluate a human approach test applicable for on-farm use in loose-housed pregnant sows. The test approach latency has been analysed for relation to the behaviour during the test and the clinical health of the sow.

Data were collected in 10 commercial sow herds (mean herd size: 438 sows) with loose-housed pregnant sows. 820 sows were tested when moved from the gestation to the farrowing sheds. In a 10-metre passage the individual sow had to pass a stationary human. The latency to approach the human and the total passing time were monitored and the occurrence and location of stopping, turning round and retreating as well as rooting or other explorative behaviours were recorded. The sows were categorised according to their relative latency to approach the human compared to their total passing time (T): “not fearful”: latency < 0.5 T; “slightly fearful”: latency 0.5 T - 0.67 T; “fearful”: latency > 0.67 T; “very fearful”: refused to approach within 2 min. Further, 675 sows were examined clinically focusing on body condition, leg disorders and skin lesions.

Preliminary analyses of the data by Chi-square tests showed that sows, which performed explorative or avoidance behaviours while approaching the human were more likely to be categorised as “fearful” ($P<0.0001$), both behaviours resulting in a longer time to approach. 67 % of lame sows were considered “fearful” or “very fearful” compared to 51 % slightly lame sows and 33 % sows without lameness, respectively (Chi-square =15.45, d.f.=6, P=0.017), and a similar classification appeared in 67 % sows with abscesses compared to 35 % sows without abscesses (Chi-square =8.20, d.f.=3, P=0.042).

The results indicate a relation between the test category and the behaviours performed by the sow. Further they suggest an association between clinical health and the test result.

PREFERENCES OF SHEEP FOR DIFFERENT TYPES OF PEN FLOORING

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The objective of this experiment was to investigate sheep preferences for different types of pen flooring.
In experiment 1, a total of 16 ewes, divided into 4 groups, were subjected to 4 different treatments were they could choose between 2 lying areas with different flooring materials (solid wooden floor vs. rubber mats, expanded metal vs. solid wooden floor, solid wooden floor vs. straw or expanded metal vs. straw). In experiment 2, a total of 8 individual ewes was subjected to the same treatments, first fully coated and then sheared. The ewes were video taped for 48 hours in each treatment period. Mann-Whitney U-test was used to analyse the preferences of different flooring materials. A Kruskal Wallis test was used to analyse the effect of flooring materials on total lying time.
In experiment 1, there were no significant preferences for lying area in any of the treatments. Mean lying time was 68 %, and there were no significant differences between treatments.
In experiment 2, unsheared ewes preferred wooden floor to rubber mats ($P < 0.05$), there were no significant preferences in any other treatments. Sheared ewes preferred straw to expanded metal ($P< 0.0001$), wooden floor to expanded metal ($P < 0.05$), and straw to wooden floor ($P < 0.05$). There were no significant preferences between rubber mats and wooden floor. Mean lying time for unsheared ewes was 65 %, and there were no significant differences between treatments. Mean lying time for sheared ewes was 50 %, and ewes in pens with straw bedding tended to have a longer lying time than ewes without access to straw ($P = 0.11$).
The different preference between sheared and unsheared ewes, show that qualities like the thermal conductivity and softness of the floor influence the preferences of sheared ewes, but not unsheared ewes.

VISUAL DISCRIMINATION LEARNING AND CRITICAL SPATIAL ACUITY IN LAMBS

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Visual discrimination learning and spatial acuity were investigated for 14 British Friesland-Texel female lambs, to provide information that would facilitate designing a suitable visual environment for sheep. Test animals were randomly assigned to two groups; Group 1 was trained to recognise a black and white vertical grate while Group 2 was trained on a similar horizontal grate. Test animals were placed in a Y-maze and simultaneously presented with the test grate and a blank grey square image (28 x 28cm^2), at a distance of 2m. Mean (± SEM) illuminance at average lambs' eye level was 198.9 ± 2.4 lux, and mean (± SEM) luminance of the visual stimuli in each maze arm was 9.4 ± 0.1 cd m^{-2}.

Each animal was subjected to alternate day sessions consisting of 20 trials. Selection of the correct stimulus resulted in a food reward. Positions of the visual stimuli for each trial were alternated according a random Gellerman series. Animals were considered successful in attaining the learning criterion if they achieved ≥ 75% correct choices in 4 consecutive sessions ($\chi^2 = 5$, $P<0.05$, 1df).

Having fulfilled this criterion, visual acuity was determined by progressively decreasing the width of the grate by half the previous width, to a point where the lambs were unable to discriminate between the images. Spatial acuity criterion was set at ≥ 75% correct choices ($\chi^2 = 5$, $P<0.05$, 1df) in 3 consecutive or 3 out of 5 sessions.

There was no significant difference in the learning ability ($P = 0.162$, t-test) or spatial acuity ($P = 0.192$, Fisher exact test) between groups. The range of highest acuity was between 11.74 and 13.16 cycles deg^{-1}, higher than previously reported. Comparisons of visual acuity with that reported for other species are not appropriate due to variations in illumination and visual stimuli.

EFFECT OF PRENATAL STRESS OR ACTH INJECTION DURING FOETAL DEVELOPMENT ON THE RESPONSE TO NOVELTY AND STARTLING STIMULUS OF KIDS

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Pregnant farm animals can encounter various stressors that can affect their welfare and production. However, only a few studies have focused on the effect of prenatal stress on the offspring. Based on studies in rats and humans, prenatal stress could alter the welfare of young farm animals by reducing their ability to cope with environmental changes. Forty-one pregnant goats were used in this experiment. Starting 5 weeks before parturition, 13 goats were transported for 1 hour twice a week for 5 weeks, 14 goats were injected twice a week for 5 weeks with ACTH (SynacthèneND, 0.125 IU/kg body-weight) to mimic the cortisol response induced by transportation (ACTH), and 14 goats were undisturbed (CON). The response to novelty and startling stimulus of kids was tested at 1 month of age (TRAN= 6 females/ 6 males, ACTH=7/7, CON=7/6). GLM and MIXED model procedures were conducted (SAS). For most of the variables studied, there were treatment effects mainly in females. A startling stimulus resulted in more interruption to drinking milk in TRAN females (TRAN vs CON: p=0.008; TRAN vs ACTH: p=0.004). There was no treatment effect on behaviour in each of 5 exposures to a novel arena. However, while the frequency of jumping decreased over the 5 exposures in the CON females (p=0.022), the time spent running increased in TRAN and ACTH females (TRAN: p=0.004; ACTH: p=0.013). The ACTH females had higher cortisol response to an ACTH injection than the CON females (p=0.042). In conclusion, prenatal stress had differential sex effects. In addition, the effects of prenatal stress on the offspring cannot be solely explained by an increase in maternal cortisol since the effects of ACTH injections during gestation were not always similar to those produced by transportation.

CAN DOMESTIC FOWL SHOW SELF-CONTROL?

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The cognitive ability of fowl to anticipate the consequences of a choice or action over time influences the impact of environmental events on their welfare. Of general interest in several fields is the ability to choose a larger, more delayed reinforcer over a smaller, less delayed reinforcer available at the same frequency. Defined as self-control, this has been examined in a number of species, proving difficult to demonstrate in many.

In an initial experiment, hens were impulsive, choosing 2s delay to 3s access to food over 6s delay to 7s access. However, a discounting function associated with delay could devalue the self-control option. Sixteen naïve hens were used to address this question. Half (Standard group) chose between 2s delay to 3s access and 22s delay to 22s access to commercial pelleted food in a two-key operant pecking task (FR1) with consecutive trials at intervals of 60s. Half (Bonus group) chose between 2s delay to 3s access and 6s delay to 22s access to food in an otherwise identical task. Key colour (red or green), position and associated delay/access times were balanced across birds. Individuals were tested in daily sessions of 16 free-choice trials randomly interspersed with 2 forced trials for each option until stable responding was reached.

The proportions of free choices made by each bird for the self-control option in the final 5 stable-responding sessions were analysed using an Analysis of Variance (as the residual plots indicated a normal distribution and constant variance). The mean proportions of choices for self-control shown by the two groups were significantly different (Standard, 0.22 vs. Bonus, 0.93; s.e.d. = 0.109, at 10 d.f.; $p<0.001$). The response of the Bonus group indicates that, if possible discounting of the value of a delayed reward is taken into account, domestic fowl can show self-control for food.

THE OPEN-FIELD: TEST OF EMOTIONALITY OR AN APPROACH-AVOIDANCE CONFLICT?

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Animals' reactions in the open-field test are usually explained in terms of emotionality, fearfulness, temperament, stress-susceptibility, exploration or coping style. We review the open-field test in different species. Locomotor activity in the open-field is often seen as the outcome of a one-factor process (Hall, 1934; Archer, 1973, Broadhurst, 1975, all references in this abstract cf. Ramos and Mormede, Neur. Biobehav. Rev. 22:33, 1998). However, an alternative multi-factor interpretation of the open-field test has also been suggested (a.o. Royce, 1977; Whimbey and Denenberg, 1967; Walsh and Cummins, 1976; Suarez and Gallup, 1981). The multi-factor interpretation of locomotor activity mostly centres around the dimensions of fear and exploration, both motivating the animal's activity in the open-field (Markel et al., 1989). Repeated testing is often done to separate locomotor activity based on fear or on exploration. This is achieved by extending the session or introducing a new stimulus (bucket, alarm bell). Carry-over effects, however, complicate interpretation. Koene (PhD thesis, 1988) showed by factor analysis that locomotor activity of rats on the first day in an open-field loads on a different factor than activity on subsequent days. The difference between the activity (e.g. line crossings) on day 1 and day 2 of the test varies consistently with the genetic and social background of subjects. It shows, furthermore, a consistent relation with speed of conflict resolution in an approach-avoidance conflict (reaching a goal with appetitive and aversive properties). The reviewed literature strongly supports the two-factorial interpretation of locomotor activity in an open-field. Some examples of repeated testing of rats, pigs and chicken in the open-field test are given to support the approach-avoidance interpretation. It is concluded that the open-field test must be done twice (preferable exactly 24 hours apart) for a correct interpretation of locomotor activity based on a two-factor approach-avoidance conflict.

EFFECTS OF POSTNATAL MATERNAL SEPARATIONS ON MATERNAL CARE AND HPA-RESPONSES TO STRESS IN RATS.

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In rats, neonatal maternal separations can persistently alter stress responsiveness, mediated partly through separation-induced changes in maternal care. In view of studying housing effects on rats' abilities to cope with stress, we examined how different postnatal treatments affect maternal care and endocrine stress responses in the adult offspring.

From postnatal day 1-13, Lister-hooded dams and pups underwent one of the following daily treatments: maternal separation (MS: placing dam in separate cage for 4 hours), postnatal handling of dams (PHd: placing dam in separate cage for 15 min), postnatal handling of dams and pups (PHdp: placing both dam and pups in separate cages for 15 min), or they were left completely undisturbed (UC) (n=8 per treatment). Throughout this period, maternal behaviour was scored at 3-min intervals for 60 min every third hour. Rats were weaned at 21 days and kept in groups of 4 littermates in standard cages. At 70 days, one male and one female of each litter were bled by tail-incision immediately before and 0, 35 and 95 minutes after 25 min restraint stress to determine plasma ACTH and corticosterone levels.

PHd and PHdp groups did not differ in maternal care or the offspring's stress responses and were therefore pooled (PH) for further analyses (ANOVA). PH and MS increased active nursing ($p<0.01$) compared to UC, which was associated with reduced ACTH ($p<0.01$) and corticosterone ($p<0.01$) responses in PH, but not MS, females compared to UC females. Similar trends in males did not reach significance ($p>0.05$).

While enhanced active nursing induced by brief separations (PH) attenuated stress responsiveness in the offspring, long separations (MS) enhanced stress responsiveness, despite compensation for the 4-hour deprivation through increased active nursing. Thus, it is not the amount of active nursing, but rather its temporal patterning, that mediates stress responsiveness in laboratory rats.

AUTOMATIC MONITORING OF ACUTE STRESS IN PIGS BY VOCALIZATION ANALYSIS

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Our objective was to develop a system that monitors and records the amount of pigs' stress calls and that can be employed in various environments. Using a combination of sound analysis by linear prediction coding and artificial neuronal networks we were able to detect stress vocalizations of pigs.
The system was trained with stress calls of pigs (German landrace) of various ages (9 piglets – 14 d, 9 growing pigs – 35 d, 9 adult sows) against grunts vocalized in non-stress situations and noise. Stressors applied were immobilization by holding piglets upright at the thorax, by forcing growing pigs on the back, and by snaring of sows. These procedures did not only elicit stress vocalizations as indicators of high levels of excitement but also hormonal and neurophysiological reactions that indicate stress.
Using defined stress situations the system (STREMODO: stress monitor and documentation unit) was first tested under experimental conditions in a noisy stable of our research institute revealing only small recognition errors (false positive: 0.72 %, false negative: 2.86 %).
STREMODO was then applied in a commercial farm where stress vocalizations during feeding were compared at 1:1 and 6:1 feeding place / animal ratios. A comparison of the system with 6 expert human judgments resulted in an average correlation of 0.84 (SAS, Spearman correlation coefficients, $p<0.0001$, extremes 0.78 and 0.87) with respect to occurrence and duration of stress calls. The humans had difficulties to exactly determine the start and stops of the individual screams and to be concentrated even for the relatively short time (10 min) of the recording showing the greater reliability of the technical system.
Hence, STREMODO can be routinely used for objective, non-invasive measurements of acute, vocalized stress occurring in various farming environments, during transport and slaughtering.

THE EFFECT OF ACCOMMODATING SUCKING AND MASSAGE ON THE BEHAVIOUR OF ARTIFICIALLY-REARED PIGLETS

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Neonatal piglets are often used in biomedical research applications that require artificial rearing. Social housing can be problematic because they develop belly-nosing, navel- and ear-sucking that results in injury. Our objective was to determine the effectiveness of using feeding devices that provide various opportunities for sucking and massage on reducing piglet-directed behaviour of group-housed laboratory piglets.

Fifteen piglets were used in each of four trials. The piglets nursed their dam for ca. 72 hours to obtain passive immunity before transfer to a laboratory facility where they were allotted, five per group, to one of three stainless steel housing units. Each unit featured a different style of feeding system for the delivery of milk replacer: a plastic trough (T), a nipple (N) mounted on a smooth plexiglass wall, or a nipple mounted on a water filled pillow (artificial udder/AU). Each system had five feeding spaces so that all piglets fed simultaneously. Milk was provided at six-hour intervals, and behaviour was sampled on alternate days for 12 days post-weaning. Polynomial orthogonal contrasts were used to determine differences among treatments in overall means, and in linear and quadratic trends over time.

Both time spent sucking/chewing on pen-mates and belly-nosing were markedly higher in T piglets than either N or AU, overall (DF=2; mean:$P<0.05$) and over time (DF=2; quadratic:$P<0.05$) On day 10, belly-nosing averaged 3.97%(S.D.=1.06), 0.85%(S.D.=0.85) and 0.11%(S.D.=0.23) for T, N, and AU, respectively. N piglets developed a stereotypic snout rubbing on the wall behind the nipples. AU piglets massaged and often fell asleep in contact with the udder. Resting patterns were also affected. N and AU piglets spent significantly more time resting in the hour following feeding than T piglets ($P<0.05$).

A feeding device that accommodates both sucking and massage can significantly reduce piglet-directed behaviour and may facilitate social housing of artificially-reared piglets.

STABLE VERSUS DYNAMIC GROUP HOUSING SYSTEMS FOR PREGNANT SOWS AND THE MOMENT OF INTRODUCTION

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Aggression between sows during early pregnancy may affect sow welfare and reproductive performance. However, in some group housing systems aggression from changes in group composition during this critical period is unavoidable. To assess the effect of the moment of introduction of new sows into a dynamic group, and the difference between dynamic groups and stable groups, a split-plot study was set up, with service groups as replicates. The main treatments were dynamic (D) versus stable (S) groups. Sub-treatment was the moment of introduction. Within the dynamic groups new sows were introduced one day (D1),15 days (D15) or 29 days (D29) after insemination. Stable groups were formed after weaning. Sow performance, reproduction results, and feeding patterns were analysed.

Two dynamic groups were created;52 pregnant sows on average, four new sows entered each group weekly. The stable groups consisted of service groups of 13 sows.

Sows were fed with electronic feeders without protection, 13 animals per feeder. Housing was on concrete flooring, 2.6m^2 per animal, 40% slatted floor.

We studied 16 replicates (498 litters total). Average skin lesions, scored every fortnight, were 5.0^a,6.8^b,7.4^c and 7.5^c (scale: 0=no lesions, 15=maximum lesions) for S,D1,D15 and D29, respectively (P<0.05; different superscripts indicate significant difference). Claw conditions, scored before farrowing, were 6.0^a,6.5^b,6.6^b, and 6.3^b (scale: 0=good condition 9= poor condition) for S,D1,D15 and D29, respectively. Main treatment influenced feeding pattern. Sows in dynamic groups had to eat their individual ratio in smaller portions due to disturbances at the feeders. Despite these differences we found no effects of the treatments on pregnancy rates, litter size or litter weight.

Although sows in stable groups faced less aggression during pregnancy, an effect on reproductive performance could not be demonstrated. Contrary to general advice this study shows that the moment of introduction does not influence the reproduction results.

BEHAVIOUR OF PIGS WITH DIFFERENT EARLY LIFE ENRICHMENT IN A FREE EXPLORATION TEST

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Enrichment was provided during two different periods in the early life of pigs, to investigate whether early enrichment modified behaviour or performance. Forty-eight litters were exposed to one of eight treatments (six litters/treatment). Two enrichment objects, designed on the basis of previous experiments, were applied. Object1 provided variable, particulate substrates to the pigs, in compliance with the recent EU Directive (2001/93/EC). Object2 provided chewing and gustatory stimulation. A barren pen and a strawed pen served as controls. The four treatments were provided either during a four-week period immediately post-partum or post-weaning.

Litters were subjected to a free exploration test at 9-10 weeks of age. Pigs were given access to a novel arena adjoining their home pen for a 10-minute exploration period, after which they were returned to their pen. A novel object (knotted rope) was then hung in the arena and the pigs were allowed to exit for a further 10 minutes.

One of the variables used to compare the treatment groups was the time taken for all but two pigs to exit their home pen, because not all pigs in a group always emerged. The results showed that all groups emerged significantly faster in the second part of the test (ANOVA, mean emergence time and SEM, first part: 124.7s+/-11.5s; second part: 54.9s+/-7.4s, $P<0.001$). Emergence times were not affected by treatment, however, the extent to which pigs emerged faster in the second part of the test was influenced by prior enrichment with object1, in both periods (mean difference between first part and second part and SEM, barren 55.4s+/-15.9s, straw 39.2s+/-27.5s, object1 115.8s+/-18.9s, object2 45.8s+/-18.2s, $P<0.05$). This may suggest increased behavioural flexibility as a consequence of variable enrichment in early life.

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INFLUENCE OF WEANING AGE ON STRESS-INDUCED DEFICITS OF SPATIAL LEARNING IN PIGS

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Using a modified water maze paradigm, we assessed the spatial learning abilities of nursing and newly-weaned pigs, and examine how these were affected by age of weaning. The maze is an escape task, in which pigs are placed in a large pool of opaque water and required to locate a submerged platform, in order to escape from the pool. The latency of pigs to reach the platform from a pre-determined release point is recorded over seven exposures to the maze, separated by 10-minute intervals. We examined whether the presentation of a stressor (15-min social isolation), immediately prior to testing, affects the performance of pigs in the maze. Forty-eight female pigs were weaned at d12 (early-weaning, EW) or d21 (conventional-weaning, CW) and tested once at either 14 or 23 days of age. Trial analysis showed a highly significant correlation between length of the swimming path and latency to find the platform (Pearson's product moment correlation; n=336, r = 0.929, $p<0.0001$), indicating that a decrease in latency across a trial is a reliable measure of spatial learning. Repeated measures analysis of variance revealed significant effects of weaning age (GLM; $F_{1,48}= 7.19$, $p=0.0106$) and age at testing (GLM; $F_{1,48}= 33.36$, $p<0.0001$) on performance in the maze, but no significant interaction between these factors. Isolating the pigs prior to testing caused a significant impairment in performance (GLM; $F_{1,48}= 18.59$, $p=0.0001$) compared to non-isolated control animals, and analysis of the data also highlighted a significant interaction between weaning age and isolation treatment (GLM; $F_{1,48}= 11.14$, $p<0.0018$), with EW pigs showing no improvement across the seven exposures following isolation. Our results suggest that the observed deficits in spatial learning, indicative of potential cognitive disruption, may be affected by age at which the developing brain is exposed to increases in stress hormones, which can occur during weaning.

RELATIONSHIP BETWEEN AGGRESSIVE BEHAVIOUR AT WEANING AND SOCIAL RANK OF PIGS WITH DIFFERENT COPING CHARACTERISTICS

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Several studies have demonstrated a relationship between classification of piglets as high-resisting (HR) or low-resisting (LR), based on their response in a so-called Backtest, and response patterns or coping styles in later life. The current study investigated whether individual differences in Backtest response are related to aggressive behaviour and the establishment of dominance relationships after weaning.
Pigs were subjected to the Backtest, a manual restraint in supine position, at 10 and 17 days of age and classified according to the number of escape attempts (Hessing et al. 1993, Appl Anim Behav Sci 40:187-96). Thirty HR and 30 LR pigs of similar weight were weaned at 4 weeks of age and relocated to 10 pens. Per pen, 6 unfamiliar pigs (3 LR and 3 HR) were mixed and fights (physical contact between pigs for ≥10 sec, involving ≥5 head knocks) were recorded for 3 hours. The social rank of each pig (Lee and Craig 1982, Appl Anim Ethol 8:377-90) was determined using the outcome of agonistic interactions (≥60 per pen) during the first two days after mixing.
At mixing, HR pigs spent significantly more time fighting, started more fights and had a shorter attack latency than LR pigs. HR and LR pigs did, however, not differ in social rank. Fighting efforts (frequency, duration and latency) at mixing were highly correlated with the achieved social rank in LR pigs, but not in HR pigs, indicating a different strategy.
In conclusion, the Backtest response of pigs relates to aggressiveness and the strategy used for establishing dominance relationships. The results suggests that LR pigs have a flexible, adaptable strategy in social confrontations, whereas the high level of aggression displayed by HR pigs, irrespective of their success, supports the view that these animals are more likely to adopt a rigid, proactive coping style.

DIFFERENCES IN STRESS REACTIONS OF BEEF-SUCKLER COWS WITH DIFFERENT SOCIAL STRATEGIES

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Individual differences in social behaviour and in reactions to non-social challenging situations might be caused by fundamental differences in coping with challenge. We tested in cows whether different social strategy types showed consistent differences in their reactions to challenging situations.
Social interactions of a 19-head-herd of beef-suckler cows were recorded for 209h. By using factor and cluster analysis the animals were classified into three groups of social strategy: agonistic dominant (AD), non-agonistic (NA) and agonistic challenging (AC). NA- and AC-animals did not differ in their dominance value. NA-cows less frequently received agonistic interactions and more often initiated social licking and head-play compared to AC-cows. The cows were individually tested in three situations: one without social isolation: *handling-test* (restraining and manipulating the cows); two with social isolation: *arena-test* (unfamiliar surrounding) & *surprise-test* (arena plus novel object and a sudden acoustic signal). Behaviour, heart rate and cortisolmetabolite concentration were measured. Mann-Whitney-U-tests were used for group comparison.
The three strategy groups showed some differences in their reactions, which suggest consistency: In the handling-test, AC-animals defended fewest against the restraint (Median: AC:5; NA:18.5; AD:20; $p<0.01$), showed least leg movements (AC:1; NA:2; AD:5; $p<0.05$) and tended to try to escape most often. NA-animals rubbed their head longest at the human ($p<0.05$), probably comparable to their affiliative behaviour within the herd. AD-animals showed the highest heart rate (AD/NA: $p<0.05$). In tests with social isolation, AC-animals stepped back most often in the starting-box (arena-test) and had the longest latency to re-explore the novel object after the acoustic surprise (surprise-test). Once more AD-animals had the highest heart rate in the arena test (AD/AC: $p<0.05$).
The three social strategy types showed some consistent differences in their reactions to stressors, which were less distinct in situations with social isolation. AC-animals seem to be more fearful than the other two groups.

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REPEATABILITY OF FACTOR ANALYSIS; A STUDY OF OVINE TEMPERAMENT

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It has been proposed that the open-field/arena test in conjunction with mulitivariate analysis (e.g. factor analysis) may be a means of measuring animal temperament. However, its widespread application is dependent on the stability of factor construction and the repeatability of factor scores for individual animals over time. The aim of this study was to assess these characteristics of factor analysis using ovine behavioural data taken from 3 repeated rounds of arena testing (day1, day 8 and day 311). One hundred and ninety Mule (Blue Leicester Sire x Scottish Black-Face/Welsh Speckled-Face dam), ewe lambs (6 months old at round 1) were tested for 6 minutes in a 13m X 3m arena. Four factors were generated (varimax rotation) using data on latency to bleat, total number of vocalisations, distance travelled, time spent in different areas of the arena and number of times crossing across areas. Stability of factor loadings and scores between rounds were tested using Kendall's coefficient of concordance and repeatability values were also generated for factor scores.
All factor loadings for the 4 factors generated were significantly correlated between rounds (0.86, $p<0.01$; 0.94, $p<0.01$; 0.89, $p<0.01$; 0.86, $p<0.01$). Factor scores were also significantly correlated between rounds (0.59, $p<0.001$; 0.79, $p=0<001$; 0.56, $p<0.001$; 0.46, $p<0.001$) but coefficient values were generally much reduced. These latter coefficients were mirrored, but to a lesser degree, by the repeatability data (0.39, 0.65, 0.34, 0.21).
In conclusion, the limits or boundaries of sheep behaviour are firmly set as indicated by the stable construction of factors over time, but within that, a range of individual behaviours can take place that may vary over time with the experience of the animal or minor changes in the test environment.

ENVIRONMENT AND PERSONALITY: EFFECTS OF PRENATAL UNDERNUTRITION ON EMOTIONAL REACTIVITY IN ADULT SHEEP

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Pregnant farm animals in extensive husbandry systems are often subject to periods of undernutrition during winter or dry season. The aim of this study was to find out whether prenatal undernutrition (PU) during the early stages of foetal development in sheep can change the offspring's emotional reactivity.
The experimental animals were the offspring of Scottish Blackface ewes who had either been fed to meet their maintenance requirements throughout the first 95 days of pregnancy (C), or 50% of that amount (PU). From day 96, they were fed to gain sufficient condition to support lactation. Following birth, the two experimental groups were reared together and treated the same. Twelve males and twenty females were randomly selected from each of the two original groups (49 C and 35 PU). Emotional reactivity was assessed at 18 months of age from the reaction to restraint in a weigh crate, social isolation, novelty and the sudden presentation of a stimulus.
PU animals were more active during restraint (crate vibration (mV): 127.2±25.1 vs. 86.1±28.1; Mann-Whitney, $p<0.05$) and had a longer latency to approach the novel stimulus than controls (120.9±13.5 vs. 74.3±11.8 sec; REML, $p=0.012$). There was a significant effect of time and a sex-by-treatment interaction (REML, $p<0.01$) on locomotion after sudden stimulation: PU males and C females showed a higher initial level of locomotion compared to C males, which only gradually declined, while PU females started at a high initial rate but virtually stopped walking in the third minute after the stimulation.
PU increased emotional reactivity in both male and female sheep. Undernutrition during pregnancy, therefore, not only affects the welfare of the ewe, but can also increase emotional reactivity of her lambs. Excessive undernutrition of pregnant ewes may, thus, produce highly reactive sheep, who would find it more difficult to cope with routine management procedures.

BEHAVIOUR, HEART RATE AND MILK CORTISOL OF SIMMENTAL AND BROWN SWISS COWS DURING MILKING IN A ROBOTIC SYSTEM COMPARED TO A HERRINGBONE PARLOUR

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Cows' stress responses were compared during normal successful milking in a 2x6 herringbone parlour (Happel) and in a robot (Lely). We observed 42 cows: 12 Simmental and 11 Brown Swiss in the robot, 10 Simmental and 9 Brown Swiss in the parlour. Both prior to and during the observations each cow was milked in one system only. Behaviour during milking and milking procedure timings were observed directly two to six times per cow. Heart rate was recorded telemetrically. Samples of composite milk were analysed for cortisol using an enzyme-immuno-assay.

Milking lasted longer in the parlour than in the robot (general mixed model: $F_{1,39}$=12.06, P=0.0013), after significant effects of milk yield, day of lactation and time of day had been taken into account. The robot took longer to locate the udder in Simmental than in Brown Swiss cows (Mann-Whithey-U-test: $U_{11,12}$=32, P=0.037). Kicking and stepping with the hind legs was less frequent in the robot than in the parlour ($U_{23,19}$=76.5 for kicks; $U_{23,19}$=85 for steps; P<0.001 in both cases). Brown Swiss cows stepped less than Simmental cows in the robotic milking group ($U_{11,12}$=32, P=0.036). In the parlour, kicks occurred more frequently during the time period from the beginning of udder cleaning until cluster attachment was completed, than at other times (Friedman test: $F_{19,4}$=32.41, P<0.001; Bonferroni-corrected posthoc-comparisons: P<0.01). There was no difference in heart rate during milking between cows milked in the robot and the parlour. The robotic milking group had higher milk cortisol values than the parlour group ($U_{23,19}$=130.5, P=0.026).

Cows showed more behavioural signs of discomfort in the milking parlour than in the robot, but they had higher milk cortisol levels in the robot. Robotic milking needs to be evaluated on the basis of the overall evidence from different studies, taking into account conditions and factors that vary on farm level.

A GRADUAL SEPARATION FROM THE MOTHER INDUCES BEHAVIORAL, IMMUNE AND ENDOCRINE ALTERATIONS IN ARTIFICIALLY REARED LAMBS

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Forty Comisana lambs were assigned to a control dam-suckled group (DS) and three test groups of 10 each. The GRAD lambs group were gradually separated from their dams over ten days, while the SUB and EM groups were abruptly removed from their dams 24 to 30 h post-partum. After separation, the SUB lambs were provided with a milk substitute, while the EM lambs were subjected to a gradual transition from ewe milk to the milk substitute over ten days. At 12 and 32 days of age all the lambs underwent 10 min isolation tests. Blood samples were collected immediately before the isolation test, and 10 and 60 min after to evaluate cortisol concentrations. Cell-mediated immune responses in vivo to phytohemagglutinin injection were evaluated at 7, 21 and 35 d of age, while antibody titers against chicken egg albumin were determined at 2, 10, 20, 30 and 42 days of age. The weight gains of the lambs were also recorded weekly. When isolated in a novel environment, the GRAD lambs performed less frequent climbing attempts ($P < 0.05$) than did the DS lambs. After the introduction of a hobby horse, the GRAD lambs displayed a longer latency time to move than did the DS, SUB ($P<0.01$) and EM lambs ($P<0.05$), and a shorter duration of movement than the DS lambs ($P<0.05$). The GRAD lambs showed a higher cortisol release and a lower cell-mediated immune response than the lambs in the other groups; their antibody titers were also lower than those of the EM and SUB lambs. The GRAD lambs exhibited a lower growth rate than the DS ($P < 0.01$), EM ($P < 0.05$) and SUB lambs ($P < 0.001$). Our results suggest that delaying separation of artificially reared lambs from their mothers adversely affects their behavioral, immune and endocrine responses.

PROMOTING SENSORY VARIETY IN CONCENTRATE DIETS FOR STABLED HORSES: EFFECTS ON BEHAVIOUR AND SELECTION

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Published studies investigating foraging behaviour with bulk forages have identified the importance of variety. Whether restricted sensory variety also affects foraging behaviour on concentrate diets is currently unclear. Foraging was identified as sniff, manipulate, chew or ingest a foodstuff. To investigate this in three replicated trials, up to eight horses were introduced into each of two identical stables containing a single concentrate feed, or four concentrate feeds for five minutes. In order to control for palatability effects each concentrate was presented as the single concentrate option on two occasions within each trial. Trials were videotaped and 12 mutually exclusive behaviour patterns compared.

Data was evaluated using Observer 3 and SPSS v10. Square root transformations normalised the data allowing GLM ANOVA. Commercially available low energy concentrates used in Trials 1 and 2 presented a range of sensory variety. In Trial 3, four otherwise identical base diets were presented flavoured with molasses, garlic, mint or herbs, to test whether manipulating one sensory characteristic was sufficient to effect changes in behaviour and diet selection.

When Single or Multiple concentrates were presented significant differences in foraging and non-foraging behaviour were recorded in all three trials e.g. Foraging bouts were longer in Single than Multiple sessions (Trial 1: $F18.1$ *df* 7 $P<0.005$ Trial 2: $F9.4$ *df* 5 $P<0.05$, Trial 3 $F12$ *df* 7 $P<0.05$), Stand duration was also longer in the Single session (Trial 1: $F21.2$ *df* 7 $P<0.005$, Trial 2: $F15.7$ *df* 5 $P<0.01$, Trial 3: $F9.2$ *df* 7 $P<0.05$). In all trials, multiple session non-foraging behaviour, foraging behaviour and selection patterns resembled that reported for free ranging horses more closely.

Further study is required to determine whether these effects persist over longer periods. However, these trials indicate that promoting sensory variety in concentrate diets facilitates the expression of highly motivated foraging behaviour.

THE PRACTICALITY OF FORAGING ENRICHMENT FOR STABLED HORSES AND ITS EFFECT ON BEHAVIOUR

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This trial aimed to establish whether the behavioural effects observed when stabled horses were provided with multiple forages (Equine Vet. J. 34:7, 686-691, 2002) persist over longer time periods.

Nine horses (aged 5–20 years; mixed breeding) acting as their own controls participated in an 18-day cross-over Latin Square trial. They were provided with comparable weights of either a single forage (SF) diet (hay) or a multiple forage (MF) diet (three short-chop and three long-chop commercially available forages), in two daily feeds. Following a two-day acclimatisation, the horses were maintained on their treatments for seven days. Horses were observed on alternate days, morning and afternoon, during the 25 minutes following forage delivery. Horses then crossed-over onto the other treatment and, after another two-day acclimatisation, the same protocol was followed for a further seven days. Observations from video were analysed using The Observer 3.0® and SPSS (version 11).

