Experimental Animal Welfare Efforts

—Environmental enrichment (focusing on rodents)—

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Animal welfare in experimental animals

At home and abroad, there is a demand for consideration of the welfare of experimental animals. Animal welfare means considering the 3Rs(Refinement, Reduction, Replacement) .

Eliminate animal suffering (housing, experimental procedures, psychological stress, handling of animals) to the extent that it does not affect research.

Consider well-being* as much as possible while they are alive.

* Well-being means that animals are able to feel at ease and express the inherent characteristics of the animal species in terms of their behavior.

Definition of environmental enrichment

"The primary purpose of environmental enrichment is to enhance animal well-being. Environmental enrichment provides stimuli, structures and resources that facilitate the expression of species-specific behaviors. This can be achieved by providing

(ILAR's guide 8th edition)

"Environmental enrichment should provide stimuli to facilitate the expression of species-appropriate behavioral and psychological activities in a low-stimulus environment."

Reinhardt（2002）

Classification of environmental enrichment

Sociality

・Reproduce the original “sociality” of animals by forming groups and coming into contact with other animals.
・Acclimatization to humans
(example)
Group housing, physical, visual and social interaction with animals in adjacent cages
Acclimatization to humans/improvement of affinity
Acclimatization to rearing environment/experiment

Space

・A space that considers animal characteristics such as climbing trees and swimming
・In addition to the width and height, the content of the space is enhanced.
(example)
Cage size that allows free movement Standing up and vertical movement possible Cage structure that allows various movements
Hideout, perch, hammock

Cognition

・Environment where the animal can operate by itself, such as complex devices and playground equipmentRequires problem-solving
・Stimulates animal intelligence
(example)
Food cannot be obtained without performing complicated operations.

Foraging

・Eating in the wild can be difficult!
・Change the type and method of feeding
(example)
Use a puzzle-like device to hide and search for food

Sensation

・Not fix the breeding environment, but give stimulation to “sounds” and “smells”
・Stimulate the five senses and change the environment
(example)
Toys and mirrors that match the animal species
Diversification of food and extended contact time Nesting materials, music, and images

It is necessary to provide a combination according to the characteristics of the animal species! !

Partially quoted from LABIO21 JUL 2016

Diverse examples of environmental enrichment by species

<Mouse>

・Prefers materials that can be used as nest materials (optimal for lineage maintenance and breeding)

・ Prefers to explore plastic pipes (climb > hideout, sleeping place)

・Prefers running wheels (running wheels) and uses them voluntarily

<Rat>

・Appropriately sized wooden tools: no danger, encourage biting (wood chips, wooden balls > acrylic plates, PVC pipes)

・Tend to prefer rubbing against walls and high places (lookouts)

<Rabbit>

・Installation of structures for the purpose of hiding and searching

・Box with chips (rest area)

・Wooden bites and tooth sharpening sticks

Quoted from the Japanese Society for Laboratory Animal Science, Laboratory Animal Manager Workshop Textbook

Types of environmental enrichment in rodents

Chocolate O's
Certified

Timothy Hay Bulked Packed
Certified

Mouse Fort
Certified

Rat Tunnels
Certified

Rat Tunnel
Stainless Steel End Caps
Certified

Rest Stops
Certified

Bio-Huts for Rats
Certified

Nutra-Gel
Complete Nutrition

Electro-Gel
Electrolyte Replenisher

Nesting Sheets
Certified

Safe Harbor Mouse Retreat
Certified

Timothy Hay Mini Bales
Certified

Pure-Water Gel
Total Hydration

Pyramid Feeder
Certified

Rainbow Foraging Bits
Certified

Wood Gnawing Blocks
Certified

1. Ingenuity of feed: nutritional supplements, roughage
2. Playground equipment/forage search device: ball, rope
3. Shelter (evacuation site): dome, tube
4. Privacy: enclosures, bulkheads, visual barriers
5. Resting place: high shelf, resting board
6. Nesting materials: paper, cloth, wood shavings
7. Pieces of wood: chewing sticks, markings

