

## Going back to nature: the benefits of wood enrichment

*Karen M. Froberg-Fejko, VMD & Jaime L. Lecker, PhD*

Environmental enrichment can be defined as altering the living environment of captive animals in order to provide them with opportunities to express more of their natural behavioral repertoire. The challenge of providing effective enrichment in laboratory species is to ensure that it allows for normal behavioral opportunities. For many animals, these behaviors include foraging, sheltering, exploring, nest building and gnawing. In the wild, many species use wood and bark to satisfy these behaviors, thereby maintaining physiological and behavioral health. For laboratory animals, various wood enrichment products are available that will provide appropriate environmental enrichment and satisfy those same needs.

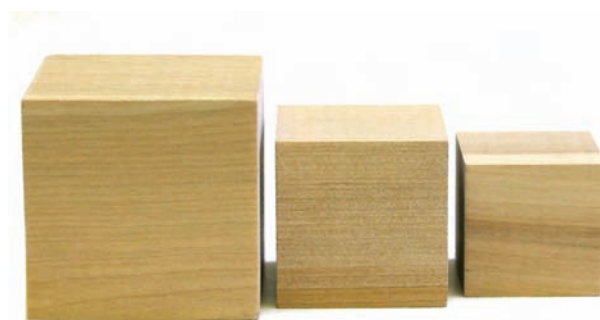
### Wood Products as Enrichment

There are two wood types: softwoods and hardwoods. The distinction between hardwood and softwood is made on the basis of the method of reproduction used by the tree from which the wood is obtained. Softwood is a generic term for wood from conifers or gymnosperms (trees and plants having seeds with no covering). Examples of softwood include pine, spruce, cedar, fir, Douglas fir, hemlock, cypress and yew. The term hardwood designates wood from broad-leaved, mostly deciduous, angiosperms (trees and plants that produce seeds with some sort of covering). Examples of hardwood include oak, maple, birch, aspen and poplar. Despite their names, hardwood is not necessarily a harder or more dense material, and softwood is not necessarily a softer or less dense material. For example, balsa wood is one of the lightest and least dense woods that exist, and it is considered a hardwood. The most important safety concern in the use of wood products as enrichment is the characteristic aroma of softwoods. This scent comes from aromatic (volatile) hydrocarbons. Studies have demonstrated that aromatic hydrocarbons induce liver microsomal enzymes, increase incidence of cancer and are toxic to cells. One of the first studies on the effects of softwood beddings on liver function, done by Vessel in 1967, found that use of softwood beddings significantly increased the production of liver microsomal enzymes<sup>2</sup>. Hardwoods are safer than softwoods, create fewer experimental variables and are used extensively in research as bedding, nesting material and forms of enrichment.

### Enrichment for Rodents and Rabbits

Many wood enrichment products are available to meet a variety of protocol requirements. For use in strict Good Laboratory Practice (GLP) and toxicology programs, Bio-Serv's certified (contaminant screened) Wood Gnawing Blocks (Fig. 1) offer clean hardwood blocks that are certified not to exceed maximum concentrations of key contaminants such as heavy metals, aflatoxins, chlorinated hydrocarbons and organophosphates. Wood Gnawing Blocks are available in three sizes to accommodate mice, rats, rabbits and guinea pigs. All of the aforementioned species have openrooted dentition, and their teeth continuously grow throughout their life. Bio-Serv's Wood Gnawing Blocks provide safe, natural gnawing enrichment, which supports excellent dental health. They are priced economically for cost-conscious budgets and can be autoclaved for use in barrier operations.

Hardwood blocks have been used as proactive enrichment to reduce atypical convalescence issues and discomfort or distress while facilitating quality care. A report by Kimberly A. Wasko, CVT, VTS, RALAT (Department of Surgery, Drexel University, College of Medicine, Philadelphia, PA) demonstrated remarkable results; 98% of animals (rats) experienced substantially decreased complications, such as weight loss, dehydration, lethargy and dull mentation, when they were provided treat enrichments and Wood Gnawing Blocks during their recovery after surgery<sup>3</sup>. Other researchers have used hardwood chunks with holes in which treats can be hidden to decrease inter-mouse aggression. The mice search for the treats and gnaw on the wood instead of fighting with their cagemates.