Horses on the MF diet performed foraging behaviour significantly more frequently ($T=0$, $P<0.01$, Wilcoxon's test for matched pairs) and for longer periods ($T=2$, $P<0.05$) than horses on the SF diet. Horses on the SF diet spent significantly longer performing behaviour thought to be indicative of a search for alternative resources, such as moving or looking out of the stable ($T=2$, $P<0.05$). On the MF diet, foraging on the six forages differed significantly in frequency ($X^2=37.435$, $v=5$, $P<0.001$, Friedman test), latency ($X^2=21.643$, $v=5$, $P<0.01$) and duration ($X^2=31.174$, $v=5$, $P<0.001$). Horses demonstrated preferences for particular forages but sampled all forages during observations.

It is concluded that the previously published short-term behavioural effects of MF provision do persist over longer periods of time (nine days). The methodology described also proved to be an efficient means of managing horses under forage-enriched conditions and could easily be adopted by horse owners to facilitate foraging behaviour.

DO INDIVIDUAL DIFFERENCES IN MATERNAL BEHAVIOUR INFLUENCE THE EARLY SUCKLING BEHAVIOUR IN DOMESTIC PIGS?

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The early milk intake in newborn piglets is very important for their survival. In lactating sows the milk flow is almost steady during the first hours after birth (Phase1-P1) and become than cyclic (Phase 2-P2). It is not well understood whether the individual differences in maternal behaviour during P1 and P2 influence the suckling behaviour in newborn piglets. This study had two aims: (i) to identify the time of transition from P1 to P2. (ii) to examine whether the individual maternal behaviour in terms of udder accessibility, posture changes and grunting duration influences the suckling duration in P1 and the nursing frequency in P2 as an indicator for milk transfer. Seven sows were video taped for 24 h post partum. The distinction between P1 and P2 was based on the increase of intervals between nursings. The nursing and suckling behaviour were analysed in detail. The first analysis showed: (i) it was possible to identify the time of transition from P1 to P2 in 6 sows: P1 ended 7.46 h (±1.35h) after the delivery of the last piglet. Surprisingly, there was a low variation between sows. (ii) During P1 resp. P2 udder accessibility was 87 % (±0.11) resp. 68% (±0.23), frequency of posture changes was 0.3/h (±0.2) resp. 0.33/h (±0.12); grunting duration was 29.4 min/h (±7) res. 8.4 min/ h (±3) and suckling duration 34.3 min/h (±5) resp. nursing frequency 1.4 nursings/h (±0.2). Surprisingly, there were no significant correlations between the individual maternal behaviour (udder access, posture changes and grunting duration) and the suckling duration in P1 or the nursing frequency in P2 (Spearman, NS). These results should be interpreted with caution for two reasons: the limited number of sows or because suckling duration rather than the milk intake itself was taken as an indicator of milk transfer.

NOT ANIMAL RELATED BUT HOUSING PARAMETERS DETERMINE AN EXPERT'S INTUITIVE WELFARE ASSESSMENT OF PIG FARMS

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On-farm welfare assessment systems usually involve checklists with pre-determined sets of parameters. The current study investigated whether these sets can be mathematically determined using an expert's assessment of welfare as reference. In this pilot study 31 finishing and 31 dry sow units were visited by three welfare researchers (out of a pool of five) acting as 'experts'. Independent from each other, the experts gave an intuitive welfare score on a scale ranging from 1 (poor) to 10 (excellent), five minutes after entering a pig room. They then recorded 45 animal and housing related parameters such as group size, skin damage and light intensity. Data were analysed after all farms were visited. Apart from one expert who scored consistently lower than the others, experts agreed strongly regarding their intuitive scores (REML-analysis, $P>0.05$). For each pig category a model search was performed to establish a multiple regression model for the welfare scores (averaged over experts). These scores for Sows were strongly related to the factors 'group housing' (6.23 vs 2.94 for Yes vs No; $P<0.05$), 'straw presence' (6.39 vs 4.83 for Yes vs No respectively; $P<0.05$) and 'protected feeding' (5.60 vs 4.75 for Yes vs No respectively; $P<0.05$). The linear model for Sow Welfare which included these three factors accounted for 89% (=R^2-adjusted) of the variance. The Finishing pig scores were related to 'presence of separate feeding and resting areas' (5.28 vs 4.09 for Yes vs No respectively; $P<0.05$), 'enrichment materials' (6.44 vs 4.05 for Yes vs No respectively; $P<0.05$) and 'light intensity' (4.86 vs 4.08 for High (>10 lux) vs Low (£10 lux); $P<0.05$). The resulting model accounted for 78% of the variance. This study suggests that a limited number of parameters may serve to explain welfare scores by welfare researchers. Furthermore, housing parameters appear more important than animal based parameters.

STATUTORY MONITORING OF ANIMAL WELFARE ON UK FARMS AND THE INFLUENCE OF FARM ASSURANCE SCHEMES

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Community and national legislation set out minimum welfare standards for the protection of farmed animals; together with national codes of recommendations, they define conditions needed to avoid unnecessary suffering or injury and to take account of animals' physiological and behavioural needs. The GB State Veterinary Service (SVS) visits farms to ensure that these welfare laws are being implemented, to educate and encourage livestock keepers to improve welfare standards and, where necessary, take enforcement action.

The results of SVS welfare visits carried out during 2002 will be presented. Compliance with welfare legislation differs between intensive and extensive husbandry systems, with most non-compliance seen in grazing animals: 32.9% of inspections of beef, dairy and sheep/goat enterprises showed breaches of legislation compared to 20.1% in pigs and poultry. These were mainly due to inadequate disease treatment, record keeping and housing.

In addition to SVS monitoring, UK farms that have signed up to voluntary Farm Assurance Schemes (FAS) receive checks from independent inspectors. FAS are designed to assure consumers that farmers produce food that meets all legal standards and additional agreed policies of good welfare and agricultural practices. However, it is unclear whether the potential welfare benefits of FAS are being achieved; the Farm Animal Welfare Council recommended that welfare compliance on assured and non-assured farms is compared by expanding the scope of information collected during SVS inspections. A pilot study in Scotland showed that of 49 inspections of non-FAS enterprises, 23 (46.9%) did not comply with legislation and unnecessary pain/distress was found in 15 (30.6%). However, for the 72 FAS enterprise inspections, these figures were 23 (31.9%) and 1 (1.4%), respectively. Infringements were mainly for inadequate disease treatment and housing. Therefore, initial results suggest that there was better compliance on assured farms than non-assured ones.

SEASONAL DIFFERENCES IN BEHAVIOUR AND PHYSIOLOGY OF PERFORMING AND EXHIBIT MACAWS KEPT AT A ZOO OPEN TO THE PUBLIC

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The performance of learnt behaviours has been advocated as suitable enrichment for captive animals. This paper reports the behavioural and physiological responses of (1) performing parrots and (2) parrots simply exhibited to the public, during periods of high and low visitor numbers (high season/HS, and low season/LS, respectively). Data were obtained from three pairs of exhibit macaws [*Ara macao*] and six macaws that regularly performed to the public within the same zoo but were housed away from the public. Behaviour was observed instantaneously during 36 sessions and faecal samples were obtained the day after.

Performing birds had significantly higher faecal corticosteroid concentrations during the high season than the low season (HS 3,586±538 ng/g, LS 1,188±141 ng/g, Paired t-test, $t=3.93$, $df=5$, $p<0.01$). Faecal corticosteroid concentrations did not differ between low and high season for exhibit birds (HS 2,612±1,065ng/g, LS 3,315±661ng/g).

Performing birds spent significantly more time in positive interactions with other birds during low than high season (LS 9.4±3.0%, HS 2.8±1.4%, paired $t=-2.60$, $p=0.047$). Exhibit birds spent significantly more time inactive during low than high season (LS 75±5%, HS 66±7.4%, paired $t=-2.84$, $p=0.036$).

Faecal corticosteroid levels were significantly lower in performing birds during the low season compared to exhibit birds (Mann-Whitney $U = 0.000$, $N = 3,6$, $p=0.0119$), but were similar in the two groups during the high season.

Significant behavioural differences in activity levels and preening were found between the two groups of birds: Exhibit parrots were inactive during 70±4.4% of observations and preened during 9±2.8%; performing parrots were inactive during 40±4.0% of observations and preened during 28±5.2% (General Linear Model, $F_{1,10} = 20.67$, $p=0.001$, preening $F_{1,10} = 5.69$, $p=0.04$).

In conclusion: training and low level of performing such as experienced during low season appeared to be beneficial to performing macaws. In contrast, higher visitor numbers benefited exhibit macaws.

SELF-ADMINISTRATION OF ANXIOLYTIC IN LABORATORY MICE IN DIFFERENT HOUSING CONDITIONS

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Laboratory mice are typically housed in small cages containing only food, water and litter. Such stimulus-poor and unresponsive environments may induce negative psychological states indicating compromised welfare. To improve welfare, cages are sometimes equipped with items such as nesting material and shelters, resulting in reduced anxiety as measured in standard tests outside the home cage. We aimed to assess the anxiety of mice within the home cage by allowing them to self-administer an anxiolytic, and to examine the effects of housing.

Female C57Bl/6J mice (3/cage) were housed in Standard (n=10), Unpredictable (n=10) and Furnished (n=6) cages. Standard cages contained only sawdust, food and water. Unpredictable cages were identical to Standard but exposing mice to repeated disturbances by tilting and changing cage position. Furnished cages were double the size of Standard cages and contained nesting material, nest box, tubes, chew blocks and a running wheel. The mice were offered drinking water from two bottles simultaneously available, one containing tap water and one containing a solution (0.08 g/ml) of a benzodiazepine anxiolytic. The positions of the bottles were balanced over treatments.

The mean proportions of total fluid consumed from the anxiolytic bottle were: Furnished, 0.46 (rear bottle) and 0.53 (front bottle); Unpredictable, 0.61 and 0.46; Standard 0.65 and 0.51. Two-way ANOVA showed a significant effect of housing, bottle position and interaction on self-administration of anxiolytic ($F_{2,1,2}$ = 4.1, 9.9, 7.6; P = 0.02, 0.002, 0.01). Mice in Furnished cages consumed significantly less anxiolytic than mice in Unpredictable and Standard cages, and more anxiolytic was consumed from the rear bottle by the Unpredictable and Standard mice.

The results indicate that mice in standard cages may experience chronic anxiety that is alleviated by providing items which mice are motivated to use. The results are discussed in relation to the behaviour and welfare of mice.

SOCIAL CONTEXT AFFECTS THE MOTIVATION OF LABORATORY MICE TO GAIN ACCESS TO RESOURCES

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Consumer demand studies measuring the motivation that animals have for resources have almost exclusively used gregarious species, but have tested animals housed in isolation. Social context could influence the motivation for resources. In the present study, a single mouse from each of six groups was trained to perform an operant task that could not be performed by non-trained cage-mates. Performance of this task allowed the trained mouse to leave the start-cage containing cage-mates and enter a resource-cage. The motivation to enter this resource cage was tested when it provided either additional space or a running-wheel, when cage-mates were either present or absent from the start-cage.

When cage-mates were present in the start-cage, the number of visits to the running-wheel was significantly less than when cage-mates were absent (2.8±0.6 and 4.2±0.6 visits/24h: ANOVA, F_1=6.6, P=0.019), however, there was no significant effect of cage-mates presence on the number of visits to the additional space (3.2±0.8 and 3.0±0.9 visits/24h: ANOVA, F_1=0.067, P=0.79). Overall, the mice occupied the resource-cage longer when cage-mates were present in the start-cage (13,640±3,317 and 7,383±933 s/24h: ANOVA, F_1= 5.11, P=0.03), however, there was no significant effect of mouse, resource (additional space or running-wheel) or interactions on the duration of time in the resource-cage. When cage-mates were present in the start-cage, the trained mice performed significantly fewer (1.0±0.6 and 2.3±0.6 bouts/24h: ANOVA, F_1= 4.09, P=0.048) and shorter (377±128 and 1,119±31 s/bout: ANOVA, F_1= 4.21, P=0.046) bouts of wheel running.

These data show that social context can have a significant effect on the motivation that animals have for resources, and this effect is resource dependent. In addition, social context influenced the use of a running-wheel. The influence of social context should therefore be considered in the design and interpretation of consumer demand studies.

ANALYSIS OF THE MOVEMENT AND USE OF SPACE BY ANIMALS IN CONFINEMENT

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Spatial confinement imposes behavioral restrictions to animals because of limitations in movement patterns and use of space. High animal densities, variations in group size, and/or social factors, may exacerbate these effects. The understanding of how wild captive and domestic animals use the space and how they move within a confined environment is of paramount importance to designing facilities that best adjust to the animals' biological requirements and, hence, maximize their health and welfare. The statistical methodology currently available to conduct spatial and movement analysis was originally developed to address habitat use and management of wild animal populations. These statistical models include the following assumptions: 1) the animal is unconstrained in its movement throughout space, 2) the animal spatial distribution follows a bivariate normal distribution, implying that the animal moves at random and has a single center of activity located in the middle of its home range that is elliptical in shape, and 3) the observations are independent. These assumptions, which are already problematic when studying free living species, are completely violated when applied to captive animals, particularly when successive animal locations are collected during short observation periods. Furthermore, confined animals show a disproportionate preference to use the periphery of the available space rather than the center as is assumed. Hence these statistical models tend to provide biased results when applied to animals in captive environments. In this methodological paper we examine through an example the effect of critical sampling factors (such as sample size, sampling interval period and total sampling length) on analysis of movement patterns and use of space. We highlight some limitations of frequently employed spatial analysis techniques when applied to captive animals under different animal densities or housing conditions. Finally we discuss some of the potential risks for incorrect conclusions based on these methods.

PREVALENCE OF TAIL BITING IN PIGS AND ASSOCIATIONS TO CARCASS CONDEMNATIONS – A FINNISH PILOT STUDY

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The aim of this study was to investigate the prevalence of tail biting in Finland and the relationship between tail biting and carcass condemnation. Tail docking as a way of controlling tail biting is not allowed in Finland.
The material consisted of 10852 pigs slaughtered during one week at a Finnish abattoir. The quality of each tail was classified as healthy, healed tail biting or inflamed tail biting. The length of the tail was recorded as normal or short (< 10 cm). A tail that was both inflamed and short was defined as severely bitten. Associations between tail biting and risk of carcass condemnations were estimated using χ^2 –tests. Tests were performed with SPSS (8.0) for Windows.
A total of 35% of the pigs had bitten tails. 12% of all pigs had inflamed tail bites, while 23% showed evidence of healed tail biting. 1.3% of the pigs had severely bitten tails. All kinds of tail biting increased the risk for both whole and partial carcass condemnations ($p < 0.001$ for all). This was especially clear in pigs with severe tail biting: 27% of these pigs had at least some parts condemned, while the corresponding percentage for healthy-tailed pigs was 5.1% ($p < 0.001$). Especially the risk for condemnations due to arthritis and abscesses increased significantly in all kinds of tail bitten pigs ($p < 0.01$ for all).
The percentage of tail biting was unexpectedly high and shows that tail biting is a serious problem in Finland. The result might by slightly exaggerated as healed tail bites possibly include some tails injured otherwise. Tail biting causes a highly increased risk of carcass condemnation, also in it's less severe forms, showing that, in addition to being a serious welfare problem, tail biting causes big economical losses.

SOW INFLUENCE ON THE WEANING IN TWO DIFFERENT HOUSING ENVIRONMENTS

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In natural conditions weaning is process during which the sow gradually increases the cost of the piglets to get access to milk. In farming conditions the role of sows' nursing behaviour may be strongly affected by housing environment. We investigated sows' nursing behaviour (nursing frequency, proportion of nursings terminated by sow, incidence of non-nutritive nursings and nursing synchrony) in the group housing system (GH-6-11 sows kept in large pens) and individual housing system (IH) in small pens. The observations were carried out in 5 GH and 5 IH commercial farms in Sweden. Nursing behaviour of 4 focal sows per farm was recorded for 7 hours in 2 lactation periods (fourth week, one day before weaning; weaning=5.5 weeks). The data were submitted to a SAS GLM procedure with 2 factors: farm type and lactating period (repeated factor). The significance of the model was tested using F-Value (LS means). There was no significant difference between GH and IH farms in total number of nursings ($F_{(1, 15)}$=0.07, p>0.5, means:GH=7.6, IH=7.5) or in number of nutritive nursings ($F_{(1, 15)}$=0.05, p>0.5, means:GH=6, IH=6). However on GH farms sows terminated higher proportion of nursings ($F_{(1, 15)}$=13.56, p<0.01, means:GH=0.96, IH=0.81) and allowed piglets' post-ejection massage for shorter time ($F_{(1,15)}$=8.53, p<0.01, means:GH=65 sec, IH=102 sec). The effect of lactation period was not significant in either environment. We conclude: 1) Sows from both housing environments were nursing and letting down milk at the same frequency and therefore the milk supply was probably as high in GH as in IH. 2) Sows from GH farms terminated nursings more frequently and shortened them more than IH sows. 3) The weaning process did not proceed noticeably between the fourth and sixth week of lactation, which may suggest that important changes in sows' nursing behaviour already occurred in both systems before week 4.

EFFECT OF WATER DRINKER TYPE ON ORAL-NASAL BEHAVIOUR IN EARLY-WEANED PIGS

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Early-weaned piglets appear to be highly motivated to engage in motor patterns associated with nursing, which often leads to the development of belly-nosing. These piglets are also observed to spend more time at nipple drinkers and to consume more water. It is possible that a nipple drinker somehow accommodates sucking behaviour, but any relationship between drinking behaviour and the development of other oral-nasal behaviour patterns has not been explored. In this study, we examined the effect of drinker type on belly-nosing and other pen-mate directed behaviours in early-weaned piglets. Over six trials, a total of 352 Yorkshire pigs were weaned at 14 days and assigned to pens (n=44) of 8 pigs based on litter, weight and sex. Half the pens were furnished with water nipple drinkers while the other half had drinking bowls. Water and feed intake were recorded on a daily basis for the first week and a weekly basis for the subsequent two weeks. Piglet behaviours were video-recorded for 24-hours on a sample of pens (n=32) on days 5, 9, 11, 13, 16 and 18 post-weaning. Piglets with a drinker bowl spent significantly less time belly-nosing than those with a nipple drinker (1.13% bowl v. 2.02% nipple; $F=10.36$; $DF=1$; $p=0.0054$) and spent less time performing all oral-nasal behaviours (1.92% bowl v. 3.03% nipple; $F=8.97$; $DF=1$; $p=0.0086$). Drinker type did not affect any other behaviours. The bowl drinkers led to decreased water usage (5.86 l/pen/day bowl v. 13.42 l/pen/day nipple; $F=46.47$; $DF=1$; $p<0.0001$) and a tendency for increased feed intake at two days post-weaning (66.33g/pig/day bowl v. 48.06g/pig/day nipple; $F=3.48$; $DF=1$; $p=0.0695$). However, overall feed intake and weight gain were not affected by drinker type. These results suggest that drinker type, and the motor patterns that it accommodates, can play a role in the development of other oral-nasal behaviours.

SOME POTENTIAL INDICATORS FOR SATIETY IN EMPTY SOWS

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Lack of sufficient feeling of satiety is a major cause for reduced welfare in non-lactating sows. In order to determine the effects of nutritional measures on the satiety of restricted-fed sows, it is important to know what to measure. In this study, some parameters were tested as potential indicators for satiety.
Empty first-parity sows, fitted with a catheter in the jugular vein, were either fed a high-fibre diet (H; 45% sugarbeet pulp; n=5) or a low-fibre diet (L; n=5). First, sows had unrestricted access to feed (UR), later access to feed was restricted (R; 900 g at 07:00 and 19:00h). In both periods the number of posture changes (lying-sitting-standing) was analysed from video-recordings (06:00-20:00h). Blood samples, taken every 2h from 10:00-18:00h (after the post-meal peak), were analysed for stability of glucose level (sum of absolute differences between consecutive samples) and mean glucose level. Non-esterified fatty acids (NEFA) were analysed in the last two samples. Data were statistically analysed by analysis of variance with animal as random effect, and diet, feeding level and interactions as fixed effects.
Feed restriction had a significant effect on posture changes and NEFA concentrations of L-sows, but not of H-sows. L-R-sows showed more posture changes (58.6 versus 34.8; $P<0.01$) and had higher NEFA concentrations (0.17 mmol/l versus 0.06 mmol/l; $P=0.001$) than L-UR-sows. H-sows had more stable glucose levels than L-sows ($P<0.05$), while there was no effect of feeding level. Between 12:00 and 14:00h glucose levels of L-R-sows dropped, whereas those of L-UR-sows increased. UR-sows (5.25 mmol/l) had higher mean glucose levels than R-sows (4.95 mmol/l; $P<0.05$).
These results imply that the number of posture changes, NEFA concentrations and stability of glucose level can be used as indicators for satiety. Feeding the H-diet improves satiety as no differences were found between restricted and unrestricted feeding.

DO PIGS OF DIFFERENT AGES SYNCHRONISE THEIR BEHAVIOUR IN ENRICHED PENS?

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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. Ten novel objects were presented to groups of three focal pigs of different ages (3, 5 or 13 weeks old). Each object was presented to three different groups of each age for a period of five days. Video recordings were made of the pigs' behaviour and subsequently, continuously, analysed for activity, inactivity and object directed behaviour on days one and five. The observed performance of any given behaviour, 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 unrelated t-tests.

All of the age groups synchronised their behaviour to a much greater extent than expected by chance ($P<0.001$). The degree of synchrony (-1 to +1) of activity decreased with age (0.813 vs. 0.621 vs. 0.443, respectively, s.e.d. 0.191, $P<0.001$). The sucklers showed a higher degree of synchrony of inactivity than the weaners and growers (0.961 vs. 0.886 vs. 0.901, respectively, s.e.d. 0.054, $P<0.001$). No significant effect of age, or object, was found for the degree of synchronisation of object use. An interaction was found for day ¥ age ($P<0.05$). The sucklers showed an increase in synchronisation of object use over the five day period whereas the weaners and growers showed a decrease in the degree of synchronisation.

As pigs showed behavioural synchronisation when using objects, object design and group size should be considered when providing enrichment in order to minimise potential competition.

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VOCALIZATION ANALYSIS AS A TOOL FOR WELFARE ASSESSMENT IN FARM ANIMALS. WHERE ARE WE AND WHERE DO WE GO?

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In farm animals vocalizations may supply us with hints on their well-being in an easy way, given that the meanings of the respective calls are well-established. Then, it is possible to judge acoustically uttered current needs and impaired welfare by non-invasive monitoring. For these reasons, the analysis of farm-animal vocalization has gained increasing interest in the last years and a variety of attempts to elucidate the message they give us has been made. These will be reviewed in order to give an overview of the present state-of-the-art in this discipline and to critically elucidate further developments.

Emotionally relevant external events, hormone concentrations affecting mood and appetitive behaviour, thirst and hunger are able to stimulate a complex central nervous network that regulates endocrine feedback and behaviour in order to maintain or regain homeostasis. Particular states of mood or emotion may thus be accompanied by specific behaviours, vocalization being one of them. Typical examples may be nurse grunts of lactating sows, distress calls of domestic fowl, and separation calls in various species.

Modern techniques of sound analysis have provided tools to discriminate, analyse and classify specific vocalizations. The main problem that persists up to date is the extraction of suitable features from the utterances to be analysed. Too many features easily overload the computational system and too few result in poor performance. Hence, several attempts have been made to reduce the dimensionality of the input vector for classification. For special applications in animal sound analysis this has been done successfully.

A serious problem remains, however, in another aspect of vocalization analysis. How can we really know what an utterance means? The problem of meaning seems to be more difficult to solve than that of the technical tools. Scientific techniques that appear to be suitable for semantic decoding are discussed.

EFFECTS OF ENVIRONMENTAL ENRICHMENT AT TWO PHASES OF DEVELOPMENT ON THE INCIDENCE OF BELLY NOSING BEHAVIOUR IN EARLY WEANED PIGS

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The incidence of belly nosing related behaviours were studied in 480 piglets, weaned at 14 days of age, provided with environmental enrichment during either or both pre- and post-weaning. Pen enrichment was modified by providing either a foam rubber mat on the pen wall (Nose), rubber nipples (Suck), a Bite-Rite Tail Chew ^{TM} (Bite), a dirt-filled tray (Root), or nothing (Control). Scan sampling observations, at 5-minute intervals, were made between 08:30 and 16:30 at 3, 10, 19, 26, and 33 days of age. Observations during the pre-weaning phase were made to determine the number of piglets lying (Lying), standing, nursing, and interacting with environmental enrichment (WENR). During the post-weaning phase, observations were made to determine the number of piglets belly nosing (BN), belly sucking (BS), other nosing and sucking (Other), biting (Biting), eating (Eating), drinking (Drinking), and WENR. An analysis of variance was performed with environmental enrichment and phase of development in the main-plot, and age as a sub-plot. Root had the highest incidence of WENR (8.20; $P<0.0001$) and Lying behaviours (327.1; $P<0.05$), while Nose had the lowest incidences of both (0.30 and 289.25, respectively). In the post-weaning phase, Root pigs had the highest incidence of WENR (30.37; $P<0.0001$). Control pigs performed Other (8.69) and Biting (4.40) behaviours the most ($P<0.0003$ and $P<0.10$, respectively). Eating behaviour was highest in Nose pigs (29.00; $P<0.0007$), while Drinking was highest in Suck pigs (3.87; $P<0.10$). Providing enrichment during the post-weaning phase was found to be more effective at reducing vices than providing enrichment during the pre-weaning phase. Providing enrichment during the nursery phase led to reduced levels of BN (4.86), BS (0.60), Other (6.80), and Biting (3.70) behaviours ($P<0.05$, $P<0.02$, $P<0.01$ and $P<0.05$, respectively). These findings suggest a sensitive period for belly nosing behaviour does not exist in the farrowing environment.

ONTOGENY OF TAIL-IN-MOUTH BEHAVIOUR IN PIGLETS REARED IN BARREN OR ENRICHED ENVIRONMENTS

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Tail-in-Mouth (TIM) behaviour is defined as oral manipulation of a pig's tail by another pig – without causing any visible trauma. TIM is thought to be the precursor of tail biting.
The objective of this experiment was to elucidate the ontogeny of TIM among piglets. Our hypotheses were as follows:
(1) TIM activity is higher among piglets penned in a stimulus-deprived than in an enriched environment.
(2) TIM activity increases as the piglets grow older, paralleled by an increased motivation to explore in general.
(3) Immature females and males perform the same amount of TIM.
(4) There is an association between TIM activity and teat-order.
Twelve sows and their litters were individually housed in equal-sized pens. Six of the twelve pens were enriched with compost and straw. Besides suckling, the piglets were floor-fed from week two. In the other six pens, there was no environmental enrichment and the piglets were only nursed.
Observation periods were as follows: 5 periods each lasting 10 minutes, 2 days weekly during 4 consecutive weeks. Every TIM instances and whether they occurred during periods of activity or rest were recorded. Additionally, the gender and teat-order of the actor as well as the receiver were recorded. Poisson regression was used to evaluate the significance of environment, activity, week, gender, and teat-order.
TIM was 3.4 times as frequent in the barren environment as compared to the enriched ($P < 0.010$). TIM was more frequent during activity than rest ($P = 0.003$). TIM increased over time ($P < 0.001$). The frequency of TIM performed by male pigs increased according to decreasing teat-order. For females, the opposite was recorded.
In conclusion, TIM activity seems to be highly related to the environment. But it is also affected by individual characteristics such as age, gender, and teat-order.

GLUCOCORTICOIDS AND THEIR METABOLITES IN THE HIPPOCAMPUS OF WEANED AND UNWEANED PIGLETS

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We demonstrated previously that pigs weaned younger than 12 days of age showed deficits in spatial memory and increased aggression when subjected to stress. The hippocampus, a brain region that controls memory processes, has binding sites for adrenal steroids. At 12 days of age 6 piglets were weaned (W), while 6 littermates remained unweaned (U). At day 14 of age they were either socially isolated (WI=3 & UI=3) for 15 minutes or kept as control (WC=3 & UC=3). Piglets were euthanized, using pentobarbital sodium, and hippocampal tissue collected. Glucocorticoids and metabolites were isolated using solid phase extraction followed by HPLC fractioning. Hippocampal concentrations of cortisol, corticosterone, cortisone and 11ß-hydroxyetiocholanolone were quantified using enzyme-immunoassays. Mean hippocampal concentrations of cortisol, corticosterone, cortisone and 11ß-hydroxyetiocholanolone (pg/g tissue ± SEM) were 355 ± 91; 3,714 ± 546; 6,906 ± 1,689 and 1,106 ± 208 respectively. Cortisol, the glucocorticoid hormone present at the highest concentration in the peripheral circulation, had the lowest concentration among the measured steroids ($p<0.01$). Social isolation resulted in higher hippocampal cortisol and corticosterone levels ($p<0.05$) in unweaned pigs compared to the other groups (Cortisol: UC 254 ± 69, UI 742 ± 288, WC 220 ± 20 & WI 205 ± 63 pg/g tissue; Corticosterone: UC 3,274 ± 685, UI 6,018 ± 1,201, WC 3,018 ± 611 & WI 2,546 ± 766 pg/g tissue). No differences were observed for cortisone and 11ß-hydroxyetiocholanolone. Considering the small sample size it is necessary to be cautious with the interpretation of these results, but we speculate that the low hippocampal glucocorticoid concentration in isolated early-weaned pig may be associated with the cognitive deficits previously reported.

IS STONECHEWING THE OUTDOOR PIG'S ORAL STEREOTYPY?

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Two factors that influence oral stereotypies in sows tethered individually indoors are meal-timing, and extent of foraging. This project examined the effect of these on stonechewing in outdoor pigs. Groups of gestating sows, in outdoor arable paddocks with ark housing, were scanned at 4-min intervals over 6-8h periods including daily meal-times. In Experiment 1, the impact of meal-timing was examined in two ways: firstly, two groups (N=11,20) fed normally mid-morning were compared with two groups (N=15,19) for which feeding was delayed by 170 mins on experimental days. With delayed feeding, no rise in stonechewing occurred after the habitual meal-time, but it rose sharply following actual delivery: the instantaneous probability of stonechewing over the period 1–2.5 h after the deferred meal was 0.546, compared to 0.333 over the same period with feeding not deferred ($t=3.48$, $p<.02$). Secondly, a single group (N=10) was observed on 4 days; on two middle days, as well as being fed as normal at 945 h, an additional meal was delivered 150 mins later. The second meal initiated a second upsurge in stonechewing: comparing the hour before with that after re-feeding, the mean incidence continued falling (by .04) in control conditions but rose (by 0.32) following the second meal ($t=6.00$, $p<.001$). In Experiment 2, two groups (N=14,11) were each observed for 1 d with rollnuts distributed evenly over the whole paddock, compared to the normal 12m-long straight feed-line. Distributing feed extended foraging/rooting time from 40 to 120 mins, deferred the upsurge in stonechewing, halved peak incidence (from probabilities of 0.758 to 0.385), and reduced overall time stonechewing over the 6h post-feeding from 130.5 to 60.6 mins ($t=5.16$, $p<.001$). Stonechewing seems to be initiated by the act of feeding and can be displaced by inducing more foraging, supporting an affirmative answer to the title's question.

AGREEMENT AND DISAGREEMENT BETWEEN MULTIPLE MEASURES OF DAIRY CATTLE WELFARE

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The use of multiple measures of welfare has been widely advocated, and agreement between multiple measures is often taken as confirmation that a particular issue is important for animal welfare. In this presentation, we argue that both agreement and disagreement between multiple measures have interpretative value. We use examples from the dairy housing literature to identify areas of agreement and disagreement between two types of measures: preference and biological functioning. Experiments on lying surfaces show that dairy cattle clearly prefer heavily bedded stalls. When animals have no choice between treatments, cattle spend more time lying on well-bedded surfaces and less time evaluating these surfaces before lying down. Cattle also experience fewer leg and hoof injuries when they have ample bedding. In contrast, preference and other measures disagree in experiments on freestall dimensions. Cattle do not appear to show preferences for different freestall widths. However, when animals have no choice between treatments, cattle spend less time lying in narrow stalls and more time standing with only the front hooves in the stall and the rear hooves in the alley. These changes in lying and standing behavior are associated with a higher incidence of hoof injuries. Thus freestall width affects measures of biological function, but cows seem not to choose stalls based on this feature. Cases where multiple measures of welfare agree provide a high level of confidence about the welfare consequences of a given housing feature. Cases where these measures disagree can provide insights into how animals evaluate features in their environment.

LAYING-HENS HAVE DIFFICULTY JUMPING DOWNWARD BETWEEN PERCHES

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In aviary systems, hens must jump or fly between perches in order to gain access to resources. It is therefore important to identify factors that compromise accuracy of landing on perches, and so may cause injury.
Twenty 50 weeks old Lohmann Brown layers, reared in floor pens with continuous access to perches from hatching, were first trained to jump a horizontal gap between perches of 80 cm. Then, in the experiment (2 x 2 x 2 design) each bird made eight jumps differing in terms of direction (upward or downward (14∞)), illumination (5 or 20 lux), and contrast between perch and background (high or low). Jumps were recorded on video, and outcomes were assigned to four categories: “successful”, “successful with clumsy landing”, “perch missed” and “jump refused”. A jump was successful when the bird took off and landed without loosing its balance within five minutes of placement on the take-off perch.
Successful jumps occurred more frequently on upward (70 out of 80) than downward jumps (37 out of 80) (GLMM, SED = 0.511, Wald statistic = 25.31, $P<0.001$). In more details no “successful jump with clumsy landing” and “perch missed” were observed in upward jumps, when 18 “successful jump with clumsy landing” and 15 “perch missed” were observed in downward jumps. Light intensity (5 vs. 20: 52 vs. 55) and contrast (low vs. high: 51 vs 56) had no effect on successful jumps.
Under aviary conditions, missing a perch or making a clumsy landing is likely to entail some risk of injury. These results indicate that illumination (in the range 5 - 20 lux) does not affect this risk, but that the direction of jumping does. The implication for aviary design is that hens should not be required to make long downward jumps to perches in order to reach resources.

GASTRIC DISTENSION TRIGGERS PREFERENCE FOR THE MOTHER IN SHEEP

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Newborn lambs develop a preference for their mother in less than 24h, thus offering a unique model to study the biological basis of filial bonding. The presence of colostrum in the digestive tract is decisive for the establishment of this preferential relationship. The present study focused on the possible influence of biochemical and mechanical stimuli linked to post-ingestive processes on the development of the infant-mother bond.

