



Behavior for the Laboratory Animal Veterinarian

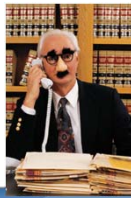
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Environmental Enrichment/Behavioral Husbandry

- Define enrichment/aims of your behavioral husbandry program are
- Understanding of natural behavioral repertoire
- Understanding of laboratory behavioral repertoire
- Create a behavioral husbandry program
 - Training
 - Enrichment
 - Behavioral medicine program

Disclaimers

- This is not an ACLAM sanctioned presentation
- All information is deemed reliable and correct
 - No warranty for accuracy
- No information presented is known to be specifically included in ACLAM Board examinations



Enrichment defined

- Artificial Environments are uncontrolled by the animal
- Behavior allows them to control their environment
- Most of this behavior requires “substrates”
- Enrichment is the provision of these “substrates”
- What substrates they want depends on their species typical behavior

Behavior Domains

- 4: animal care
 - Species-specific husbandry & environmental enrichment
- ~~2: recognition of pain & distress~~
- 3: research: characterization of animal models
 - phenotyping, behavioral assessment

What is the purpose of Environmental Enrichment ??

Environmental Enrichment is a change to an individual's environment aimed at stimulating species-typical activity by introducing physical, mental and social complexity that allows them choice and control over their environment, and allows them the expression of normal behaviors. **Be goal oriented and allow for species-typical activity**

Provides a feeling of security for the animals

How do we know if we're doing that?

- “species typical activity”??
- “goal oriented”??
- “feel secure”??



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Let's think about rats

- Sensory modalities
- Normal behavioral repertoire
- Resource requirements
- Indicators of welfare



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Knowing...

- Ethology
 - Natural behavior
 - Individual history
 - Desired Lab behavior
- Asking: How are we doing?



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Vision



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Relevance...or random pretty things



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Light intensity

- Normally inhabit burrows & other enclosed environments
- nocturnal/crepuscular
- most activities are in low light environments
- Retinal atrophy & cataract formation, particularly in albino strains



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Scent of a rat

- Smell is primary sense for monitoring environment
- Marking odors
- Alarm odors
- Informational odors
 - Gender
 - Relatedness
 - Dominance
 - Health status
 - Handler



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Think of it like this...

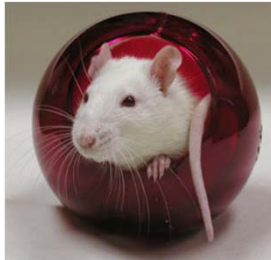


- Visually poor
- Olfactory rich
- Auditory rich (different range)
- Tactile vibrissae

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Can you hear me now?

- Rodents have very acute hearing
- They can hear up into the ultrasonic frequencies!
- Their behavior can be affected by sounds we can't hear
- Ultrasonic vocalizations to aversive conditions
- 50kHz ("laughing") vocalizations associated with positive affective response



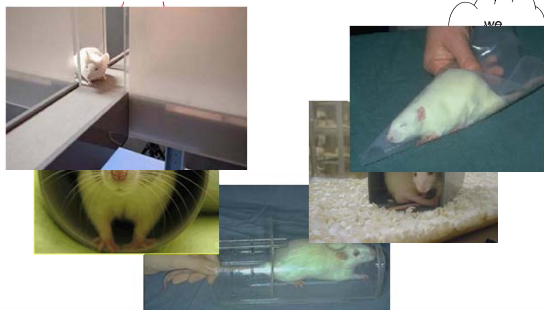
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Ethology: Natural History Questionnaire:

- Wild habitat?
- Wild behavior in response to changes in temperature and weather?
- What temperature/humidity range does it experience in the wild?
- What are self-maintenance/comfort behaviors?
- When is it most active?
- What are it's main threats?
- What are it's main sensory modalities?
- What is it's social structure?
- How do these change over the animals lifetime?
- Is the animal territorial? How does it mark/defend that territory?
- How does the animal raise young?
- What is the animal's diet?

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Vibrissae & Thigmotaxis



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Behavioral Repertoire



- Rest
- Chew
- Perch
- Tunnel
- Hierarchy



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What would a rat do?

