



**FIGURE 1.** A variety of toys. Clockwise from upper right: Gumadisc; Flying disc; Nylabone frisbee; plastic chain; Nylabone; knobby dummies.

# ENVIRONMENTAL ENRICHMENT

By Anne Marie DeLuca, BS, and Karen C. Kranda, RN

**T**HE UNITED STATES DEPARTMENT of Agriculture's (USDA) Animal Welfare Standards<sup>1</sup> now require exercise and socialization programs for dogs. To date, we have not been able to find any citations of environmental enrichment designed specially for dogs. Voit *et al.*<sup>2</sup> have published extensive information concerning companion animal behavioral problems; since the community has largely neglected *research* animal behavior, we devised an environmental enrichment program to improve the well-being of our research dogs, cats, and pigs.

Since a great number of our animals were involved in long-term protocols (2-6 years), we tried to maintain them in a pleasant environment. We achieved that goal by encouraging the animals to become extremely comfort-

able with human companionship and by giving them toys to keep them occupied during the long stretches, evenings, and nights when humans were not present. We introduced a variety of play-things into the kennels of our dogs (1-12 year old NIH-bred or purpose-bred beagles and hounds), cats (random-source, USDA-approved vendors), and miniature pigs (NIH-bred).

We are presenting this as a subjective study since we had difficulty assessing the animals' interest in the play-toys—we had to observe the animals from a distance or while hidden, and then inspect toys after the animals finished their play. Due to the kennel structure at our facility, we found it best to watch outside kennels from a point 30 feet away through the windows of the inside kennels of the adjacent wing. We observed dogs and pigs in inside portions of the facility by peeking over the four-foot solid wall of an adjoining kennel. We were unable to make undetected observations of the cats.

## Dogs

Our colony has an average daily census of 148 animals, including 54 dogs involved in studies of two-year or longer duration. These are healthy, group-housed animals that are involved in NIH-approved protocols for the duration of their lives. Since all the dogs are purpose-

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FIGURE 2. A hound playing with a Gumabone tug.

# IN A LARGE ANIMAL FACILITY

bred, we assumed that they had no prior experience with toys.

We introduced a novel toy into each kennel once a week, and proceeded to monitor its condition for one week on a daily basis. Since the dogs had free access to the outdoors, we also tracked each toy's movement. After one week, we replaced each toy with another. We observed the animals in the morning and late afternoon for six months. During that time, we introduced the dogs to a great variety of play-things (Table 1) to discern which toys elicited the most interest.

Most dogs initially expressed curiosity in each toy: they sniffed, batted, and, in the case of a realistic duck decoy, barked at it. Such attention lasted only a few minutes, since the dogs were invariably more interested in their human observer. In general, we found the hounds and beagles were equally receptive to the toys. Some of the dogs played with any toy, while others ignored everything, and still others had a favorite. All of the dogs preferred toys that they could chew. The beagles also enjoyed noisy toys.

All of the dogs ignored the *Almost Indestructible* (10 in. polypropylene) Ball (Canine Capers, Easley, OH). When out of the kennel, several dogs played with Nylaballs (Nylabone Products, Neptune, NJ).

TABLE 1. Number of animals, species-wide, that showed interest in various toys. Key: 0 = none, 1 = 25%, 2 = 50%, 3 = the majority of the animals. We define interest as the amount of toy destruction and/or movement that we noted in daily observations.

TOYS	BEAGLES	HOUNDS	CATS	PIGS
Apples				3
Balls	1	1	3	3
Catnip			3	
Golf			3	
Nylaball		1		
Punch			3	
Squish			1	
Bones		2	2	
Bottles		3	3	
Cat-a-Comb				3
Cat Track				2
Chains	3	2	2	3
Ducks		3	3	
Dumbbells		2	2	
Dummies			0	3
Frisbees (Nylabone)		0	2	
Frisbees (Gumadisc)		2	3	
Kongs	0	0	0	2
Plaque Attackers		2		
Purrsuit			3	
Rawhide		3	3	
Basted	3	3		
Pressed		3	3	
Salamis		3	3	
Tug				
Cotton	0	0	0	3
Gumabone	0	3		
Vinyl		3	2	

Empty plastic bottles (500, 1000, and 1500 ml) were a great favorite of the majority of the dogs; chewed plastic pieces, however, clogged the outside drains and forced us to stop using the bottles. Some dogs enjoyed ham-flavored Souper and Giant Nylabones (Fig. 1—Nylabone Products, Neptune, NJ), but these also clogged drains. We gave Gumabone Plaque Attackers (Nylabone Products, Neptune, NJ) to dogs that tended to destroy toys quickly, and these lasted several weeks. The dogs devoured ham-flavored frisbees (Gumadisc Flying Disc, Nylabone Products, Neptune, NJ [Fig. 1]) very quickly, and they chewed and usually kicked ham-scented Nylabone frisbees out of the kennel and into the interior hallway. Most of the beagles chewed and carried German solid vinyl dumb-bells (8 in.—Ethical Inc., Newark, NJ) with ease. Seventy-five percent of the hounds chewed knobby dummies (2 in. x 2 in. or 10 in. x 3 in. polypropylene with a rough surface—Dekalb Plastics, Chicago, IL [Fig. 1]) down to an inch or two within a week; the other hounds and the beagles ignored these toys.