Lambs were deprived of suckling for the first 12h (maternal udder was covered), but could interact freely with their mother. We used seven naso-gastric infusions of saline (N=11) or colostrum (collected from a pool of sheep) (N=11) during this 12h period to mimic the amount of milk ingested when newborns suckle their dam (total amount=10% of birth weight). Sham lambs (N=12) received no fluids. At 12h post-partum, the covers were removed and lambs were allowed to suckle. Lambs were tested in a two-choice test between their own dam and an alien ewe at 12h and 24h after birth.

At twelve hours, saline and colostrum lambs spent significantly more time near their mother than the alien ewe, while sham lambs did not (Wilcoxon tests: colostrum: $p=0.037$; saline: $p=0.013$; sham: $p=0.814$). This behavioural difference persisted at 24h post-natal despite the fact they all had access to the mother's udder (colostrum: $p=0.012$; saline: $p=0.033$; sham: $p=0.594$). This effect was not related to locomotor activity, thermoregulation, growth rate or dams' behaviour.

Mechanical stimuli originating from the gastrointestinal region, such as gastric distension or emptying, are sufficient for the establishment of early mother preference in lambs, without the necessity of colostrum ingestion or sucking activity. Gastrointestinal mechanical stimuli can therefore facilitate learning through their association with cues from the external environment, in particular those originating from the mother.

WELFARE OF PEKIN-DUCKS INCREASES WHEN FREELY ACCESSIBLE OPEN WATER IS PROVIDED

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A possible threat to the welfare of commercially kept ducks is the inability to perform sufficient preening behaviour, due to the absence of freely accessible open water. Water is usually provided by nipple drinkers which allow ducks only to drink. In Europe, it is now recommended that ducks should have access to open drinkers which allow them to wetten the upper part of the body. The current study was designed to gain knowledge on the actual need of pekin ducks for freely accessible open water, and is based upon preference testing and reactions to deprivation.
Four treatment groups were established on the basis of a cumulating degree of water accessibility: nipple drinkers only (n=4), plus a trough (n=6), plus shallow water (n=6), plus deep water (n=6). REML and Wald tests, and subsequent pairwise t-testing, was used for statistical analysis. A study of location preference showed that, when available, pekin-ducks spent most of their time in shallow (3%) and deep water (4%), and less time at a trough (1%) (Wald Statistic (WS)=21.84; df=5; $p<0.05$). Access to deep and shallow water significantly increased preening behaviour when compared to provision of only nipple drinkers (WS=49.20; df=3; $p<0.05$). Preening behaviour did not increase when open water was provided with a trough. When half of the groups was deprived of water between 5 and 6 weeks of age, a significant decrease in preening behaviour was seen (WS=31.99; df=6; $p<0.05$), but only in ducks which previously had access to deep and shallow water. At the age of slaughter, only plumage of ducks given deep and shallow water was clean.
It was concluded that pekin-ducks have a behavioural need for freely accessible open water.

THE RELATIONSHIP BETWEEN BREAST BLISTERS AND THE AVAILABILITY AND USE OF PERCHES BY ORGANIC BROILERS

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Organic broiler producers are concerned that the occurrence of breast blisters is associated with perching. This was investigated together with a comparison between two strains. Four groups of each 60 Labresse broilers and 12 groups of each 60 i657 broilers where housed indoors in straw bedded pens (9.5 m^2) and fed ad libitum with standard organic broiler feed. The birds were subjected to one of three perch availabilities: 15 cm per bird (Labresse and i657), 7.5 cm per bird (i657 only), and 0 cm per bird (i657 only) with four replicates per treatment. At 43 days of age 52 birds from each group were moved to outdoor housing facilities with access to grass-covered outdoor areas (each 9m by 22m). The use of perches was monitored via video recordings throughout the experimental period until slaughter on day 84. The incidence and severity of breast blisters were recorded on a scale from 0 to 2 at slaughter. Data were analysed using GLM.
Groups of i657 with the highest perch availability used these more than groups with half the perch length (9.5 vs. 3.9 birds perching at midnight; $P<0.001$) and groups of i657 with perches had a higher breast blister score than groups with no access to perches (0.24 vs. 0.12; $P<0.05$). Labresse had a higher breast blister score than i657 (0.58 vs. 0.24; $P<0.001$), but used the perches significantly less (0.1 vs. 9.5 birds perching at midnight; $P<0.001$) and weighed less (2011g vs. 2246g; $P<0.01$) than i657. Males had a higher breast blister score than females, and this was most prominent in the Labresse strain (1.06 vs. 0.08; $P<0.001$). In some broiler strains access to perches may increase the occurrence of breast blisters, but significant strain differences in the occurrence of breast blisters are also found independent of perch use.

FARM LEVEL FACTORS ASSOCIATED WITH FEATHER PECKING IN ORGANIC LAYING HENS

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Compared to other poultry husbandry systems, the preconditions of organic laying hen husbandry (outdoor area, litter area, nest boxes, perches, low density) seem to be more welfare friendly. However, feather pecking is one of the major problems.
Farm-level factors that could be associated with feather pecking were monitored in 63 organic flocks from 26 farms. Data on housing and management practices were collected and plumage damage as a measure of feather pecking was scored at 50 weeks of age or older. Multiple linear regression was used to analyse the data. Model selection involved two steps. First the SELECT procedure was used to select candidate regression models. Second the correlation between biological relevant terms found in the best regression model were studied using Summary Statistics.
No or little plumage damage was found in 18 (29%) flocks, moderate damage in 12 (19%) flocks and severe damage in 33 (52%) flocks. For plumage damage score two possible models were selected. The first model only included the percentage of hens that went outside ($P<.001$; R^2_{adj} 38%; Cp 1.92). In the second model significant contributions were made by age at purchase ($P<.001$) and cockerel ratio ($P<.009$; R^2_{adj} 46%; Cp 2.77). Flock size ($P<.001$), age at purchase ($P<.001$), cockerel ratio ($P<.017$) and percentage of run coverage over 1 meter high ($P<.015$) all contributed significantly to the use of the outdoor run (R^2_{adj} = 77.0%; Cp=3.92).
Based on these results organic farmers are likely to benefit from small flocks, rearing their own layers, keeping them together with cockerels and stimulating the use of the outdoor run by making it attractive with vegetative or artificial cover.

DOES NOSE RINGING MAKE ANY SENSE?

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Outdoor sows are nose ringed to maintain grass cover. Intact pasture insures the sows possibility to graze and is also assumed to reduce the nutrient leaching. However, no evidence of reduced leaching from fields with ringed sows is available. Rooting behaviour constitutes an essential part of the sows' natural behavioural repertoire. In organic husbandry it is an established aim to consider the animals' natural behaviour, and by allowing nose ringing in organic pig production the natural behaviour of the animals has been prevented in order to consider the environment. The purpose of this experiment was to relate grazing and rooting activity of sows to grass cover and nutrient leaching. Three treatments were tested on 78 sows in total: 1:sows with nose rings, 2:sows without nose rings, 3:sows without nose rings and with a gradual pasture allocation. All treatments were carried out with pregnant and lactating sows. The stocking rate was the same for all three treatments and the experiment was carried out May to September 2002. The behaviour of the sows, level of activity and position in the field were registered for one day each week during the entire grazing season. In July and September the grass cover was quantified by remote sensing and in September soil samples were taken in order to determine the nutrient leaching. Data were analysed using ANOVA. The incidence of grazing behaviour was the same in all three treatments. Grass cover was twice as dense in fields with ringed sows than in fields with unringed sows($p<0.05$). When unringed sows graze as much as ringed it would indicate that the nourishment in the grass is similar even though the cover is less, i.e. the grass is growing more in the fields with unringed sows. Growing grass absorbs nutrients, which may result in a reduced nutrient leaching.

A FUNCTIONAL APPROACH OF FEMALE HOMOSEXUAL BEHAVIOUR IN AMERICAN BISON (*Bison bison bison*).

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We present data on female homosexual behaviour in American bison and review functional hypotheses with regard to its occurrence. Past evolutionary theories considered homosexual behaviour either maladaptive or biologically irrelevant. Recently, it was suggested that some homosexual behaviour was adaptive during the course of evolution since it may serve to express dominance, regulate tension, reinforce social bonds, stimulate heterosexual partners, or impede a competitor's reproduction. We collected behavioural data on the incidence of homosexual behaviour in a bison herd (*Bison bison bison*) of 42 same aged females in a commercial farm, La Ferme des Bisons, Recogne, Belgium. The animals grazed year-round on large meadows (1 ha/adult - 160 ha total) and were fed additional hay in winter. In June 2001, before the onset of the breeding season, three breeding males joined the group of females. From May till September 2001, agonistic and sexual behaviours were scored in the entire group by ad libitum all occurrences sampling (325hrs). For a subset of fourteen individuals, the behavioural observation data on oestrus were complemented by the analysis of a progesterone metabolite (20oxoP) obtained from faeces. The female hierarchy was significantly linear (Matman-analysis: h'=0,51, p<.0001, DC=0,94). We observed 194 homosexual interactions in 39 same-sex dyads. The average dominance rank of the actor (x=3,64, SD=4,44) was significantly higher (MWU-test, two-tailed p=.000) than the receivers' (x=19,67, SD=12,39). In 83% of the dyads observed on different days either the actor or the receiver was in or near-oestrus. After omitting the pregnant individuals, the actors' average P-level was significantly higher (MWU-test, two-tailed p=.002) than the receivers'. The distribution of the data was in line with the expectations derived from the dominance expression and control of reproduction hypotheses but the evidence regarding functional benefits (cycles prior to conception, timing subsequent birth) was not conclusive.

PRELIMINARY OBSERVATIONS ON THE BEHAVIOUR OF CHAMOIS (*Rupicapra rupicapra*) IN DISTURBED AND UNDISTURBED ALPINE AREAS

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The role of National Parks for wildlife protection is potentially in conflict with extensive animal husbandry and recreational tourism.
The present study aims to compare behaviour of chamois in the Val Grande National Park (Western Italian Alps) in a valley used for sheep and cattle grazing and visited by tourists (disturbed area: DA) and in a neighbouring valley scarcely affected by human activity (undisturbed area: UA). We observed 38 focal animals for 10 minutes. Data were compared by Wilcoxon Two-Sample Test and results are presented as median-Med, lower quartile-Q1 and upper quartile-Q3.
When no potential source of disturbance was visible in DA, the behaviour of chamois did not differ from that observed in UA. Therefore, we focussed on comparisons between the situation with any disturbance *vs* no disturbance within the same area (DA). Chamois spent significantly less time feeding and displayed shorter duration of feeding bouts in the presence of humans, cattle or sheep (n=9; Med=12.5, Q1=0.0, Q3=30% of the observed time, and Med=37.5, Q1=36.0, Q3=56.3 minutes) than with no disturbance (n=7; Med=32.5, Q1=20.0, Q3=62.5%; $P < 0.05$ and Med=108.8, Q1=93.8, Q3=120.0 minutes; $P < 0.01$). Chamois spent more time self-grooming in the presence of disturbance (n=9; Med=15.0, Q1=6.7, Q3=17.5% of the observed time) than in its absence (n=7; Med=0.0, Q1=0.0, Q3=12.5%; $P < 0.05$) in DA. No significant difference was recorded for the other behaviours.
Our preliminary results suggest that, although chamois do enter areas with grazing sheep or cattle and/or tourists, using protected areas for human activities may have an impact on chamois behaviour, affecting their basic activities. Therefore, it may be advisable to evaluate carefully using these areas for different activities, considering all potential costs and benefits, and taking into account the importance of specific areas (such as breeding areas or birth sites) for wildlife conservation.

SURVIVAL OF THE FITTEST: A REVIEW OF THE BEHAVIOURAL AND PHYSIOLOGICAL ADAPTATIONS OF EXTENSIVELY MANAGED SHEEP BREEDS FAVOURING LAMB SURVIVAL

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Extensively managed animals, often living in harsh and unfavourable environments, need specific adaptations that promote survivability. This is particularly important at parturition and during the neonatal period, when ewe and lamb mortality is highest. To understand the survival adaptations of extensively managed breeds, we compared the behavioural and physiological adaptations of ewes and lambs of hill (extensive) breeds of sheep to lowland (intensively-managed) breeds during pregnancy, parturition and lactation.

Hill sheep have a smaller average litter size than lowland and carry a significantly heavier litter (proportional to their own body weight), which may be achieved through more efficient placental exchange. Hill ewes have a shorter labour, an easier delivery and a shorter interval between delivery of littermates than intensive ewes. Hill ewe breeds lick their newborn lambs more than lowland ewes immediately after birth, and have a higher rate of low-pitched bleating (both important behaviours for the development of ewe-lamb attachment). These behavioural differences result in better ewe-lamb recognition 24 hours after birth in hill ewes, and closer ewe-lamb spatial relationships during lactation. This may also be due to decreased social gregariousness and increased ranging behaviour of hill ewes compared to lowland ewes, which maintain closer spatial proximity to other ewes during lactation. Hill lambs are quicker to stand and suck after birth than lowland lambs, and maintain higher rectal temperatures. Better thermoregulation is partly due to birthcoat characteristics, but is also accompanied by higher thyroid hormone concentrations (important for endogenous heat production) in hill lambs than lowland. The colostrum of hill ewes has higher fat and Vitamin E content than lowland ewes, which may also contribute to improved thermoregulation.

This suggests that sheep adapted to extensive management systems have efficient behavioural and physiological mechanisms to enhance lamb survivability in harsh environments, that are reduced in intensively managed sheep breeds.

DEVELOPMENT AND IMPLEMENTATION OF A SURVEY ASSESSING ATTITUDES OF U.S. ANIMAL SCIENCE FACULTY TOWARD FARM ANIMAL WELFARE: RESULTS FROM A SAMPLE GROUP

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Welfare scientists continue to generate significant research aimed at animal welfare issues. We predict that animal scientists' attitudes play an important role in whether research results are implemented into practice. The objective of this project was to develop a survey instrument that would assess attitudes toward farm animal welfare, using a sample of U.S. animal science faculty (ANS).

We developed our instrument through initial face-to-face interviews. Based on 34 interviews, a questionnaire was developed. We asked faculty to assess appropriateness of the instrument, whether questions were "leading", and whether it asked the "right" questions. Additionally, the survey was reviewed by a social scientist specializing in using surveys to assess attitudes.

Based on the pilot exercise, a final version, which contained 52 quantitative (Likert) and 8 qualitative (open-ended) items, was given to faculty (n=31) with the following result highlights. Three percent disagreed that "predominant methods used in animal production provide an appropriate level of animal welfare" for beef, dairy and sheep. Twenty-five percent responded similarly when answering regarding layer chickens, meat birds and swine. This species perception difference was significant ($P<.05$; Fisher's test). When asked whether respondents agreed that the Five Freedoms were important to good "quality of life," an average of 94% agreed with each feature, excepting the Freedom to express normal behavior (71% agreement; $P<.05$, Fisher's test). Further questions asked respondents to agree/disagree that certain production practices might represent a concern: 58% agreed that dehorning cattle without anesthetic is a concern, 84% agreed level of lameness in dairy cattle is a concern; 65% agreed that sow gestation crates are a concern; 67% *disagreed* that branding of beef cattle is a concern; 54% *disagreed* that toe trimming of poultry is a concern.

The refined survey will be sent to ANS throughout the U.S. to ascertain attitudes toward farm animal welfare.

VALIDATING ON-FARM TOOLS FOR THEIR ABILITY TO DETECT LAMENESS IN DAIRY COWS

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Lameness in dairy cattle is a major welfare problem, but is difficult to detect. We examined if lameness could be detected by automated recording of cows' weight distribution across their legs. To measure weight distribution, 39 lactating Holstein cows stood for 4 periods of 5 minutes on a scale with each leg on one weight-recording unit. Following this, the cow was videotaped while walking and their gait scored by a trained and experienced observer. The cows were hoof trimmed and the incidence and severity of hoof lesions recorded. Correlations were calculated between the gait score, hoof injury score, and weight distribution. Twenty-four cows had hoof injuries and hemorrhages were the most frequent. Most injuries (60.2%) occurred in the back legs. Hoof injury score was correlated with components of the gait score: frequency of injuries in the back legs was correlated with overall lameness score ($r=0.60$ $n=35$, $p<.001$), joint flexion ($r=0.45$, $n=35$, $p<.01$), asymmetric steps ($r=0.50$, $n=35$, $p<.01$) and reluctance to bear weight ($r=0.42$, $n=35$, $p<.05$), indicating that these components of the gait scores are a reflection of back leg injuries. Healthy cows distributed more (53%) of their weight on their front legs. Cows with high hoof injury scores showed a greater variation in weight between their legs but did not appear to avoid putting weight on an injured hoof. The difference in weight distributed between the front legs was correlated with a high lameness score ($r=0.30$, $n=39$, $p<.1$), an arched back ($r=0.27$, $n=39$, $p<.1$) and head bobbing ($r=0.36$, $n=39$, $p<.05$), so these components of the gait score may be related to front leg problems. Weight distribution analysis shows potential to help identify lame cows. However, the relationship between hoof injury and weight distribution is complex and more studies are needed to establish more precise relationships.

EFFECTS OF STALL AVAILABILITY ON TIME BUDGETS AND AGONISTIC INTERACTIONS IN DAIRY CATTLE

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Overstocking is common on commercial free-stall dairy farms and is even recommended by extensionists to reduce capital investment per cow. However, little is known about the effects of such management practices on behaviour and the long-term consequences and health impacts. We studied the effects of three levels of stall availability on the time budgets and agonistic interactions in 36 dairy cattle randomly assigned to 4 groups. Using a switch-back design with treatment order balanced, the groups of 9 cows were given access to 12, 9 and 6 stalls for one week each, allowing for a within-cow test of stocking density. After 5 days of acclimatization at each density, time budgets and displacements from stalls were measured during the last 48 h of each treatment period using continuous video recording and direct observations. When animals had access to fewer stalls, they spent less time lying down (12: 56.0%, 9: 55.5%, 6: 51.2%, s.e.m.=0.65%; P=0.001, GLM, df=2) and spent more time standing in the alleyways (12: 12.7%, 9: 14.1%, 6: 20.0%, s.e.m.= 0.58%; P=0.0001, GLM, df=2), but did not alter the time they spent feeding. Moreover, animals were most likely to displace one another from stalls when there were only 6 stalls available (6: 5.9 events $cow^{-1}48h^{-1}$). Displacements from the stalls were lowest at the 1:1 cow-to-stall ratio (9: 2.1, 12: 3.8, s.e.m.=0.37; P=0.002, GLM, df=2). Agonistic interactions elsewhere in the pen were not influenced by stall availability. In conclusion reducing stall availability can compromise welfare by reducing lying time, increasing time spent standing in the alley and increasing competition for stalls.

EFFECTS OF PRE-JOURNEY FASTING ON THE PHYSIOLOGICAL RESPONSES OF YOUNG CATTLE TO 8-HOUR ROAD TRANSPORT

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The objective was to evaluate the effects of fasting bulls (230kg) for 8 hours prior to an 8-hour road journey and their ability to cope with the stress of transport. SAS/STAT® software was used to analyse the data. Pre-planned, matched pair t-test to detect changes over time were made using PROC MEANS. No differences (P>0.05) in rectal body temperature or in liveweight among treatments on days 0 (pre-transport), 1, 4 and 10 (post-transport) were recorded. Animals that were fasted and transported (n=18) lost 9.4% bodyweight following the 8-hour journey, while non-fasted and transported animals (NF+T; n=18) lost 7.2%. Control animals at grass and non-fasted (NF+G; n=18) gained 2%. Animals that were fasted continuously and not transported (F+F; n=18) and non-fasted control animals that were fasted for 8 hours (NF+F; n=18) lost 6.1% and 6.2% bodyweight. There was no significant (P>0.05) change in plasma globulin, glucose, urea, haemoglobin, beta-hydroxy butyrate, fibrinogen concentrations, haematocrit and monocyte %, monocyte and red blood cell numbers, platelet numbers, lymphocyte numbers among treatments pre or post transport. The % lymphocytes were significantly reduced (P£0.001) in the F+T and NF+T transported animals ((F+T; 47.2±9.52 (pre) and 35.5±7.88sd (post); NF+T; 48.8±10.66sd (pre) and 36.4±11.4sd (post)). The % of neutrophils were significantly increased (P£0.001) in the F+T and NF+T transported animals (F+T;50.6±10.6 (pre) and. 63.8±7.75sd (post) and (NF+T; 48.6±10.7 (pre) and 61.1±11.95sd (post)). Median albumin concentrations were significantly higher (P<0.0001) post-transport in the F+T treatment (37.6g/l) than NF+G (35.4g/l), F+F (35.7g/l), and NF+F (35.5g/l) treatments and the NF+T (36.7g/l) treatment had significantly lower (P<0.0001) albumin levels than the F+T treatment. In conclusion, bodyweights were reduced, the % lymphocytes were reduced and the % neutrophils were increased post-transport following an 8-hour road journey while access to feed for 8 hours prior to transport had little benefit for animal welfare.

EFFECT OF DRIVER BEHAVIOUR ON THE BEHAVIOUR OF SHEEP IN TRANSIT

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This study examined relationships between driver behaviour and driving events, and behavioural responses of six groups of 10 sheep to these events. Two drivers drove three standard 7h journeys each. Video recordings were made of the sheep, the driver, the speedometer and the driver's view of the road ahead and were analysed by continuous focal observations. A lag sequential analysis was used to examine relationships between either driver behaviour or driving events and responses of the sheep. The effects of driver, journey stage and road type on the frequency of driving events, vehicle speed and behaviour of the sheep were examined. Normal mixed models, with random effects fitted for sheep and interaction between sheep and journey were used to analyse sheep resting behaviour. Variables based on the number of events followed a negative binomial distribution and were examined using generalised linear models.

Seventy-nine percent of losses of balance and 44% of disturbances to lying behaviour were preceded by driving events, such as, acceleration, braking, cornering and gear changing. When driven on a main single carriageway, the risk of loss of balance by a sheep within a group was 16 times greater than when on a motorway (95% confidence limits 8 to 34). The percentage of time that sheep spent lying down (36%) and the percentage of time spent ruminating (15%) was greater on motorway sections than on single carriageways (17% and 4% respectively) ($P<0.001$). Differences in driving style (vehicle speed and cornering acceleration forces) did not have an obvious effect on stability, but there was a significant effect on rest (lying, rumination and lack of movement).

A training video based on the video recordings and results of this study has been produced. An understanding by drivers of how driving style affects the responses of the animals should improve animal welfare.

THE INFLUENCE OF WEANING AGE ON POST-MIXING AGONISTIC INTERACTIONS IN GROWING PIGS

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In the United States, piglets are weaned at an increasingly younger age in order to raise production efficiency. The effects of early weaning have been widely studied, but no consensus has been reached on the effects of weaning age on aggressive behaviour. This experiment investigated the effects of weaning age on agonistic interactions after mixing. Forty-seven piglets from 6 litters were weaned at either 10 days (EW, n=24) or 21 days (CW, n=23). At 9 weeks of age, both EW and CW animals were regrouped into 4 pens based on their weight (6 EW, 6 CW/pen) and agonistic interactions within EW pairs and within CW pairs were monitored for 3 days. Results indicate that fights in EW animals were more frequent (7.70 fights ± 1.19 vs. 5.30 fights ± 0.90) and lasted longer (32.69 seconds ± 4.14 vs. 19.68 seconds ± 2.32) than in CW pigs on day 1, while no effect of weaning age was found on subsequent days (Frequency: Day x Weaning age, GLMM, $F_{2,86}=3.09$; $p<0.05$; Duration: Day x Weaning age, GLMM, $F_{2,86}=5.14$; $p<0.01$). Furthermore, while no significant effects of weaning age were found on the outcome of fights, on day 1, the number of fights not won by the initiator was greater for EW pigs (1.70 fights ± 0.37 vs. 0.87 fights ± 0.29, Day x Weaning Age, GLMM, $F_{2,86}=3.38$; $p<0.05$).

We hypothesize that the increase in post-mixing aggression is caused by temporary, stress-induced disruptions in recognition of dominant animals or failure to act on social cues. It is concluded that, while the effects of early weaning on post-mixing aggression were only short-lasting, they might reflect a long-lasting impairment in neural processing of information at periods of acute stress and thus have considerable implications on pig welfare.

POSTER PRESENTATIONS

ABSTRACT WITHDRAWN

DOES PAUSES IN TESTING AFFECT THE DEMAND FUNCTION FOR LOCOMOTOR ACTIVITY IN DAIRY CALVES?

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One method to measure motivation is to generate demand curves for the behaviour in question using operant conditioning. A methodical question is, however, if the results of this type of test are affected by pauses in testing. For some types of behaviour the animals may be tested every day and for others it may be relevant to test them every second or fourth day. However, with several days of pause in operant testing, the animals' ability to respond may deteriorate. Therefore, the aim of the present experiment was to examine if calves' ability to respond operantly for access to perform locomotor behaviour in an exercise arena declined when there was a long pause in operant testing compared to a short one. Six dairy calves housed in small individual pens were subjected to operant sessions either every second or every fifth day. A fixed ratio (FR8, 16 and 24) was used. The motivation to perform locomotor behaviour was held constant by giving controlled access to the exercise arena between operant sessions. A pause of one or four days in operant testing affected neither demand function based on the number of 2-minute rewards per session (common demand function: 3.5–0.82x) nor the demand function based on the time calves spent galloping/bucking during the rewards (common demand function: 4.2–0.26x). With an increasing workload the number of rewards decreased ($P<0.001$) and the locomotor activity per operant session decreased ($P<0.05$). The pause between individual rewards increased from 270 s at FR8 to 411 s at FR24 ($P<0.001$). However, the length of pause in operant testing did not affect the median latency to press the panel (36s) or the median pause between presses (1.8s). In summary, the experiment showed that a four-day pause in operant testing did not affect the calves' ability to respond.

HEART RATE IN HORSES HANDLED BY KNOWN/ UNKNOWN PERSONS

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Aim of this work was to evaluate the heart rate (HR) as adequate indicator of orthosympathetic activity during routine horse handling (p.e. halter fastened, grooming, hoof cleaning, positioning of saddle,…). Tests were performed on ten horses by two persons: one known to the horses and seen daily, and another unknown to the horses. Tests were standardized and performed on separate days by the two persons. A heart rate recorder was applied to the horse. The beginning of test coincided with the start of recording of HR, synchronized with a manual chronometer. The horse was then brought to the paddock and it was freed and left quiet for 5 min. Then the person entered the paddock and took the horse. In the test sequence the following reference points were identified 1) closing of the gate after the person entering the paddock; 2) halter fastened; 3) closing the gate after the horse left from the paddock; 4) horse tied to the hitching post; 5) starting grooming on left side; 6) starting grooming on right side; 7) beginning cleaning of 1st hoof; 8) end cleaning of 4th hoof; 9) positioning of the saddle; 10) girth strap fastened; 11) throat strap of bridle fastened. Chronometer revealed the time in which each reference point occurred from the beginning of test. The average value of the HR of horses was calculated corresponding to the time of each reference point, during tests carried out by both the known and unknown person. Results showed a higher HR for tests carried out by the unknown person that is statically significant (*t*-Student's test, $P<0.05$) in reference point: 5 ($P=0.041$), 6 ($P=0.041$), 10 ($P=0.047$) and 11 ($P=0.045$). This suggest that handling by an unknown person, even when performing routine actions, induces elevated orthosympathetic activity reflected by an increased heart rate.

THE SPECTRAL SENSITIVITY OF DOMESTIC TURKEYS AND DUCKS DETERMINED BY A BEHAVIOURAL TEST

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Knowing the spectral sensitivity of poultry species is important for several reasons. Firstly, it enables measurement of the illuminance of environments as perceived by poultry. Secondly, it allows colour effects on poultry to be distinguished from illuminance effects. Thirdly, it allows exploration of the colour visual ecology of these birds.

A behavioural test was used to determine the spectral sensitivity of six domestic turkeys and six ducks. Birds were trained to peck an illuminated over a dark panel, for a small food reward. Reassignment of the lit and dark panel following the food reward was randomised. Thirteen narrow band-pass filters were used to transmit light at determined wavelengths including UV_A (between 326-694 nm). The illuminance of the light stimulus was reduced to the lowest illuminance at which birds were able to discriminate accurately the illuminated panel from the dark, according to a pre-determined criterion – this determined the bird's threshold sensitivity for that wavelength. A similar test was also conducted on seven humans.

Both turkeys and ducks had similar but subtlety different spectral sensitivities to each other, and both could perceive UV_A wavelengths, to different degrees. For both species peak sensitivity was between 544-577 nm (green-yellow), with depressions at 508 nm (blue-green) and 600 nm (orange). However, their sensitivity differed in the 600-633 nm (orange) and 326-415 nm (UV_A–violet) ranges. Both turkeys and ducks had very different spectral sensitivities to the human subjects tested. These data have implications for how colours are visualised and for the measurement of illuminance as perceived by these species – since the lux unit, that uses the human spectral sensitivity curve, will be inaccurate for describing duck and turkey perceived illuminance. The shape of the spectral sensitivity curve and the presence of UV_A sensitivity raise several questions relating to the visual ecology of these species.

IS FEAR OF A POTENTIAL PREDATOR (Dog) "INNATE" IN SHEEP?

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In many species, spontaneous avoidance and fear of potential predators occur in the absence of previous experience.
We studied the reactions of naïve sheep towards a potential predator (dog) and an unknown non predator species (pig).
In a first experiment, two groups of adult Romanov X Ile-de-France ewes (N=2X20), with no prior exposure to dogs, were tested. They were individually confronted with a caged dog or an empty cage (group 1) or to a pig of the same size or the same empty cage (group 2), in a standardised test (Vandenheede, Bouissou, Picard, 1998). In a second experiment, 24 different ewes were confronted successively with both stimuli (dog and pig), half of the animals being tested first with the dog, and the other half first tested with the pig.
26 behavioural items (including locomotor activity, feeding behaviour, vocalizations, glances to the stimuli, eliminations,…) and fear scores were compared between situations using Mann-Withney U tests and Wilcoxon tests.
The presence of an unknown animal of either species led to a reduction in feeding time, locomotor activity, vocalisations and latency to bleat, as compared with isolation alone. However there were almost no significant differences in the various behavioural items observed in the presence of a pig or of a dog, except for feeding time (dog: 5.6 sec, pig: 15.6 sec, $p<0.05$). Overall fear scores did not differ between dog presence or isolation (respectively 18.83±3.33 vs 19.06±4.00, NS), pig presence or isolation (respectively 19.79±2.88 vs 20.05±3.59, NS) nor between dog and pig presence (respectively 19.99±3.63 vs 20.01±3.16, NS).
Enhanced fear responses to a potential predator as compared to isolation or the presence of an unfamiliar, but non predator animal, was not evident in our experimental conditions. In conclusion, fear of predators (at least a dog) may not be innate in sheep.

MEMORISATION ABILITY OF HOLSTEIN HORSES IN MAZE TEST CONSIDERING THEIR REACTIVITY TO OPTIC STIMULUS

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Memorisation ability of 42 Holstein horses: 17 mares, 22 stallions and 3 geldings was assessed using T-type maze test (with 4 critical places where horse was able to choose right or wrong way). The following indices: number of points awarded according to point scale for equine behaviour in test: from 1 (many mistakes, choosing the wrong way, lost in maze) to 10 (no mistake, correct and fast passage) and time (s) of maze passage, were considered during evaluation of memory ability. The highest memorisation ability was shown by mares (points 8.82±1.67, time 13.27±10.00), lower by stallions (7.59±2.52, 36.56±33.89) and the lowest by geldings (5.00±4.58, 94.07±76.27). There were significant differences in points (P£0.05) and in time (P£0.01) between sex groups. Reactivity of all horses to optic stimulus was also assessed using excitability test. Horse behaviour in this test characterizes index of response to optic stimulus (horse was walked by a stableman along a path between 2 rotating black-white squares). The response was evaluated according to point scale. Individuals evaluated from 1 to 8 points were classified to excitable ones, from 9 to 15 points to medium-excitable and from 16 to 20 points to quiet ones. The most quiet response to optic stimulus was shown by 20 horses (10 mares, 8 stallions, 2 geldings), the most violent reaction only by 4 stallions and other 18 horses (7 mares, 10 stallions, 1 gelding) were classified to medium-excitable ones. The average scores (points) of excitability test for mares 15.41±1.69, for stallions 11.35±2.00 and for geldings 17.34±1.41 were found (significant differences at P£0.01 between sex groups). Significance of differences between average scores was assessed by the t-Student test. Significant influence of sex on level of reactivity to optic stimulus and memorisation ability was stated. Considering level of reactivity the medium-excitable horses suceeded in memorisation test.

EFFECT OF HOUSING SYSTEMS OF LACTATING SOWS ON THE PIGLETS' BEHAVIOUR DURING BEHAVIOURAL TESTS

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The effects of rearing conditions to stressors were studied in the heaviest piglets (HP) and in the lightest piglets (LP) of the litter shortly before weaning. The isolation test (IT) and the human approach test (HAT) were apply to test whether piglets from a modified farrowing crate with straw (Type A) can cope better with stress than piglets from a farrowing crate without straw (Type B). We predicted, (i) that piglets from Type B have a higher stress reaction indicated by frequency of screams, lower locomotor's activity and less physical contacts with humans in the HAT then Type A. (ii) The differences in the stress reaction between LP and HP is greater in Type B than in Type A. From every litter 2 LP and 2 HP were chosen. At the age of 26 days piglets were individually tested during a 3 min lasting IT and the next day during a 3 min lasting standard HAT in the same experimental room. The first results show that (i) litters from Type A and B had nearly the same frequency of all observed categories in both tests (n=8 vs. 8 litters, t-test, NS). (ii) Based on the results found in hypothesis $_{(i)}$ we compared LP and HP from both housing systems together. There were not significant differences in the stress reaction (n=8 vs. 8 litters, Wilcoxon signed-rank test, NS) during both tests. However, there was the tendency that HP had more physical contacts with the human and shorter locomotion latency during HAT (n=8 vs. 8 litters, Wilcoxon signed-rank test, $p<0.08$). In summary the results suggest (i) that the low differences between the testing housing conditions did not decreased the fear reaction from piglets of the enriched environment. (ii) There was a tendency that HP had a lower fear reaction in HAT.

