

THE Enrichment RECORD



Fall, 2009

Global Research Education and Training, LLC • 57 S. Main Street, Neptune, NJ 07753-5032 Email: mackta@gr8tt.com • Web: www.gr8tt.com

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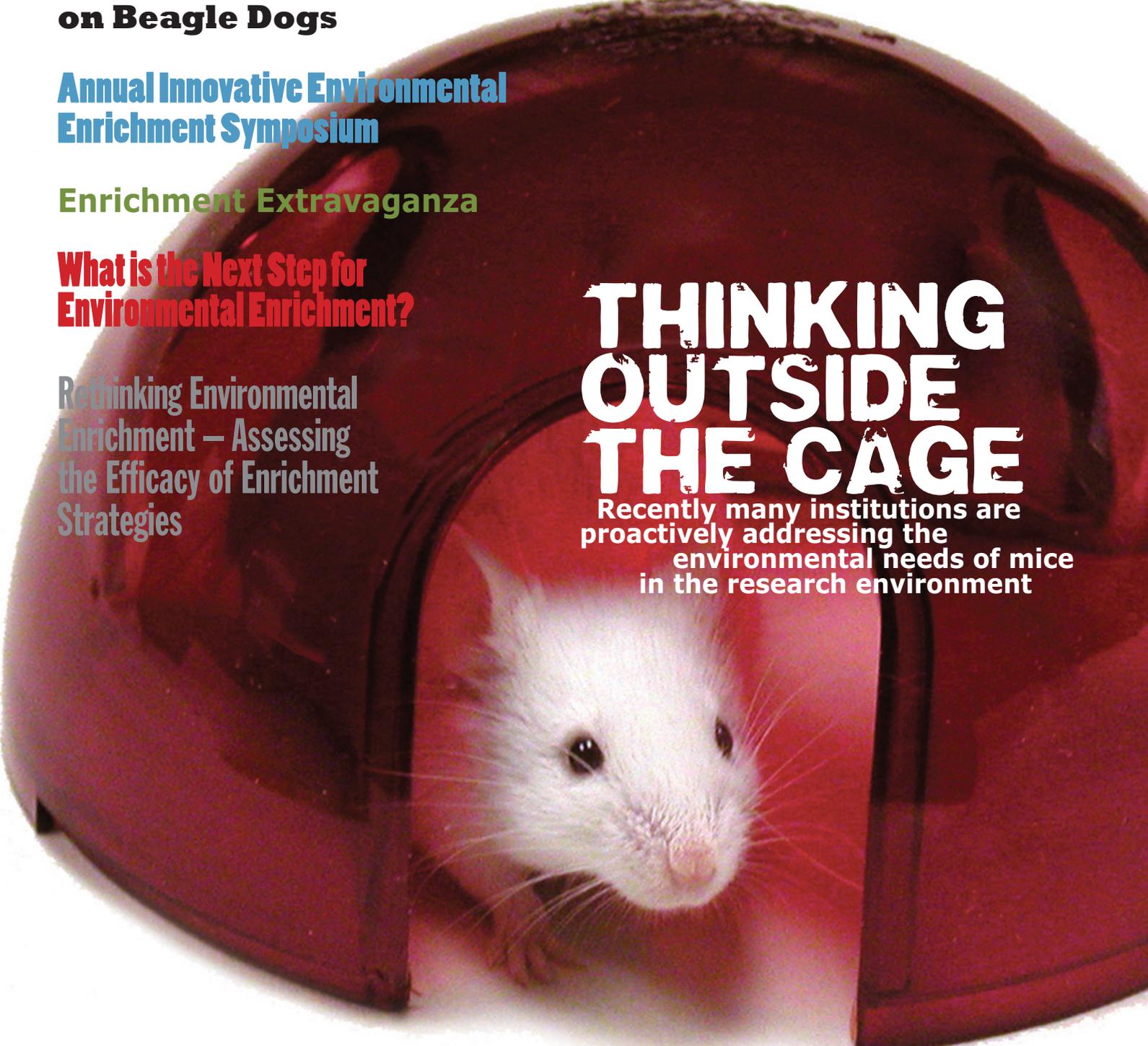
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THINKING OUTSIDE THE CAGE

Recently many institutions are proactively addressing the environmental needs of mice in the research environment

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Discussing environmental
enrichment in the optimal care
of laboratory animals

**Documenting best practices and
approaches for addressing
challenges of implementation
& assessment at every level.**

**Sharing data on the impact
of environmental enrichment
on the science**

**Building the case for integrating
enrichment into research design**

In Other Words

Welcome to the first issue of *The Enrichment Record*. A group of passionate enrichment advocates from academia and industry are the spark for this effort to ignite and excite the laboratory animal community from top to bottom. Lots of people talk about environmental enrichment. We want to document what people are doing to foster lab environments that foster species-typical behaviors.

Since environmental enrichment means different things to different folks, especially when it comes to managing budgets, we want to share successful strategies for implementing programs that advance the actual welfare of the animals in our care. Obviously, there is a rich variety of factors to consider. We are counting on you, our readers, to keep the discussions relevant and reasonable. From your perspective, what is possible? What is practical? Since we will be talking about animal well-being, don't forget personnel issues. Stress in the workplace can affect non-human animals...and ultimately the science.

Our agenda is to engage the lab animal community in an informed discussion about all aspects of environmental enrichment for laboratory animals. We welcome input and insights from anyone who cares about advancing lab animal welfare and has experience to share.

Please be advised that *The Enrichment Record* is a reader-friendly, easily accessible online publication. Content is not peer-reviewed and does not necessarily represent the views of the publisher. Consider *The Record* to be your forum. We want to hear from you if you have a formal environmental enrichment program... an environmental enrichment committee...enrichment SOPs...assessment strategies... species-specific training focusing on enrichment, and great ideas that have worked or have not!

