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# Give a rat a bone: satisfying rodents' need to gnaw

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Gnawing is an important natural behavior for rodents. Rodents' teeth grow continuously throughout their lives, and gnawing maintains their dental health. In keeping with recommendations of the *Guide for the Care and Use of Laboratory Animals*<sup>1</sup>, rodents should be provided with enrichment items that encourage gnawing as a natural behavior. Bio-Serv offers two different types of chewable bone-shaped enrichment items for lab rats and mice that are safe and economical.

## Rodent dentition

Rodents have open-rooted dentition, meaning that their teeth grow continuously throughout their lives. The incisors, which are specialized for gnawing, continue to grow and curve. It was observed in rats that incisors allowed to grow without restraint would form a spiral with an angle of 86° (ref. 2). The incisors have hard enamel only on the front surface, with soft dentin in the back, and so they wear down at an angle, with the soft dentin wearing off before the enamel does. This guarantees a sharp, bevel-shaped cutting edge.

Rodents, and rats in particular, can gnaw powerfully, because of the attachment points of the masseter muscles. Their anatomic position enables them to move the lower jaw up and down and far forward. The masseter muscles pass through the eye sockets and insert behind the eyes. During gnawing, the rapid movement of the masseter muscles moves the eyeballs move up and down, a phenomenon called eye boggling.

## Gnawing behavior in rodents

Gnawing is an important natural behavior by which rodents maintain their dental health and prevent the development of malocclusion. In a rodent with malocclusion, the teeth are not aligned properly, and natural grinding cannot take place. Gnawing and bruxing (or soft, repetitive grinding of the incisors against each other) help keep the incisors sharp and trimmed. If they are not trimmed, they can cause trauma to the soft palate, infection and abscesses, which in turn will eventually lead to starvation.

## Encouraging gnawing behavior in lab rodents

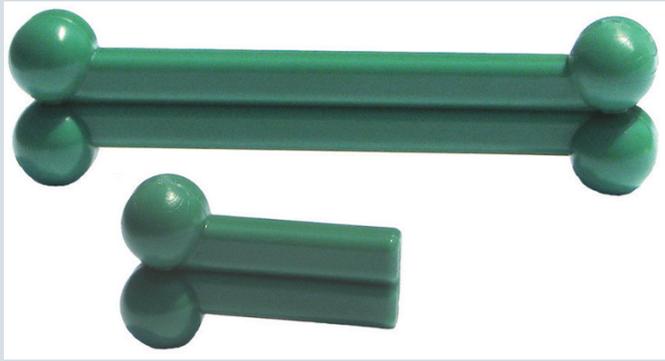
In the wild, rodents gnaw on sticks and bark. In the laboratory, the *Guide for the Care and Use of Laboratory Animals* suggests providing rodents with beneficial chewing enrichment such as wood chewing sticks<sup>1</sup>. Some people are concerned that rodents might ingest such material, resulting in an intestinal obstruction, but those fears are unfounded as rodents actually grind the material into bits, swallowing very little if any of it. It is possible that tiny



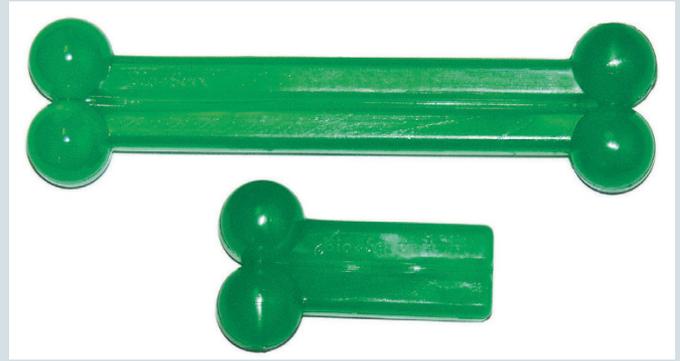
pieces of the material could be ingested, however, so it is important to provide laboratory rodents with safe gnawing materials.