ENRICHMENT AFFECTS BEHAVIOUR IN YOUNG OSTRICH CHICKS

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Commercially reared ostrich chicks are typically kept in barren, indoor environments. This experiment investigated the effects of environmental enrichment on pecking behaviour, exploration, and food consumption in ostrich (*Struthio camelus*) chicks, aged 10 to 21 days. Four groups of 20 randomly selected ostrich chicks were housed as day-old in heated huts and after 10 days allowed access to sand-covered areas (30m^2), which were either barren (Control, n=2 groups) or enriched with cabbage, cones and sticks (Enriched, n=2 groups). On day 18 the chicks were allowed access to outdoor grass-covered areas (20m^2). Pecking behaviour was registered by focal sampling of five chicks per group (4x5 min/chick/day) on day 10 and 12. All enriched chicks pecked towards the cabbage, of which they consumed considerable amounts (310 g/chick in 12 days). The enriched chicks did not increase their overall pecking frequency (Enriched: 12.1 ±1.6 vs. Control: 13.5 ±1.9 pecks/chick/minute) but tended to peck less towards fixtures in the pen (3.8 ±0.6 pecks/chick/minute), compared to control chicks (7.6 ±1.4, $F=3.97$, $P=0.062$). In a novel object test on day 17, a higher percentage of enriched chicks stayed close to (26.7 (15,33) vs. Control: 0 (0,13), $Z=6.16$, $P<0.001$) and delivered more pecks (67.8 ±12.3 vs. Control: 29.4 ±13.7, $F=4.38$, $P=0.05$) towards Sorrel (*Rumex acetosa*), whereas no difference was found in the response towards adult ostrich feathers. Additionally, a higher percentage of enriched chicks were observed outside on day 18 and 21 (Enriched: 64.8 ±4.4 vs. Control 47.9 ±4.8, $F=8.18$, $P=0.005$). Enriched chicks consumed more food (945 ±5.0 g/chick) than did control chicks (799 ±11.0 g/chick) during the experimental period.
We suggest that environmental enrichment improve the welfare of ostrich chicks in terms of increased exploration and less pecking towards fixtures in the pen, without compromising food consumption.

WORM RUNNING BEHAVIOUR IN DOMESTIC FOWL

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Aggression is rare in young domestic fowl, making it impossible to identify social ranks based on aggression during early life. However, chicks perform another apparently competitive behaviour, worm running, in which they run carrying a worm-like object protruding from their beak while flock mates attempt to grab the object. A 'worm' can, thus, pass rapidly between different birds in a group, but some birds may be more successful at monopolising the 'worm' than others. We compared the frequency that individuals in groups (N=17) of 12 female White Leghorn chicks ran with a 'worm' when young with their frequency of aggression when older. We hypothesised that social ranks based on worm running behaviour are stable over time and are positively correlated with social ranks based on aggression when older. At 8-12, and 68-70, days of age, we scored the frequency that each bird in a group ran carrying a worm-like object (twisted paper or pipe cleaner) during three 10-min tests. The bird holding the 'worm' most often was placed in rank one and so on down the rank order. An aggression index for each bird was calculated as the number of aggressive acts given, divided by the number given and received, during three 1-h observation periods when the birds were 68-70 days. Contrary to our hypothesis, ranks obtained in worm running tests were rarely correlated over the two age periods (Spearman rank correlation: r_s=0.02-0.73, P=0.02-0.96, for the different groups, respectively) or with the aggression index (chicks: r_s=0.01-0.25, P>0.26; pullets: rs=0.04-0.75, P=0.008-0.91) after sequential Bonferroni adjustment. Our results suggest that the frequency of acquiring a 'worm' in worm running tests is not related to competitive ability or social dominance. Instead, worm running fits criteria for play, suggesting that the frequency of this behaviour could be a useful indicator of domestic fowl well-being.

THE MOTIVATION OF HIGH AND LOW YIELDING DAIRY COWS FOR SUPPLEMENTARY CONCENTRATE FEED

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The high energy requirements for milk production may increase the motivation of high-yielding cows for concentrated food, which was tested by operant conditioning.
Six low- and seven high-yielding Holstein-Friesian cows, with mean respective yields of 14.2 and 26.4 kg d-1, but balanced for mean body condition score, lactation stage, age and pregnancy stage were used. The cows were housed together in a straw-bedded shed with ad libitum water and total mixed ration (TMR). The operant device - a nose-operated drinker bowl - was placed in a separate pen and delivered, in response to a progressively increasing number of presses (increments of 3), 330g of concentrate (standard dairy nuts). Each cow had one 30 min test session daily for 12 d, which was terminated prematurely if pressing ceased for 5 min. Breaking points and reward delivery times were recorded for each cow. Behavioural observations were conducted on each cow on return to the housing pen post-testing for 20 min using instantaneous scan sampling at 2 min intervals.
Each measure was tested for yield group differences by ANOVA.
There were no differences between low- and high-yielding groups in the mean breaking points (18 versus 14, s.e.d. 4.6) or time taken to receive a reward (128 versus 123 s, s.e.d. 23.2). There was a positive correlation between the amount of time spent in the test pen and the breaking point for the high-yielding cows (r^2 = 71.9, P=0.02), but not the low-yielding cows (P=0.28). Post-testing, the high-yielding cows spent more time feeding on the TMR than the low-yielding cows (17 versus 9 min, s.e.d. 2.6).
Therefore, high yielding cows did not demonstrate a greater appetite for concentrate. However, they made more efficient use of their test time and spent longer feeding post-testing, which indicates an increased appetite in comparison to the low-yielding cows.

EMOTIONAL REACTIVITY TO SUDDEN AND NOVEL EVENTS IN PIGS SUBMITTED TO REPEATED SOCIAL REGROUPING DURING THE GROWING-FINISHING PERIOD

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A chronic social instability was used as a paradigm to evaluate the effect of chronic stress on the emotional reactivity of pigs to sudden (opening umbrella) and novelty (unfamiliar object) events. A total of 16 pairs of pigs (40 kg) were used. Eight pairs of pigs (C) remained together in the same pen throughout the experimental 4 wk period. For the other eight pairs (R), partner and pen were changed 12 times during this period. The emotional reactivity tests were performed within the pen and were carried out after the two last regroupings. Non parametric tests were used to compare treatments (C vs R pairs) and repetition effect (Mann-Whitney, Wilcoxon). During the first umbrella test, 75% of pairs reacted similarly by jumping or running away from the opening umbrella. In the second umbrella test, R pairs exhibited a slight moving while C pairs jumped and flew ($P<0.10$). After closing the umbrella, the delay of the first animal to approach the event zone was low (<10sec) in both tests. Only R pairs exhibited a reduced approach delay to event zone area in the second test compared to the first one (8 vs 20 sec; $P<0.05$). During the novelty test, the majority of pairs (90% of total pairs) were interested in the object and only one stable pair exhibited fearful behaviours. The delay for the first animal to approach and touch the object was affected only in the second object test, where values were higher in regrouped pairs than in control pairs (approaching: 2.5 vs 0.62 sec; touching 4.5 vs 1.9 sec; $P<0.05$). Overall results showed limited effect of social instability on the emotional reactivity of growing pigs. Nevertheless, results may suggest a loss of reactivity over time. Further investigations are needed to develop the experimental procedures and test this hypothesis.

MATCHING HORSES FOR COURSES: DEVELOPMENT OF ROBUST TESTS OF EQUINE TEMPERAMENT TO ADDRESS EQUINE WELFARE

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Robust tests of equine temperament are needed to match individual horses to their optimum career and training methods and as a welfare research tool in individual differences. Temperament is difficult to define but may be considered an individual's basic stance towards continuing changes and challenges in its environment. Attempts to measure temperament by scoring an animal known to the assessor on a set of subjective scales allows for measurements of qualities not readily dissected into behavioural elements, but suffers from a lack of reliability. Here I used inter-observer reliability from an opportunity sample of 106 riders or handlers rating 53 familiar riding horses and ponies (two raters per animal) to determine a reliable set of scales ($P<0.002$ after Bonferroni correction). Sixteen reliable items including ratings of paired-semantic-opposites of horse-world temperament terms and frequencies or likelihood of observed temperament-related behaviour were identified. Principal component analysis from 102 independent respondents revealed five independent dimensions that correspond to the Five Factor model of personality – extraversion, agreeableness, emotionality, openness to experience and conscientiousness – suggesting a valid tool for measuring individual differences in these animals. Attempts to infer temperament from an animal's responses to specific behavioural tests are more objective but suffer from high individual-situation interaction and so may also suffer from poor reliability as well as validity. Here I found a set of reliable ($P<0.006$ after Bonferroni correction) and discriminative behavioural tests from concurrence on test-retest in an opportunity sample of 33 riding horses and ponies unknown to the experimenter, and from the range of responses observed to unexpected stimuli, novel object, tactile stimulation and unfamiliar substrate. However, their validity as measures of temperament corresponding to the Five Factor Model was not demonstrated, suggesting that the behavioural responses may reflect the animal's past experience more than its underlying temperament.

THE QUALITATIVE ASSESSMENT OF WATER BUFFALO (*BUBALUS BUBALIS*) BEHAVIOUR

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The whole animal approach is a new methodology developed to assess animal behaviour (Wemelsfelder et al., Anim. Behav. 62:209, 2001). The aim of the present study was to test the applicability of qualitative behaviour assessment to buffalo. Eight buffalo heifers aged 16-18 months were individually filmed both in their indoor home pen and in an unfamiliar outdoor pen for 2.5 min where a still and unknown person was located. Eleven animal scientists from 6 different European countries were instructed to provide qualitative assessment of in- and outdoor videos using Free Choice Profiling methodology, which allows observers to generate their own descriptive vocabulary. Three data sets were generated: 1 for animals tested indoor, 1 for the same subjects tested outdoor and 1 obtained merging these two (indoor + outdoor). They were analysed with Generalized Procrustes Analysis, a multivariate technique which does not require fixed variables. All three analyses showed significant consensus among observers ($P<0.001$). The 2 main dimensions of the consensus profile of indoor, outdoor and merged data explained 53.9 and 13.8, 49.2 and 15.4 and 53.2 and 10.6 % of the total variation, respectively. In all three profiles observers characterised the first dimension of these consensus profiles in terms of an animal's activity level (e.g. as 'agitated', 'active' or 'relaxed') and the second one in terms of its level of confidence (e.g. as 'perky', 'uncomfortable' or 'afraid'). These 2 main dimensions provided good discrimination between individual buffaloes. Results of the merged data showed that in the outdoor condition animals scored more highly on the first dimension (being more restless and explorative) than in the indoor home pen. There was no difference between in- and outdoor scores on the second dimension. We concluded that behavioural patterns as described by qualitative assessment may be effectively used for the evaluation of buffalo welfare.

WHAT IS BEHAVIOURAL TESTING IN DOGS ? A BIBLIOGRAPHIC REVIEW

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A bibliographic review on behavioural tests was undertaken in order to prepare for a research project on behavioural differences in dogs. The questions posed were as follows: How is a behavioural test defined? What are both the quality requirements of a test and their implementation in research? What are the dog breeds and ages? How is a dog stimulated? Why are tests on dogs undertaken?

This review demonstrates that a behavioural test is a standardised experimental situation where the dog's temperament is determined by its behaviour (movements, positions, vocalisations) and statistically compared with that of other dogs in the same situation.

The implementation of the four quality requirements applied in behavioural testing (standardisation, reliability, sensitivity and validity) does not appear clearly or systematically in the literature.

The dog breeds are chosen according to their physical (body size, coat) and behavioural (service, police or hunting dogs) characteristics. The animals are tested as puppies or adults. Few studies have been carried out on juvenile dogs.

Two classes of stimuli are identified: social (intra or interspecific stimuli, alive or not) and environmental (place or objects, mobile or not, noisy, luminous). Behavioural tests carried out on puppies attempt to predict the occurrence of adult behavioural problems (aggressions, fears, separation anxiety) or their trainability (guide-dog for the blind, police dog). Behavioural tests in adult dogs are particularly concerned with the selection of pets or working dogs as breeders. Some of these tests attempt to select dogs in shelters with the aim of reintroducing them as pets or more recently, as service animals.

This review clearly demonstrates an enormous lack of uniformity as regards the authors' objectives, the characteristics of the stimulus employed and the behavioural data and its interpretation. Bibliographic results in adult dogs testing are more encouraging that those in puppy testing.

ABSTRACT WITHDRAWN

SOCIAL ANXIETY AND TRANSFER OF INFORMATION IN SHEEP

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This study investigated whether sheep show anxiety about the absence of a separated group mate and whether sheep respond to information from group mates that have recently had a disturbing experience. In part I (n=5) each individual within a group acted in turn as an Information Provider (IP) to the remaining Receiver Sheep (RS). IPs were visually isolated and exposed either to a handling treatment (up-ending) or a control treatment without handling before they rejoined the group. These two successive treatments were repeated 3 times for all individuals, with synchronised heart rate measurement taken throughout and later averaged per individual. In part II (n=10) the effect of IP familiarity was assessed. Familiar and unfamiliar sheep acted in turn as IPs, each receiving 3 pairs of successive handling and control treatments. In part I RS heart rate decreased following the return of IPs from isolation (ANOVA, $p<0.01$), a greater decrease being shown following the return of certain IPs than others ($p<0.01$). RS heart rate decreased less following the return of IPs from the handling treatment ($p<0.01$). In part II the overall decrease in RS heart rate was not affected by IP familiarity. However, RS heart rate decreased less following the return of some familiar IPs from the handling treatment, but not following the return of unfamiliar IPs from the handling treatment ($p<0.05$).
In conclusion, heart rate changes indicated that RS were calmed by the return of IPs to the group, and were therefore anxious either about the absence of separated IPs or about the decrease in group size. RS additionally responded with increased heart rate to putative information from recently handled IPs. Although anxiety about the absence of both familiar and unfamiliar IPs was indicated, RS appeared to respond only to information from specific, familiar IPs.

DIFFERENCES IN OPEN FIELD BEHAVIOUR BETWEEN GILTS OF TWO GENOTYPES SEGREGATING AT THE HALOTHANE (RYR1) LOCUS

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The Open Field (OF) test has been widely used to assess fear and novelty responses in domestic species. The results obtained in pigs and their interpretation have been somewhat contradictory and this may be partially explained by the variety of methods used and the influence of factors such as rearing experience, genetic background or social motivation. The aim of this study was to investigate the effect of halothane genotype on open field behaviour in growing pigs. Fifteen heterozygous (Nn) and fifteen halothane free (NN) gilts of 19 weeks of age were subjected to three replicates of an open field test two days apart from each other. All tests were performed between 0800 and 1000 h on 9 consecutive days. Thus, the 10 gilts (5 Nn and 5 NN) in group 1 were tested in days 1, 4 and 7, gilts in group 2 in days 2, 5 and 8, and gilts in group 3 in days 3, 6 and 9. Number of grid lines crossed and defaecation score were measured. There was a significant individual correlation between the three replicates of the test, both for number of grid lines crossed and defaecation score ($p<0.05$). NN gilts crossed more grid lines (i.e. showed more overall activity) compared to NN gilts ($p<0.05$), but no significant differences in defaecation score between genotypes were observed. No differences in overall activity or defaecation score were found among the three replicates and this indicates that either the number of replicates or the time span between subsequent tests were not enough to observe an effect of habituation. These results suggest that halothane genotype may have an effect on the behaviour in a novel environment test and, thus, it would be interesting to take into account this factor when using this methodology to assess fear responses in pigs.

THE VALIDITY AND REPRODUCIBILITY OF A BEHAVIOR TEST IN GERMAN SHEPHERD DOGS.

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Since 1949 the SC has applied a standardized behaviour test. From 1978 onwards these results have been stored in their database. A successful test is a prerequisite for breeding approval.
The aim of the study was to see if the test used by the Swiss German Shepherd club (SC) is a sensitive and specific method to verify a dogs character reliable. The tested traits are self confidence, nerve stability, hardness, sharpness, defence drive, reaction to gunfire and temperament.
Our data consist of results from the behaviour test 2000 – 2002 of 149 dogs out of 185 were willing to participate in the study (Their test results did not differ from the results of the non-participating dogs. After a year 38 dogs of vouluntary participating owners were tested a second time. Owners were asked by questionnaire about various situations in the dog's past. The aim of this second test was to find out the factors which could have changed or had an influence on the dog's test results. The questionnaires were analysed with statistical methods (Fisher-Exact test, chi-square, and logistic regression) to find out any significant influences on the dog's behaviour. We found several significant influences on one or more of the tested parameters in the behaviour test (early contact to kids, education of the young dog, contact to kids). There was no significant differences found between the results of the first and the second test. Therefore the test is reproducible.

EFFECTS OF POLYUNSATURATED FATTY ACID CONTENT IN SOW FEED ON THE BEHAVIOURAL DEVELOPMENT OF PIGLETS

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Polyunsaturated fatty acids (PUFA) are essential for the development of the nervous system. Furthermore, it is reported that the concentration of long chain PUFA(n-3), in the maternal diet improves the cognitive development of rat and human foetuses.

Our hypothesis was that sows fed high content of 18:3(n-3), will get piglets with improved development of the CNS monitored as behaviour, compared to piglets from sows given less 18:3(n-3).

Twenty-seven multiparous Yorkshire sows were split into four groups (A-D) and fed grain based diets throughout pregnancy and lactation. A (n=6) was fed a diet with low fat and low PUFA, B (n=4) a high fat and low PUFA diet, C (n=7) a high fat and high PUFA(n-6) diet (low PUFA(n-3)), and D (n=10) a high fat and high PUFA(n-3) diet.

Three behavioural tests were performed on 5-7 randomly chosen piglets per litter (n=167). Recognition of the mother's faeces was tested 2d after birth. Back test was performed twice (2-4d and 4w) and a detour test was performed at 4w.

No significant difference was found in recognition of maternal scent or in the detour test. We found that D piglets struggled and vocalised significantly more in the first back test than A, B and C piglets (GLM; $p<0.01$, $p<0.01$). At 4w we found no difference in struggling but A piglets vocalised more (GLM; $p=0.05$). Litter effect was included in models.

The study shows that the content of 18:3(n-3) in sow feed influences the behaviour of piglets in the back test. Whether this is related to an improved development of the CNS can be questioned, since there was no effect on recognition of the mother. Therefore, we conclude that PUFA(n-3) including long chain PUFA (20:5(n-3), 22:6(n-3)) has to be tested further to be able to evaluate the impact of PUFA on the brain.

CHARACTERISTICS OF EQUINE COLOUR PERCEPTION

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This study was conducted on 11 Arabian mares and 9 half-bred Anglo-Arabian stallions using a novel method to evaluate colour perception. The ability of horses to discriminate between two colour boards using red, blue, green and yellow ones, was assessed. All horses were learning to discriminate such pairs as: red-blue, red-green, red-yellow, blue-green, blue-yellow and green-yellow. In the pre-test period every horse was asked to learn association between a particular colour and feed reward. In the proper test every horse was asked to discriminate between 2 boards: colour board associated with feed vs. other colour board. The following scores: number of points awarded according to point scalescore for equine behaviour in test which ranged: from 1 (many mistakes) to 10 (no mistake); time to find proper colour board, number of mistakes, heartbeat rate, were considered during evaluation of colour perception. Significance of differences between average scores was assessed by the t-Student test. The best scores for colour pair: blue-yellow (9.13±1.09 points; 0.16±0.37 mistakes; 11.71±6.14 s) and the worst results for colour pair: green-yellow (6.45±2.76 points; 0.79±0.88 mistakes; 26.21±17.40 s), were obtained by mares (significant differences at P£0.01 in points, mistakes and time between these two studied colour pairs). The stallions were also the best in blue-yellow discrimination (8.61±1.62 points; 0.17±0.39 mistakes; 11.19±0.17 s) and the worst in green-yellow one (5.61±3.52 points; 0.83±0.80 mistakes; 29.61±17.69 s); there were significant differences in points (P£0.01), mistakes (P£0.05) and time (P£0.05) between these two colour pairs. One of the highest heartbeat rates for colour pair: green-yellow was also found, in mares 83.63±35.58 beats/min and in stallions 69.44±26.61 beats/min. Higher scores and shorter time to find proper colour board were obtained by more quiet horses (with little HR increase to colour stimulus). Generally equine discrimination ability of red, blue, green and yellow was found.

CARACTERISATION OF TEMPERAMENT IN YOUNG HORSES

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Temperament, defined as a set of behavioural characteristics (traits) which presents a certain stability over time and across situations (Bates, 1989), can be a determining factor in horse's management.
The aim of this study was to assess 4 hypothetical behavioural traits: fearfulness, social motivation, persistence and general activity. We also studied the reactions of the animals to humans. This study was done with 22 Anglo-Arab and 33 Welsh, 7-12 month old foals.
For each behavioural trait studied, we designed at least 2 tests, in order to assess behavioural stability across situations (e.g. study of fearfulness involved novel object tests and surprise tests, social motivation was assessed by isolation tests and separation-reunion tests, persistance was assessed by a distraction test and a frustration test). Short term stability was assessed by re-testing the animals twice at a 6 week interval. Reaction to passive and active humans included touching and haltering. Finally, in each test locomotor activity was measured. Statistical analysis included Spearman correlations, principal component analysis and multiple correspondence analysis.
As examples of the results, in fearfulness tests, the frequency of contacts with a novel object was significantly correlated with the flight distance and heart rate measured during surprise tests (Anglo-Arabs: $R=-0.54$, $p<0.01$; $R=-0.58$; $p<0.01$ respectively). Moreover, results of tests and re-tests were well correlated (e.g.: frequency of contacts with a novel object; Anglo-Arabs: $R=0.58$, $p<0.01$).
In conclusion, the behavioural characteristics studied might be considered as temperament traits in horses. This is the first step of a longitudinal study, concerning long term behavioural stability and the establishment of behavioural profiles (relationships between the various traits including social aspects, or other behavioural characteristic such as learning ability). The assessement of the suitability of these profiles for horses' utilisation in various aspects of riding will be the final step.

SOCIAL DISCRIMINATION AMONG LAMBS: A COMPARISON OF TWO BEHAVIOURAL TESTS

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Social discrimination among lambs is often studied using choice tests in which subjects are free to approach two stimulus individuals that are simultaneously present in separate cages. We compared the sensitivity of this testing procedure with a «distress» test in which 2 lambs are placed together in a novel $1m^2$ pen and their bleat rates recorded (increased bleating = greater distress).

Twenty-four Pairs of Prealpes du Sud twin lambs were separated shortly after birth and housed in groups of 6 artificially fed (unrelated) animals. Three weeks later, lambs participated in a two-choice test and a "distress test" to evaluate recognition of Familiar penmates (F) and their Unfamiliar Twin (UT). Each lamb participated in 3-4 different tests.

Subjects spent more time near F than an Unfamiliar Unrelated individual (UU) (Wilcoxon signed-ranks test: $n=19$, $p<0.01$) during the choice test. Likewise, the median bleating frequency was significantly lower in the presence of an F partner than for lambs paired with a UU partner (distress test) (Mann-Whitney U-test: $n=12/12$, $p<0.01$), which is evidence of recognition.

When given the choice between UT and UU individuals, lambs displayed no reliable preference ($n=16$, NS). Nevertheless, in the distress test, lambs in UT pairs bleated less than those paired with UU lambs ($n=12/12$, $p<0.05$).

Lambs responded discriminatively to a familiar individual (relatively simple discrimination) in both test situations but there was differential responsiveness to unfamiliar twins vs. unfamiliar unrelated lambs (more subtle discrimination) only during the distress test. The distress test therefore appears to be more sensitive than the more commonly used simultaneous choice test. The inconsistent results between the two testing methods might reflect motivational differences or differential availability of salient cues from the stimulus individuals.

CONTRAFREELOADING DECREASES WITH AGE AND SOCIAL ISOLATION IN RED JUNGLE FOWL AND WHITE LEGHORN LAYERS

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Contrafreeloading (CFL), *i.e.* choosing food which requires work over free food, has been studied in several different species. Some factors that decrease the degree of CFL are food deprivation, environmental uncertainty and increased effort to obtain earned food. Leghorn, selected for larger and higher egg numbers have a lower degree of CFL compared with jungle fowl (wild type). We examined if the degree of CFL varies with age, sex and social isolation in a Leghorn layer strain and jungle fowl and if there were any breed differences in these effects.
Thirty birds of red jungle fowl and White Leghorn were allowed a choice of feeding, during 48h, from freely available food or food mixed with wood shavings. Both sexes were tested individually as young birds (8-10 weeks) and after they were sexually mature (27-29 weeks). To test the possible effects of social stimuli, the same birds were also tested in pairs at 30 weeks of age.
Jungle fowl showed more CFL at younger age compared with Leghorn ($p<0.01$) and both breeds showed more CFL at young age compared to when sexually mature (JF: $p<0.001$, WL: $p<0.05$). There were no differences between the two breeds after they were sexually mature, when tested individually. When the birds were tested in pairs when sexually mature, jungle fowl showed more CFL than Leghorn ($p<0.001$). There were no differences between the sexes in any of the breeds
We conclude that age and social isolation influence the level of CFL in fowl and that jungle fowl seems to be more sensitive to social isolation than Leghorn. The results support earlier findings that CFL is lower in Leghorns than jungle fowl, indicating a possible side effect of selection for increased production.

INDIVIDUAL DISCRIMINATION OF CONSPECIFICS BY JUVENILE DOMESTIC PIGS (*Sus scrofa*)

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Social stress in domestic pigs is significantly reduced if stable dominance hierarchies are allowed to develop. Social recognition is essential for the formation and maintenance of hierarchies, however the extent of pigs' recognition capabilities are largely unknown. Ability to recognise individuals has been assumed, mainly due to the aggression shown towards unfamiliar conspecifics. We investigated the ability of six-week-old female pigs to discriminate between pairs of similar-aged female conspecifics in a Y-maze.

In three consecutive experiments, the pair of stimulus pigs was either familiar unrelated group-mates (expt. 1, n=9), familiar littermates (expt. 2, n=8), or unfamiliar littermates (expt. 3, n=12). Olfactory, auditory and visual cues from both stimulus pigs were available to the test pig during the trials. Approaches to a pre-determined correct stimulus were rewarded with food in a series of sessions each of 10 consecutive trials. Eight or more approaches out of 10 to the correct stimulus fulfilled the criterion for successful discrimination. Each pig completed a maximum of 12 sessions.

All pigs (n=29) tested successfully discriminated at least once ($p=0.054$: Binomial law) and at least one third in each experiment successfully discriminated in three consecutive sessions ($p<0.0002$: Binomial law), showing rapid task acquisition. GLMM analyses of logit-transformed data indicated substantial inter-session improvement (expt.1, slope=0.524, s.e. 0.151, 30df, $p<0.01$) in pigs discriminating between familiar unrelated group-mates whereas pigs discriminating between unfamiliar littermates progressed more slowly (expt. 3, slope=0.259, s.e. 0.051, 120df, $p<0.01$).

In experiment three, test pigs whose stimuli were rewarded only for test pig successes learned faster than test pigs whose stimuli were rewarded only for test pig failure ($t=5.663$, $p<0.01$, 120df). However, uncooperative stimulus pig behaviour did not prevent successful discriminations.

These data indicate that this technique is reliable, and that juvenile pigs are capable of discriminating between individuals regardless of their familiarity or relatedness.

USE OF AN OPERANT METHOD TO STUDY PREFERENCE FOR PERENNIAL RYEGRASS OR WHITE CLOVER BY SHEEP

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In previous studies sheep offered adjacent monocultures of ryegrass and clover ate approximately 70% clover i.e. a mixed diet. Here, we used an operant method to study motivation of sheep to eat the two species. Each experimental paddock contained monocultures of grass and clover separated by a fence and was used by four, non-lactating ewes. Directional gates equipped with electronic identification technology recorded when sheep passed from one species to the other. Sheep wore IGER behaviour recorders to record grazing, ruminating and idling. There were three treatments: control, in which each gate led directly to the other species, working for grass or working for clover. In the latter cases sheep had to transit a 50m race containing no vegetation before reaching the species it was working for, while the return gate was as for the control. The aim was that the required work reflected natural foraging behaviour. There were 3 replicates. An ANOVA showed no significant treatment effects in any of the parameters studied. On average, over the 24-hour recording period, the sheep spent 371 minutes eating of which 81.8% was on clover, and had 12.5 meals. The lack of a significant treatment effect could be due to the sheep perceiving transit through the relatively confined directional gate as an aversive event, and the 'cost' of this exceeded the additional 'work' required to walk down the 50m race. This is supported by the fact that the average number of transitions between the two herbages recorded in this study (3.78) was considerably less than in similar previous studies without the gate (typically 25 during daylight hours, Champion, pers. comm.). This shows that, in general, the sheep in this study were prepared to 'work' (i.e. transit through a gate) for a mixed diet but reduced the number of times they switched herbages.

A NOVEL APPROACH TO TESTING SOCIAL RECOGNITION IN PIGS AND THE MODULATING EFFECTS OF RELOCATION

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Social recognition in piglets has not been systematically studied. In this experiment, a novel protocol was developed to familiarize animals and to assess which behaviors are indicative of social recognition. Furthermore, we investigated whether or not relocation affected the occurrence of these behaviors.
The familiarization protocol consisted of twice exposing 2 unweaned litters to each other for 4 hours in an arena with two compartments separated by netting. The arena was located between two farrowing pens and could be freely accessed. On the following day, pairs of littermates were exposed to each other for two 10-minute periods, after which piglets were considered familiar. Relocation occurred after these exposures and involved switching piglets and sows between farrowing pens.
Forty-eight 10-day-old piglets were assigned to one of three different relocation treatments (no transport, n=12; transport without change in arena location, n=20 or transport with change in arena location, n=16) and were subsequently exposed to either a familiar or unfamiliar conspecific (n=24, for both treatments) for a 5-minute period. During this exposure, no netting was present and piglets could freely interact.
Analysis of behavior showed that duration of social investigation is a clear indicator of familiarity, unfamiliar piglets spend more time on investigative behavior than familiar animals (GLM, $F_{1,42}$=23.78; $p<0.001$). Duration of fighting did not significantly differ between familiar and unfamiliar animals (GLM, $F_{1,42}$=0.36; $p=0.55$). Relocation of animals significantly increased the time spent on social investigation for both familiar and unfamiliar animals (GLM, $F_{1,42}$=5.31; $p<0.001$), but only if the spatial orientation of the arena was changed.
Investigative behavior is a valid indicator of social recognition. Piglets recognized familiar conspecifics up to 4 hours after the proposed familiarization protocol. However, relocation of animals with changes in the physical environment did influence the outcome of the recognition test.

RESPONSE OF DAIRY COWS TO SEPARATION FROM CALVES: EFFECTS OF CALVES' AGE AND VISUAL/AUDITORY CONTACT

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The aim of this experiment was to evaluate how the behavioural response of dairy cows to the separation from their calves is affected by two factors: age of separation and visual/auditory contact between mother and calf. We examined two hypotheses:
H1: The cow's behavioural response will increase in relation to calf's age at separation.
H2: The visual/auditory contact with a calf after separation will further increase the cow's behavioural response.
We observed 46 multiparous dairy cows divided into 6 treatments according to the calf's age of separation (1, 4 and 7 days) and contact or no contact after separation. After separation, the cows from the contact treatment were housed in individual pens near to the calves' pens. The behaviour of cows was recorded between 0-1, 8-9, 24-25, 49-50 hours after separation. The differences between treatments were tested with the GLM procedure and with the Tukey's studentized range test.
We found some evidence for the H1: The cows from the day 1-separation group vocalised less, than the cows from the day 7-separation group ($p=0.0372$), they sniffed the air less ($p=0.0118$) and they placed their heads outside the pen less often than the cows from the day 4 and day 7-separation group ($p=0.004$). The differences between the day 4 and 7 were not significant. H2: was strongly supported, because the cows from the contact treatment vocalised more ($p=0.0002$), sniffed the air more ($p=0.0062$) and spend more time with a head out of the pen ($p=<0.0001$) than the cows housed without the contact.
We conclude that behavioural responses of cows to calf's separation increase from the day 1 until the day 4 or 7, but the increases between the day 4 and 7 are not significant. The cows' behavioural responses are much more intensive when the cows can see and hear their calves.

THE EFFECT OF CLICKER TRAINING ON THE LATENCY TO APPROACH NOVEL OBJECTS IN YOUNG HORSES (EQUUS CABALLUS)

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Clicker trained animals are believed to be have decreased latency in learning new behaviors. This study examined the latency to approach novel objects in a clicker trained group and a naive group. We hypothesized that clicker trained horses will approach novel objects within a shorter latency period than naïve horses. The experimental group consisted of six yearling, two geldings and four fillies. The control group consisted of seven yearling, two geldings and five fillies. The experimental group received four consecutive days of pre-trial clicker training, which consisted of being walked in straight lines and circles, stopped and backed up for a few feet. This was done with the clicker as a secondary reinforcer and the grain as a primary reinforcer. The control group received the same handling with no reinforcement. Each training session lasted five minutes. On testing day, each subject was introduced to two novel objects: 1) a black garbage bag draped over a 5 foot long post and 2) a plastic sheeting positioned on the ground. Each subject was given five minutes to approach each novel object. The session was terminated when the subject approached the object and made physical contact. The subject was removed from the test area and then reintroduced to the second object in the same test area after five minutes. The order of testing and approach to the objects were randomly selected. Independent samples T-test were conducted to compare the latency of approach to novel objects by the control and experimental groups. No significant difference was found in latency of approach to the garbage bag ($p=0.411$) and plastic sheeting ($p=0.442$), by both groups. These preliminary results indicated clicker trained horses did not have a decreased latency in learning new behaviors. Further testing is needed to examine various factors involved in clicker training.

PREFERENCE OF PIGS FOR ILLUMINANCE

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The welfare of pigs may be compromised by imposing artificial illuminance levels and photoperiods. This experiment was designed to investigate inherent preferences for these in juvenile pigs. Two batches of eight gilts were raised indoors under a continuous illuminance gradient of 400-0 lux from shaded bulbs. At 7-weeks-old each batch was divided into two groups of four pigs which were introduced into four compartments of a preference chamber. Each pig/group had a choice of four illuminances (<4, 4, 40 and 400 lux), one per compartment. The groups occupied the chamber for two acclimatisation days then eight experimentation days; every two days they were removed for chamber cleaning and resetting of the illuminances following a random balanced pattern. Each four-pig group repeated the experiment aged 11 weeks. The location and behaviour of each pig was recorded by scan-sampling the video footage every sixth minute throughout the central 24-hour period of each two-day occupation. ANOVAs were performed on logarithmically transformed data for each group of four pigs.