Whereas the hounds happily chewed up ham-flavored Gumabone tugs (12¾ in.—Nylabone Products, Neptune, NJ [Fig. 2]) in two or three days, the beagles completely ignored these toys and concentrated on the German solid vinyl (11 1/4 in.) tug (Ethical Inc., Newark, NJ). When we hung 20 in. lengths of red-link plastic chain (Fig. 1) from the kennel wall, we found that the majority of the hounds ignored them, but several pulled the chains down and chewed them to destruction. We removed the chains from the hounds' kennels and gave them to the beagles; in contrast to the hounds, the beagles chewed them and dragged loose chains in and out of the kennels. We then attached 36 in. 100% cotton, washable Fiber Tugs (Booda, Gardena, CA) in the hounds' kennels and found no evidence of destruction or soiling.

Since beagles and hounds are hunting dogs, we decided to give them toy ducks. The hounds got Dead Duck Trainer decoys (soft propylene weighted and colored for realism—Dekalb Plastics, Chicago, IL [Fig. 3]) which they almost always picked up immediately and carried outside. By evening, the hounds had chewed off the decoys' beaks and heads—they rendered the decoys wingless and tailless by the end of the week. We gave the beagles 9 in. orange vinyl ducks (Heuter Toledo Inc., Bellevue, OH—Fig. 4) with recessed squeakers. These were great favorites, and the beagles chewed off the beaks at once—after several days, the vinyl ducks were missing heads and tails. Since this population of dogs were not trained to hunt, the fact that they tended to chew the appendages rather than the bodies of the duck decoys probably indicated a preference for chewing rather than



FIGURE 3. Typical destruction of realistic Dead Duck Trainer Decoys.

prior conditioning to attack.

Rawhide bones (12 in. pressed, 9 & 18 in. knotted [Fig. 5] or 14 in. pressed tugs—Items, Inc., St. Louis, MO) were favorites of all the dogs. They chewed beef-basted (Harpers, Chicago, IL) or pressed rawhide overnight. Our geriatric dogs ignored everything except beef-basted pressed rawhide salamis (Europet E-3658—Europet, Inc., Highland Park, IL [Fig. 6]), which they ate immediately. Normally, it took one to two weeks for a hound to devour an 18 in. white rawhide bone (Items, Inc., St. Louis, MO). The beagles ate 9 in. rawhide bones in the same length of time.

To date, we have not observed any gastrointestinal upsets, and since we began this program we have not found pieces of the toys in the stomach or bowels of any of the dogs during necropsy.

## Cats

The majority of our research cats lived in a free-roaming room, and spent most of the day sitting on a window perch, watching the activity in the hallway. Two of the 8-12 cats living in this room were part of a long-term protocol. The cats' favorite toys—like the 12 in. giant sheepskin mice (Petraport, Anaheim, CA)—contained catnip. We hung fresh catnip in stockinette bags which the cats quickly pulled down and ultimately batted into the water bowls. We gave them catnip-treated punchball toys (Petraport, Anaheim, CA—Fig. 7)—2 in. puffs mounted by a spring to a 6 in. x 6 in. base. The cats always played with these toys, and they lasted longer than the catnip bags. The cats also had "Mr. Spats' Cat-a-combs" groomer (Tarel Seven Designs, Secaucus, NJ) mounted on the walls. They usually knocked these off the wall and used them as play-things (they managed to open the compartment and dig out the catnip) rather than as grooming tools. Most of the cats spent time playing "Purrsuit"

**FIGURE 4.** Destruction of orange vinyl ducks.

(Tarel Seven Designs, Secaucus, NJ)—every morning, we placed toys inside a maze and the cats chased them and tried, with a great deal of success, to get the smaller ones out.

The cats had a preference for balls or bells with catnip in them, and for golf balls. They ignored the Squish balls (Ethical Inc., Newark, NJ). The cats also spent time playing with the Cat-Track (Dorskocil, Arlington, TX)—

**FIGURE 5.** An 18 in. knotted rawhide bone, before and after the animals played with it for a couple of days.

a light-weight ball trapped in a circular track. They could see the ball and could bat at it, but not dislodge it. They also like to bat at the chains that hung from the sleeping perches.

Since the free-roaming cats preferred to sleep in their litter pans than on the polyvinyl-coated perches, we placed "Sheepskin" Cuddlers and Orthopedic Pet Beds (Fleximat, Chicago, IL) in the room. After these wash-



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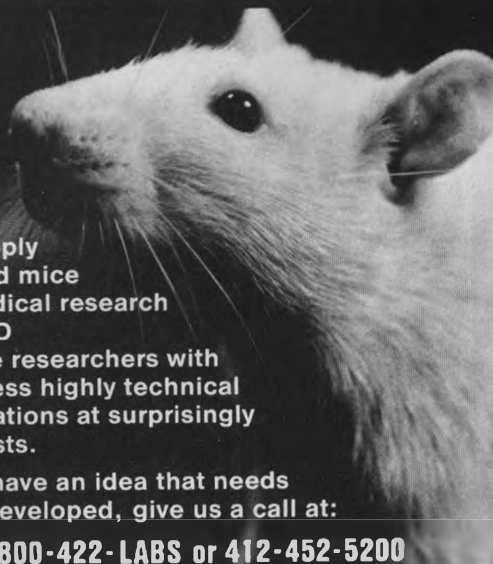
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**FIGURE 6.** A hound demolishing a Europet Salami, minutes after receiving it.



