

Performance-Based Approach to Environmental Enrichment for Mice and Rats



Sonya P. Swing, DVM, PhD, DACLAM; Emily Bartlett, LVT, LATG; Veterinary Sciences, Taconic Biosciences, Inc., Germantown, NY
Wendy E. Nack-Lawlor, JD; Regulatory, Taconic Biosciences, Inc., Rensselaer, NY

ABSTRACT

An environmental enrichment policy for mice and rats should fulfill the objective of promoting animal welfare by defining the objects and/or structures to be included in the micro-environment, to encourage species-typical behaviors and engagement with their surroundings. Providing the appropriate materials to enhance the environment, rather than to create stress within the environment, is key to a successful enrichment program. While bedding and nesting material, chew blocks and similar items are typically associated with desirable enrichment for mice and rats, differences between lines suggest that the most effective forms of enrichment will vary within a species, and not only between different species. A performance-based, or Environmental Enrichment Efficacy Evaluation (4 E's), approach offers an effective means of assessing the type of enrichment best suited to support the well-being of a particular model. Environmental enrichment may be characterized as ineffective where the animals ignore it, interact with it in an unproductive manner, or where the object/structure generates or increases aggressive behaviors. By designing a study wherein a different form of enrichment is offered to each study group within a line, observations of the animals' interaction with and reaction to the object/structure in the cage allows identification of the best choice of species appropriate and line-specific enrichment. As a measure of desired performance, or efficacy, observation data is scored against performance criteria based on the targeted undesirable behavior with the most successful environmental enrichment resulting in reduced observations of the malbehavior. One example studied is reduced conspecific aggression, but other behaviors such as stereotypies and overgrooming will also be evaluated. These studies enable the most effective enrichment item to be utilized for the given line of mouse or rat, a more economical and appropriate enrichment approach.

METHODS AND MATERIALS

Two cases of conspecific aggression were used to evaluate the efficacy of different environmental enrichments. All studies are IACUC approved. The first case was aggression between BALB/c females (Figure 1) and the second was between male B6 mice with diet-induced obesity (B6DIO). Aspen chew sticks (medium, Lomir, Quebec) were introduced to the BALB/c mice (Figure 2). For the B6DIO, aspen chew sticks were evaluated as well as the Crawl Ball (Figure 3) (Bio-Serv, Frenchtown, NJ). The Crawl Ball is actually intended for use in rats but the opening size was necessary for the obese mice. Fight and bite wounds were counted and evaluated for severity for a period of 8 weeks.

RESULTS

Aggression between the BALB/c mice decreased greatly with the introduction of the chew sticks. (Figure 4). Note that some staff changes during vacation periods led to an aggression increase that dropped upon return of the routine animal technician.

The B6DIO mice did not use the chew sticks as intended; instead, they pushed them to a corner of the cage and used them as a latrine. The Crawl Ball was used by the mice but did not decrease aggression overall (Figure 5).

DISCUSSION

Our studies have shown that rodent environmental enrichment is not a “one size fits all” program. By conducting efficacy evaluation of environmental enrichment, we are able to determine what enrichment items accomplish the desired goal, in this case decreased aggression. We also learned that some enrichment provides no obvious benefit and may not be worth the expense for that item. Identifying enrichment that achieves a beneficial outcome is a core part of a strong enrichment program.



Figure 1: Typical bite marks seen in female BALB/c aggression.



Figure 2: Weanling BALB/c cage with nesting squares and chew sticks.