The pigs preferred <4 to 400 lux at both ages; backtransformed means 10.3 v 2.9 hours/day at 7 weeks (transformed means 5.74 v 4.47, s.e.d.=0.474 *et seqq,* P<0.05.) and 8.6 v 3.7 hours at 11 weeks (5.74 v 4.90, s.e.d.=0.191, P<0.05). The pigs predominantly lay inactive (approx. 19.5 hours/day) for which <4 and 4 lux were significantly preferred (P<0.05, d.f.=271). Eating was the only active behaviour affected consistently by illuminance; more occurred under <4 than 400 lux (28.3 v 13.5 minutes/day (2.74 v 2.07, s.e.d.=0.20, d.f.=1055, P<0.05)). In conclusion, the pigs showed preference for #4 lux especially when lying inactive, suggesting low illuminance is a more comfortable environment and its provision may improve pigs' welfare. This contradicts the latest EC directive which suggests that pigs should be housed in a minimum of 40 lux.

STANDARD HOUSING FOR RATS IS STRESSFUL AS SHOWN BY ENHANCED SENSITIVITY TO REWARDS

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The present study was designed to investigate the effects of potentially stressful standard housing conditions for laboratory rats on the sensitivity to rewards as reflected by their anticipatory activity for sucrose. This anticipatory response was evoked in a Pavlovian conditioning paradigm in which a sucrose-reward was repeatedly announced by a stimulus (bell+light). Underlying neurocircuitry of the anticipatory response in expectation of a reward involves mesolimbic dopaminergic systems of which it is known that they can be sensitised by stressors. Rats (6-7 weeks old) were socially housed in standard or enriched conditions (n=12 per group; n=3 per cage) and after a few weeks subjected to the conditioning paradigm. Anticipatory activity was studied in the interval between the announcement and the delivery of the reward by means of continuous behavioural observation with an ethogram of 17 behavioural elements and subsequent calculation of the performed behavioural transitions. The enriched cages were relatively simple and consisted of standard Makrolon cages (type IV; 1875 cm^2) with some extensions, such as, a rim to increase the height, a shelter, a climbing-object and gnawing sticks. The results show that the anticipatory increase in activity after presentation of the stimulus that announced the sucrose-reward was stronger in the standard housed rats ($t=3.64$, $df=22$, $p<0.001$) as compared to the enriched housed rats. This indicates that the standard housed animals were more sensitive to the reward. Furthermore, this effect appeared to be robust since it could be evoked under different test-conditions (home-cage, observation cage) and was not influenced by the regular consumption of sucrose. In line with the known effects of stress on reward-sensitivity, it is concluded that the standard housed rats were more stressed which is likely to be caused by deprivation of the ability to satisfy behavioural needs, such as rearing, hiding, climbing, in these impoverished housing conditions.

EFFECTIVENESS OF CLICKER-TRAINING ON TEACHING TRAILER LOADING TO WEANLING HORSES

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Clicker training is a training technique gaining popularity in the United States. Though frequently employed in dog training, it is becoming increasingly accepted for use with horses as well. At this time, there are no known scientific studies documenting its effectiveness as a training tool in horses. The present preliminary study was designed to assess the effect of clicker training on the first time trailer loading of weanling horses. Thirteen trailer naïve weanling horses were divided into either experimental or control groups. The experimental group received four days of handling using clicker training. The control group received four days of handling with traditional methods. During the five-minute training sessions the horses were walked, turned and backed, by the same handler. Experimental horses were given food rewards paired with the clicker as a secondary reinforcer. On the fifth day, the horses were tested. Each horse was given a five-minute testing session during which time the handler attempted to load the horse on the trailer. The variables tested included: latency to placing one foot on the trailer, to enter the trailer and number of horse initiated back steps. Pooled variance independent t-tests indicated that there were no significant differences between the two groups for all the variables tested ($p>0.215$ - 0.848). However, separate variance t-tests indicated that geldings were significantly more like to enter the trailer than fillies ($p<0.033$). Though these results suggest that there are no benefits for clicker training over traditional methods of handling, more research is needed. In this preliminary study, the amount of pre-trailer loading training may have been inadequate for horses of this age. It isIt is also possible that clicker training may be effective for teaching other tasks such as general handling as opposed to trailer loading.

THE RESPONSE OF CALVES TO ISOLATION IN FAMILIAR SURROUNDING

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In intensive management system, letting cattle go outside daily for grazing or exercise is popular. In this system one cattle is occasionally left alone in the barn because of the visceral or kinetic disorder. To determine experimentally whether such social isolation in the familiar surrounding is a severe psychological stressor or not, behavioural, autonomic and pituitary-adrenocortical response of calves to the removal of peers were determined.

Four castrated Holstein male calves (5 to 6 months old) were reared in stanchion cages and taken outdoors for 2 to 3 hours daily. In the experiment, the test calf was isolated in its own cage by removing peers; two calves 2 hours before the experiment started until the end and the test calfís neighbour for 1 hour during the experiment. The data were obtained between 30 min before removing all the three calves and 60 min after the neighbour came back. In the control experiment the neighbour remained. The isolation test was repeated twice. Frequency of specific behavioural categories and duration of lying and standing were recorded. Blood samplings were conducted every 30 min from jugular catheters for the assay of ACTH and cortisol. Heart rate (HR) and rectal temperature (RT) were continuously recorded by a telemetry system. The differences between control and each test were statistically analysed by Studentís paired t-test.

Social separation induced increase in vocalization during 1-hour isolation in first ($p=0.055$) and second ($p<0.05$) treatment and the significant decrease in the ratio of lying in both treatments ($p<0.05$). However, plasma concentration of ACTH and cortisol, HR, and RT did not changed.

That physiological responses were not induced by such social isolation and that only the behavioural responses were induced suggest that the isolation in the familiar surrounding by removing peer might not be a severe psychological stressor for calves.

A TEST OF SOCIAL RECOGNITION IN THE DOMESTIC LAYING HEN

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With the approaching ban on battery cages, an increasing number of laying hens will be kept in large flocks. The question still remains whether in large flocks birds move around individually or in small sub-groups of familiar hens. In the current experiment we tested pairs of hens to see whether there were consistent differences in behaviour between unfamiliar and familiar pairs.

Four groups of 12 hens each were housed in separate rooms. At 24 weeks of age 24 pairs of birds, of which 12 were unfamiliar and 12 familiar, were confronted with each other in a test cage (100 x 50 cm) during 5 min. Half of both the unfamiliar and familiar pairs had been habituated daily to the test environment during two weeks before the test. During the 5-min test we scored all aggressive and affiliative interactions continuously and measured the distance between birds every 10 sec.

An ANOVA showed no effect of familiarity on aggressive and affiliative behaviour, nor on the mean distance between birds. We did find an effect of familiarity with the test environment. Habituated pairs of birds showed more aggressive pecks (0.80 ± 0.30) than non-habituated pairs (0.08 ± 0.28: $P<0.05$) and a larger mutual mean distance (18.74 ± 6.08 and 8.25 ± 1.83 cm, respectively: $P<0.001$).

Unexpectedly, the hens in this experiment showed no clear behavioural signs of recognition of a group member and no difference in mean distance between unfamiliar and familiar birds. This means that under our test conditions hens either failed to recognise group members or that signs of recognition were too subtle to measure. Furthermore, our results stress the effect of familiarity with the test environment on behaviour in social recognition tests. The results of our experiment will be discussed in relation to previous studies on social recognition in hens.

DIETARY VARIETY AND ANIMAL WELFARE: ENHANCING PERFORMANCE IN PRODUCTION AGRICULTURE

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In debates about the well-being of wild and domestic animals great scrutiny has focused on the physical environment, but little attention has been given to feeding practices. If a nutritionally balanced ration is available, we assume animal needs are met. However, these "nutritious" foods may be a significant source of discomfort. Nutritional well-being, behavior, and performance are strongly interrelated and yet the link has not been appreciated by scientists or managers operating under traditional feeding paradigms.

New evidence shows that most creatures have biofeedback systems that allow them to discern and regulate intake of primary nutrients, toxins, and medicines in appropriate ratios if offered appropriate alternatives. Nevertheless, animals in confinement are typically fed «total-mixed rations» and livestock often forage on pastures seeded to monocultures. Individuals within a group vary greatly in their food preferences due to differences in their abilities to metabolize nutrients and toxins. Such interactions depend on the state of the animal and the chemical characteristics of the foods available to it. Temporal variation in individual needs and requirements prohibits any single diet from meeting the needs of any individual, even one on average ideally suited to that food. Thus, an integral part of allowing animals to meet their unique nutritional needs and maintain their individual wellness involves having a variety of foods available so that each animal can select the diet that best meets its needs.

Wild animals consume a variety of foods that alleviate illnesses, and improve individual welfare. Domestic livestock also perform better when offered a choice of foods rather than a single mixed ration. Offering a variety of foods allows animals to maintain individual wellness, and may provide producers with an opportunity to enhance performance and lower feed costs.

HOW JAPANESE WILD BOARS OVERCOME OBSTACLES TO OBTAIN FOOD

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Japanese wild boars, like European wild boars, cause damage to agriculture although farmers install numerous fences to keep them out. Our previous study, reported in the 36th ISAE, described the jumping ability of Japanese wild boars. The present study investigated the behaviour of wild boars when presented with obstacles to obtaining food.

Two females(4-5 years) and two males (3 years),which were born wild, were studied in captivity in order to determine their reactions to obstacles preventing them from obtaining food. Food was placed behind obstacles and the wild boars were observed in their attempts to reach it.

Five obstacles (2 m long x 1 m deep) were used in our study. Three of these were composed of 3 to 5 iron bars placed parallel to each other. The other two were wire mesh which had a 15cm square grid and a 7.5cm square grid. The height of each obstacle, initially 20cm, was increased by 10cm until the height of 60 cm was reached.

As the number of bars increased, the wild boars passed under the lower obstacle (Kruskal-Wallis Test, $P<0.05$). When the wire mesh was installed, the time required by the boars increased. It was also observed that the wild boars touched the wire mesh more frequently than the iron bars. (Mann-Whitney's U Test, $P<0.05$).

As this obstacle became more complicated, we observed that the wild boars chose to pass under it rather than going over it, despite the fact that the obstacle was very low. This result will be a big help for development of new fence to keep wild boars out.

VOLUNTARY INTAKE AND GRAZING BEHAVIOR OF HOKKAIDO NATIVE HORSES AND THOROUGHBRED ON IMPROVED PASTURE

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Hokkaido native horses, which were established over about two centuries on Hokkaido island located in the northernmost part of Japan, is one of the kind of Japanese horses. They have been believed to have high resistance to cold as well as outstanding ability to digest low quality roughage, and traditionally kept outdoors all year round. In this study, voluntary intake and grazing behavior of Hokkaido native horses on improved pasture were compared with Thoroughbred.

In October, 3 Thoroughbred(TH:BW=579kg) were grazed on the grassland pasture(2.73ha), consisted of Kentucky bluegrass, for 13 days. The behavioral study was carried out for 24hr on the 13th day, and grazing, resting and other behavior was recorded at 10min intervals. The behavioral observation on feeding station(FS), which is the area available in a fan-shape in front of the horse when its front feet are stationary, were carried out 6 times for each horse for 10min. Feces were collected from 9th to 13th day at about 4hr intervals, and dry matter intake was estimated with a double-indicator method. After finishing the experiment on TH, 3 Hokkaido native horses(HH:BW=451kg) were grazed on the pasture for 13 days, and same measurements were carried out with same procedure. All data were analyzed by F-test and t-test.

The grazing time of HH was shorter than that of TH(817 vs. 970min/d, $P<0.05$). The dry matter intake by HH was lower than that by TH(8.5 vs. 13.5kg/d, $P<0.05$), but the body weight change of HH and TH during experiment were similar. The length of HH's stay on a FS tended to be shorter than TH, and the mean distance between FS was tended to be longer for HH than TH. It seems that Hokkaido native horses change FS frequently and move longer distance than Thoroughbred to ingest comparatively higher quality grass.

CAN THE PROVISION OF TEMPORARILY ACCESSIBLE EXTRA AREAS IMPROVE ANIMAL WELFARE IN BROILERS?

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The typically barren conditions in commercial broiler housing and the inactivity of the birds may be viewed critically under animal welfare aspects. Improvements in this regard might also help to alleviate the considerable problems with lameness. In an attempt to find effective environmental enrichment measures for broilers, the use of temporarily accessible areas with clean straw and sand and extra lighting was investigated. Two 2 m? areas, adjacent to the 8 m? home pen, were accessible from about 1200 to 1600 hours daily. It was hypothesized that the only temporal availability would sustain motivation to use the areas, and that through stimulation of locomotion, walking ability would be improved compared to an 'unenriched' control group. Three batches of each 106 Lohmann meat broilers per group were consecutively investigated. In scan samples every 5 minutes from video recordings at the end of weeks 1 to 5 of age, numbers of walking/standing or sitting/lying birds were counted. On average 47 % (minimum, week 1) to 53 % (maximum, week 4) of all birds of the group were in the areas at each scan, and there was no difference in use over weeks (Friedman's ANOVA Chi?=1.33, n.s., n=3, k=5). However, the proportion of birds sitting/lying steadily increased from 49 % (week 1) to 85 % (week 5). Gait scoring (following Kestin et al., Vet. Rec.131: 190, 1992) revealed no differences between 'enriched' and 'unenriched' broilers (Mann-Whitney, p=0.8, n=110) with 80 % (enriched) and 85 % (unenriched) of birds showing no (9 % respectively 5 %). or slight gait defects. Thus, although the extra areas were obviously constantly attractive to the broilers, and thereby possibly improved welfare, they did not sufficiently affect locomotion to lead to an improved walking ability.
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HOMOSEXUAL INTERACTIONS IN MALE AMERICAN BISON (*Bison bison bison*) UNDER SEMI-NATURAL CONDITIONS

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Bison bulls (*Bison bison bison*) are known to engage in homosexual interactions but the functional benefits of this behaviour – bonding, dominance expression or experience acquisition – are not yet defined. We collected data on homosexual interactions between bison males and evaluated them in function of season, age, dominance and reciprocity. The study herd was kept under semi-natural conditions. Data on homosexual interactions (mounting, chin on back) were collected over a period of three years by focal and all occurrences sampling. At the onset of the rut, the bison bulls were divided over four female herds with approximately one bull per 15 females. After the rut, the males were assembled in a bachelor group (BG). Observations in the four mixed groups of bison were carried out during the breeding season (2000:578h, # males=14; 2001:394h, #=11) and data on the adult male BG were collected out of the breeding season (1999-2001:291h, 5 groups, #=6-8). All bulls engaged in heterosexual behaviours during the breeding season. We observed 276 homosexual interactions in 57 dyads. Almost all homosexual behaviour was performed out of the breeding season (MWU-test, two tailed, rut versus non-rut, $p=.01$). We found for three of the five BG that younger bulls performed more homosexual interactions than older bulls (Kr matrix correlation, $p<.05$). Subdominants initiated and received more interactions than dominant bulls (Kr matrix correlation, $p<.05$) but this was a side-effect of the correlations with the factor age (Kr partial correlation). Homosexual interactions were found to be reciprocal in all but one BG (Kr matrix correlation, $p<.05$) even after partialling out the factor age ($p<.05$, except for one BG). Our results show that bison bulls perform age-related as well as reciprocal homosexual behaviour. This is not in line with the dominance expression hypothesis but consistent with both the bonding and experience acquisition hypotheses.

BENEFITS AND COSTS OF ALLO-SUCKLING IN PIGLETS

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Group housing systems for lactating sows with piglets allow animals to behave more naturally than traditional restrictive systems do. However, allo-suckling of piglets in these systems may occur. Among allo-sucklers there are permanent and occasional allo-sucklers. Generally presumed benefit of allo-suckling is the increase of milk intake, but there are probably some costs too, e.g. massage of alien teats and naso-nasal contacts with alien sows.

The aim was to investigate costs and benefits of allo-suckling: (i) whether allo-suckling has effect on the piglet's growth and (ii) whether piglets invest in to opportunity to allo-suckle through massaging alien teats and naso-nasal contacts with an alien sow.

Two sows were housed individually up to weaning and piglets had access to both from day 10 post partum. The behaviour of 10 pairs of sows with their litters was videotaped for 6 hours on day 9, 10, 16 and 24 post partum. The frequency of allo-suckling, massage of alien teats and naso-nasal contacts with the alien sow were analysed. Permanent allo-sucklers (4.6% of piglets) as well as occasional allo-sucklers (3.1% of piglets) were rare. (i) Piglets, which suckled from an alien sow permanently, were not heavier than faithful piglets at weaning (t – test, NS). (ii) Permanent allo-sucklers massaged alien teats more frequently before milk ejection (t-test, $t = 10.14$, $p<0.01$) and after it (t-test, $t = 8.42$, $p<0.01$) than faithful piglets. Interestingly, occasional allo-sucklers and faithful piglets massaged alien teats too. The frequency of naso-nasal contacts with an alien sow was nearly the same in permanent allo-sucklers and faithful piglets.

Surprisingly, allo-suckling had no effect on the growth of permanent allo-sucklers. However, the results indicate that not only permanent allo-sucklers but also occasional allo-sucklers and faithful piglets invested in the opportunity to massage and probably suckle alien teats.

AFFILIATIVE GROUP SIZE IN GRAZING DAIRY COWS

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In a previous study, cows from the same farm formed affiliative groups in a communal pasture. However, there were few social bonds among them when there were many cows from the same farm and they could freely divide into subgroups (Takeda et al., Appl. Anim. Behav. Sci., 67, 181, 2000). In this study, we investigated how many cows formed an affiliative group.

Seventy Jersey cows grazing on pasture (2 ha) were milked twice daily and fed hay and formula feed before each milking. Eight cows, aged 8-11 years, were selected as focal animals. Each focal animal was followed and observed for totally 49 hours per animal in the pasture from July to August. The identity and distance of each cow's nearest neighbour were recorded at 10-min intervals, and allogrooming and the participants in allogrooming were recorded continuously.

Most focal animals frequently choose 7 cows as nearest neighbour and allogroomed with 14 cows significantly more than expected (binominal test, $P<0.05$). The nearest neighbour partner relations correlated significantly with the grooming relations (Spearman's rho=0.41, $P<0.001$). Affiliative companions were defined as cows were observed significantly in the nearest neighbour partner relations and grooming relations. From our observation, average affiliative group size of 8 focal animals was 5.3 (ranged 0 to 9).With increase in the group size, the distance to nearest neighbours was short, and time spent allogrooming was long (Spearman's rho=0.74 and 0.66, $P=0.06$ and 0.08). Affiliative groups formed among cows of similar age rather than according to kinship (binominal test, $P<0.001$). Moreover, milk yield (305 days) tended to increase with sizes of affiliative groups (Pearson's r=0.72, $P<0.05$). In present study, the largest group size in which the formation was possible was nine in cows, and affiliative group sizes may influence animal productivity.

USE OF OUTDOOR RUN BY LAYING HENS: EFFECT OF COCKS AND OF VEGETATION

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Unstructured outdoor runs are not used evenly by hens. The area near the hen-house is over-frequented by the animals. This results in a destruction of vegetation, higher nutrient input (nitrogen, phosphorus, potassium) and a higher risk of accumulation of pathogens.
In this study the effect of cocks and of structuring the run by planting hedges on the distribution of hens in the run was investigated.
In April 1999 different bushes were planted on the outside run of a commercial farm. The plants were arranged in parallel lines, leading away from the hen house and continue to grow throughout the study.
Use of the outdoor run by four hen groups was studied. Group 1 (380 hens) starting in October 1998, group 2 (480 hens) in April 1999, group 3 (380 hens, 12 cocks) in January 2000 and group 4 (480 hens, 20 cocks) in July 2000. Number of hens and distance from the hen house (0–2, 2–30, 30–60, 60–90 m) were recorded by direct observations from July 1999 to December 2000.
From group 1 to 4, an increasing use of the outdoor run was observed. The mean percentage of hens in the run increased from 16 to 60 %. Use of the 30–60 m sector increased from 2 to 10 % and use of the 60–90 m sector from 0,1 to 12 % of all hens. In this sector, hens were found more often near the hedges which indicates an influence of the hedges. In the groups with cocks, hens spread faster over the area following a disturbance.
The results indicate that structuring outdoor runs with hedges and adding cocks increase the use of an outdoor run by laying hens. However, these effects could not be separated with the present data.

ASSESSMENT OF THE WELFARE OF DAIRY COWS KEPT IN OPEN BUILDINGS

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In order to save investment costs, dairy cows are increasingly kept in open buildings in central Europe. This study aimed at assessing whether cows are able to cope with the range of climatic conditions which may occur in such buildings. On each of four Swiss farms, ten lactating cows were observed over a total of five weeks in winter, spring and summer. For each cow, the following parameters were recorded simultaneously: skin temperature, body surface temperature (infrared thermography), rectal temperature, lying behaviour, heart rate, and milk cortisol concentration. In addition, we continuously measured air temperature (range -13.8 to 28.7°C) and relative air humidity (range 25.8 to 98.8%). Based on these measurements, the mean value of a temperature humidity index (THI) was calculated for each farm and each observation day, for night and day.

As expected, the THI had significant effects (General Linear Model, $p < 0.0001$) on skin and body surface temperature during both night and day. With regard to rectal temperature, duration of lying and cortisol concentration in the milk, there were significant effects ($p < 0.0001$) of THI for the day but not for the night time. Heart rate and frequency of lying did not covary significantly with THI. For most physiological and behavioural parameters, we also observed significant differences between farms ($p < 0.05$) and significant interactions between THI and farm ($p < 0.05$).

In conclusion, our results indicate that the prevalent climatic conditions on the farms during the day induced stronger thermoregulatory responses in the cows than the conditions that prevailed during the night. However, within the measured range of climatic conditions, the cows were hardly exposed to severe cold or heat stress and thus able to cope with these conditions.

PLAY ETHOGRAM AND THE ONSET OF PLAY BEHAVIOUR IN PRZEWALSKI HORSES AT ASKANIA NOVA RESERVE

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The play behaviour of Przewalski horses of a harem group was studied at the Reserve "Askania Nova". The aim of this study was to develop a play ethogram, to fix the age at onset of the certain play components, to found the differences in play activity between males and females. 15 colts and 14 fillies were observed during their first 2.5 years of life. 1051 hours of direct visual observations in daytime were made between 1992 and 2002. All months were represented.

It was found that the average play activity in males was higher than in females. At the age under 12 months males spent 0.01% to 6.81% of their day time playing, as opposed to 0 to 0.79% for females. A peak of play activity occurred between 30 and 50 days of life.

21 individual play behaviours were included in the ethogram. Manipulative play was rarely registered (it totalled 1.0% to 12.5% of all play entries). Various playful jumps and runs were the main components of foals' play during the first days of life. The preferableness of the play elements by Przewalski horses depended on their age and sex. Males at any age preferred vigorous play fights including bites/grasps (6.1-71.7%), pounces (2.5-12.5%); females preferred locomotor play including runs (3.4-44.1%), chases (6.7-33.3%), and also nips/bites (16.1-50.5%). Almost all of the play elements were first observed during the first month of life. The age at onset of the play elements depended on the sex of foals. Males tended to show elements of social play earlier than females. Two entries (dancing and kneeling) were registered in males exclusively. There were also aggressive and friendly interactions during play. Males under 12 months of age showed more friendly acts than females. Females at any age showed more aggressions than males.

OWNER-DOG INTERACTIONS AFTER A SHORT SEPARATION: AN OBSERVATIONAL STUDY

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The present study was conducted to analyse differences between woman and man owners in the attachment towards their dogs. We investigated whether women engaged more than men in verbal and non verbal care giving behaviour after a short separation from their pets. The sample consisted of 25 owner-dog pairs, 15 women and 10 men, ranging from 19 to 61 years of age. The research was conducted using a modified version of Ainsworth's Strange Situation. The owners were also requested to fill in the CENSHARE Pet Attachment Survey questionnaire (PAS) concerning the relationship with their dogs. The following behaviours were recorded as frequency of occurrence and/or duration: talk and command, affiliation ("touch and contact", "pet", "pick up", "kiss" and "hug") and playful attitude ("tug of war", "struggle", "throw the ball", and "kick the ball"). ANOVAs for repeated measures were performed on behaviours with owner's gender and dog's sex as main factors. Scores obtained in the PAS questionnaire were analysed using Rho Spearman Rank Correlation and Mann-Whitney U test.
The ANOVAs carried out on the owners' behaviour revealed that the main differences between women and men concerned the duration of talk. Women talked to their dog significantly longer but not more frequently then men did (talk duration: $F_{1,23}$=9.06, p=0.0062; talk frequency: $F_{1,23}$=1.03, n.s.). When exiting from the experimental room, women had more problems in controlling their dog and had to push them more than men did even not significantly ($F_{1,23}$=3.57, p=0.07). Other result showed that the frequency of affiliative behaviours increased with time ($F_{1,23}$=7.77, p=0.01) while talk duration decreased ($F_{1,23}$=7.66, p=0.01). No differences were found between women and men in the scores of the PAS questionnaire in agreement with behavioural analysis. The results suggest that in women the attachment relationship is characterized more than in men by verbal communication.

SURVEY OF TODAY'S HUMAN-DOG RELATIONSHIP IN TUSCANY AND CORRELATED CANINE BEHAVIOURAL PROBLEMS.

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During the centuries the human-dog relationship has been subjected to many changes, according to the different human life styles and the changeable appreciation bestowed upon the dog. Moreover local customs and traditions make this relationship unique and different from others developed in different contests. The aim of this study was to investigate the relationship between human beings and dog in Tuscany, focusing on whether possible behavioural canine problems may be related to particular interactions with the owners. For this purpose, questionnaires were circulated to the owners of 120 dogs, during the veterinary visits. Every questionnaire was composed by 93 questions regarding: owner biography (age, sex, profession, cultural level, family composition), the dog (race, age, sex, provenience, feeding, behavioural problems), dog life environment and the aspects of relationship human-dog. Statistical analysis was performed by using a Chi square ($?^2$) test.
The results show a high percentage of pure-bred (72.6%) and adult dogs (92.8%), living in families composed of three (40.7%) or four (31.5%) members. Dog's owners had a fairly high cultural level (42.3% of owners had a school leaving certificate and 20.8% a degree) and more frequently had a subordinate employment (62%). Love for animals was the commonest reason for acquisition of a dog (63%), followed by companionship (16%). Very often (89.8%) verbal communication was used by owner, also speaking to the dogs about important subjects (39.1%). Behavioural problems mentioned were: territorial-type aggression (34.7%), inappropriate mating behaviour (31.4%), separation anxiety (22.8%) and inadequate elimination habits (14.4%). A significant correlation was only found between mating behaviour and dog habit to sleep in the owner's bedroom ($?^2$= 9.74, $P<0.01$) or on the bed ($?^2$ =7.167, $P<0.05$). These findings provide, according to the Authors, an interesting insight into some of the factors that may be related to the occurrence of behaviour problems in dogs.

ABSTRACT WITHDRAWN

INTERACTIONS BETWEEN JAPANESE PRIMARY SCHOOL CHILDREN AND ANIMALS KEPT AS AIDS FOR TEACHING SOCIAL RESPONSIBILITY

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Many Japanese primary schools keep animals such as rabbits or chickens to aid in teaching children social responsibility. To investigate interactions between children and such animals, we sent a questionnaire to 1012 primary schools. In each school, a teacher and five children in charge of caring for the animals were asked to describe methods for keeping animals at school and interactions between children and the animals. Among the 507 completed responses, 482 schools (95%) kept animals. In 75% of cases, teachers reported that children appointed to an Animal Caring Committee were responsible mainly for daily care for the animals. Only seven schools answered that all children who wished to take care of animals were allowed to participate in that activity. Most teachers (88%) thought that children who did not volunteer for an Animal Caring Committee were not interested in animals in school. Complete responses were obtained from 2273 children (response rate: 45%). When asked whether they enjoyed caring for animals, 57% of participants answered ìYes, I enjoy it very muchî and 36% answered ìYes, I enjoy itî. Children who answered that they liked animals had a tendency also to enjoy caring for them ($r=0.46$, $P<0.01$) and to speak to the animals frequently ($r=0.37$, $P<0.01$). The children who had kept animals at home liked animals ($P<0.001$), enjoyed caring for them ($P<0.05$) and enjoyed speaking to them ($P<0.001$) more than children who had not kept animals at home. Among gender differences in responses, female students enjoyed more friendly relations with animals than male students ($P<0.001$). In conclusion, the results revealed that only a limited proportion of primary school students interacted directly with animals kept in schools. It would be desirable to design a specific curriculum to encourage more children to interact with animals during their primary education.

AGGRESSIVE BEHAVIOUR IN DOG BREEDS RE-HOMED FROM RESCUE SHELTERS

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Some owners consider threatening behaviour towards unfamiliar people to be a desirable temperament characteristic, but aggression in other circumstances is generally considered inappropriate. This study investigates whether such differentially aggressive behaviour is exhibited across different breeds of dog re-homed from rescue shelters.

One month following adoption, new owners of 234 shelter dogs reported their dog's behavioural response in various situations they had encountered. Aggression was rated using 5-point Likert scales (1=no aggression displayed, 3=growls and threatens, 5=bites). Responses across all situations were positively skewed (min=1, max=5). Scores of 3, 4 and 5 were considered to be aggressive responses. The percentage of dogs showing these scores was 32.5% in response to seeing cats, 29.6% in response to the doorbell at home, 19.8% in response to other dogs, 16.7% in response to unfamiliar visitors to the house, and 8.7% in response to unfamiliar people when out walking. The incidence of aggressive behaviour directed towards the owner was far less (1.5%).

Eight breed groups were compared using Kruskal-Wallis test for k independent samples and Dunn's multiple comparison test. There was a high degree of variation within all breed groups. German Shepherds (n=15) and Rottweillers (n=8) displayed more aggression when the doorbell rang, compared with other breeds (Kruskal-Wallis, $X^2=14.98$, $p<0.05$). German Shepherds (n=15) and Terriers (n=54) displayed more aggression towards unfamiliar visitors to the house (Kruskal-Wallis, $X^2=24.02$, $p<0.01$). German Shepherds, Rottweillers and Terriers were more likely to have displayed aggression at any time since adoption, compared with other breeds (Kruskal-Wallis, $X^2=16.07$, $p<0.05$). Aggression displayed when reprimanded differed between breed groups (Kruskal-Wallis, $X^2=21.14$, $p<0.01$), with Terriers and German Shepherds again displaying most aggression. Other breed groups included Mongrels, Labradors, Lurchers, Border Collies and Springer Spaniels. These shelter dogs may be more suitable for owners who consider guarding behaviour to be an undesirable trait.

"CAT LOVERS": A QUESTIONNAIRE STUDY IN MILAN, ITALY

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The Milan Local sanitary Agency works to take a census of stray cats and to sterilize them in collaboration with animalist associations and private citizens (i.e cat lovers) who take care of the colonies. The aim of the present study was 1) to make a preliminary description of the characteristics of italian "cat lovers" evaluating whether they correspond to the widespread stereotype that depict them as rather old, poor and socially isolated women, 2) to evaluate their attachment to their cats and to compare their attitudes towards cats with those of cat owners who do not take care of stray cats. The study was conducted in Milan between November 1998 and June 2000. 46 cat lovers (men and women) that took stray cats for sterilization and 36 randomly selected cat owners were asked to fill in two different kind of questionnaires: the CENSHARE Pet Attachment Survey questionnaire (PAS) concerning the relationship and attachment to their cats, and a questionnaire aimed at gaining background personal information. The cat lovers' questionnaire consisted of 35 items (10 concerning stray cats) whereas the cat owners' questionnaire contained exclusively the items not concerning stray cats (25 items).
No significant differences were found between cat lovers and cat owners in the scores of the PAS questionnaire: however cat lovers tended to have higher attachment scores. Although preliminary our data suggest that the "cat lover" traditional stereotype is only partially true: in particular not all cat lovers are women (87%), in general they have a job and a family, and their age vary quite a lot. The main differences between cat lovers and cat owners were related to retirement (35% vs 11%) and full time job (28% vs 61%). Principal components Analysis and K-NN Analysis did not show clear differences between the two groups.

INFLUENCE OF PERSONALITY TRAITS ON PERFORMANCE OF THE DAIRY HERD

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The human-animal contact may have influence on productivity and health status of herd of dairy cows. The human behaviour towards animals is determined by personality and attitudes towards them.
Aims of study were to assess the relationship between personality traits, attitudes and age of stockpersons working with a herd and productivity and health indicators of that herd.
In total 31 dairy farms in Central Bohemia were involved in this study, each having 3-10 stockpersons. Dairy herd size was between 80 and 688 cows, 141 stockpersons were asked to fill two questionnaires anonymously of which 127 could be used. Respondents were people speaking Czech. The farms had hybrid populations of Czech Fleckvieh x Holstein-Frisian cattle. For measurement of personality traits (Neuroticism, Extraversion, Openness to new experiences, Agreeableness and Conscientiousness) the Czech version of NEO - Big Five Personality Inventory (Costa, P. T., Jr., McCrae, R. R. Psych. Assess., 4, 5:13, 1992) was used. The attitude questionnaire assessed general attitude of stockpersons towards cows and general beliefs about them. Relationships between personality traits, attitudes, farm productivity and quality characteristics (milk yield, price of milk), and herd health status (veterinary costs, percent of culling, mean lactation order) were explored using Spearman correlation coefficients. The correlations between variables were based on farm averages.
Veterinary costs correlated positively with personality traits Neuroticism ($r=0.34$, $p=0.07$) and Conscientiousness negatively ($r=-0.36$, $p<0.05$), and the costs also negatively correlated with Age of stockpersons ($r=-48$, $p<0.01$). Price of sold milk correlated positively with Experiences of stockpersons working with dairy cows ($r=0.34$, $p=0.06$) and with Age ($r=0.53$, $p<0.01$). Attitudes of stockpersons were not in significant. The results show personality traits and age could influence price of sold milk and veterinary costs a cow per year and could be criteria for recruitment of suitable stockpersons.

