Effects of Anthropogenic Noise on the Behaviour and Welfare of wild mice (Mus musculus)

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What is noise?
- Unwanted sound.

Features:
- Loudness
- Hearing range
- Complexity: discordant mixtures of frequency

The perception of noise is relative
- Undesirable physical and physiological effects

ANTHROPOGENIC NOISE
General features:
- Elevated volume
- Flat surfaces: sound refraction and altered frequencies
- Low frequency range (below 2000 Hz)
- Great differences when compared with natural sounds – less opportunity to adapt

Sources of anthropogenic noises for wildlife:
- Transportation systems
  - Aircrafts
  - Ships
  - Trains
- TRAFFIC NOISE: roads and vehicles.
- Industrial noise sources
  - Military bases and operations
  - Factories
  - Logging
  - Drilling platforms
- Mining operations

MY RESEARCH:
- Relationship between mining noise and wildlife
- Wild mice:
  - Presence in mining areas
  - Well researched
  - Useful physiological methodologies
  - Used for noise exposure experiments

ANTHROPOGENIC NOISE
- Senses
- Environmental Assessment
- Hearing = perception of sound
- Amplitude:
  - Energy input = volume.
  - Wave height: the higher, the louder.
  - Measurement unit = decibels (dB).
- Frequency:
  - Cycles/unit of time, pressure changes = pitch.
  - The more cycles/sec, the higher the pitch.
  - Measurement unit = Hertz (Hz).
Methodology

- 12 males, 24 females, n=36
- Treatments (4 males and 8 females, n=12, 1 week habituation)
  - LN= Loud noise treatment (70-75 dB, 24 hrs/7 days/3 weeks)
  - LWN= Low noise treatment (60-65 dB, 24 hrs/7 days/3 weeks)
  - CT= control (below 55 dB)
- Mining noise soundtrack
  - Mixture of common machinery found on web sources:
    - coal truck
    - drill
    - bulldozer
    - scraper/shovel
    - dump, truck
    - rock crusher
    - draglines
    - bicycler
- 3 rooms soundproofed
- Collection of fecal samples (corticosterone)
- Tissue extraction: spleen, adrenal glands, thymus.
- Surveillance cameras coupled to video recorders
- Analysis of behaviors during replay (5 days, first 5 min of each hour)
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PRELIMINARY RESULTS: Organ weights

- Treatment effects:
  - SED=0.002, F=3.53, p=0.042
  - SED=0.003, F=13.43, P<0.001
- Treatment* gender effects:
  - SED=0.003, F=13.43, P=0.001
  - SED= 48.08, F=3.83, P=0.041

Individual behaviors: hiding, nesting, climbing, feeding and drinking, freezing, grooming, circling.
Preliminary conclusions

• LN treatment increases stress related behaviours in wild mice (circling): right or left?

• Loud noise (70-75 dB) affects the weight of spleen in wild mice:
  - Inverse relationship between corticosterone and spleen weight (faecal analysis).

• Experiments addressing effects of different sets of frequencies.

Thank you for your attention