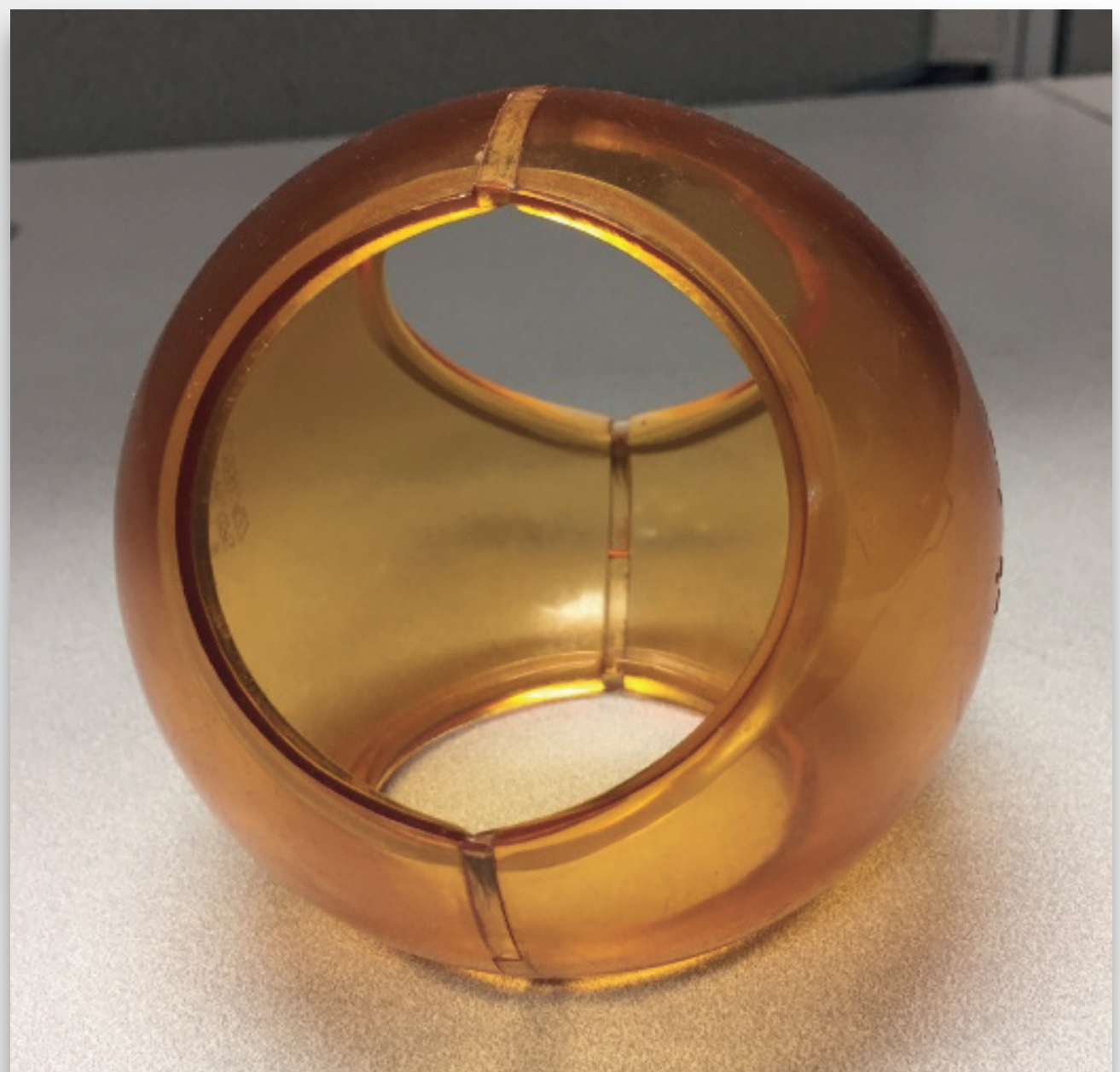


Figure 3: Bio-Serv Crawl Ball.