- Think about natural and individual behaviors, how would it be practical to apply these to a laboratory setting?



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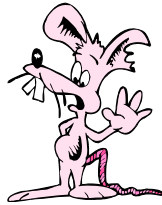
Habituation



- Habituation is the development of tolerance
- Wild rabbits are naturally afraid of humans as a prey species
- We can habituate them to human handling for the laboratory

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why 'natural' isn't always 'better'

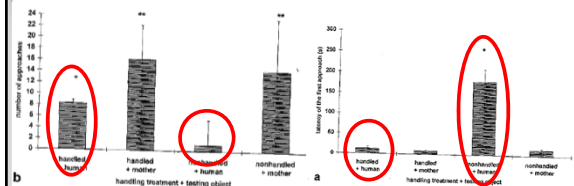


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Handling Neonates

Pongracz, Altbacker & Fenes 2001

- Daily handling d1-8 post partum, 15s per pup (<3m/litter)
- Statistically significant changes:
 - Decreased latency to approach humans
 - Increased number of approaches in a given time period



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Lab vs. Wild



Wild rabbits are naturally afraid of other species: survival for a prey species.

When frightened in the wild, rabbits go to burrow.

The problem with burrows:

Burrow raised rabbits in captivity are less socialized to humans.

Fear of other species is good in the wild to avoid predation, but in the laboratory it can lead to injury to both animal and handler.

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Acclimation

- Acclimation is the process of desensitizing animals to a procedure
- Exposure to environments, equipment, or procedures can decrease the stress response associated with them



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Procedural Acclimations

Swennes 2011

- 4mo rabbits handled 5m/weekday x3wks
- Acclimated to handling, transport, treatment cart, transport box & vein palpation
- Scored by novel handlers 1 (most compliant) to 5 (most resistant)
- Handled rabbits had lower overall scores but no significant differences



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Behavioral Husbandry



- Provides enrichment
- Provides behavioral management, habituations & acclimations to allow the animal to best adapt to the laboratory environment
- Is self-assessing
 - Encourages desirable behaviors
 - Discourages abnormal behaviors

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Habituation

- **less than 3 minutes of handling per litter for the first 8 days post-partum** allowed for rabbits that were not only more willing to be approached by humans, but were more likely to approach them more rapidly, **allowing for easier catch and handling** even after weaning
- Acclimation and positive reinforcement of rabbits **even at older ages** allows for **easier handling, less escape and increased compliance with research manipulations**, though older animals **may require more frequent or longer handling sessions** to achieve desired results



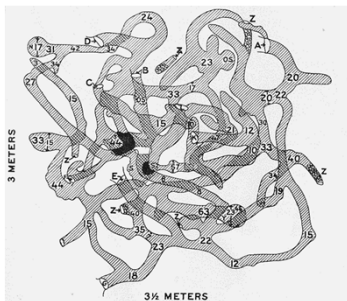
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Behavioral Medicine



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Practical Matters



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What to look for? What are you trying to produce with your enrichment program?

Specific
Measurable
Observable



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Activity; Curious & Exploratory

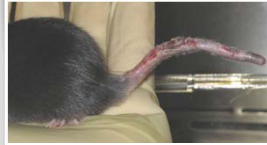


- Hopping
- Jumping
- Interacting with manipulanda
- Foraging



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Aggressive Behaviors



- Conspecific aggression, particularly in sexually mature animals
- Aggression vs. caretakers
- Risk of injury to the animal, to the handlers

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Comfort & Maintenance Behaviors

- Grooming
- Yawning
- Stretching
- Resting
- Eating
- Drinking
- Foraging



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Stereotypic Behaviors



- Stereotypic behaviors:
 - Repeated biting (of bars, or playing with water bottles or food hoppers)
 - Vertical sliding of nose between bars
 - Digging or clawing at cage walls or bars
 - Fur pulling, barbering or overgrooming
 - Circling/flipping/jumping pacing
 - Head swaying
 - Self-injurious behavior

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Abnormal/Harmful Behaviors

- There are 2 types of abnormal behaviors that can be harmful :

Aggressive behaviors are generally directed towards animals of the same species, but can be directed towards people especially if there is fear