Various studies have confirmed the safety of nylon gnawing materials for lab rodents. In 1993, a 13-week study evaluated whether the introduction of a nylon bone-shaped chew toy would impact body weight, food consumption or clinical laboratory values or would induce intestinal lesions or blockages in rats and mice. The results of that study demonstrated that a nylon bone was manipulated (chewed) by the rodents without causing any negative effects on body weight, food consumption or clinical parameters or any intestinal lesions. The scientist who carried out that study noted that the nylon bone proved to be durable, nontoxic, easily sanitized and inexpensive<sup>3</sup>. In 1998, a 90-day feeding study was conducted in Sprague Dawley rats to assess the potential for adverse toxicological effects associated with the use of a nylon bone. Control animals ( $n = 10$  of each sex) received powdered untreated rodent chow only, and the test animals ( $n = 10$  of each sex) received the powdered chow and a nylon bone. The authors of the

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**FIGURE 1** | Bio-Serv Nylon Bones provide gnawing enrichment for rats.



**FIGURE 2** | Bio-Serv Gummy Bones are made of polyurethane and are appropriate enrichment for mice.

study conducted detailed cageside observations and noted that the nylon bones were utilized (chewed) and provided a suitable gnawing medium for the rats. There were no statistically significant differences noted in body weight, food consumption or organ weight of test rats compared with the controls. No gross or microscopic lesions were attributed to the use of the nylon bone<sup>4</sup>.

#### Dental toys satisfy the gnawing needs of rodents

Bio-Serv offers a variety of safe dental toys including our own Bio-Serv Bones that satisfy the gnawing needs of both rats and mice.

Bio-Serv Nylon Bones (Fig. 1) and Bio-Serv Gummy Bones (Fig. 2) are certified (contaminant screened) so they can be used in Good Laboratory Practice (GLP) and toxicology studies as well as traditional studies without the concern of introducing unwanted chemical variables. The Bio-Serv Nylon Bone is molded from 100% virgin nylon, unlike other nylon bones that are made of bits of nylon material that is annealed together to form the bone shape. The Bio-Serv Nylon Bone is a very hard, dense chew toy that works well for rats. The Bio-Serv Nylon bone is cagewasher-safe and autoclavable. The Bio-Serv Gummy Bone is made of 100% virgin polyurethane and is slightly more pliable than nylon and is most appropriate for mice. The Bio-Serv Gummy Bone is also cagewasher-safe.

Bio-Serv Nylon Bones and Gummy Bones are made in a bright green color and are highly visible in animal bedding. A natural colored bone might be difficult to see in bedding and accidentally be discarded as a result. This could be problematic if the bone were inadvertently placed into an automatic disposal system. The bright green color of our Bio-Serv Nylon Bones and Gummy Bones reduces this likelihood of such a mishap. The green color is harmless to the animals and complies with federally stipulated requirements for food contact.

Bio-Serv Nylon Bones and Gummy Bones are more economical than similar chew toys from other manufacturers. A box of 50

Bio-Serv Nylon Bones costs several dollars less than a box of 50 Nylabones of the same size. Bio-Serv Nylon Bones and Gummy Bones are also available in half sizes, packaged 100 pieces per box, to maximize savings.

Bio-Serv is constantly striving to develop cutting-edge, scientifically based enrichment options, which promote good animal welfare at a reasonable cost. Bio-Serv Nylon Bones and Bio-Serv Gummy Bones are keen examples of our goal.

#### Company profile

With over 44 years of experience, Bio-Serv can assist customers in achieving their environmental enrichment and treatment goals. Our well-trained professional staff including a PhD nutritionist and a veterinarian is available full-time and is prepared to help our customers with their specific needs. For more information on Bio-Serv's Nylon Bones or Gummy Bones, please call us at 800-996-9908 (US and Canada) or visit our website at <http://www.bio-serv.com>.

1. Institute for Laboratory Animal Research. *Guide for the Care and Use of Laboratory Animals* 8th edn. (National Academies Press, Washington, DC, 2011).
2. Herzberg, F. & Schour, I. The pattern of appositional growth in the incisor of the rat. *Anat. Rec.* **80**, 497–506 (1941).
3. Watson, D. Evaluation of inanimate objects on commonly monitored variables in preclinical safety studies for mice and rats. *Lab Anim. Sci.* **43**, 378–380 (1993).
4. FMC Toxicology Laboratory, Chemical Research and Development Center. *90-Day Feeding Study in Rats with Untreated Rodent Chow and Nylabones* (FMC Corporation, Princeton, NJ, 1998).

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