ABSTRACT WITHDRAWN

EVALUATION OF PRACTICAL AND FUTURE KEEPING OF SMALL DOMESTIC ANIMALS IN SWISS PET SHOPS

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Problem: Animal protection-related research and the legislation of different countries have rarely dealt with the keeping of pet animals, with the exception of dogs and cats. Popular literature has often repeated source material and references about specifications for the keeping of small domestic animals without discernment and without taking actual research into account.
Objective/Methods: This survey is a compilation of recommendations and norms taken from current scientific and popular literature for the keeping of small pet mammals, ornamental birds, reptiles, amphibians, toy fish and invertebrates. In addition, a total of 93 pet shops in Switzerland (by random choice) has been interviewed, concerning their situation and presentation, variety and number of animals sold as well as the range of cages and interior installations offered, and future trends.
Statistics: NCSS
First Results/Conclusions:

- The situation for rodents is quite satisfactory, but the types of pens available offer little variety and the choice of installations is subject to local conditions.
- The situation of ornamental birds is in some cases appalling and is in urgent need of improvement. Often enough their keeping lacks adequate light, space or distraction.
- Reptiles have become increasingly popular, whereby there are also local differences. The keeping of these animals does require vast informative preparation. The available enclosures are often suitable for young animals only.
- Amphibians (poison frogs) are rarely found in pet shops. The terrariums are usually reptile enclosures or adapted from such, and are unsuitable.
- Fish are the most widely sold animals. The supply depends entirely on customer demand.
- Invertebrates such as mussels, snails, tarantula or scorpions are held either as additions to aquariums or individually. The specific requirements of the individual species are handled very differently.

A TEMPORARY ADOPTION PROGRAM FOR SHELTERED DOGS: EFFECTS ON THE POSSIBILITY OF SUCCESSFULLY RE-HOMING DOGS AND THEIR WELFARE

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In many European countries the high rate of dogs returned to the shelter after adoption is one of the main problems in successfully re-homing dogs. This has a marked negative effect on dog welfare and human-pet relationship. Temporary Adoption (TA) Programs, which have been developed to improve sheltered dogs welfare, could help decrease return rate and increase successful adoptions. These programs can also provide families with a trial period before definitive adoption of a pet and consist in several phases. In the first, a suitable dog is selected among those available for TA, with the help of the shelter responsible, in the second the family can take the dog out from the shelter for a few hours, and in the final phase they can take the dog home for a day at a time. The aim of this study was to evaluate the effects of a TA Program on the rate of successfully re-homing sheltered dogs and, thus, on their welfare. For 109 dogs which arrived at the shelter in 2001 the following data were collected: whether they underwent a TA Program or not, adoption rate after one year, whether the final adopter was the temporary one, rate of dogs returned to the shelter after final adoption. All these dogs were more than four months old when they arrived at the shelter and had been present in the shelter for more than four months. A Fisher Exact Test showed that dogs in the TA Program were significantly more adopted ($P<0,0001$) than control dogs, and that dogs definitively adopted by the temporary adopter were less frequently returned ($P<0,01$) than dogs adopted by strangers. It is concluded that TA programs, facilitating adoptions, can have a positive effect on dogs' welfare. These are among the first scientific evidences of such benefits.

OWNERS ARE RELIABLE OBSERVERS OF THEIR OWN DOG'S BEHAVIOUR

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Temperament tests conducted on dogs in rescue shelters are frequently validated using measures derived from new owners' reports of their dog's behaviour. It is possible that error in owner reporting arises from attempts to mislead researchers or through misinterpretation of behaviour signals. The reliability of owner report is therefore investigated. Subjects were 40 adult dogs re-homed to new owners from rescue shelters in the UK. Dogs were assessed by an unfamiliar tester in their homes two weeks following adoption. Concurrent with assessment, two owners of each dog reported independently on how these dogs behaved across 75 different situations. Temperament trait scores were derived from questionnaire for 5 traits.

Inter-owner reliability coefficients were moderate to high across all traits (Spearman: Aggressiveness, rho=0.863, $p<0.001$; Excitability, rho=0.494, $p<0.10$; Playfulness, rho=0.609, $p<0.05$; Fearfulness, rho=0.812, $p<0.001$; Obedience, rho=0.818, $p<0.002$).

Correlations between owner and tester ratings were lower. Owner ratings of dog playfulness were correlated with play displayed towards the tester in the tug of war test (rho=0.525; $P<0.001$), when the tester groomed the dog (rho=0.444; $P<0.005$), when the dog had its lead put on (rho=0.333; $P<0.005$) and when the dog was walked on the lead (rho=0.489; $P<0.02$). Owner report of dog behaviour towards unfamiliar people was correlated with how excitably the dog behaved towards the tester (rho=0.321; $P<0.05$). Agreement between owners and tester ratings for aggression displayed when scolded was good (Kendall coefficient, agreement=78%; W=0.001) and aggression towards an unfamiliar person was moderate (Kendall coefficient, agreement=54%; W=0.032). Owner ratings of fearfulness and obedience were not correlated with tester observations.

Correspondence between owner and tester observations were varied, suggesting that dogs behave differently towards unfamiliar people compared with familiar owners. Inter-owner reliability coefficients suggest that owner reports are more likely to provide a reliable external criteria for the validation of temperament tests than an independent tester.

DEVELOPMENT OF TECHNIQUES FOR SUCCESSFULLY MANAGING URBAN CATS COLONIES: AN ONGOING CASE STUDY IN FLORENCE, ITALY

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Under Italian federal law 281/1991 concerning the prevention of strays, the responsibility for urban feral cat populations lies with the regional and municipal government agencies. We undertook an investigation of the feral cat colonies in the City of Florence, Italy: the aim of this study was to determine the optimal conditions of equilibrium and stability that would facilitate proper enforcement of the law. A total of 159 colonies were found, equally distributed in space in vicinity to human concentrations, with size ranging from 9 to 16 cats; the most utilized habitat was garden (42%), followed by park (10%), street (9%), court (9%), fields (8%). The health conditions of the animals were by and large good, the principle risks of infection were found to be Fiv and Felv in unsterilized adults and rhinotracheitis in younger animals; around 67% of the cats were spayed and neutered. Four colonies differing as to the percentage of animals sterilized and degree of visibility toward humans were compared by recording the individual presences during feeding time all around a year. The comparison showed that optimal population control and health conditions could be obtained spaying and neutering of randomly captured cats: when only females are sterilized, presence of unsterilized males was significantly lower than sterilized ones (t-test, $p<0.001$). When both sexes are sterilized, the equilibrium of the colony is unaffected. Greater number of cats were abandoned in the visible colonies (up to 133% of initial population , as opposed to the 3% in the less visible ones). In conclusion, optimal population control can be obtained by the parallel implementation of two campaigns: on one hand spaying and neutering of randomly captured cats, on the other correctly informing the citizenry about the problem of strays.

ASSESSMENT OF THE MICHIGAN STATE UNIVERSITY EQUINE WELFARE INTERVENTION STRATEGY (MSU-©EQWIS-ACTION) USING BRAZILIAN DRAUGHT HORSES AS A CASE STUDY

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The MSU EQuine Welfare Intervention Strategy (MSU-EQWIS-ACTION) is an intervention strategy which encompasses data collection, followed by tailored education strategies to improve horse welfare. The protocol is designed to be implemented in 10 days. ACTION stands for: **A**ssessment; **C**ompilation of information; **T**ailoring intervention; **I**mplementation of the strategy; **O**rganization of local networks and targeting **N**ext population. The intervention was tested in two communities in the township of Cachoeirinha, Brazil where more than 500 draught horses are currently used. We interviewed horse owners (n=14) and inspected their horses (n=24). We assessed demographics, feeding management, health and husbandry practices. Random sampling of 110 animals was carried out in the neighboring town of Porto Alegre, home of more than 5,000 draught horses, assessing body score, health, workload and coat quality. We developed a manual and facilitated two workshops. We structured networks to assess the long-term sustainability of the MSU©EQWIS-ACTION. The random sampling data (n=110) indicated that 18% of the inspected horses were very thin, 56% were thin and 26% were in adequate condition. Out of 61 horses, 70% were "not lame;" 23% were "slightly lame;" and 7% showed "easily noticeable" lameness. The horses owned by the 14 subjects interviewed showed an average of 3.1 body condition score (scale 1 to 9; 1=very thin). 50% of the horses were scored as thin, 41% scored as very thin and 9% rated as adequate. None of the interviewed owners provided trace mineral salt. Deworming strategies were not implemented on a regular basis. Some horses were brushed post-exercise (40%) but bathing was rare. The format of the workshops was based on the interview and random sampling data. The number of horse owners interested in joining the project doubled in the first month post-intervention. Monthly data collection, assessing the MSU©EQWIS-ACTION protocol, is carried out by the local task force.

ABSTRACT WITHDRAWN

WHAT CAUSES CROWDING? MODELLING BEHAVIOUR AT HIGH STOCKING DENSITY.

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Theoretical models are presented to identify the separate effects of space and group size on behaviour of chickens at high stocking densities, with relevance for all animals. Freedom of movement is analysed by taking the area of a hen as 475 cm^2 and finding the number of free bird spaces left at different space allowances. The appropriateness of this model is supported by published data from different housing systems: time spent in locomotion has the same relationship with space allowance as predicted freedom of movement. This analysis provides support for current recommendations of a maximum of 7 laying hens/m^2 on deep litter, but suggests that a maximum for broilers of 34 kg/m^2 unacceptably restricts freedom of movement. In cages, freedom of movement increases with space allowance per hen (this result is also supported by data) and, for a given space allowance, with cage and group size. Models are also presented for nesting, perching and feeding. Recommendations are derived for hens in furnished cages. The main part of the cage should be as large as possible; an absolute minimum of 600 cm^2 per bird is suggested, but 675 cm^2 per bird is probably the minimum practical. Perch and feeder space are determined by body width, and should be provided at 14 cm or more per bird, with a possible derogation for white birds of 12 cm. The number of nest spaces needed per bird varies with number of birds, with nest spaces being 300 cm^2 each. These recommendations cumulate to a minimum of 800 cm^2 per bird for groups of more than 8, 850 cm^2 for groups of 4 to 7, and 900 cm^2 for groups of 3 or fewer. Crowding is primarily caused by limited space allowance but for a given space allowance is worse in small enclosures and groups.

SEPARATION DISTRESS IN NEONATAL GOATS: ANALYSIS OF QUANTITATIVE ELECTROENCEPHALOGRAPHY AND BIOCHEMICAL PERIPHERAL MARKERS.

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In goat a selective and reciprocal mother-young bond is rapidly established at birth and persists even beyond the lactation period under natural conditions. Therefore physical separation of mother and young may result in psychobiological disturbance. Aim of this study was to assess quantitative electroencephalography (q-EEG) and biochemical peripheral markers accompanied by behavioural observations (vocal rate) before and after separation in growing kids.
Seven healthy Saanen kids showing normal behavioural patterns were selected just after two days from birth. Kids were tested before (basal condition -B-) and after separation (stress condition -S-) from their mother, respectively at 15 (T1), 30 (T2), 45 (T3), 60 (T4) and 75 (T5) days of age. All experimental trials were videotaped and analysed. Each EEG recording session lasted 10 minutes. At the end a standardized method for blood collection were implemented. Blood samples were collected in order to perform cortisol and catecholamine (epinephrine, norepinephrine, dopamine) plasma levels by radioimmunoassays. q-EEG analysis was performed using Fast Fourier Trasform; the spectral bands d (0.5-4.0 Hz), q (4.1-8.0 Hz), a (8.1-12.0 Hz) and b (12.1-30.0 Hz) were calculated and expressed as relative power (%). Kolmogorov-Smirnov test for normality and paired t-test were used for statistical comparison. Statistical analysis showed significant increases in cortisol, epinephrine, norepinephrine plasma levels and significant decrease in dopamine plasma levels between BT1 vs ST1. Significant increase was found for q band between BT2 vs ST2. Kids tended to vocalize more in S, but this difference was significant only between BT1 vs ST1 (Wilcoxon's test). These results, as well as behavioural data, suggest a primary response of sympatho-adrenal axis and adrenal cortex to separation distress followed by the bioelectrical activity response according to the development of the central nervous system.

RELATION BETWEEN THE TYPOLOGY OF ACTIVITY BOUTS AND THE FIRST EVENTS IN THE BOUTS IN BROILER CHICKENS

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Locomotor activity reduces leg problems and thus improves welfare in broiler chickens. In order to know which behavioural patterns locomotor activity is associated with, we previously achieved a categorisation of activity bouts. This typology was helpful to analyse which behaviours induced standing or walking (Bizeray et al 2002). In the present work we studied the relationship between body weight and the occurrence of bouts from the FORAGING class (high locomotor activity) and we tried to find some simple criteria of the bouts that would be enough to classify the bouts without a long-lasting recording.

Broiler chickens were observed from one week to 5 weeks of age. An activity bout started when the animal stood up and finished when it had been lying down doing nothing for at least 30 s. The percentage of bouts belonging to the FORAGING class was negatively correlated to hatching weight ($R=-0.44$; $P<0.05$) and to body weight at 21 days of age ($R = - 0.55$; $P<0.01$). We took into account the two first behavioural patterns and the fact that the activity bout was longer or not than 3 minutes. These three criteria were sufficient to attribute 77 % of the activity bouts to the correct class, i.e. the class designed by the most long-lasting behaviour (n = 708). The allocation of a bout to a class via this simplified method was better for short bouts (91 %) than in long bouts (57 %).

The present data show that the classification was helpful to study the relationship between body weight and exploratory behaviour. The simplified method would be useful to study short activity bouts in commercial conditions where it is difficult to achieve video or computerised recording of focal observations.

References: Bizeray, D.; Leterrier, C.; Constantin, P.; Le Pape, G.; Faure, J.M. 2002. Behav. Proc., 58:45-55.

BEHAVIOUR OF SOWS AND PIGLETS IN DIFFERENT TYPES OF FARROWING PEN

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This study compared the behaviour of sows and piglets in 3 different types of farrowing pens. Two of them were as individual type, straw-bedded pens with free movement of sow (FP-pens) and pens with slatted floor and crate (CP-pens). The 3rd type was a straw-bedded group pen for 6 sows with feeding in the electronic feeder (GP-pen). In both individual pens 4 sows were observed before farrowing (2 days) and 2 sows after farrowing during 24 hours. In GP-pen was observed six sows. 23 piglets in FP-pens, 22 piglets in CP-pens and 48-41 piglets in GP-pen were observed after farrowing in the 1st and 2nd week, when sows were observed. We used the ANOVA for statistical evaluation.

The longest period lying of sows was found in the GP-pen (94 % of time). Sows lay longer time in the CP-pens compared with the FP-pens (88-92 vs. 73-81 % of time). The longest lying period of sows was recorded in all housing types in the 1st week after farrowing. Sows were more active before farrowing, when they prepared for parturition. They had greater possibility for nesting behaviour, exploration and manifestations of maternal behaviour in the FP-pens and GP-pen.

In the individual pens piglets lay longer in the CP-pens, but lying at the udder of sow was longer in the FP-pens. Suckling in both types of individual pens presented more than half from the total activity. Total suckling activities (including massage) was longer in the GP-pen (29 % of time), but the suckling of own dam dominated. Suckling of alien sows was higher in the older piglets ($p<0.05$). Total time of one suckling bout was longer in the GP-pen.

Better welfare conditions for sows and their piglets were in FP and GP pens. In the GP-pen were more cases of piglets crushing.

EFFECT OF COVERING SLATTED FLOORS WITH MATS ON THE BEHAVIOUR AND WELFARE OF LOOSE HOUSED SOWS AT MIXING

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Introducing unfamiliar sows to one another in groups results in aggression that can lead to injury and lameness particularly on slatted floors. The objective of this study was to evaluate the effect on sow behaviour and welfare of covering slatted floors with mats during mixing.

One-month post service, 32 multiparous sows were assigned on the basis of parity, in groups of four, to pens with a slatted roaming area and four full-length feeding stalls. Prior to mixing the roaming area in four of the pens was covered with a mat (MAT, n=4), in the other pens it was left uncovered (NO MAT, n=4). The duration and frequency of fights over a 24hr period post-mixing was established from video recordings. Prior to, and 24hrs after mixing, sows were inspected for injuries inflicted by other sows and injuries caused by trauma from the physical environment. Injuries were scored (0 to 6) according to severity.

There were significantly fewer fights in the MAT treatment (2.5 ϒ 0.50 vs 6.0 ϒ 1.22; Mann-Whitney Z=-1.97, P<0.05). Furthermore, MAT fights were significantly shorter (43.0 ϒ 3.23 secs vs 110.1 ϒ 21.9 secs; Mann-Whitney Z=-2.17, P<0.05). Traumatic injury scores post-mixing did not differ between treatments (Mann-Whitney Z=-1.59, P>0.05). NO MAT sows tended to have higher aggression induced injury scores post-mixing (10.8 ϒ 1.89 vs 5.8 ϒ 0.85; Mann-Whitney Z=-1.75, P<0.07).

Mats in the roaming area reduced both the number and duration of fights post-mixing with a concomitant reduction in the severity of aggression induced injuries. Hence, mats improved sow welfare in the short-term. However, sows may have been reluctant to enter into conflict on the mats as they offered poor foothold when wet. This could prolong the time it takes for the dominance hierarchy to be established. Mats offered no protection from traumatic injuries.

FIRST STEPS IN THE EVALUATION OF FLUCTUATING ASYMMETRY (FA) AS A POTENTIAL ANIMAL WELFARE INDICATOR: RELIABILITY TESTING

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Fluctuating asymmetry may be a promising welfare indicator reflecting long-term effects of possibly stressful conditions. Organisms possess a number of bilateral characters which are symmetrical in the ideal case. Genetic factors and environmental stressors can impair the ability of the organism to control a stable morphological development with resulting small, randomly directed deviations from symmetry (FA). However, fluctuating asymmetries are generally very small relative to the measured traits. Thus, measurement errors can greatly impair reliability and thereby validity. We, therefore, compared three methods of measurement at 156 pairs of tarsometatarsi and accompanying digiti of muscovy ducks (*Cairina Moschata dom.*) obtained from the slaughterhouse. We measured with an electronic calliper four different characters at the feet, either in an unprocessed (i.e. with soft tissue) soft (n=154) or frozen (n= 92) state, or in the pure bones (n=156), three times each, and calculated coefficients of variation (standard deviation/mean) of the repeated measurements per character. These coefficients ranged from 1.5 % - 3.6 % (frozen), 1.0 % - 2.1 % (soft) and 0.3 % - 1.4 % (pure bones). Repeatability of measurements did not differ between right and left feet, but was significantly better (coefficients of variation lower) in measurements of pure bones compared to unprocessed feet (signed rank test, $p<0.001$ in all cases) and in soft compared to frozen state ($p<0.003$ in all cases). Therefore, in terms of repeatability, measurement of pure bones seems to be the best choice. However, processing of the feet requires a considerable time investment for preparation and identification (about 10-20 minutes per foot), and defleshing by beetles (*Dermestes maculates*: about 4 days, in only small samples). We therefore continue to investigate whether certain limits for a reliable measurement of fluctuating asymmetry can be established.

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FACTORS AFFECTING THE WELFARE OF NON-RACING HORSES IN PRINCE EDWARD ISLAND, CANADA

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In North America, there are few representative, horse-level data on the effects of management practices on equine welfare. To help address this need, a survey was conducted in Prince Edward Island in the summer of 2002, examining the welfare and management of 314 non-racing horses (ponies, miniature horses, draft horses, and other horses that are not race horses). Welfare was assessed by two endpoints: occurrence of stereotypies and body condition score (BCS). Owners were recruited by a random phone book search (response rate 70%) and completed a pretested questionnaire that examined care and handling practices, bit usage and other factors. Through site visits, the amount of grain and hay fed per meal were weighed, feed was sampled, and each horse was examined by a veterinarian. Descriptive statistics were generated and logistic and linear regression were used to examine factors affecting the two welfare endpoints. The prevalences of crib-biting, wind-sucking and weaving were 3.7%, 3.7% and 5.1% respectively. The risk of having one of these stereotypies increased with age (OR= 2.10 for an 11-year increase, p=0.013) and use of a non-snaffle bit (OR=3.39, p=0.026). The risk tended to decrease with longer daily time at grass (OR= 0.59 for a 12-hour increase, p=0.068) and with horse type (draft horses were less likely than light horses to have a stereotypy OR=0.13, p=0.054). BCS tended to be high (mean ±» s.e. 5.7 ± 1.0 on a 9-point scale) and was higher in mares (p<0.001) and in horses examined later in the summer (p=0.025). Our results show associations but not necessarily causal relationships. They suggest that increased turn-out time and owner education can improve equine welfare. Further research is indicated on any role of bits and riding aids in the development and maintenance of stereotypies.

AGONISTIC BEHAVIOUR OF PIGLETS REDUCED BY SINGLE-SEX GROUPING AT WEANING

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Regrouping of piglets is a common procedure at weaning that leads to aggressive behaviours considered as a welfare problem.
This experiment was conducted to determine whether it is better to group piglets by sex at weaning or to mix them in male-female groups. Large White piglets were weaned at 28 days and assigned to 4 conditions, with 6 groups of animals/condition : (C1) 4 male and 4 female piglets reared together from birth, (C2) 8 unfamiliar male piglets, (C3) 8 unfamiliar female piglets, and (C4) 4 male and 4 female unfamiliar piglets. All groups were videotaped at 28, 29, 31, 39 and 46 days for 2h. Aggressive interactions were quantified. Scratches on each piglet were counted on day 27, 29 and 33. Feeding consumption and piglets' weights were quantified from weaning to 65 days.
On d28 and d29, familiar piglets fought less than the other groups ($p<0,05$). On d29, there were more scratches and mean fighting durations were longer in the unfamiliar mixed group (C4) compared to the unfamiliar single sex groups (C2, C3) (3650s vs 1500s and 1500s ; $p<0,01$). In the two mixed-sex groups, fighting between males and females was more frequent than fighting by piglets of the same sex (70% vs 30% ; $p<0,05$). The within-sex fights were less aggressive in the familiar group (C1) compared to the unfamiliar groups ($p<0,05$). Fights between males were more severe and longer in C4 than in C1 ($p<0,05$) and C2 ($0,05<p<0,06$). In C4, fights between 2 males were more intense than females' fights ($p<0,05$) and even than mixed-sex fights ($p<0,05$). However, fights in male vs female single-sex groups did not differ. Females seem to increase male aggressive behaviour in mixed groups. Growth and food intake were not affected by the treatment. Grouping piglets by sex reduces aggression immediately after weaning.

USAGE FREQUENCY UND ACTIVITY OF MALE TURKEYS FROM SIX STRAINS IN AN ENRICHED ENVIRONMENT

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In commercial turkey farming problems like locomotory disorders and cannibalism are related to genetics and a barren environment. We tested the effect of spatial enrichment on the activity of birds from different strains. A total of 2106 one-day-old male turkeys of three light strains in a first trial and of three heavy strains in a second trial were housed either in a barren (n=6) or an enriched (n=6) compartment (4.0 x 4.5 m) until aging 18 weeks, respectively. Compared to the barren the enriched compartments were equipped with straw bales and elevated levels, and birds had access to a roofed outside run and a grass pasture from the 6th week of age. Each second week the use of structures inside the compartment was video recorded and birds' behaviour in the outside area was observed directly. Heavy turkeys used the elevated level slightly more often (31-33 %) compared to light turkeys (20-28 %). Use of outside areas was higher for light strains (68-73 %) than for heavy strains (23-28 %). Locomotion in the outside areas was significantly (mixed linear model, $p<0.05$ respectively) affected by strain, more frequent on the grass pasture (43%) than in the roofed outside run (13 %), and declined with age from 36 to 25 %. Activities whilst standing were significantly higher on grass pasture (40%) compared to roofed outside run (34 %), and varied significantly with age (27-46 %) and time of day. Activities whilst sitting were observed significantly less frequent on grass pasture (17 %) than in the roofed outside run (53 %), but this varied significantly between strains (strain*area), with age (28-44 %), and time of day. Our results suggest that heavy and light turkey strains differ in their use of an enriched environment and this alters with age.

CROSS-SUCKING BEFORE AND AFTER WEANING BY CALVES FED WITH A COMPUTERIZED MILK FEEDING SYSTEM

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Group-rearing of young calves reduces labour and improves animal welfare but farmers are concerned about cross-sucking. We examined the behavior of 128 calves raised in groups (median=8). Calves were fed with a computerized milk replacer feeding system. The milk feeder was fitted with a special door to allow calves to suck without interference from others. Calves were allowed a maximum of 4L /d in four portions, and milk flow regulated to increase sucking time. Calves visited the milk feeder on average 17 times/d. Calves were videotaped for 2 X 24h period each week (8-12 times). Each video was scanned to search for all cross-sucking events by individually identified calves. We observed a total of 238 cross-sucking events over 2145 calf-days. Rates of cross-sucking were 0.08 and 0.09 cross-sucking events/ calf-day for the young calves and older calves respectively. Cross-sucking events did not last very long. For the younger calves (4d-25d), a cross-sucking lasted on average only 90s with a range from 21s to 193s. For the older calves (26d-50d), the average cross-sucking lasted 77s (range 19s to 391s). We also observed the group reared calves (n=134) after weaning at 50d when they were mixed with calves that had been reared individually and bucket fed during the milk feeding period (n=176). Cross-sucking rates were 0.12-events/ calf-day for the group-reared calves and 0.15 events/ calf-day for individually reared calves (t test; $p>.05$). Overall, cross-sucking rates were extremely low. The computerized milk feeder did not cause cross-sucking behaviour to develop during the milk feeding period nor did it lead to an increase in cross-sucking following weaning. However, it is important that the feeder be operated in a way as to allow adequate sucking time for the calves.

THE EFFECT OF DIET CHANGE ON THE BEHAVIOUR OF CHICKS

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Feather and vent pecking are abnormal behaviours with serious welfare and economic consequences in flocks of laying hens housed in non-cage systems. Epidemiological work has identified frequent diet change as a risk factor for these behaviours. The effect of sudden diet change on the behaviour of layer chicks was investigated, using 72 day-old chicks. Chicks were pair housed in boxes with litter, a perch and a drinker. A 3-week familiarity phase was given during which 36 chicks (group U) were fed unflavoured feed and 36 chicks (group O) feed flavoured with orange oil. Chicks in each group were then assigned to 1 of 3 treatments: a dietary preference test (P, n=12), a diet change (DC, n=12) or a control group (C, n=12). DC treatment of group O involved abrupt change to unflavoured food, and of group U, to orange flavoured food. The birds' behaviour was filmed on days 1 and 7 of treatment using overhead cameras and coded using Observer (Noldus). Food consumption was measured. P Chicks in both groups consumed more unflavoured feed than orange flavoured feed over the treatment period (Repeated Measure ANOVA; O: $F=22.06$; $p=0.001$; U: $F=10.806$; $p=0.008$). Food consumption of DC and C chicks did not differ within either group. DC chicks in Group O exhibited few behavioural differences to controls. However, DC chicks in group U exhibited increased activity on days 1 (t-test; $t=-3.060$; $p=0.012$) and 7 (t-test; $t=-2.991$; $p=0.014$). They also spent longer in bouts of pecking at their box and the furniture within it on day 1 (t-test; $t=-2.205$; $p=0.052$), and by day 7 they showed more beak activity (t-test; $t=2.665$; $p=0.024$). Little injurious pecking was observed. Diet change in an unpreferred direction may lead to increased activity and redirection of pecks. The relevance of these changes to injurious pecking is discussed.

EFFECTS OF SHORT AND LONG DISTANCE ROAD TRANSPORT ON PLASMA β-ENDORPHIN OF LIMOUSIN CALVES

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The purpose of this study was to evaluate the effects of road transportations of different lengths on circulating β-endorphin levels of Limousin calves and their correlation to previous stabling and temperament. The study was carried out on 10 male Limousin calves, aged between 10 and 15 months, weighing 516 ± 35 (S.D.) kg, transported from France to Sicily over a distance of 2.200 Km (about 33 hours). The subjects studied were divided for their previous stabling (multiple boxes and fixed cattle-sheds) and for their temperament (calm and aggressive subjects) depending on a restless and aggressive attitude showed with respect to co-specifics. Blood samples were taken during three different times: at the morning, immediately before loading, after short distance transport (< 100 Km) and then at their arrival in Sicily, after a long distance transport (2.200 km). Circulating β-endorphin concentrations were analysed by RIA. To determine the effect of transport stress an analysis of variance (ANOVA) for repeated measures was applied. To compare post-transport and basal values a paired t-test was applied. Per cent differences (?%) were calculated. Data obtained suggest that transport procedures induce a general increase of circulating b-endorphin levels after short (+ 1.7%) and long (+ 43.9%) distances as compared to basal values, regardless of the previous stabling and temperament. Moreover, subjects originating from multiple boxes showed lower circulating β-endorphin levels than subjects from fixed cattle-sheds in basal conditions. Calm subjects showed higher circulating b-endorphin levels than aggressive subjects both in basal conditions and after long distances. No significant differences between different previous stabling and temperament were found. These results showed that temperament and previous stabling do not overcome the negative effects of transport stress in calves.

RAISING OSTRICHES IN GERMANY – MORTALITY OF OSTRICH CHICKS ON FOUR FARMS THROUGHOUT ONE YEAR

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In Germany ostrich farming for meat production started in 1992, and there is a controversial discussion whether ostrich farming is possible under the humid and cold weather condition often prevalent such as in fall and winter. As a first step we examined the mortality of ostrich chicks on four German farms (two in the south, two in the north of Germany) in relation to time of year (February to December 2002). Chicks were raised in flocks of 14 up to 52 birds, were fed ad libitum, and had free access to paddocks and shelters from two weeks of age.
Mortality of chicks was recorded from hatching until the age of three months, and 170 chicks were examined post mortem.
In total the number of 799 (339, 143, 175, 142) fertile eggs were incubated and 556 (204, 112, 126, 114) chicks hatched. Mortality of chicks until the age of three months varied enormously between farms (33%, 13%, 25%, 70%). The highest losses in chicks occurred before the age of seven days (14%, 9%, 13%, 4%). Mortality of older chicks (two weeks until three months of age) decreased on three farms (6%, 1%, 5%), only on one farm the mortality did highly increase (52%). Of the 170 examined chicks 52% died of yolk-sac infection, 7% of the chicks died due to accidents and in 41% of the examined chicks death was caused by stress.
We did not find any evident increase of mortality or incidence of infections in fall or winter. Nor did any investigated chick show a disease which could be attributed to weather (e.g. pneumonia).Our results indicate that management factors have an important effect on the raising success of ostrich chicks. In contrast, we did not find strong evidence for an effect of weather conditions.

IS THE RUNNING WHEEL BENEFICIAL OR HARMFUL FOR GOLDEN HAMSTERS KEPT AS PETS?

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Many studies on running wheels demonstrated significant influences on the physiology and behaviour of rodents. The conditions in those studies were not necessarily applicable to golden hamsters kept as pets such as ad libitum feeding and moderately large cages (0.5 m^2). We measured the total reproduction of 20 females of *Mesocricetus auratus*, their running activity, and quantified their non-reproductive behaviour three times during their first year. Total reproductive success should indicate the physical condition of the females. The twenty females consisted of 10 sister pairs which were matched according to their body mass at weaning, one sister had a functional running wheel, the other sister had a non-functional, but identical-looking wheel.

There were only few significant differences of reproductive parameters between hamsters with and without functional wheels, but litters of hamsters with a functional wheel tended to be larger with fewer total failures of litters. Probably, the running activity did not affect the reproductive success of the females, because the females greatly reduced their running during late pregnancy and lactation.

All females were video-taped once before any animal had a functional wheel to obtain a base level of behaviour. Females which ran in the wheel during the second video-tape showed significantly less stereotypic bar-gnawing compared to the base level ($F_{1,18}$= 4.74, P = 0.04), shorter inactive periods ($F_{1,18}$= 7.73, P = 0.01), but more grooming ($F_{1,18}$= 8.1, P = 0.01) than females without the running wheels. During the third session, wheel running was significantly negatively correlated with stereotypic gnawing, digging, and it was positively correlated with rearing and grooming. The changes in behaviour patterns will be discussed in regard to welfare of hamsters with and without running wheels.

ON-FARM ASSESSMENT OF BEEF CATTLE WELFARE FOR CERTIFICATION PURPOSE

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A new scoring method was developed to evaluate beef cattle welfare at farm level for certification purpose. The method does not require any handling or prolonged behavioural observations of the animals and it considers 4 classes of parameters: 1) Housing systems and facilities (pen and group size, space at the manger, type of floor); 2) Animal cleanliness and health (morbility, mortality, traumatic events; 3) Animal behaviour (reaction to either the farmer or the observer approach, lying, eating, ruminating); 4) Management quality (animals regrouping, feed and diet analysis, feeding strategies). Three score levels: 1= unacceptable, 2= acceptable, and 3= optimum were identified for each variable considered within class. The acceptable level of several variables was set based on the EU report on beef cattle welfare (EU-SCAHAW, 2001). The protocol was applied to 100 intensive beef cattle farms located in the Po Valley. All farms reared more than 300 young bulls/year belonging mainly to French pure beef breeds or crossbreeds. Animals were group housed and fed once a day a total mixed ration based on corn silage. Each farm was visited by a trained observer in the morning before feeding delivery recording all the information required by the protocol. A synthetic index of beef cattle welfare (WI) was calculated for each farm by summing the scores obtained for the 4 classes of parameters. The maximum WI was 100, while the threshold of acceptance was set to 75 by summing the acceptable scores of the four classes of parameters. None of the farms included in the survey reached the maximum score, but 50% of them resulted above the threshold of acceptance. Most of the farms which were below this threshold were mainly penalized by the low management quality. Therefore there is a need of improving the professional skill of the beef farmers.

WHICH TEMPERATURES DO PIGS IN DIFFERENT WEIGHT CLASSES NEED IN THE LYING AREA?

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Pigs react to extreme ambient temperatures with changes in their lying behaviour. We tested if this behavioural adaptation depends on pigs` weight and if there are additional reactions of the HPA system.
Subjects were 12 groups of 9 fattening pigs each, kept in pens with 33% slatted and 67% solid concrete floor. Pigs were exposed to a broad range of temperatures (4 groups in winter: 2-19°C; 8 groups in summer: 11-29°C). Groups were tested in 3 periods (weight 30-40kg: lying area of 0.46m^2/pig, 50-70kg, >85kg: both lying area of 0.67m^2/pig). On 3 days of each period, when temperatures were in the intended range, we took saliva samples from all pigs between 19:00 and 22:00 for the analysis of cortisol concentration. Time of saliva-collection was adapted to seasonal differences in daylight and animal activity. Lying behaviour was recorded by video from 8:00 to 6:00. Data were analysed using ANOVA for repeated measures (winter) and linear regression (summer).
In summer, the area pigs used for resting was affected by temperature and weight. With increasing temperature, the number of pigs lying in the slatted area increased ($p<0.001$). With increasing weight, subjects chose this area at lower temperatures. Up to 19°C, pigs mostly lay with contact to penmates. With increasing temperatures, they avoided contact ($p<0.001$). Pigs >85kg lay without contact at lower temperatures than pigs <70kg. Up to 17°C all pigs lay in the solid area. Especially the small pigs huddled when temperatures decreased ($p<0.01$).
We found no significant relationship between cortisol level and temperature. Compared to pigs <70kg, pigs >85kg showed higher concentrations of cortisol in summer ($p<0.05$).
Our results show that the behavioural adaptation of pigs to ambient temperatures depends on their weight. This weight-dependent difference in the behavioural adaptation is important with respect to climatic and spatial requirements in fattening pigs.

