Stereotypical Behavior: A LAREF Discussion

The following discussion took place on the Laboratory Animal Refinement & Enrichment Forum [LAREF]. Ernie Davis, NIH Animal Center, Poolsville, Maryland; Natasha Down, York University, Toronto; Joseph Garner, University of California, Davis; Anna Olsson, Institute for Molecular and Cell Biology, Porto, Portugal; Emily Patterson-Kane, University of British Columbia, Vancouver; and Chris Sherwin, University of Bristol, United Kingdom, all posted contributions, which have been edited and expanded by Viktor Reinhardt, moderator of LAREF.

The discussion was initiated by the observation that animals kept in legally minimum-sized, unstructured enclosures very often exhibit stereotypical behaviors. Traditionally these repetitive movement patterns without obvious goals or functions are categorized as "abnormal".

Figure 1: Stereotypical ear-pulling in an individually caged rhesus macaque.

It was argued that a healthy animal kept in a small, barren enclosure has little choice of expressing his/her biologically inherent drive to engage in species-typical behaviors other than pacing back and forth, running in circles, somersaulting, rocking, self-biting, bar-biting, ear-pulling (*Figure 1*), hair-pulling, eye-poking, etc. There is nothing really "abnormal" except the abnormally restrictive and abnormally boring housing condition that induces the stereotyped expression of these activities. The majority of macaques kept in conventional standard cages exhibit stereotypical activities (Erwin & Deni, 1979; Lutz et al., 2003). These behavioral patterns thus become "normative" under the given circumstance (Reinhardt). In caged mice, barbering (fur and whisker trimming) is another example of a stereotypy that has become a normative behavior pattern within the context of inadequate living conditions (Anonymous).

It is the artificial environment in which stereotypies develop that is "abnormal" as it does not allow the animals to satisfy basic behavioral needs (Olsson). The label "abnormal" would be more fitting for the inadequate confinement condition rather than for the subject's unsuccessful attempt to adjust to it. We tend to project abnormality onto animals rather than onto the people who create deficient living quarters for them. It would be fair to first focus on the husbandry conditions, study the environmental factors that lead to the development of abnormal behaviors, and then correct these factors in order to prevent abnormal behaviors in the future (Reinhardt). These unsuccessful attempts of adjusting could also be described as "behavior indicative of an abnormal environment" (Patterson-Kane).

Many stereotypies are signs of frustration, with the subject being chronically thwarted from expressing basic activities such as taking a few free steps in one direction, climbing and perching, retreating to a secluded place, foraging, and interacting with another conspecific (Reinhardt). Scientific evidence suggests that animals who engage in stereotypical behavior show a disorganization of brain function (Kraemer et al., 1997; Garner & Mason, 2002) and alterations in their stress reactivity (Tiefenbacher et al., 2004). These "abnormalities" are likely to introduce uncontrolled variables into research data, thereby jeopardizing the validity of science that is done with the affected subjects. It is ironic that the unstimulating, minimum-sized housing environment that promotes the development of stereotypies is often defended with the assertion that it minimizes the number of extraneous variables that could influence research data (Reinhardt).

A temporary replacement of stereotypical behaviors with species-typical behaviors does occur with environmental enrichment, but the effect is usually only of short duration, because the subject quickly loses interest in the enrichment and is then left again with nothing to do but engage in the habitual, repetitive behavior pattern(s) (Reinhardt).

Viktor Reinhardt is with the Animal Welfare Institute, Washington, DC. Contact him at 6014 Palmer Dr., Weed, CA 96094 [e-mail: *viktorawi@siskiyou.net*].

The question was raised whether any of the 140 LAREF members can share success stories of environmental modifications that cured animals from stereotypical behaviors:

1. Feather-pecking was virtually eliminated in group-housed turkeys by providing the animals with straw, UV light and vertical visual blinds (Sherwin).
2. Hair loss, presumably resulting from hair pulling and hair eating, was successfully treated by transferring an individually caged rhesus macaque to a compatible group-housing arrangement (Down).
3. Seven individually caged rhesus macaques were cured of self-injurious biting by transferring them to compatible pair-housing arrangements (Reinhardt). Since very stressful situations can trigger self-injurious biting even in group-housed animals, transfer to pair-housing probably suppressed rather than eliminated this stereotypy (Davis).

The paucity of success stories supports the findings that neurological alterations are associated with the development of stereotypical behavior patterns which tend to be irreversible (Reinhardt).

Preventing stereotypies by rearing and housing the animals in species-appropriately enriched conditions is probably a better strategy than waiting for the development of these behavioral problems and then investing time and resources in the futile attempt to eradicate them (Garner).

References

Erwin, J., & Deni, R. (1979). Strangers in a strange land: Abnormal behavior or abnormal environments? In J. Erwin, T. Maple, & G. Mitchell (Eds.), *Captivity and Behavior* (pp. 1-28). New York: Van Nostrand Reinhold.

Garner, J. P., & Mason, G. J. (2002). Evidence for a relationship between cage stereotypies and behavioural disinhibition in laboratory rodents. *Behavioural Brain Research, 136*, 83-92.

Kraemer, G. W., Schmidt, D. E., & Ebert, M. H. (1997). The behavioral neurobiology of self-injurious behavior in rhesus monkeys: Current concepts and relations to impulsive behavior in humans. *Annals of the New York Academy of Sciences, 836*, 12-38.

Lutz, C., Well, A., & Novak, M. (2003). Stereotypic and self-injurious behavior in rhesus macaques: A survey and retrospective analysis of environment and early experience. *American Journal of Primatology, 60*, 1-15.

Tiefenbacher, S., Novak, M. A., Marinus, L. M., Chase, W. K., Miller, J. A., & Meyer, J. S. (2004). Altered hypothalamic-pituitary-adrenocortical function in rhesus monkeys (*Macaca mulatta*) with self-injurious behavior. *Psychoneuroendocrinology 29*, 501-515.