Quoted from Bio-serve HP

Examples of laboratory animal welfare initiatives at the Institute of Longevity

Nesting materials

Care Feeds

Happy Mat

Special breeding feed

CMF Sprouts

Enrichment

Biotunnel

Nest

Wood chips

Mouse swing

Running wheel

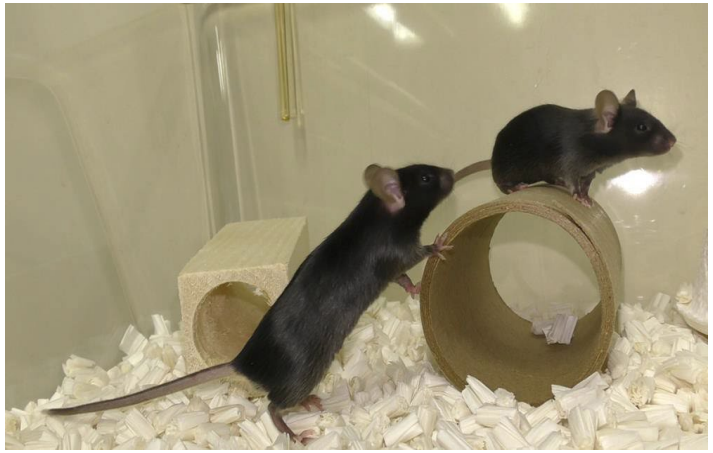
When mouse breeding is not going well, or mice fight, etc., it may be improved by adding enrichment or nesting materials.

For details, please contact the Experimental Animal Management Office.

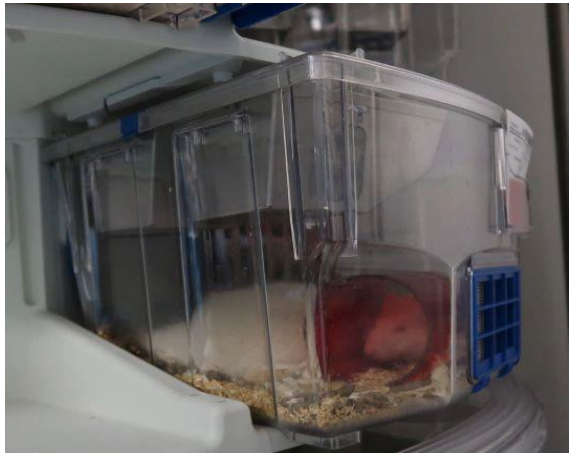
Quoted from the text of the animal experiment seminar

Examples of environmental enrichment

mouse



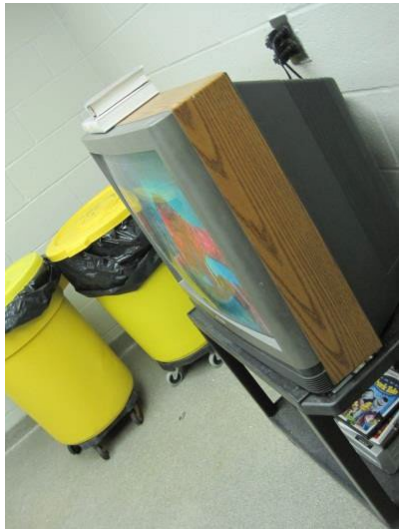
rat



Examples of Environmental Enrichment at U.S. Animal Experimental Facilities


Cynomolgus monkey breeding room


Baboon Keeping Room


showing video to baboons


rabbit breeding room


pig breeding room


nutritional supplement

Effects of environmental enrichment

Environmental enrichment acts as a stress buffer.

Fighting was induced by the presence of nesting material in aggressive strains of mice. But adding shelter to this cage averted the struggle.

Emviromental modification and agonistic behavior in NIH/S male mise: nest in material enhances fighting but shelters prevent it. *Kaliste EK et al. Comp.Med.56:202-8.2006*

Environmental enrichment is immunostimulating.

Environmental enrichment has anticancer effects.

Addition of environmental enrichment reduced the tumor size of tumor-bearing mice.

Emviromental and Genetic Activation of a Brain-Adipocyte BDNF/Leptin Axis Causes Cancer Remission and Inhibition. *Cao L et al. Cell 142:52-64. 2010*

1. Acclimatization is efficient
2. Reduced fighting between animals
3. Mischief of the automatic water nozzle is reduced
4. Relatively easy to handle

Handling with Consideration for Laboratory Animal Welfare

Mouse handling posters

NC 3Rs National Centre for the Replacement Refinement & Reduction of Animals in Research

To support the adoption of non-aversive methods for picking up mice, we have produced an A2-sized poster for display in animal facilities and laboratories.

https://www.nc3rs.org.uk/mouse-handling-poster

Taming anxiety in laboratory mice
Nature Methods 7, 825-826 (2010)

Abstract

Routine laboratory animal handling has profound effects on their anxiety and stress responses, but little is known about the impact of handling method. We found that picking up mice by the tail induced aversion and high anxiety, whereas use of tunnels or open hand led to voluntary approach, low anxiety and acceptance of physical restraint. Using the latter methods, one can minimize a widespread source of anxiety in laboratory mice.

