

STANDARD OPERATING PROCEDURE

ENVIRONMENTAL ENRICHMENT FOR SALAMANDERS AND NEWTS USED IN RESEARCH AND TEACHING

1.0 PURPOSE:

- 1.1 This standard operating procedure (SOP) describes the methods for environmental enrichment of salamanders and newts (*Salamandridae*) used for research and teaching purposes.
- 1.2 These methods are intended to improve the well-being of these animals by increasing species-specific behaviors and reducing maladaptive behaviors.
- 1.3 This SOP is part of the UGA Environmental Enrichment Program that fully complies with the requirements of the National Research Council, *Guide for the Care and Use of Laboratory Animal*, ed8 available at <http://grants.nih.gov/grants/olaw/Guide-for-the-Care-and-Use-of-Laboratory-Animals.pdf> and the Animal Welfare Act and Regulations: Public Law 99-198 – The Improved Standards for Laboratory Animal Act available at <http://www.nal.usda.gov/awic/legislat/awa.htm>.

2.0 STANDARDS:

2.1 Natural Behavior:

The family *Salamandridae* contains approximately 550 species of amphibians, including newts. (Blackburn and Wake, 2011) Newts are considered salamanders but all salamanders are not newts. Unique to this family of vertebrates is the ability to regenerate lost limbs, as well as other body parts. The earliest known salamanders existed some 164 million years ago. (Gao et al., 2012) All salamanders have moist skin and are usually reliant on habitats in or near water in order to burrow in moist soil. Most salamander species are aquatic early in life, some stay that way and others become terrestrial. Newts often dwell in or near water. Mole and Tiger Salamanders spend most of their lives underground, often occupying rodent, tortoise or crawfish holes in wet, soft soil. They absorb almost all of their water through their skin. All salamanders are natural climbers.

2.2 Environmental enrichment must be evaluated by taking into account the following:

- 2.2.1 The Natural Behavior and needs of salamanders (see above)
- 2.2.2 Social Enrichment – Housing of compatible co specific might offer some level of enrichment. Every effort will be made socially house social species. If social housing is not possible, animals should be housed in a manner that allows for as much tactile, auditory, visual or olfactory contact as possible. Social housing is a recognized and important part of the Environment Enrichment Program but should not be viewed as the sole means of meeting the enrichment needs of animals.
- 2.2.3 Physical Enrichment (devices, toys, etc) – Physical enrichment can be an important part of the Environmental Enrichment Program. However the selection of physical enrichment should take into account the safety of the device, its ability to stimulate and maintain the animal’s interest and its impact on the research being conducted. Physical enrichment should be carefully monitored to assess its impact of the goals of increasing natural behaviors.
- 2.2.4 Activity/Food Enrichment – Activity/food enrichment can be an important part of the Environmental Enrichment Program. However, the selection of activity/food enrichment should take into account the health of the animal, the limitations of its

confines and its impact on the research being conducted. Any activity/food enrichment should be planned in consultation with the Attending Veterinarian (AV) and the Principal Investigator (PI).

- 2.3 The enrichment program is carried out by University Research Animal Resources (URAR). Specific needs and requirements should be communicated to the Assistant Director of the Animal Resources (AR) Unit.
- 2.4 Unless specifically justified by the PI in the Animal Use Proposal (AUP), all animals will receive enrichment. It is recognized that animal enrichment can be a research variable. In caring for the psychological well-being of animals, it is important to recognize limitations and use a balanced approach in providing the best possible care and allowing for the expression of species-typical behavior within a functioning research environment.
- 2.5 Abnormal Behaviors:

The Environmental Enrichment Program is a dynamic process. Ongoing evaluation is a necessary component to meeting the goal of more species-specific natural behaviors. University Research Animal Resources (URAR) will regularly monitor all enrichment, in part, by looking for stereotypical behaviors that might indicate animal stress or maladaptation to the laboratory environment.

Abnormal behaviors in salamanders include:

- Excessive secretion of skin poisons (often a striking color)
- Anorexia
- Irregular locomotion: walking or swimming

When these behaviors are observed, URAR will evaluate the need for additional environmental enrichment. All changes to enrichment will be approved by the AV and the PI. Enrichment changes will be made for all animals on study, in order to minimize research variability, even if all of the animals are not showing the stereotypical behavior.

3.0 PROCEDURES:

- 3.1 Social Enrichment – Salamanders will be group housed if possible. Until proven otherwise in the literature, it will be assumed that salamanders are social species.
- 3.2 Physical Enrichment for Burrowing Salamanders- in order of preference
 - 3.2.1 Box filled with at least 8” of moist soil for burrowing or equivalent
 - 3.2.2 Apparatus for hiding that provides appropriate moisture (e.g. wet paper bag with moist paper towels)
 - 3.2.3 Shade or hide box with regular misting
 - 3.2.4 Increased vertical space for climbing
- 3.3 Physical Enrichment for Newts- in order of preference
 - 3.3.1 Water enrichment large enough to swim and a place for resting
 - 3.3.2 Aquatic plants for hiding
 - 3.3.3 Shelters for hiding

4.0 RECORDS:

The Animal Care Staff will log provision of enrichment daily according to their facility specific documentation records.

5.0 DEFINITIONS AND REFERENCES:

5.1 Definitions:

- 5.1.1 Animal Use Proposal (AUP): a detailed written description of the procedures involving the use of animals in a research or instructional project.
- 5.1.2 Attending Veterinarian (AV): the veterinarian responsible for the health and well-being of all laboratory animals used at the institution
- 5.1.3 Enrichment: a method of providing animals with the opportunity to behave as they do in the wild, playing, foraging, grooming, and interacting in other ways with one another.
- 5.1.4 Principal Investigator (PI): the scientist who plans and coordinates all phases of the research or instructional work and the protocol.
- 5.1.5 Standard Operating Procedure (SOP): a set of standardized instructions for dealing with routine laboratory procedures

5.2 References:

- Amphibians and Reptiles / Monitoring & Assessment*. US EPA at www.water.epa.gov/type/wetlands/assessment/herp.cfm
- Animal Welfare Act and Regulations: Public Law 99-198 – The Improved Standards for Laboratory Animal Act (<http://www.nal.usda.gov/awic/legislat/awa.htm>)
- Blackburn, D. and Wake, D. (2011) *Class Amphibia Gray: Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness*. Zootaxa
- Gao et. al (2012) *Late Jurassic salamandroid from western Liaoning China*. Proceedings of the National Academy of Sciences of the United States of America
- National Research Council, *Guide for the Care and Use of Laboratory Animals*, ed 8 available at <http://grants.nih.gov/grants/olaw/Guide-for-the-Care-and-Use-of-Laboratory-Animals.pdf>
- Weed, J. and Raber, J. (2005) *Balancing animal research with animal well-being: Establishments of goals and harmonization of approaches*. ILAR
- Young, R.J. (2003) *Environmental Enrichment for Captive Animals: UFAW Animal Welfare Series*. Blackwell Publishers