BEHAVIOUR OF DAIRY COWS IN THE LYING AREA OF THREE LOOSE HOUSING SYSTEMS

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Nowadays, dairy farmers can choose between different loose housing systems (cubicles, straw yard, bedded sloped floor). These systems differ in the lay-out of the lying area so that the resting behaviour of the cows could be affected. Aim of the study was to investigate possible behavioural differences between these systems.
Three systems were compared on an experimental farm. 20 dairy cows were kept in each system (cubicles with straw mattresses: 1,25 x 2,6 m; size of the lying area in straw yard and bedded sloped floor: 6 m^2/cow). Behaviour of the cows was recorded by direct observations for 5 days from 10 to 14.30 h. Number of cows lying, lying positions, and ruminating while lying were recorded in 30 min. intervals. Lying down, standing up, and social behaviours (displacements, social licking) were recorded continously. Differences between systems were tested with Kruskal-Wallis and Mann-Whitney-U-Tests.
The mean number of lying cows, percentage of ruminating and body side while lying did not differ between the systems. Duration of lying periods was highest in the cubicle compartment. Percentage of stretching of fore or hindlegs while lying increased from cubicle, sloped floor to straw yard system. Lying in the feeding alley was only observed in the cubicle system (1 %). Duration of preparation before lying down and duration of standing up were longer in cubicles. 1/5 of cows hitted against cubicle side partitions during the lying down movement and 1/3 at the neck-rail while standing up. Defecation/urination after standing up occurred more often in cubicles. No differences in social behaviour were found. However, overall frequency of social contacts was low.
The resting behaviour of the cows was more affected in the cubicle system despite a comfortable cubicle design.

SHEARING EFFECT ON WELFARE AND MILK YIELD AT MACHINE MILKING OF DAIRY SHEEP WITH DIFFERENT TEMPERAMENT

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The aim of the study was to estimate the shearing effect on welfare and milk yield at machine milking of dairy sheep of different temperaments. The temperament estimation was done through a Complex Score (CS), reflecting the behavioural traits of each animal during machine milking in a milking parlour. A factor analysis for behavioural traits produced four factors: 1) Activity towards neighbours; 2) Feeding reaction towards forage offered by hand; 3) Reaction towards positioning of teatcups; 4) Order entering milking parlour. Emotions were additionally assessed by the following methods: Fear-inducing, Open Field and Learning tests (Novelty-Food motivation-Learning). On the base of the CS three temperaments, differing significantly ($p<0.001$) in the behavioural traits, were established: Calm (C), Nervous (N) and intermediate (I) type ewes. High coefficients of repeatability of the behavioural traits and CS in two consecutive years and by different observers in ewes of different ages were determined (r from 0.5 to 0.97, $p<0.001$).

Results of machine milking of 187 Local Stara Zagora dairy ewes were used. The most typical representatives of the temperaments were chosen among them – Calm (C) – 12 ewes, Nervous (N) – 12 and Intermediate (I) – 12 ewes. The animals were of the same age and date of lambing. Morning machine milk yield was recorded before shearing, one day after shearing and two days after shearing.

Shearing caused a significant negative effect on milk yield at machine milking for the three temperaments. The biggest decrease was found in C (107ml) followed by N (103ml) and I (67ml), $p<0.05$, one day after shearing. The greatest contrast in differences in milk yield were between C and N temperaments – 100ml, $p<0.05$. The decrease continued nonsignificantly during the second day after shearing in C (38ml), I (13ml) and N (7ml).

ENVIRONMENTAL COMPLEXITY INFLUENCES EXPLORATORY BEHAVIOUR AND INTERSUCKING IN GROUP-HOUSED DAIRY CALVES

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According to results of an epidemiological study the rearing of calves in an unstimulating environment should enhance the prevalence of intersucking (Keil et al., Prev.vet.med. 45: 305-323, 2000).
The aim of the present study was to compare the behaviour of group-housed dairy calves reared outdoors in huts (higher environmental complexity, five farms, 14 female animals in total) with the behaviour of calves housed indoors on deep litter (lower environmental complexity, six farms, 21 female animals in total). Both housing systems had comparable group size, space per animal and milk-feeding management. Each group of calves was observed at the end of the milk-feeding period (mean age 16.6 weeks) by video (2 x 16hours/day). We looked at the calves' activity (feeding, standing, lying) and their exploratory behaviour by time-sampling, and continuously recorded sucking and play behaviour. The two housing systems were compared on farm-level (Wilcoxon rank-sum test).
Nearly all calves (34 out of 35) sucked the udder region of group-members (=intersucking). Calves in both conditions preferred to suck the udder compared to the head or other body parts (5.9 vs. 0.4 and 2.7 min/animal, day, respectively, signed rank test, both $p<0.001$). However, outdoor calves tended to intersuck less frequently (5.8 vs. 7.6 bouts/animal, day, n.s.) and less long (2.5 vs. 8.0 min/animal, day; n.s.) and the mean duration of sucking bouts (0.4 vs. 1.0 min/bout, $p<0.01$) was lower compared to indoor calves. Furthermore, outdoor calves showed more exploratory behaviour than indoor calves (7.1 vs. 3.9 times/animal, day, $p<0.05$). The calves' daily activity, the duration and frequency of play, and the frequency of oral behaviour directed to the pen did not differ significantly between housing systems.
Our results indicate, that a higher environmental complexity as it is realised in outdoor huts can help to reduce intersucking in artificially reared dairy calves.

HOW DOES THE HOUSING CONDITION INFLUENCE MORPHOLOGICAL, ETHOLOGICAL AND PHYSIOLOGICAL PARAMETERS OF BUDGERIGARS (*Melopsittacus undulatus*)?

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The budgerigar is a common pet worldwide; lots of individuals spend their time in human company under various housing conditions. In our study we focused on body weight, video observations of flying behavior and fecal concentrations of corticosterone metabolites to specify the influence of different sizes of housings for budgerigars.

In part one forty-eight budgerigars were placed pair wise (male and female) in full-size cages (160x40x50 cm, group A, B) or half-size cages (80x40x50 cm, group C) for ten weeks. At halftime cage size changed by inserting (B) respectively replacing a separator (C). Birds of Group A stayed in large housings.

In part two the same forty-eight budgerigars were housed either in large cages (160x50x40 cm) or in aviaries (2x2x1 m) during a four weeks period. All parameters were measured in the beginning, before changing cage size (only part 1) and at the end, with additional testings for corticosterone metabolites. All data were analysed with repeated measurement ANOVA (SAS statistical software).

We found differences between males and females for all parameters: males were flying more than females and had a higher amount of corticosterone metabolites in faeces. Females got higher weight when placed in cages and especially females of group A (without change of cage size) gained weight. Animals in aviaries generally were lighter, although in our case they were more inactive than in cages. Budgerigars in half-size cages were flying more often than birds in full-size cages or aviaries, the females in the smaller housings flew longer distances. The amount of corticosterone metabolites was not influenced by the housing conditions, but there was a higher amount during weeks with video observations.

The changes in weight and flying behaviour can be interpreted as an adaptation to the different housing conditions and the amount of corticosterone metabolites has shown that in our study not the housing conditions itself but the man made interruptions are more stressful for the budgerigars. This fact will be analysed in further studies.

REARING PHEASANT CHICKENS UNDER VARIOUS STOCKING DENSITIES AND GROUP SIZES: WHICH IS BETTER IN REDUCING FEATHER PECKING?

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In commercial game bird production, outbreaks of feather pecking are common, resulting in serious welfare problems. In an earlier experiment, decreasing stocking density and group size (in combination) from 275 chickens per group at 3.8 chickens per m^2 aviary to 165/2.4 chickens per m^2 aviary resulted in increased plumage condition and reduced incidence of wounds. In order to assess the specific effect of stocking density at two different group sizes experiments were made at two game farms with a total of 3,360 pheasant chickens. Pheasants were reared in groups of 80 or 240 chickens at stocking densities of 0.7, 1.3 or 4.0 birds per m^2 aviary, with 4 replications per treatment combination, except only 2 replications on the 240/0.7 treatment. Plumage quality (minimum 1 to maximum 4 points for each of 6 body parts, in total 6 to 24 p) and skin injuries (%birds injured) were recorded at the age of 5-6 weeks on 30 chickens from each pen.

Higher stocking densities resulted in poorer plumage condition (19.7 vs. 21.2 and 22.3, $F(2,21)=7.08$, $P<0.01$) and higher frequency of birds with injuries to their skin (33, 13 and 7.2 %, $Chi^2(2)=53.1$, $P<0.001$). Group size effects on the quality of the plumage were less clear. Wing plumage was higher at higher group size (3.3 vs. 2.2 p, $F(1,21)=5.48$, $P<0.05$), while tail length was longer at lower group size (103 vs. 76 mm, $F(1,21)=6.91$, $P<0.05$). At the larger group size there were significantly more skin injuries (27 vs. 13%, $Chi^2(1)=19.5$, $P<0.0001$). The effect of stocking density and group size on the quality of the plumage proved to be additive, and no interaction was found between the two factors. In the period between 35 and 42 days of age, the plumage quality decreased significantly over time with 0.36 p per day ($F(1,21)=11.21$, $P<0.01$).

EATING AND MOVING BEHAVIOR OF GRAZING COWS ON FEEDING STATION FOR DIFFERENT PASTURE-CONDITIONS AND GRAZING-SYSTEMS

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When cattle are grazing on pasture, they eat in standing posture, then move to the next eating-place. The area eaten by a standing animal is defined as the feeding station (FS). In this study, the eating and moving behavior of dairy cows on FSs were observed on two different pastures. In Exp. 1, the grazing behavior of two cows was videotaped through 2.5 hours. They were grazing with 4 dairy cows on 1 ha pasture by a strip grazing system. Observations were done on July and October. Mean grass height (GH) and mean tiller density (TD) in this pasture was 17.7cm and 4498/ m^2. In Exp. 2, the grazing behavior of 12 cows was videotaped through 5 minutes. They were grazing with 58 dairy cows on 60.2 ha pasture by a set-stocking system. Observations were done on July and September. GH and TD in this pasture were 6.0 cm and 9059/ m^2. In spite of big differences of pasture-conditions and grazing-systems, the number of bite and staying duration on each FS were not statistically different in Exps. 1 and 2 (7.8 and 10.4 times/FS; 8.2 and 9.4 sec/FS, respectively). Moved distances between FSs in Exp. 1 ranged from 1 to 29 steps with the highest frequency (86.7 %) recorded for one step, while in Exp. 2, the number of steps between FSs ranged from 1 to 46 steps and the highest frequency (91.9%) was recorded for the 1 and 2 steps. Using log-survivor analysis, moving in a group of FSs that had distances less than 2 steps in Exp. 1 and less than 3 steps in Exp. 2 could be statistically included in one sequence of grazing behavior as a feeding patch. Cows did not change their activities on each FS, but changed their feeding patches for different pastures.

EFFECT OF INCREASED PLASMA CORTISOL CONCENTRATIONS IN PREGNANT SOWS ON BODY WEIGHT AND BEHAVIOUR OF THEIR PIGLETS

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Prenatal stress adversely affects development and behaviour of the offspring, supposedly mediated by increased maternal corticosteroid levels during gestation. We studied if and in which period of gestation elevated plasma cortisol concentrations in pregnant sows influence body weight and behaviour of the piglets postnatally. Oral cortisol administration was used as a model to obtain elevated plasma cortisol concentrations in pregnant sows. The dosage chosen (0.3 mg/kg bodyweight) corresponded with the effects of practical stressors on porcine plasma cortisol concentrations.

Four groups (n = 5 or 6 second-parity sows per group) were used. Three groups received cortisol twice daily during one trimester of the gestation period (T1,T2,T3) and a placebo during the other two trimesters. The control group received a placebo throughout gestation (C).

Piglets were weighed at birth, at 10 and 17 days and at weaning. Between birth and four weeks of age, all piglets were subjected to the backtest (BT), the tonic immobility test (TI-test) and the novel object test (NOT).

No difference between treatments was found for any production parameter (e.g. gestation length, birth weight or number of piglets born (total and alive)). At 10 and 17 days of age, T1-gilts weighed less than C-gilts ($p<0.05$). At weaning T3-boars tended to weigh less than C-boars ($p=0.08$).

No difference between treatments was found in the BT and the TI-test. In the NOT however, T1-piglets covered a smaller distance ($p< 0.05$) after introduction of the novel object, and they interacted less with it ($p<0.05$). Notably, the latency time to touch the novel object did not differ from the C-group.

These preliminary results indicate that in sows, increased cortisol concentrations during gestation affect the behavioural response of their offspring in a novel object test. Other parameters and additional replications are still under study but will be presented and discussed.

FEEDING BEHAVIOUR OF WEANED PIGS FED EITHER PELLETS OR MEAL: EFFECTS OF THE NUMBER OF ANIMALS PER FEEDING PLACE

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Feeding conditions deeply influence productivity and welfare of weaned pigs. In order to test the effects of the number of animals per feeding place, water intake and feeding behaviour of 2 groups comprising either 30 or 50 weaned pigs were compared during six weeks after weaning. The same pen design (a deep bedded 20 m?-area, i.e. ≥ 0.4 m?/pig) and model of tube feeder, allowing pigs to choose between wet and dry feed, were used. Two trials were realised: pellets were delivered during trial 1 (G30p vs. G50p) and meal during trial 2 (G30m vs. G50m).

No difference in the daily mean time spent per pig at the feeder according to the number of pigs per group was observed, whatever the diet. However, the daily occupation rates of the feeder, considering 4 wet/dry feeding places/feeder, were higher in G50 than in G30, whatever the diet: respectively 99 vs. 56% with pellets (ANOVA2, $F_{1,3,3}=105.0$, $p<0.01$) and 138 vs. 87% with meal (ANOVA2, $F_{1,3,3}=22.3$, $p<0.05$). Feeder overcrowding situation was thus only observed in the group of 50 pigs fed meal.

The mean daily water intake and the drinking time per pig were lower in G50 than in G30, whatever the diet: respectively 1.7 l and 18.3 min versus 2.1 l and 22.9 min/day with pellets (Matched-pairs t test, $t=5.9$, $N=42$, $p<0.001$ and ANOVA2, $F_{1,3,3}=21.6$, $p<0.05$), and 1.9 l and 22.7 min versus 2.3 l and 31.2 min/day with meal (Matched-pairs t test, $t=6.2$, $N=46$, $p<0.001$ and ANOVA2, $F_{1,3,3}=14.4$, $p<0.05$).

When using feeders with integrated watering system, the number of pigs per feeding place influences feeding behaviour. This effect varied according to food presentation, i.e. pellets or meal. Considering food presentation would thus be important to determine an optimal number of pigs per feeding place.

EFFECT OF GENETIC LINE ON ACTIVITY AND EASE OF HANDLING OF GROWING PIGS

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This study was undertaken to compare behaviour and ease of handling of 3 genetic lines of female pigs (Hamline: H, Large White: LW and Meishan-derived dam line: M)* during the growing period. For each line, 44 pigs (average 24.5±2.0 kg) were housed in pens of 11 animals. Agonistic behaviour was measured by video recording during 48 h after pen formation (scan sampling at 1-min intervals). Postures were measured for 24 h by video recording (5-min intervals) 3 times at 4-wk intervals over the experiment. In addition, dDirect observations during daytime (4 h at 1.5-min intervals) were made at the same periods to measure postures and the frequency ofthe following behaviours feeding, exploration, social behaviour (aggression, abnormal behaviours, other contacts), locomotion and "toy" manipulation. Ease of handling was determined at weighing (twice at 4-wk intervals) and before slaughter by measuring handling speed and frequency of running, stopping, turning around and vocalising. Heart rate was also measured at weighing on 2 pigs per penon 2 pigs per pen. Data was analysed by analysis of variance. Observations following mixing and direct observations showed that LW pigs were more aggressive than H and M pigs ($P<0.05$). Direct observations Direct observations confirmed this difference ($P<0.05$) and also showed that LW pigs tended to perform more social abnormal behaviours ($P=0.06$) and other contacts ($P=0.07$) than H and M pigs. There was no genetic line effect on postures, neither on handling at slaughter. At weighing, H pigs took more time ($P<0.05$) than LW and M to get out of their pen, and ran more often than M ($P<0.05$), while LW pigs made more about-turns and vocalisations, and had greater heart rate increase than M ($P<0.05$) pigs. In conclusion, the studied genetic lines differed mostly in their ease of handling and social behaviour. These variables may have welfare and production consequences and should be taken into account when selecting pigs.
*From GENEX Swine Group

THE EFFECT OF PROVIDING MANIPULABLE SUBSTRATES TO PIGLETS IN THE FARROWING CRATE ON THEIR WELFARE AND THAT OF THEIR DAM

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In barren farrowing crates piglets redirect exploratory behaviour towards the sow, littermates and pen-fittings. New EU legislation states that pigs must have permanent access to manipulable substrates. The objective of this study was to evaluate the effect of providing manipulable substrates to piglets in farrowing crates on sow and piglet welfare.Ten days pre-partum, 60 multiparous sows were assigned to crates that were either barren [B], enriched with shredded paper [P] or natural fibre rope [R]). Substrates were introduced 10 days post-partum. Teat injuries were recorded pre-partum and pre-weaning (day 27). Piglet injuries were recorded on days 11, 18 and 27. Sow and piglet behaviour was recorded every 5mins during three 2hr periods on days 14, 18, 22 and 26. In addition, one male and one female piglet per litter were observed continuously for 10mins twice per test day.
On day 27, there tended to be more B sows affected by teat injuries (Chi-Square=5.24; P=0.07). There were more observations of B than R sows standing on day 18 (Kruskal-Wallis [KW]; ChiSq=6.57, P<0.05). Fewer P and R piglets were injured on day 11 (Chi-square=15.87, P<0.001) and fewer P piglets on day 18 (Chi-square=10.17, P<0.01). On day 27 more R than B piglets were injured (Chi-square=3.70, P<0.05). P piglets spent the least time exploring pen fittings on days 14 (KW; ChiSq=9.13, P<0.01), 22 (KW; ChiSq=5.94, P<0.05) and 26 (KW; ChiSq=5.57, P=0.06). They spent the longest time interacting with the substrate on all days (KW; ChiSq=20.59 [d14], 26.75 [d18], 35.75 [d22], 28.83 [d26], P<0.001). Treatment had no effect on time piglets spent directing behaviour towards the sow (P>0.05) or littermates (P>0.05).
Providing piglets with manipulable substrates in farrowing crates had beneficial implications for sow welfare. Shredded paper was more successful in improving piglet welfare than natural fibre rope.

SOCIAL INTERACTIONS OF DAIRY COWS IN A ROBOTIC MILKING SYSTEM COMPARED TO COWS MILKED IN A HERRINGBONE PARLOUR

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Robotic milking as a means of intensive animal housing may affect animal welfare. So far social behaviour has been rarely considered in assessments of robotic milking systems. In the present study we compare social behaviour of dairy cows milked in a single-box robotic milking system (Lely) in two consecutive variants- partially forced cow traffic (R1) and free cow traffic (R2)- with the social behaviour of dairy cows milked in a 2x6 herringbone-parlour (HP-group).

The two groups (15 Austrian-Simmental and 15 Brown-Swiss dehorned cows each group) were housed under identical conditions in the same building in loose-housing system with cubicles. For each variant observations were made six times on two consecutive days each for 7.5 hours per day and group. Frequency of social interactions (fighting, agonistic behaviour leading to displacement, agonistic behaviour not leading to displacement, social licking, head-play) and duration of social licking were recorded directly using continuous behaviour sampling. The data of each 2-day recording period were grouped and the frequency of each parameter as well as total duration of social licking were calculated per observation hour and cow (N=6).

Mann-Whitney-U-tests for differences between R1-group and HP-group yielded significant differences for head-play (0.10 +/- 0.03 vs. 0.05 +/- 0.02 average frequency per hour and cow; $U_{6,6}$=35; p=0.004) and for social licking (0.33 +/- 0.07 vs. 0.48 +/- 0.11; $U_{6,6}$=33; p=0.015), but not for total duration of social licking or any agonistic behaviour. With variant R2 only head-play was increased compared to HP (0.16 +/- 0.03 vs. 0.06 +/- 0.01; $U_{6,6}$=36; p=0.002).

Frequency of social interactions in our study is comparable to those found in the literature in loose-housing systems. To conclude, the robotic milking system did not negatively affect social behaviour under the investigated conditions. However, consequences of increased stocking as recommended by producers still need to be investigated.

EFFECTS OF TRANSPORT STRESS ON CIRCULATING B-ENDORPHIN, ACTH AND CORTISOL LEVELS OF DONKEYS

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Aim of the study was to evaluate the effects of transport on b-endorphin, ACTH and cortisol levels of donkeys. Blood samples were collected by jugular vein of seven male donkeys during three different times: at 09.00 a.m. before loading, at 10.00 a.m. after short distance (<50 km) and at 11.00 a.m. after long distance (100-140 km). b-endorphin and ACTH concentrations were analysed by RIA and cortisol by immuno-enzymatic assay. To compare post-transport to basal values the paired t-test was applied and analysis of variance (ANOVA) for repeated measures was calculated. The correlation between the different variables was done by linear regression (r), calculated with the Pearson method. Per cent differences (?%) were calculated. b-endorphin concentrations increased after short distance (+ 20%), but decreased after long distance (-13.7%) as compared to basal values. ACTH concentrations increased significantly ($p<0.05$) after short distance (+311.9%) and decreased after long distance (+13.4%). Cortisol concentrations increased after short (<50 km; +84.4%) and significantly ($p<0.02$) after long (100-140 km; + 101.7%) distance. ANOVA showed a significant effect on ACTH for short distance ($F=12.94$; $p<0.05$) and on cortisol concentrations for short ($F=21.37$; $p<0.01$) and long ($F=6.38$: $p<0.05$) distance. A positive and significant correlation ($r= 0.906$; $p<0.05$) between ACTH and b-endorphin concentrations after short distance was found. These results do support once more the view that b-endorphin and ACTH are co-secreted into the blood circulation in response to stress and suggest that they play a key role in the regulation of stress hormones release after transport. The results obtained confirm that transport stress influences the opioid system and adrenocortical function in donkeys like in horses. The maintenance of increased cortisol concentrations after transport suggest either a change in adrenal responsiveness or a stimulated and prolonged release of ACTH, up to the depletion for long distance road transport.

THE USE OF SHELTER BY HORSES KEPT OUTDOORS UNDER NORDIC WINTER CONDITIONS

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Keeping horses and cattle permanently outside during winter has no tradition in Norway and is highly disputed. The objective of the present study was to investigate the impact of different weather conditions on the use of shelter by Iceland horses kept outdoors during winter conditions in a mountainous area at latitude 62° north. About 40 young Iceland horses, varying from 34 to 51, were kept in an enclosure of 7 ha with scattered trees and a 120 m^2 house with straw bedding. Indoor air temperature resembled ambient outdoor air temperature. The behaviour of the horses was recorded by instantaneous sampling every 20 minutes between 4 and 12 p.m. on 18 days with selected weather conditions. The data was analysed by simple regression. The horses used the shelter for rest and sleep under all winter conditions, with temperatures ranging from + 8 to – 31°C. The horses nearly always chose to lie down inside. The horses spent more time in the shelter when ambient temperature decreased ($R^2 = 0.24$, $P < 0.05$). There are few observations with wind and precipitation, but in strong wind (15 m/sec) the horses tended to gather in lee inside or outside depending on the wind-direction. Precipitation as snow had no effect on the time spent in shelter. Wind and precipitation in combination seemed to result in more horses resting inside, as did muddy ground conditions. There was a large individual variation in the use of the shelter, but age and gender had apparently no effect on this. On one event only, a shivering horse was observed. This was on a mild (0°C), but rainy day.
The study indicates that shelter should be provided for Iceland horses in winter independent of local climatic conditions.

THE USE OF SALIVA SAMPLING AS A STRESS ASSESSMENT METHOD IN SHELTERED DOGS

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Saliva sampling to determine cortisol levels in dogs is a reliable indicator of stress in the laboratory. The aim of this study was to determine if saliva sampling would be a suitable alternative to blood sampling for the assessment of stress in an unstable environment, a county animal shelter. First, plasma and saliva measurements of cortisol were compared to determine if salivary and plasma levels corresponded. Blood samples were collected from the cephalic vein while dogs were gently restrained, and immediately after, a saliva sample was collected. Samples were collected from recently admitted dogs ("early" dogs, within 3 days of arriving at the shelter, $n = 20$) as well as dogs that were more habituated to shelter living ("late" dogs, within 14-21 days of arrival, $n = 18$). Somewhat surprisingly, we found that plasma and saliva measurements of cortisol were *not* related to one another; early dogs had higher plasma cortisol levels than late dogs, but no difference between early and late dogs existed for salivary measurements. Moreover, there was no correlation between plasma and salivary measurements. Next, we determined whether saliva sampling was stressful to dogs. We collected sequential saliva samples every 15 minutes for one hour. We found a significant rise in salivary cortisol over the first 30 minutes of this process, for both early ($n = 7$) and late ($n = 7$) dogs, suggesting that saliva collection, with its associated handling and gentle restraint, is stressful for dogs. Using alternative, "less invasive" techniques with dogs in a real-life situation presents the investigator with a unique set of problems. In this case, the dogs used appeared anxious in all handling situations and appeared to find saliva collection aversive, as indicated by avoidance behavior. Our data suggest that saliva measurement of cortisol should be used carefully in non-laboratory situations.

THE EFFECT OF AN INNOVATIVE FARROWING CRATE DEVICE ON PIGLET SURVIVAL

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Alternative farrowing crates and various devices have been designed to reduce baby pig mortalities. A further development has been the FarrowTech flooring(FTF) that fits in a farrowing stall. The flooring is designed to move piglets from beneath sows when the sow goes to lie down. This movement of the piglets is accomplished by the activation of a series of transfer belts that run from one side to the other, in this case left to right, beneath the sow while the sow is standing. A foot of the sow exerting more the 11.5 kg on any one belt will inactivate the belt. When the sow lies down an electric eye is able to shut off the power to the flooring. Two units were installed at the Swine Research Centre, Ridgetown College, University of Guelph to compare the efficacy of the FTF stalls on reducing piglet crushing by the sow with the standard rectangular stalls(SRS) fitted with rubber coated wire-mesh flooring and Oval stalls(OS) with similar flooring as the SRS. Data on 138 litters, 9 in FTF stalls, 103 in SRS and 26 in OS have been analysed. This preliminary data showed that crushing of baby pigs is reduced for piglets reared in the FTF stalls as compared to those reared in OS (0.56 vs. 1.03 pigs; χ^2=11.1; 1df; P=0.0008). There was numerically less piglets crushed in FTF stalls but no statistical difference in the number of piglets crushed between the FTF stalls and the SRS (0.55 vs 0.70; χ^2=0.79; 1df; P=0.39). Adjustments have been made to improve uniform tension on the transfer belts, protection of electrical wiring from damage by the sow, durability of sensors which turn off the operation of the transfer belts when the sow is lying down and the strength and heating resistance of the motor controller.

REACTIVITY OF THE HYPOTHALAMO-PITUITARY-ADRENAL-AXIS IN DAIRY COWS – EFFECTS OF FREQUENCY OF MILKING AND ENERGY LEVEL IN THE FEED RATION.

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The energy status of the animal can affect HPA-axis reactivity in rodents. As dairy cows experience large changes in energy status during lactation, we investigated the effects of the energy concentration in the diet (Low: 25% vs. High: 75% concentrate in a total mixed ration) and frequency of milking (2 vs 3 times a day) on HPA-axis reactivity in a 2x2 factorial design using 39 Danish Holstein cows. All cows had ad libitum access to a total mixed ration, and were kept in tie-stalls in the same barn. One month before parturition and in weeks 4-5 after calving cows were subjected to injection of CRF (0.1mg/kg), injection of ACTH (0.02 mg/kg$^{0.75}$), 15 min. social isolation, and repeated blood sampling. Series of blood samples were collected by venipuncture before and after each challenge. There was always at least two days between each test. All data were ln transformed and analysed with the mixed procedure of SAS including responses before parturition as co-variates.
Reactivity of the HPA-axis did not differ between 2 and 3 times milking in any of the tests. Cows on low energy level showed increased cortisol response to isolation (area under the curve: Low 2.48±0.10 vs. High 2.15±0.11 ln (units), P=0.04; Peak: Low 2.72±0.10 vs high 2.34±0.11 ln (ng/ml), P=0.02) and tended to have increased ACTH response (area under the curve: Low 2.75±0.14 vs High 2.51±0.13 ln (units), P=0.22; Peak: Low 2.93±0.12 vs High 2.59±0.14 ln (pg/ml), P=0.12). There were no differences between the two feeding levels in either cortisol or ACTH response to injection of CRF and ACTH (P<0.20) or to blood sampling by itself (P<0.20). The results show that the level of energy in the diet can affect HPA-reactivity at the CNS level rather than at the peripheral level, while milking frequency did not affect HPA-axis reactivity.

MICE AND RATS SHOW DIFFERENT BEHAVIOURAL RESPONSES TO CARBON DIOXIDE EUTHANASIA

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Carbon dioxide (CO_2) is the most widely used euthanasia agent for laboratory rodents. The objective of this study was to determine whether rats and mice exhibit behaviours indicative of distress during the AVMA recommended method of CO_2 euthanasia. Male Sprague Dawley rats (N=8) and Balb/c mice (N=7) were placed individually into a novel chamber and allowed to acclimatize. CO_2 was then added at a rate of 20% of the chamber volume per minute. Animals were scored continuously for gas avoidance related behaviours during the 105sec periods before and after gas flow initiation. These behaviours included activity, rearing and wall climbing, escape behaviours (rats: scratching and pushing at the chamber lid, mice: jumping) and ultrasonic vocalizations. Rats were also scored for the time that they spent with their nose contacting the chamber lid. Within animal comparisons were made using the Wilcoxon Signed Rank test, and data is presented as mean ± SEM. During CO_2 exposure, rats were 15 times more active ($S=18$, $p<0.005$), and showed increases in rearing and wall climbing (11.6±1.3 versus 1.1±0.4 events; $S=18$, $p<0.005$), escape behaviours (8.0±4.1 versus 0.0±0.0 events; $S=10.5$, $p<0.05$), ultrasonic vocalizations (19.9±5.0 versus 1.6±1.2 events; $S=14$, $p<0.01$), and time spent with the nose contacting the chamber lid (28.6±5.4 versus 8.6±6.9 secs; $S=14$, $p<0.01$). In contrast, mice showed decreased rearing and wall climbing (0.0±0.0 versus 2.7±1.2 events; $S=7.5$, $p<0.05$), and did not show a significant change in any other behaviours, including activity. Mice produced no detectable vocalizations during baseline or gas exposure. The rats exhibited obvious signs of distress while the mice did not, indicating that mice and rats respond differently to CO_2 exposure. Although these results suggest that mice are less sensitive to CO_2, they could also reflect age or strain related behavioural effects or that our test was inappropriate for mice.

COMPARATIVE ENCLOSURE FACILITIES USED BY WILD AND CAPTIVITY-BORN CAPYBARAS

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In some parts of Brazil, the capybara (*Hydrochoerus hydrochaeris*) damages corn, rice, sugarcane, and may compete with cattle for pasture during the dry season. In those places, this species is considered an agricultural pest. In these situations, the Brazilian environmental agency allows the capture of wild animals that can be used in captive-breeding programs. This study compared the use of the enclosure facilities (sheltered area, water-tank and exercise area) by wild vs. captive-born capybaras. A total of 43 adult capybaras were kept in eight groups: four groups of animals born in the wild and caught as adults (18 animals) and four groups of those born and reared in captivity (25 animals). Each group comprised one male and four to six females in one of eight outdoor enclosures. The observations were made during daylight, from 600 to 1800 hours, totaling 384 hours of data collection. We used the scan sampling method to obtain the area usage frequencies that were compared by chi-square analysis. The results show an interaction between the enclosure facility use and the daytime period. The wild animals used the water-tank more frequently than did the captive-born animals during the early hours (32 vs. 8 times, respectively) and at the end of the day (641 vs. 195 times, respectively). These results were related to escape behavior among capybaras. The caretakers cleaned the enclosure between 700 and 900 hours, and fed the animals in the afternoon, between 1400 and 1800 hours. In this study, we showed that captive-born capybaras do not alter their behavior in the presence of humans. In contrast, wild-born capybaras flee into the water-tank when the caretakers were close. Consequently, the caretaker continued to represent a threat to wild-born animals, in spite of their having been maintained in captivity for two years prior to the study.

THE SOCIAL ORGANIZATION OF PECCARIES (MAMMALIA, TAYASSUIDAE) IN CAPTIVITY

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Some Brazilian rural producers have tamed collared peccaries (*Tayassu tajacu*) and white-lipped peccaries (*T. peccary*) for production of meat and leather. However, in order to establish appropriate management techniques in captivity, their social organization must be known. This study compared the social structure of a group of 14 collared peccaries and a group of 11 white-lipped peccaries. Both groups comprise unrelated animals that were born and raised in captivity. The observations were carried out during daylight, from 600 to 1800 hours; totaling 112 hours for the collared peccaries group and 55 hours for the white-lipped peccaries group. We registered all social interactions by the animal focal sampling method every two hours in sequential observation sessions. The social dominance relationship of both species was described through agonistic interaction analysis according to the linearity index (K). The groups' cohesion was described through friendly interaction analysis using the single linkage method (Clusters Analysis). In the white-lipped group both sexes belong to only one social dominance order and its linearity index (K=0.99) indicates a near linear hierarchy, with males and females in alternate rank positions. There was a correlation between the hierarchical order and the individuals' weight (r-Spearman=0.806). Conversely, in the collared peccaries group there were two distinct monosexual hierarchies, and the linearity indices for males and females collared peccaries group's were K=0.62 and K= 0.69, respectively. We verified the formation subgroups within the peccaries groups: the subgroup of the resident animals and the subgroups of the introduced animals. More than one unfamiliar male can be maintained in both groups. However, some introduced females were severely attacked by resident females. In conclusion, in order to increment welfare the peccaries groups should be formed only with related females.