**Figure 1**  
Bio-Serv's Certified Wood Gnawing Blocks are available in three sizes to accommodate mice, rats, rabbits and guinea pigs.

## Products for Primates

For primates, wood enrichment products offer a way to provide variety and novelty. Wood enrichment products stimulate the expression of species-specific behaviors such as gnawing, foraging and perching and promote exploratory and play behavior. In the wild, primates spend a major portion of their day gathering and working for food. Foraging activity accounts for more than 60% of a primate's awake time, depending on the availability of food in the environment<sup>4</sup>. Furthermore, studies have shown that primates would rather work for food than have it readily available as in a standard feeder<sup>5</sup>. Promoting foraging activities in a research environment affords primates an opportunity for exercise and mental

stimulation. Searching for food and foraging treats hidden in hardwood chips or shavings will keep primates busy for hours. Another way to promote foraging and exploratory behaviors is to hide treats inside wood sticks. Bio-Serv offers a variety of hardwood saplings and splits (Fig. 2) with pre-drilled holes. These holes can be filled with pure acacia gum or with acacia gum mixed with foraging bits or flavored with Prang™ for added variety. What is acacia gum? Acacia gum is a natural product harvested from the sap of acacia trees and processed into a powder form. Water is added to acacia gum powder to obtain the desired sticky consistency. Bio-Serv offers acacia gum, PRANG™ and a wide variety of foraging treats to stimulate the palate of primates. Primates are naturally curious, and providing wood enrichment is an inexpensive, safe and long-lasting way to keep them occupied. Unlike commercial toys, hardwood branches or sticks do not lose their novelty effect over time, because they change their shape, color and texture due to wear and progressive hydration. Wood enrichment promotes several primate behaviors including gnawing, manipulating, chewing, perching and playing. Bio-Serv offers several types of hardwood sticks in oak, birch, maple and manzanita. All are available in several lengths and diameters. Custom sizes are also available upon request.



**Figure 2**

Hardwood saplings and splits are available with predrilled holes that can be filled with acacia gum to promote foraging. Manzanita wood is available in 9-in and 18-in lengths. Custom sizes are also available upon request.

## Health and Safety

Safety is the most important consideration when offering any enrichment products to an animal. Opponents of wood use have raised concerns that wood products may splinter or become a choking hazard; however, those concerns have been speculative at best. Reinhardt & Reinhardt reported that long-term use of hardwood sticks by hundreds of rhesus macaques resulted in no recognizable health hazards<sup>4</sup>. Wood is not a prohibited material, and its use as a form of enrichment is encouraged in the Guide for the Care and Use of Laboratory Animals<sup>1</sup>. As far as husbandry, using common sense with regard to the cleaning and replacement of soiled wood is a prerequisite when considering the addition of wood products to an enrichment program.

1. Institute for Laboratory Animal Research. Guide for the Care and Use of Laboratory Animals 8th edn. (National Academies Press, Washington, DC, 2011).
2. Vessel, E.S. Induction of drug-metabolizing enzymes in liver microsomes of mice and rats by softwood bedding. *Science* 157, 1057–1058 (1967).
3. Wasko, K.A. Enrichment adventures: Taking the initiative—creating a program that works. *The Enrichment Record* 3 (April 2010).
4. Reinhardt, V. & Reinhardt, A. Environmental Enrichment for Nonhuman Primates Kept in Research Laboratories: A Photographic Documentation and Literature Review 3rd edn. (Animal Welfare Institute, Washington, DC, 2008).
5. Lutz, C.K. & Novak, M.A. Environmental enrichment for nonhuman primates: theory and application. *ILAR J.* 46, 178–192 (2005).

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Toll Free: 800-996-9908 U.S. & Canada • Phone: 908-996-2155

Email: [sales@bio-serv.com](mailto:sales@bio-serv.com)

[www.bio-serv.com](http://www.bio-serv.com)