Animal Welfare

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What is Animal Welfare?

- No definition of ‘Welfare’ in the Animal Welfare Act
- Danger of anthropomorphism
- 5 Freedoms
Five Freedoms

- Five freedoms in the Bill of Rights, first amendment
- 1965 British Government proposal
  - Intensive Farm Animal Production
  - “stand up, lie down, turn around, groom themselves and stretch their limbs.”
- Extended and refined in 1993 by UK Farm Animal Welfare Council.
Five Freedoms

1. Freedom from hunger and thirst
2. Freedom from discomfort
   - (shelter and resting area)
3. Freedom from pain, injury or disease
   - (prompt diagnosis and treatment)
4. Freedom to express normal behavior
   - (space, facilities, company of their own kind)
5. Freedom from fear and distress
   - (avoid mental suffering).
Five Freedoms:

1. Freedom from Hunger & Thirst

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain, injury or disease
- Freedom to express normal behavior
- Freedom from fear and distress
Freedom from Hunger and Thirst

Readily Available Quality Controlled Food & Water

- Ad libitum
- Defined diet meets lifetime needs
- Water filtered and monitored for impurities
Freedom from Hunger and Thirst

Consider Research-Related Food or Water Restriction

- Advance planning required
- Safeguards to ensure adequate nutrition and hydration
- Documented in animal care and use protocol
  - e.g. body weight measurements
  - e.g. free feeding to a predefined calorie intake
  - e.g. pair feeding to a percentage of free feeding controls
Five Freedoms:

2. Freedom from Discomfort

- Freedom from hunger and thirst
- Freedom from discomfort
  - shelter or resting area
- Freedom from pain, injury or disease
- Freedom to express normal behavior
- Freedom from fear and distress
Freedom from **Discomfort:**

**Well-Controlled Environment**

- Defined temperature
- Defined humidity
- Defined ventilation
- Defined light intensity and schedule
- Sanitation schedule
- Specific pathogen free
- Pest-free
Freedom from **Discomfort**: Shelter or Resting Area:

**What Shelter do Mice Prefer?**

- Preference testing: mice prefer paper nesting material to solid “houses”
- Prefer solid bottoms to wire grid floors
- But will choose grid floors with paper nest material over solid bottom floors without nest material
Freedom from Discomfort

Example of a Comfortable Mouse Environment

mice with nestlet bed
Freedom from **Discomfort:**

**Cage Environment**

- **Ammonia** - static isolator cages – mitigated by increased cage changing frequency

- **Drafts** - ventilated rack caging – effects mitigated by nest material
Freedom from Discomfort: Environmental Variables may Affect Research

- Odors: housing in presence of rat odors caused 330% increase in stress hormones in mice

- Cage changing: pup mortality reduced in ventilated racks when changed every 14 days compared with every 7 days

- Cage composition: Bisphenol-A from damaged polycarbonate cages affected meiosis

- Light: induces phototoxic retinopathy in many strains of albino mice
Five Freedoms:

3. Freedom from Pain, Injury or Disease

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain, injury or disease
- Freedom to express normal behavior
- Freedom from fear and distress
Freedom from Pain, Injury or Disease: How Should We Minimize Pain or Injury due to the Animal Model?

- Communicate in advance the expected effects of the animal model to all personnel
- Define monitoring frequency, intervention points (veterinary care) and endpoints (euthanasia)
- Devise ways to minimize effects of disease or model
- Monitor carefully to identify unexpected effects
Freedom from **Pain, Injury** or Disease: Examples of Simple Methods to Minimize Pain

- Thick, soft bedding for musculoskeletal disorders or obesity
- Soft, Easy-to-chew food for eating difficulties
- Longer water bottle sipper tubes for limited mobility
- More frequent cage changing for diabetes models
Example: Long Sipper Tube Gives Easy Access to Water for Animals with Neurodegenerative Disease
Freedom From Pain, Injury or Disease