LIQUID FEEDING TO IMPROVE WELFARE AND PERFORMANCE OF PIGLETS AT WEANING

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In modern pig husbandry, weaning occurs abruptly and earlier than in natural conditions. This mother-young separation induces abrupt and profond modifications in social interactions, the environment and feeding habits, which may be considered stressful for piglets. The switch from milk to solid diet leads to an abrupt reduction in feed intake, thus increasing the discomfort of piglets while inducing a growth check. Liquid feeding may buffer the nursing-weaning diet transition.
The present experiment investigated behavioural and zootechnical impacts of using automatic liquid feeders on piglets weaned at 28 days of age. Two experimental groups, each containing 10 piglets, were studied for two weeks. The first group was fed *ad libitum* dry pellets from a trough, the second group was fed the same diet freshly mixed with water and dispensed from a liquid feeder. Six replications were performed. Non-parametric statistical tests were used to analyse the behavioural data (Friedman and Wilcoxon tests for dependent data, Kruskal-Wallis and Mann-Whitney for independent data). Feed intake and weight gain were analysed using parametric statistics (repeated measures and factorial ANOVAS). All the statistical analysis were conducted using StatView for Windows.
Compared to piglets fed the dry feed, those on the liquid diet showed more feeding acts and spent more time eating during the first day of the experiment ($P<0.05$). Feed intake was markedly improved ($P<0.001$), and belly-nosing reduced ($P<0.05$). This higher consumption was maintained during the overall experimental period and resulted in an increase in weight gain ($P<0.01$). Nevertheless, piglets feed consumption tended to be disturbed until the tenth day post-weaning; it then increased linearly.
Liquid feeding reduces, but not completely, the energy deficit at weaning. Several indices of discomfort also seem to be lowered. However, the stress associated with weaning, although reduced during the first day, is still present.

LARGE ANIMAL AND WELFARE: PHYSIOLOGICAL MARKERS OF TRANSPORTATION STRESS IN CALVES

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Transport is potentially hazardous for cattle, but it has been demonstrated that animals transported according to EU legislation are less likely to be exposed to distress. The aim of the study was to investigate the behavioural and physiological responses of calves to long-term transportation in order to evaluate animal welfare possible implications.

Twenty-four 6 month old male calves were loaded and trucked about 950 Km, from Cahors (France) to Chivasso (Italy), for about 14 hours. Blood samples were collected before departure (T0), on the arrival (T1), 24 hours (T2) and 1 week (T3) after the arrival in order to measure blood cortisol and catecholamine levels, lymphocyte glucocorticoid receptor (GRs) and β-adrenergic receptor (β-ARs) concentrations. At the same times the animal behavioural responses were observed (standard behavioural measurements).

Results confirmed normal specie-specific behavioural patterns before, during and after transportation. Serum cortisol levels and plasma catecholamines (epinephrine, norepinephrine) were determined by radioimmunoassay; lymphocyte GRs and β-ARs were measured through binding assays. Statistical analysis was performed using Tukey-Kramer Test. A significant ($P<0.05$) increase in cortisol and catecholamine concentrations was observed on T1 and was negatively correlated with lymphocyte GRs and β-ARs concentrations. On T2 and T3 blood cortisol and catecholamine levels and lymphocyte GRs and β-ARs returned to T0 similar values.

In the present study the activation of the hypothalamic-pitituary-adrenal axis and the catecholaminergic system in long-term transported calves has been confirmed and neuro-hormonal parameters have been investigated as possible stress physiological markers. The behavioural and physiological evidence suggests that a transport of 14 hours should provide adequate welfare conditions for animals.

COGNITIVE DISFUNCTION IN ELDERLY DOGS

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Behavioural modifications in elderly dogs are often indicative of dementia. The symptoms have a parallel comparison in human dementia. In dogs, cognitive processes are not directly observable and measurable as in humans, and cognitive dysfunction can be inferred only by anamnesis of the owner, observation of the behaviour and of its modifications.
Purpose of this study is to evaluate behaviours indicating cognitive dysfunction in a group of dogs aged from 4 to 14 years and to analyse its variability related to the dogs' individual characteristics (sex, age, size) and the administration of selegilin.
Data were collected monthly for three months through a questionnaire where the owners were asked to score each behaviour according to its intensity, from 0 (absence) to 3 (severe). Behaviours were gathered into seven main behavioural categories and total scores for each category were analysed by non parametric analysis of variance (Kruskal-Wallis).
Older dogs (> 10 years old; n=13) showed higher scores than younger dogs (n=8) for the following categories (mean ± se): confusion, orientation and reactivity (4.62 ± 2.04 vs 0.63 ± 0.63; $P < 0.05$); apathy (5.15 ± 1.60 vs 1.50 ± 0.98; $P < 0.05$); alteration of day/night rhythms (3.77 ± 0.61 vs 1.63 ± 0.84; $P = 0.06$); learning ability problems (work, obedience) (9.31 ± 2.35 vs 2.25 ± 0.77; $P < 0.05$). Castrated females showed a higher alteration of day/night rhythms (n=5, 5.00 ± 0.71) than males (n=7, 2.29 ± 0.89) and entire females (n=8, 1.88 ± 0.79; $P < 0.05$).
Although no statistical difference was found in response to the administration of selegilin, it seems that this drug limits purposeless and repetitive activities (treated: n=4, 2.75 ± 2.10; untreated: n=17, 6.06 ± 0.99; P=0.12), but it modify day/night rhythms (4.50 ± 1.55 vs 2.59 ± 0.54; P=0.15).

LYING-DOWN BEHAVIOUR OF BEEF BULLS IN DIFFERENT GROUP-HOUSING SYSTEMS

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In The Netherlands, beef bulls are often kept under intensive housing conditions. This may affect the lying-down behaviour, especially in full-grown bulls. In an experiment, the effect of floor area and floor type on the lying-down behaviour of beef bulls at the end of fattening was studied. A total of 192 bulls (Piemontese-X-Black-and-White) were assigned to one of four group-housing systems. Floor area was either 2.0 m^2/bull (concrete slats, reference system, C2) or 4.2 m^2/bull including a lying area of 2.8 m^2/bull consisting of concrete slats (C4), slats with a rubber top-layer (R) or straw bedding (S) in the back of the pen. Behavioural data were collected within a month before slaughter of the bulls by interval sampling (5-min-interval) during 24 hr video-observations. The experimental unit was the group pen housing 8 bulls each (n=6).
The bulls were lying 54-60% of the day, which is within the normal range for cattle. Bulls in the R and S system always used the soft bedding, whereas bulls in C4 also used the area near the feeding fence for lying (approximately 19%/day; $p<0.001$). Bulls in both C2 and C4 changed less often from standing to lying position than those in the R and S system (7.3 and 7.0 vs. 9.9 and 12.2 times/bull/day, respectively, SEM=0.6; ANOVA: F=18.12; DF=9; $p<0.001$). Furthermore, they performed this behaviour more often in an abnormal way, like a dog (approximately 90% and 70% vs. 7% and 1%, respectively, SEM=3.5; ANOVA: F=161.88; DF=9; $p<0.001$). Overall, it was concluded that soft bedding and an increased floor area positively affected the lying-down behaviour in beef bulls.

LYING BEHAVIOUR OF BREEDING BULLS KEPT IN CUBICLE HOUSING SYSTEMS AND PENS WITH A STRAW-BEDDED LYING AREA

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This study was part of a research project designed to examine alternatives to stanchion housing of breeding bulls. The investigations was aimed at quantifying lying behaviour of breeding bulls kept in cubicle housing systems and in pens provided with a straw-bedded lying area. The study included 23 breeding bulls kept individually in pens with cubicles provided with either soft lying mats (CM, seven bulls) or straw bedding (CS, 16 bulls). In addition, a total of 62 breeding bulls kept in ten groups of four to eight animals were observed in straw-bedded sloped-floor pens (SF). The time the bulls spent lying in the cubicle housing systems was registered automatically during 72 h by means of distance sensors placed above the cubicles. The quality of standing up and lying down behaviour was recorded by direct observations. The lying behaviour of the SF bulls was investigated by video recordings (72h per group). Based on this data, total time spent lying as well as the number of lying bouts per day were calculated. The median lying duration of the animals did not differ between the three housing systems (CM: 740min, CS: 790min, SF: 706min). However, the housing system had an effect on the number of lying bouts (Kruskal-Wallis, $p<0.05$). The SF animals lay more often than the CM animals (9.6 vs. 7.3 lying bouts/day; Wilcoxon rank-sum, $p<0.05$). The median number of lying bouts of the CS animals (8.7) did not differ from the others. Atypical standing up (fore legs first) and lying down behaviour (hind legs first) was never observed in the CM and rarely in the SF bulls (0.2%). The CS animals showed more atypical standing up and lying down behaviour (8.5%, chi-square, $p=0$). In conclusion, we consider both cubicle systems and straw-bedded sloped-floor pen as appropriate alternative housing systems for breeding bulls.

ELIMINATION BEHAVIOUR OF DAIRY COWS IN DEEP-BEDDED BARNS

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A deep-bedded barn, also known as a free-barn in Japan, features a resting area for the cows made of deep-bedded straw or sawdust. The barn consists of three areas: a resting area, a feeding area, and a milking area. The aim of the present study was to obtain basic information about elimination behaviour necessary for planning housing and herd management on deep-bedded barn farms. Elimination behaviour of cows (n=5 on each farm) was observed continuously over 24 hours on three commercial dairy farms (F1, F2, and F3) using this type of housing. All cows were offered TMR ad libitum.

The average number (per cow over 24 hours) of defecation (17.0, 15.6, and 19.8) and urination (10.4, 12.2, and 10.6) events on farms F1, F2, and F3, respectively was not significantly different among farms. The frequency of defecation (number/hr) was the highest in the feeding area, and the lowest in the milking area on all farms (exemplary data from F1: 1.09, 0.62, and 0.42 in the feeding, resting, and milking areas, respectively). The frequency of urination was similar in the feeding and bedding areas, but lower in the milking area (exemplary data from F1: 0.46, 0.54, 0.18, respectively). Both defecation and urination frequencies for each area were not significantly different among farms. When the observations from all farms were grouped according to area, positive correlations (Spearman rank correlation) were found in the feeding and resting areas between time spent in an area and the number of defecation ($r=0.41$ ($P>0.05$), $r=0.67$ ($P<0.05$), respectively) and urination ($r=0.75$ ($P<0.01$), $r=0.64$ ($P<0.05$), respectively) events. Cows mainly defecated within the first minute (44%) and urinated within the first two minutes (34%) of standing up from lying on the bedding. The most common frequency interval for both defecation and urination was 61-80 minutes in all areas.

A COMPARISON OF BROILER CHICKEN BEHAVIOR ON TWO DIFFERENT BEDDING TYPES

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The type of bedding on which animals are kept influences their behavior and can affect their welfare. Sand is being considered as an alternative to wood shavings as bedding for poultry in commercial production in the U.S. We examined the behavior of 60 male broiler chickens raised in 6 pens (3.05 by 3.05m) that were bedded ? in sand and ? in wood shavings. Data were collected using 5 minute scan samples for one hour six times per week. Differences in the daytime behavioral time budget on the two sides of the pen were analyzed using the GLM with pen as a blocking factor. Time budgets changed differently with age on the two substrates (behavior x substrate x weeks of age: $F_{9,675}$=4.39, p<0.0001). Several behaviors differed significantly from one another because they increased with age on the sand side while decreasing on the wood shavings side of the pen. This was true for drinking, dustbathing, sitting while preening, and resting both during the day and at night. The proportion of the total behavioral time budget spent perching on the pen divider decreased from week one to week six ($F_{1,64}$=14.46, p<0.0005). Video of behavior at night was taken during the last half of the study. As before, behavioral time budgets changed differently with age on the two substrates ($F_{4,775}$=5.53, p=0.0002). Further post hoc tests revealed that, at the mean age of the birds during the nighttime observations, the birds spent significantly more time performing the following behaviors on the sand side of the pen: drinking, feeding, resting, and standing. Birds preferred to sit on the sand rather than the wood shavings as they aged, suggesting that either the cleanliness of the substrate or some other factor may be more important than the softness of the substrate in influencing their choice.

CATTLE GRAZING BEHAVIOR IN FEEDING PATCHES ON BAMBOO-GRASS PASTURES OF DIFFERENT NUTRITIONAL QUALITY

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Differences in vegetation and nutritional distribution on grasslands can lead to changes of sheep grazing behavior at a feeding station (FS). From the viewpoint of the sequence of grazing behavior, differences in vegetation and nutritional distribution could not only influence grazing behavior of herbivores at individual FSs but also within the feeding patch (FP), which can be statistically defined as a cluster of FSs by log-survivor analysis of the distance between FSs. In this study, we observed cattle grazing behavior in the FP in two kinds of pasture: natural bamboo-grass vegetation and pasture that had been grazed the previous year.

In Exp.1, four non-lactating Japanese Black cows (body weight 553.5±58.8 kg) were kept on a natural vegetation of bamboo-grass pasture, which consisted of current and wintering leaves (CP 11.3 and 7.7%, NDF 70.5 and 55.4%) for 21 days in summer (4.6 ha, 0.87 head/ha). In Exp.2, five non-lactating Hereford cows (body weight 679.6±54.9 kg) were kept on bamboo-grass pasture which had been grazed and consisted of only current leaves (CP 11.9%, NDF 60.9%) for 11 days in autumn (5.8 ha, 0.86 head/ha). Video-recordings (10-min observations) were made at 20-min intervals for six hours per day on two focal animals for four days in Exp.1, and on three animals for three days in Exp.2.

Cows stayed in each FP for 58.7 to 67.8 sec and took 17.4 to 18.3 bites; there was no statistical difference between experiments. In both experiments, cows took 4.7 to 5.0 steps of walking as the distance within each FP, suggesting that the difference in the pasture did not significantly affect size of the FP. In spite of differences in vegetation and nutritional distribution of bamboo-grass pasture in this study, and the difference of breed, cows did not exhibit different grazing strategies.

EFFECT OF RESTRICTING SUCKLING ON THE SOCIAL BOND BETWEEN EWES AND THEIR 10-WEEK-OLD LAMBS

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To determine the effect of stopping nursing or maternal separation in the behaviour and welfare of sheep, forty ewes (10/treatment) and their 10-week-old lambs were subjected for ten days to one of the following treatments: T1=ewes were separated from their lambs by a wire fence. T2=faeces were smeared each morning on the udder to discourage suckling. T3=non-weaned controls, and T4=the udder was covered. Ewes were fed with 3 kg of commercial concentrate with 14% protein, while 300 g of the same food were offered to the lambs. In T2, T3 and T4, lambs remained with their mothers. For statistic analysis, Chi square, analysis of variance and proportion tests were used according to the data. Ewes in all treatments vocalized more than the controls ($P<0.01$; 17.9±4.3 vs 10.0±3.4 vocalizations/hour, respectively, remaining higher for a longer period ($P<0.05$) in T1. However, cortisol concentrations were not increased ($P>0.05$). Lambs in T2 and T4 performed the similar number ($P>0.05$) of suckle attempts per hour (1.0±0.97 and 1.6±1.2, respectively) with similar ($P>0.05$) length (5.3±6.2 and 16.0±12.3 sec per episode, respectively), but less ($P<0.05$) frequent and shorter that in T3 (3.4±0.5 and 105.2±16.3 sec, respectively). No differences ($P>0.05$) were found in food consumption or weight gains. Lambs in the control group vocalized less than treated groups ($P<0.05$) on days two (24.0±5.1 vs 38.6±8.3 vocalizations/hour, respectively) and three (16.0±1.7 vs 21.3±2.3 vocalizations/hour, respectively). At the end of the experiment, no difference was found ($P>0.05$) in the number of lambs that attempted to suckle in treatments 1, 2 and 4 (30, 30 and 20% respectively). It was concluded that termination of milk feeding and segregation of ewe-lamb pairs are distinct components of weaning that contribute in different ways to the lambs´ response. Separating these two factors may better simulate the natural process and reduce weaning distress.

BEHAVIOURAL CHARACTERISTICS OF THE DYSTROPHIC DOGS AS ANIMAL MODEL FOR MUSCULAR DYSTROPHY

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The behavioural changes with the progression of clinical disease level in canine X-linked muscular dystrophy were studied in four dogs (Beagle x Golden retriever). Two affected males were compared with two normal males in behaviour for four weeks at 14-15 months of age. Each dog was housed in an individual cage (960W x 1,652D mm) in the environment controlled room. The room temperature was maintained at 21+1 C (40-60% RH). The illumination cycle was 12 h of light (07:00-19:00) and 12 h of darkness. The dogs were provided with dry or wet feed according to the clinical disease level and had ad libitum access to water. The behaviour of each dog was videotaped for 24 h using an infrared camera and a time-lapse video recorder on the 1st, 5th, 10th, 15th, 19th and 22nd days during the experimental period. Behavioural data were statistically analyzed by Steel procedure as a multiple comparison test.

In the affected dogs, standing and rearing postures, and moving decreased in the last half of the experimental period ($p<0.05$). For all period, standing and rearing postures (23.7% vs. 33.4%), and moving (4.1% vs. 10.0%), investigation (3.0% vs. 14.9%) and barking (0.6% vs. 1.6%) were significantly less in the affected dogs than the normal dogs ($p<0.05$). Therefore, resting in the former (61.3%) was more frequently that in the latter (41.9%) ($p<0.05$).

The affected dogs showed less active and voluntary behaviours as compared to the normal dogs. Although additional research will be necessary, these results suggest that the behavioural characterization of the dystrophic dogs comparing to the normal ones is one of the effective methods to estimate the progression of clinical disease level.

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BEHAVIOUR OF JAPANESE WILD BOARS ON KAMAGARI ISLAND OF THE INLAND SEA OF JAPAN

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Tangerine growers on islands of the Inland Sea of Japan suffer economic loss from Japanese wild boars (Sus scrofa leucomystax) eating their fruit during fall and winter. On Kamagari Island, the boar population is sharply increasing. Effective control measures have not been undertaken, partly because information on animal behaviour is unknown. The objective of this study was therefore, to collect descriptive information on the behaviour of wild boars on the island. Kamagari Island is mountainous, and tangerines are grown in terraced fields which border on natural forests. Puddles with signs of wild boar usage were common in abandoned tangerine fields. Behaviours of the wild boars were recorded continuously at one of these puddles with a time lapse video recorder from November through January. Clock time, duration and number of visits by wild boars and their behaviour at the study site were recorded. The total number of wild boars observed was 80 during the period. Sex and individual recognition was not possible. From non-parametric statistical comparison, visits during November were significantly more frequent ($P<0.01$) than in other months. Sixty-six percent of visits were by a single individual, followed by a group of two (19%), three (13%) and four (2%) animals. According to the Kolomogorov-Smirnov test, the duration for a visit was randomly distributed (mean=2.60 min), with 85 % being less than 5 min. Clock time of visits showed a significant nocturnal pattern ($P<0.05$) with two peaks (0100-0400 and 1700-1900). Animals approached the puddles significantly more frequently ($P<0.05$) from the tangerine field than from the natural forest. The major behaviours observed were sniffing, exploring, wallowing, playing and resting. The other wild animals observed were raccoon dogs, feral cats, rats, weasels and birds. To design a viable management strategy for the species, more information on life history, diet and behaviour must be collected.

A FIELD TRIAL TO EVALUATE THE EFFICACY OF A BITLESS BRIDLE IN ALLEVIATING HEADSHAKING SYNDROME IN THE HORSE

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'Headshaking' describes a syndrome of clinical signs seen in some horses when they are ridden. It can be indicative of a number of pathologies, one of which is neuralgia in the head and face (Cook, 1980). In 1999, Cook suggested that this neuralgia might be caused by the use of the bit.

In order to test the hypothesis that ridden exercise without a bit would alleviate headshaking syndrome, a bitless bridle was tested on 29 horses for 2 weeks. Owners rated the occurrence of 9 signs, including 'vertical headshaking', 'snorting', 'rubbing the nose on the foreleg', etc on a scale from 0 (absent)-6 (continual), during ridden exercise in the week prior to testing and then in the second week of testing the bridle. They also rated the likelihood of headshaking occurring in 6 given situations and 'overall severity' on a similar scale.

There was a consistent tendency for owners to report improvement whilst wearing the bridle, but there was no evidence for a statistically significant change in the majority of measures. There was a significant improvement in the likelihood of headshaking 'in certain trigger spots' (Wilcoxon signed rank, $Z = -2.75$, $p=0.006$), 'in bright sunlight' ($Z = -2.37$, $p=0.018$) and 'in the wind' ($Z=-1.97$, $p=0.049$). Overall, 44% of horses were reported to improve in 'overall severity', 22% by at least 50% of their baseline score.

The results suggest that minimal improvement in the occurrence of headshaking signs may be seen in a short time of exercise in a bitless bridle. Sustained use of a bitless bridle may be necessary for more substantial improvement, although this was difficult to show in those followed up one year later. Nonetheless, the bridle was seen by the majority of owners in this trial to be a positive replacement or addition to their horse's tack.

THE DEVELOPMENT OF A RANKING SYSTEM FOR COMMERCIAL DAIRY FARMS

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The development of a welfare assessment scheme for dairy cows at farm level generates intense interest in most countries. The aim of this work is to investigate the possibility of constructing a ranking system for commercial dairy farms using animals and management related parameters.
In 30 commercial dairy farms in Northern Italy, cows and stockmen behaviour was observed during milking and in response to an approach test by known and unknown persons in their home pen. Management parameters were collected by direct observation and by interview to the farmers. Productivity records for each farm for the entire lactation were obtained from the regional breeders association.
Total and Partial order ranking strategies, which from a mathematical point of view are based on elementary methods of Discrete Mathematics, were applied in order to relate the farms in a rank order using more than one ranking attribute. Three total order ranking methods were used: Desirability functions, Utility functions, Dominance functions. Using all the parameters (management, behaviour and production parameters), we could generate a ranking order of all the farms, according to their overall quality. For example, the best farm had a desirability of 74.2%, the second of 72.1%, the third of 69.9%, etc.. However, farms had a different distribution in the ranking order obtained exclusively from management, behaviour or production parameters. A ranking model which relates the ranking order based on the farms' productivity with the order based on behavioural parameters was developed. The quality of this model was assessed by the Tanimoto's (T) and Spearman's (r_s) correlation coefficients (T = 75.51% and r_s = 52.2%).
The application of these methods highlights its potentialities in analysing and finding correlation in large data sets from on farm investigations, and it could be of practical use for ranking the farms according to the selected parameters.

EFFECT OF DIETARY SALT (NACL) LEVEL ON BITING BY LIQUID FED GROWING-FINISHING PIGS

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Salt (NaCl) level has been implicated in the development and expression of biting behaviour and heightened appetite for salt could make pigs particularly attracted to pen mates with injured tails. This study investigated the effect of dietary salt (NaCl) level on biting by liquid fed growing-finishing pigs.

Thirty-two pigs were housed in four pens, each containing 4 males and four females at 0.57 m^2/pig stocking density, each pig averaging 38.8±1.1 kg. All pens were supplied with a high quality commercial diet that contained no salt. The diet of two pens had 0.25% salt added, and 1% salt was added to the diet of the other two pens. The behaviour of the pigs was monitored by time-lapse video for two weeks. Diets were offered *ad lib*. The diets differed only in their salt content. The data were analysed using a GLM-ANOVA.

Pigs fed on the 1% salt diet, after an initial peak in biting, scored almost half the number of biting events than those fed on 0.25% NaCl diet. Male pigs of the high-salt treatment scored 5 times more incidences of biting than females during the first week ($P<0.001$), and then decreased by 50% at the end of the second week. On the other hand, male pigs that were fed on the low salt diet, showed a significantly greater biting incidence than female pigs only during the second half of the trial ($P<0.05$).

Intensification of pig production contributes to the frequently observed incidence of biting. The results obtained here indicate that increasing the salt concentration to 1% can decrease by 50% the incidence of biting ($P<0.05$).

DIFFERENT REARING OF DAIRY HEIFERS AND THEIR POSTPARTUM BEHAVIOUR

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The experiment aimed to identify how the different rearing of heifers before weaning affected their postpartum behaviour. Pre-experimental period: 34 Holstein heifers were from birth to weaning at 8 weeks raised in five different housing systems. Systems A and H - from 2nd day to 7th day in a hutch, then A in loose housing with drinking feeder, H in hutch. D, M and N - pen with mother until the seventh day, then D in loose housing with drinking feeder, M in hutch and N with nursing cows. Animals of all systems were kept in loose housing after weaning.
Experiment: Two days before parturition all animals were placed in individual maternity pen (4.5 ? 4.5 m). Behaviour was recorded during 24 hour after calving. The following behavioural activities (minutes/hour) were evaluated: duration of standing, movement, calf licking, sniffing, feeding and lying. Animals with calving problems were rejected from experiment. Data were processed by SAS, GLM procedure, using model: $y_{ijk} = m + system_i + animal(system)_k + time_j + (system*time)_{ij} + ((time*animal)(system))_{jk} + e_{ijk}$.
There were significant differences ($p<0.05$) between systems M and N in standing (8.83 and 18.85, resp.), movement (14.45 and 1.06, resp.) and licking (3.85 and 7.70, resp.), and between systems H and M in movement (4.86 and 14.45, resp.) and sniffing (6.48 and 0.52, resp.). Furthermore there were significant differences in movement between A and N (11.16 and 1.06, resp.) and in sniffing between H and N (6.48 and 0.17, resp.). System A (7.93) differed significantly from N and D ones (4.08 and 3.63, resp.) in the time of feeding.
These results indicate that different rearing of heifers before weaning influenced their maintenance and maternal behaviour.

COMPARISONS BETWEEN WILD AND LABORATORY RATS

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The golden standard in the assessment of animal welfare is determining the 'animal's point of view', and knowledge of an animals ecology is a good starting point in deciding which aspects of the animals surrounding to include. However, care should be taken in arbitrarily translating wild behaviour into the captive environment. This is especially important when the animal under investigation has been bred in captivity for many generations, altering behaviour and genetic make-up, which is particularly true for the laboratory rat.

The paper will review current knowledge of the ecology of wild rats and relate it to the ecology of laboratory rats and its potential impact on welfare. Recent work with wild rats in our institute has provided a renewed insight into wild rat behaviour, and specific focus in the review will be placed on the differences in social communication between wild and lab rats. The background of scent marking and the relationship with dominance hierarchies will be discussed and the impact the laboratory environment has on this. There also seems to be different needs for social contact, which will be illustrated with examples of feeding behaviour. So although wild behaviour should certainly be the basis of welfare evaluations, the paper will argue that care should be taken to avoid the pitfalls of simply expecting aspects of wild behaviour in a captive environment.

INFLUENCE OF SOCIAL AND NON-SOCIAL ENVIRONMENTAL ENRICHMENT ON THE BEHAVIOUR OF CAGED RABBITS

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Laboratory rabbits are traditionally housed in single cages. It is now demonstrated that such barren environment reduces animal health and welfare, The proposed alternative is to keep them in penned groups. However, this often induces heavy management adaptations. Another lighter solution could be to enrich the animal environment by transforming cages.

12 crossbred New Zealand White female rabbits (6 weeks old) were fed ad lib in the same room during two months. 6 of them («controls») were individually kept in standard cages (33cmx39cmx 30cm). The other 6 rabbits («enriched») were group housed (2 groups of 3) in a three times greater cage (200cmx39cmx30cm), 2/3 of which were blacked out. Enriched rabbits also received little amount of hay and carrots.

Behavioural data were directly collected using one-zero sampling method (sample duration: 10 sec, two one-hour observation periods per day (morning and evening), twice a week during 2 months). Results were analysed by comparing the mean relative frequencies for each behaviour, using Mann-Whitney U tests («enriched» vs. «controls») and Wilcoxon tests (time effect).

Grouped rabbits were more frequently seen sleeping or dozing (33.3±2.7% vs. 21.3±2.6%, $p<0.01$) and eating (20.5±4.3% vs. 12.0±3.4%, $p<0.05$). On the contrary, single caged animals were more frequently observed immobile (34.3±7.7% vs. 21.9±5.6%, $p<0.05$), interacting with their physical environment (2.3±0.9% vs. 0.2±0.1%, $p<0.01$), grooming (20.4±3.2% vs. 17.7±1.6%, $p<0.05$), or displaying fear reactions (0.9±0.7% vs. 0.0±0.0%, $p<0.01$) or stereotypies (2.6±1.9% vs. 0.0±0.1%, $p<0.01$). These last four behaviours plus sleeping/dozing were more frequent during the noisy morning than during the quieter evening sessions, when all the animals were more frequently seen eating or moving ($p<0.05$).

This preliminary study presents encouraging results. Indeed, social and non-social environmental enrichment by modifying cages induces behavioural modifications in laboratory rabbits, that could be interpreted as signs of better welfare.

WORKSHOPS

WORKSHOP n.1

QUALITATIVE ASSESSMENT OF BEHAVIOUR

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The qualitative assessment of behaviour is an integrative approach that summarises perceived details of behaviour into descriptions of *how* an animal behaves - its dynamic style of interaction with the environment. This may include subtle details of body movement and posture, incidental events such as a startle response or vocalisation, or aspects of the context in which the behaviour occurs. Such details are difficult to quantify separately, yet they determine in important ways our understanding of what the animal is doing - whether it is exploring or trying to escape, playing or fighting, resting or pining away. Such characterisations of behaviour encompass information about the animal's emotional state - whether it is calm, anxious, confident, tense or relaxed - yet in the absence of methods designed to reliably assemble such information, it has been difficult to investigate its usefulness for the science of animal welfare.

The purpose of this 2-hour workshop is to offer a platform for discussing the relevance of qualitative behaviour assessment for the scientific assessment of animal welfare. In the first hour there will be presentations by several speakers of recent experimental work, based on a method for qualitative behaviour assessment recently developed at the Scottish Agricultural College. There will be an introduction explaining this method's background and procedures, followed by four short presentations in which different authors will discuss their use of this method, recent results, and how they think these results contribute to their research. The second hour will be for general discussion of the presented work, and for any theme of interest that may arise. It is sometimes suggested that in its dependence on human integrative judgement, qualitative behaviour assessment is anthropomorphic and unreliable; it will be interesting to evaluate this assumption in light of the presented experimental work.

WORKSHOP n. 2

BEHAVIOURAL PROBLEMS IN RABBIT PRODUCTION.

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In many European Countries rabbits are reared in intensive husbandry systems where many environmental parameters might represent stressors, which potentially may negatively affect rabbit welfare, health and consequently production as well.
The housing of animals in intensive breeding units is increasingly criticised because they are kept in a barren environment and their natural locomotion pattern is restricted. This is particularly the case for species that are housed in wire cages, e.g. rabbits. In commercial rabbitries, meat rabbits are nearly exclusively housed in small collective cages. Group size ranges from 2 to 8–10 fatteners and the space per animal between 500 and 700 cm?. The height of the cages is usually only 30 cm. These limited cage dimensions restrict and even prevent normal behaviour pattern such as hopping, running or sitting up-right with ears erect. However, stereotypies or injuries due to the wire bottom are seldom observed. Currently, increasing research is being done to improve the environment with a platform, gnawing material or hiding area. Pen housing of fatteners showed possibilities but problems with fighting near slaughter age and increased risks of disease were observed. Furthermore, in intensive breeding units the management system is not fit for alternative housing of fatteners.

The improvement of the intensive rabbits systems are necessary as a series of ethological studies have shown. The disagreement regarding battery cages is a subject which is still under discussion due to the different points of view..
It is to be pointed out, why and how the Swiss Ordinance of Animal Protection was revised in 1991 and how housing systems for rabbits have been developed. The following needs have been identified as essential: Freedom of movement, social contacts, activity and gnawing objects, division of the space in functional compartments (e.g. for withdrawing), suitable nestside and -design, nest material etc. Under Swiss conditions structured cages are commercially used now. However, the question arises whether even these improved cages are suitable to the ethological requirements of the rabbit does.

The welfare group of the University of Milano has been involved in the field of rab-

bit welfare for many years. The main research interest has involved maternal behaviour with the evaluation of the relationship between the does attitude and the litter performance. In recent years most of the research has been aimed at studying different kinds of environmental enrichment for fattening rabbits. Among the different possibilities of improving rabbit environment, there is, for example, the improvement of human-animal interactions using the handling of the puppies in the first weeks of life in order to reduce fear responses toward humans with the improvement of growth rate and feed efficiency. One of the main behavioural needs of rabbits seems to be oral manipulation so it would be important for their welfare to provide them with some objects, like wood or alternative food with a high fiber content in order to reduce stereotypies and aggressiveness.

WORKSHOP n. 3

WELFARE OF SHELTERED DOGS

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The number of sheltered dogs varies between 5 and 10% of the total population of dogs depending on the country. Several studies mention that 40 to 80% of the dogs in shelters are put there due to behavioural problems, such as aggressive behaviour. Many behavioural problems are related to the system the dog lives in and are expressed towards family members. These problems often disappear when the dog is put in a shelter. Pursuit and predatory aggressions, for example, may disappear in sheltered dogs, because they are not exposed to the right triggering stimulus. Other types of aggressive behaviours, such as those due to defence reactions or personality disorders, may still be shown or even increased in sheltered dogs. If dogs show apparent aggressive behaviours, they would be euthanized. Numerous other dogs suffering from mild to intense behavioural disorders may have to live their whole lives in shelters. These dogs should be given the best living conditions possible according to their ethological and biological needs. The laws regulating the decision about the future of dogs in shelters vary from one country to another.

Sarah Heath and Gwen Bailey will give a dual presentation considering the welfare implications of rehoming dogs with aggression problems both in terms of their reaction to being kennelled within a rescue centre and in terms of the accurate assessment of their behavioural condition and the provision of suitable behavioural support in the new home.

Paola Valsecchi (Parma) will review the situation in Italy. She will report on different research programs such as the analysis of dogs temperaments to facilitate adoption, the parameters of stress in dogs entering the shelter and the evaluation of environmental enrichment programs. The aim of all these projects is to increase the welfare of sheltered dogs. Marina Verga and Clara Palestrini (Milan) have analysed the distribution of behavioural problems in dogs adopted from an Italian shelter. They will mention the problem of dangerous dogs. Diana Levi (Milan) will talk some more about the dangerous dogs, the laws regulating this problem, and measures of prevention, including the SAM (standard approach method) used at the Milan Sanitary Kennel.

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