Points to note when introducing environmental enrichment

1.Is it suitable for the target animal?

- Does not cause sudden environmental changes
- Do not cause fighting or increase the superiority (individual difference) between individuals
- Consideration not to be monopolized by a dominant individual
- No effect on sight, hearing, smell, and touch
- Some objects (structures) may be harmful (marbles are stressful for mice)

2.Is it safe for animals and caretakers?

- Durable
- Not cause injury
- No animal health problems (digestion, allergies, etc.)

3. Is it easy to clean and disinfect?

- Easy to clean
- Sterilization and disinfection by heating and chemicals are possible

4. Will it affect research and observation?

- Does not interfere with daily observation of animals
- Does not cause changes in palatability
- No effect on drug absorption/excretion

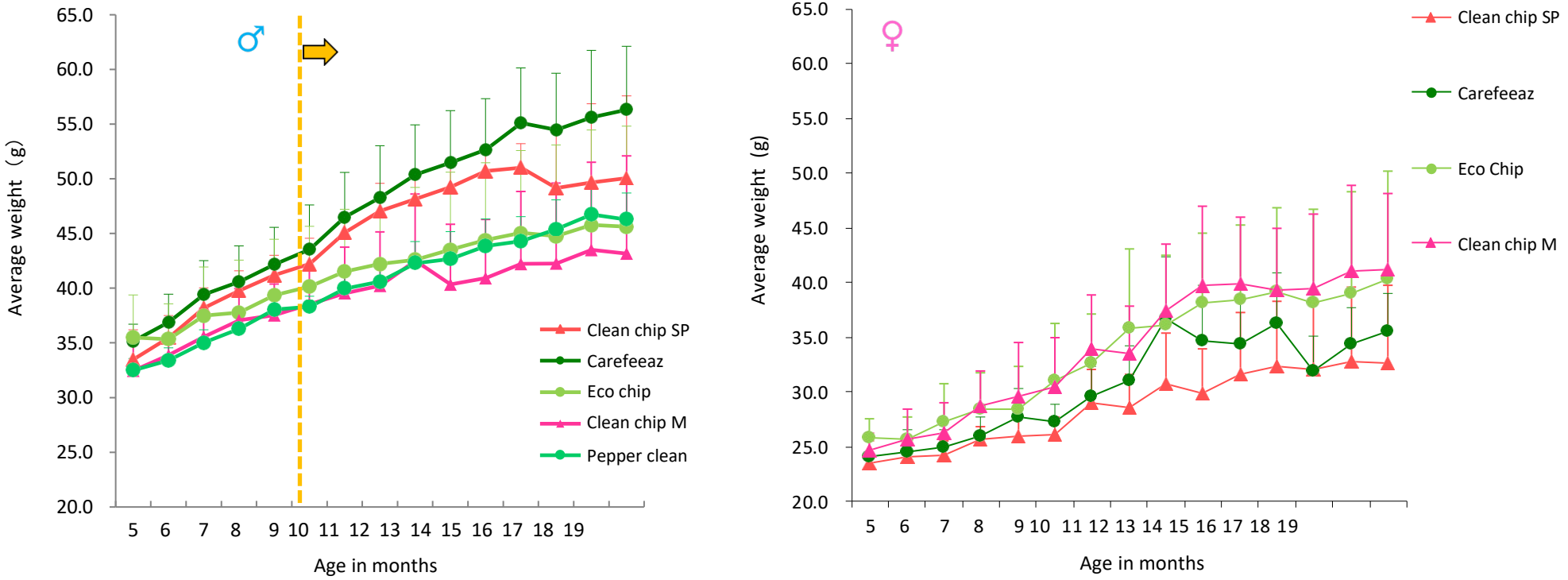
5. Is the installation method appropriate?

- Verify long-term interest (novel effects disappear rapidly), rotation
- Easiness of installation location and detachment

6. Providing animal breeding and training for animal breeders

Quoted from the Japanese Society for Laboratory Animal Science, Laboratory Animal Manager Workshop Textbook

Body weight change due to different bedding materials using B6N mice



- Different bedding types have different rates of weight gain
- Males and females have different tendencies

Be careful when bedding is the main nesting material！？

Summary

1. Experimental animals have different characteristics depending on their species and strains, so it is necessary to thoroughly consider environmental enrichment.
2. Experimental animals are subject to stress due to experimental treatments, so care should be taken for their well-being to the extent that experimental results are not affected.
3. Observe animals health every day and keep a record of your observations.