- Specific rodent infectious diseases are excluded from colony
- Continual Health monitoring to monitor for presence of disease
- Daily check of all animals (including weekends & holidays)
- Veterinarian available 24/7
Freedom from Pain, Injury or Disease: Consider Research Impact of Disease & Disease Control

- **Animal Model for cancer actually due to disease**: animal model for colon cancer required the presence of *Helicobacter spp*

- **Animal parasite affected seemingly unrelated study**: pinworms altered response of heart to cardiac stimulants

- **Treatment for parasites** with ivermectin caused unexpected deaths in FVB/NJ and 129/SvJ mice
Five Freedoms:

4. Freedom to Express Normal Behavior

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain, injury or disease
- Freedom to express normal behavior (space, facilities and company of their own kind)
- Freedom from fear and distress
Freedom to Express Normal Behavior

What is Normal Behavior?

• Species-Typical Mouse Behavior
  – Resting
  – Grooming
  – Hiding
  – Gnawing
  – Searching for food
  – Exploring
Freedom to Express Normal Behavior

Space, Facilities and Company of their own Kind

• Minimum space is regulated: 5 mice per standard cage – overcrowding prohibited

• More space may be undesirable: groups of male mice showed increased aggression in larger cages

• Is space the most important ingredient?
Space, Facilities and Company of their own Kind

- Empirical evidence that mice like to hide under things

- Disposable “houses” available. One vendor reports they may help poor breeders

- Rats shown to prefer wood for gnawing
Freedom to Express Normal Behavior

Enriched Cages are Preferred by Mice

- Mice will work for nesting material, shelter, and raised platforms
- Mice prefer more complex cages
Freedom to Express Normal Behavior

Changing Cage Facilities can Affect Research

- Enriched environment
  - Reversed effects of lead poisoning
  - Delayed progression of Huntington’s disease
  - Accelerated appearance of Alzheimer’s Disease
  - Caused fewer litters and larger stress response
  - Caused variation in body weight, organ weights and haematology
Paper Towel used as Nesting Material
Freedom to Express Normal Behavior

Space, Facilities and **Company of their own Kind**

- Social animals
  - family groups in natural environment
  - In lab, groups may be breeding groups or all males, all females or singly-housed.
Freedom to Express **Normal Behavior**

**Consider Research Impact of Isolation Housing**

- Isolation housing caused 30% increase in stress hormones
- Isolation housing caused higher heart rate
- Group housing reduced effects of stressors in rats compared with single housing
- BUT; larger groups are more stressful for male rats and mice
Five Freedoms

5. Freedom from Fear and Distress

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain, injury or disease
- Freedom to express normal behavior
- Freedom from fear and distress
Freedom from Fear and Distress

Potential Causes of Fear or Distress in the Environment

- Intermittent loud noises & vibration
- Odors or ultrasonic calls of predators (cats, rats)
- Frequent cage changing
Freedom from Fear and Distress

Sources of Ultrasonic Noise

- 20,000 – 100,000 kHz
- Inaudible to humans
- Computer monitors
- Telephones
- Lights
Freedom from Fear and Distress

Mitigating Fear and Distress due to Procedures

• Acclimation
  – to personnel
  – to apparatus
  – to new environment – e.g. after transport, cage changing

• Gentleness and skill
Freedom from Fear and Distress

Acclimation Needed for Good Research

- Mice unacclimated to handling will not swim in the Morris water maze

- Extended acclimation needed to mitigate effects of blood sample collection

- Four days may not be enough time for mice to overcome transport stress
Can we Provide the Five Freedoms?

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain, injury or disease
- Freedom to express normal behavior
- Freedom from fear and distress
Summary: Animal Welfare

- “… Absolute attainment of all five freedoms is unrealistic …”

- Relatively minor changes in our procedures can cause major improvements in animal welfare (nestlets, acclimation)

- The environment we provide for our rodents can have a major impact on research