

Appendix 1: Environmental Enrichment for Rodents

Introduction:

A major objective of the NIH Intramural Research Program (IRP) Animal Care and Use Program is to promote the humane care and use of animals in biomedical research and this guidance serves as a set of best practices to help achieve the environmental enrichment for rodents. *The Guide for the Care and Use of Laboratory Animals* (NRC, 2011) hereafter referred to as the *Guide*, promotes the humane care and use of laboratory animals and strives to enhance animal well-being, the quality of research, and the advancement of scientific knowledge that is relevant to both humans and animals.

Environmental Enrichment Strategies:

For the purpose of this document, enrichment is defined as, ‘an increase in the complexity of the environment in which the animal lives, with the goal of enhancing the animal’s welfare.’ The *Guide* states that animal programs should address the behavioral, physiological, and physical needs of the species, stocks, or strains of animals held in the laboratory. In addition, AAALAC International has stated that environmental enrichment is an important method of improving the well-being of many laboratory animal species and may be accomplished by the provision of stimuli, structures, and resources that facilitate the expression of species-appropriate behaviors.

Therefore, the end goal of enrichment is to provide the animals with the option and ability to engage in species typical behaviors and promote psychological well-being through the use of structural, social, or activity-based opportunities. A successful enrichment program takes into account all aspects of a species’ natural behavior, including social organization, foraging behavior, and daily activity of the animal (Poole and Dawkins, 1999; Steward and Raje, 2001). Environmental enrichment may include housing animals in social groups; housing animals with structural or activity-based cage supplementations or both.

The table below describes the most common strategies for rodent environmental improvements and enrichment.

Table 1: Rodent Husbandry Refinements

Social Housing	Structure and Substrate
<ul style="list-style-type: none"> • Housed in compatible pairs or groups unless stated otherwise in the research protocol or for clinical health concerns • Adult males may require single housing due to aggression 	<ul style="list-style-type: none"> • Paper nest building material (i.e., Nestlets[®] for mice), virgin pulp bedding, strips of paper fibers • Plastic or paper housing structures • Escape platforms • Foraging mix/treats
Manipulanda/Toys	Refinement Handling
<ul style="list-style-type: none"> • Plastic huts • Running wheels • Hide tube • Gnawing sticks (i.e., Nylabones) 	<ul style="list-style-type: none"> • Change cages by tunnel handling or cupping • Minimize picking up mice by the base of the tail • Positive human interaction pre-study to reduce fear

Summary:

Environmental enrichment strategies for rodents have been widely adopted across the NIH IRP, the United States, and Europe (EU Council Directive, 2010/63/EU) to address the welfare of rodents used in biomedical research. Standardized strategies have been applied to a wide range of research situations with varying research goals without adverse results. All NIH animal programs should have an environmental enrichment plan for rodents used within their program and delineate the approach to be used within the program. These environmental enrichment plans should be reviewed by the Institute/Center (IC) ACUC on a regular basis.

In order to minimize the impact of research variable between facilities and programs at the NIH, it is recommended that each program adopt two environmental enrichment strategies for rodents. For example, mice could have nesting material (e.g., Nestlet® Crink-I'Nest®) and a secondary enrichment strategy from Table 1 to be incorporated into to the microenvironment. For example, rats could have a gnawing device and a secondary enrichment strategy from Table 1. Programs choosing to go above this minimum environmental enrichment must consider the introduction of additional research variables between their animals and animals housed in different facilities and programs. In addition, any deviation from the IC's enrichment policy should be approved in the Animal Study Proposal (ASP).

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