**FIGURE 7.** A free-roaming cat with a toy mouse and Squish ball. Note the catnip-treated punch-ball toy on the orthopedic sheepskin bed.

able beds became available, the cats rarely slept in the pans. We implemented a regular wash schedule.

Cats in single cages often expressed physiological signs of boredom like psychogenic alopecia and polyphagia with resultant obesity<sup>3,4</sup>. Although we gave these cats a variety of playthings, the problems continued. We then introduced compatible cagemates, and thus alleviated the cats' boredom. The cats tended to spend the same amount of time sleeping each day, but spent less time

eating and more time grooming and playing with the cagemate when awake.

Our facility met the cage requirements of the NIH *Guide for the Care and Use of Animals*<sup>5</sup>.

### Pigs

We observed a constantly changing population of miniature pigs, with an average census of 15. The miniature pigs had a preference for large (8 in. diameter)

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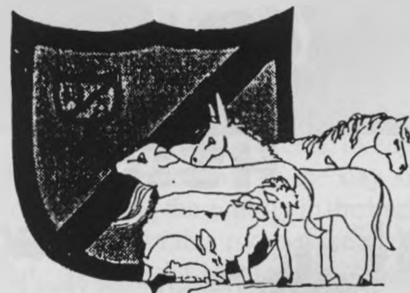
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**FIGURE 8.** A pig sniffing at the scented apple.

red scented apples (Stall Mates—Eisers, Hazleton, PA [Fig. 8]), and wall-hung objects like chain and washable cotton tugs (Fig. 9). If nothing else was available, they played with Kong toys (Kong Co., Lakewood, CO) and the *Almost* Indestructible Balls. We washed cotton items regularly and returned them to the animals, or discarded them and supplied the pigs with replacement.

### Conclusions

All of the species that we observed appeared to prefer



**FIGURE 9.** A pig chewing on a cotton tug. Note the chain hanging in the background.

chewable toys. The beagles and pigs also spent a great deal of time playing with noisy toys—chains, for example.

In addition to the toys, we gave all the animals treats frequently. We gave each of the dogs a Purina BONZ Dog Snack each morning when they came to the front of the kennel for their morning check. We gave them a special treat—canned meat—when they were subject to having blood drawn, or other procedures. The cats received canned food as a special treat, as well. The pigs enjoyed

# Guinea Pigs

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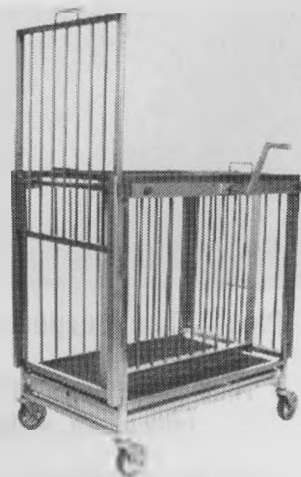
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canned dog food, grapes, apples, and bananas.

We want to stress that toys can help alleviate research animal boredom, but are not replacements for human companionship. All of the animals in our facility are used to and enjoy human contact, to the extent that we were often unable to make undetected observations of our subjects. The animals would frequently stop playing with their toys when they realized a human observer was present, forcing us to study them from afar.

All the animal species we observed demonstrated a clear preference—obvious when any person entered the kennel—for human contact over toys. The dogs that were outdoors would always come in and remain at the kennel doors until the person left the kennel. The cats stopped whatever they were doing when a person entered the room, rubbed against the person's legs, and demanded attention.

We feel that any future attempts to observe research animals playing with toys should incorporate video cameras and direct observations. This will provide a more accurate assessment of the playing.

We also recommend that other facilities make constant efforts to include human contact in research animals' daily lives.

**Authors' Note:** All of the toys that we mention here are available from R.C. Steele, Brockport, NY 14420, except for the Stall Mate Apples which we bought from the Poole General Store, Poolesville, MD 20837.

### Acknowledgments

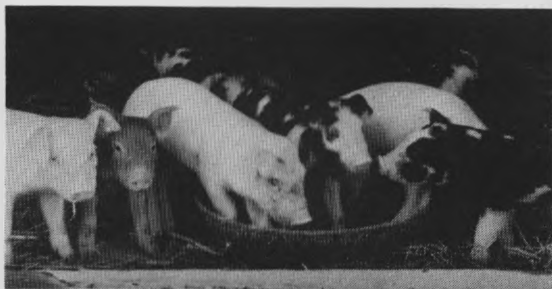
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