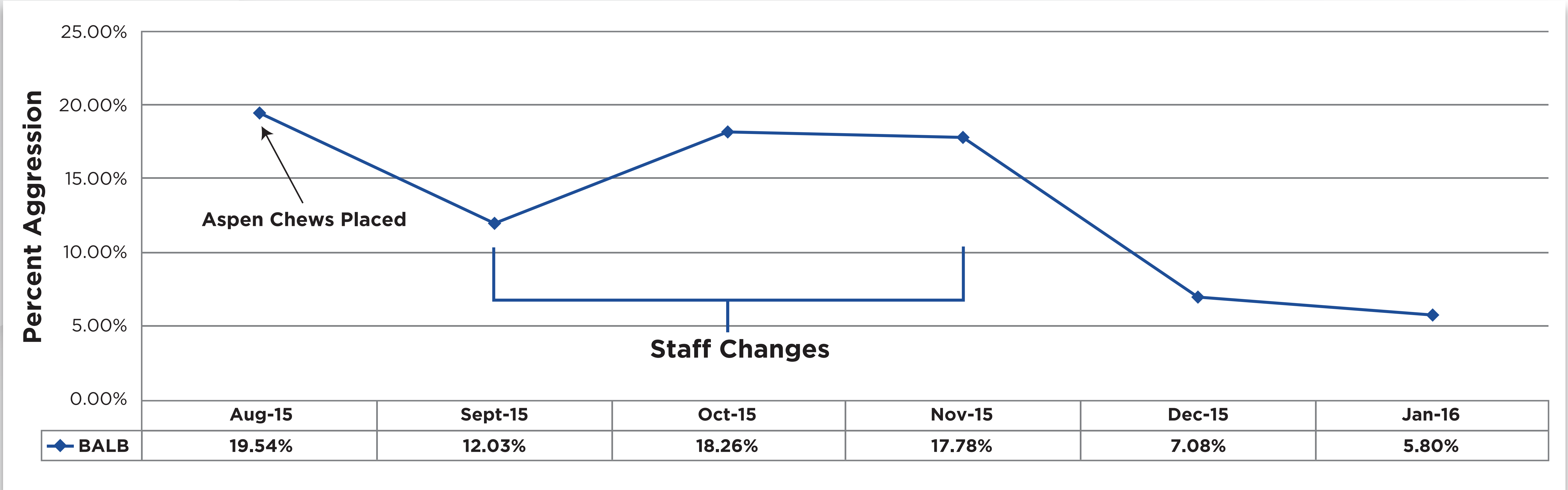


Figure 4: Reduction in BALB/c aggression seen with enrichment.

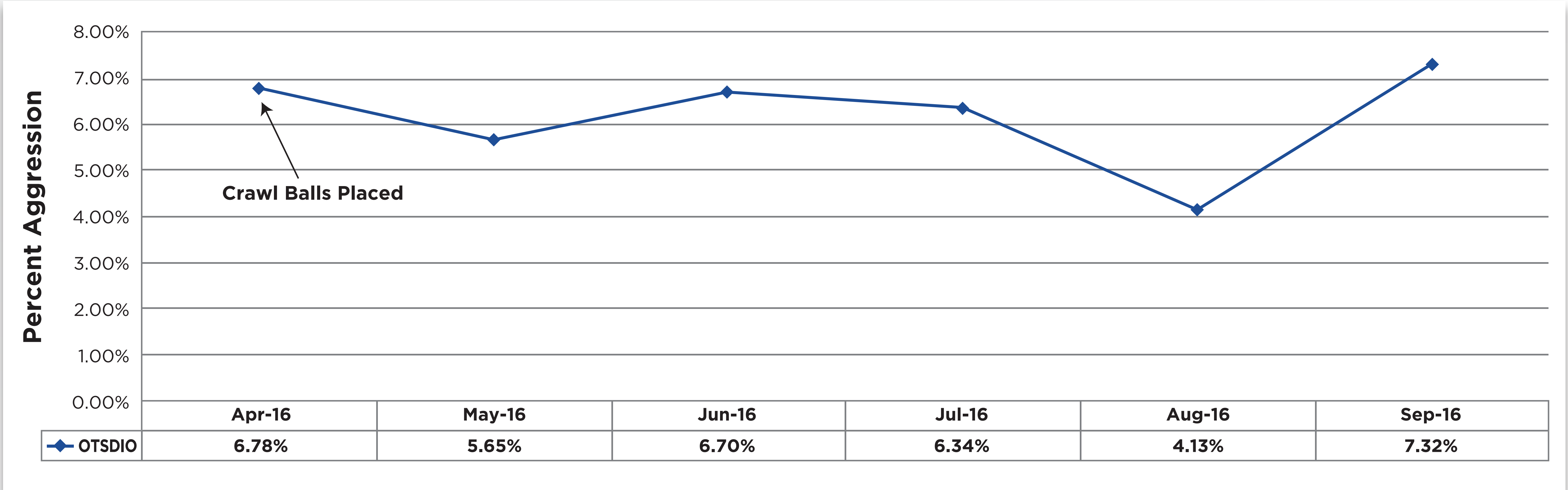


Figure 5: Aggression was not significantly reduced with use of Crawl Ball in B6DIO mice.