Stereotypical behaviors are defined as repetitive, aimless behaviors that are detrimental to the health or well being of the animal



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Behavioral Husbandry



- Define aims of program
- Understand natural behavior
- Understand laboratory behavior
- Create a behavioral husbandry program
 - Training
 - Enrichment
 - Behavioral medicine

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Training



- Behavior
- Enrichment
- Practical Matters
- Scientific Matters
- Building a Program
- Monitoring
 - Normal behavior
 - Desired behavior
 - Abnormal behavior

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It's all about balance

- Providing for the behavioral and physiologic needs of the species
- Enhancing the science



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Enrichment: Swine

- Social/Gregarious
- Clean
- Foraging/Rooting
- Strong/Destructive
- Curious/Intelligent



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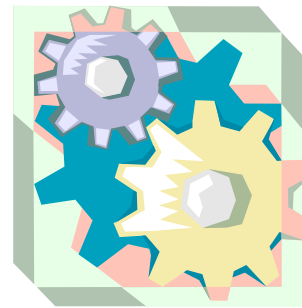
Monitoring

- Nonsocial
 - Exploring
 - Maintenance (groom, eat, drink)
- Social/Sexual
 - Sniff/follow
 - Mount
- Agnostic
 - Aggressive (chase, attack, bite)
 - Flight/submissive (retreat, on back, freeze)



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Behavioral Testing & Phenotyping



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SHIRPA

- Three stage phenotyping screen
 - Primary screen: behavioral observation
 - Secondary screen: behavioral & functional screening battery & pathology
 - Locomotor activity
 - Food & water intake
 - Balance & coordination
 - Analgesia
 - Histology/biochemistry
 - Tertiary screen: tailored to the analysis of neurological mutants
 - Anxiety
 - Learning & memory
 - Prepulse inhibition
 - EEG
 - Nerve conduction
 - MRI

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Anxiety: Open Field Activity



Patterns of exploration in a brightly lit arena are recorded

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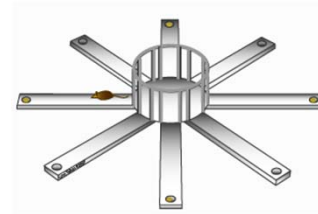
Anxiety: Light/Dark Box



Measures animal preference for dark, enclosed places over bright, exposed places

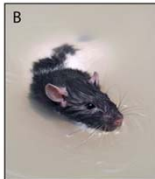
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Learning & Memory: Radial Arm maze



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Learning & Memory: Morris Water Maze

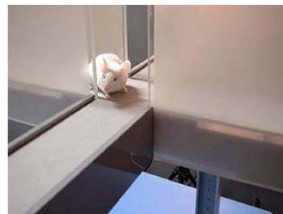


Location of a submerged platform using distal cues



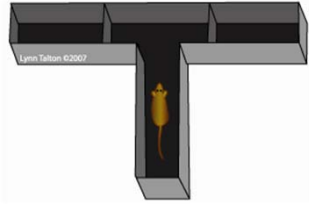
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Anxiety: Elevated Plus Maze



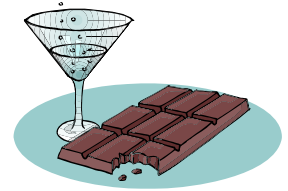
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Learning & Memory: T maze



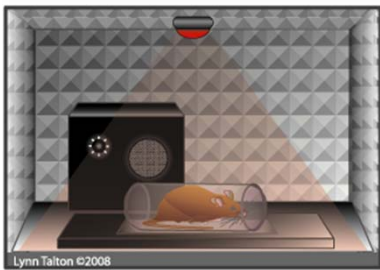
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Thank you



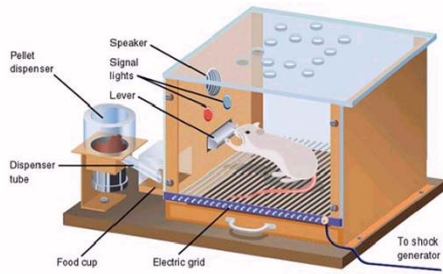
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Prepulse Inhibition: startle & habituation



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Operant Conditioning: Skinner Box



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