Help us to involve a broad audience: administrators, attending veterinarians, veterinary technicians, animal caretakers, animal behaviorists, and of course, principal investigators.

Together we can move enrichment onto the agenda of every animal researcher. In other words, improved animal care translates into better science, and we all benefit.

Jayne Mackta

Jayne Mackta, Publisher
President & CEO, Global Research Education & Training, LLC (GR8)

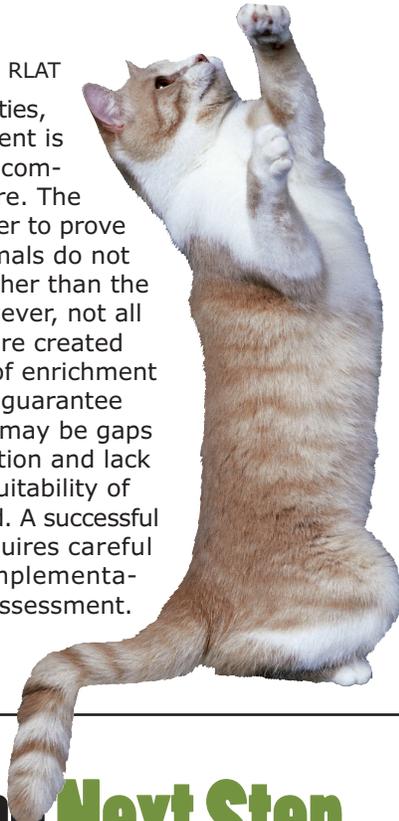




RETHINKING ENVIRONMENTAL ENRICHMENT – ASSESSING THE EFFICACY OF ENRICHMENT STRATEGIES

By JENNIFER DEEKS, RVT, RLAT

In today's research facilities, environmental enrichment is considered to be a key component to animal welfare. The onus is on the researcher to prove that their research animals do not require enrichment, rather than the other way around. However, not all enrichment programs are created equally. The provision of enrichment does not automatically guarantee animal welfare². There may be gaps in uniformity of application and lack of information on the suitability of the enrichment provided. A successful enrichment program requires careful planning, controlled implementation and frequent re-assessment.



PLANNING

The planning process should begin by identifying goals. Some general examples of goals might be to:

- Increase behavioural diversity
- Reduce the frequencies of abnormal behaviours
- Increase the range or number of normal behaviour patterns
- Increase positive utilization of the environment
- Increase the ability to cope with challenges in a more normal way³

Goals need to be species-specific. Clearly, a rodent has different requirements than a reptile. Begin by identifying behaviours and classifying them as normal or abnormal. Determine which behaviours are worth encouraging. (See appendix 1 for some examples of species-specific behaviours). It may have already been anecdotally noted that there are abnormal behaviours exhibited within a colony, such as mice that are barbering, or primates that are engaging in self mutilation.

The extent of the behaviour requires quantification so that the success of any technique may be evaluated. It is important to

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What is the Next Step for Environmental Enrichment?

Emily Patterson-Kane

Great advances have been made in determining how to effectively enrich an animal's environment. It is time for environmental enrichment to mature, beyond the initial period of exploration and into universal, mainstream application.

Currently, enrichment programs vary greatly in their development and influence within institutions. And although further research is called for, the main reason for stalled and sporadic progress—and even slide backs—is not lack of information, but lack of motivation.

Let me be clear, I do not mean motivation amongst those whose primary duty is the care of animals—but motivation on the part of those with the ultimate power over resourcing and institutional priorities.

Environmental enrichment is most important to the animal, but it is most *influenced* by the larger community of people responsible for that animal, most of whom will never even set eyes on it. We have reached a point where the easy gains (and some of the hard ones) have been made, but a change of tack may be needed.

It is time not only to take the enrichment message to those people, but to tailor it so that that enrichment is both rationally and emotionally appealing to those able to give more to it—more time, more positions, more training, more equipment, and more importance within the organization. In the current climate, to care for an animal requires an adept understanding of the human culture surrounding that animal's use.

This aspect of our work ranges from the large to the small, but the goal is always to advocate for the animal in an empathetic and emotionally positive way. And in this case I do not mean empathizing with the animal, but with all of the people who have direct and indirect power over that animal's quality of life.

It is easy to get frustrated and stuck in rut, but it is part of our job to forge a relationship between these

continued on page 3

continued from page 2

people and the animals, by any means possible such as personalized birthday cards from the rats to the staff, taking lunch with people from throughout your organization, job swap days, animal webcams, and soliciting enrichment items directly from staff.

And, when you get enrichment, please let others see it inside and outside your institution, because this gives those who helped you a feeling of pride—and those who have yet to achieve the same gains a feeling of hope and a positive example to help make their own case for improvement.

It is also important to develop an accurate and emotionally positive understanding of the core duties of others in your institution. Try to have at least some husbandry staff involved in important groups such as IACUCs, hiring and other committees, budgeting and branding initiatives. The more husbandry staff are seen as contributing to what others find important, the more these people will really try and understand what you want and help you get it. And there are also plenty of opportunities to advance the enrichment program by embedding it in protocols, vision statements, job descriptions, advertising and budget line items—and to expand and enhance the professional role of husbandry staff as animal experts.

Anyone who has trained an animal has learned that when you are frustrated by lack of progress, there is little point blaming the animals. The same is true for the human animals whom we need to engage in the enrichment process. If we form a positive relationship with them, we can, gently but persistently, get them to respond in the way we want.

And if you need to refresh your own motivation and enthusiasm, and come up with some new plans for getting this job done, then get together with your peers at work, at meetings, online, and in newsletters like this one. It is time for enrichment to find its second wind—the animals are depending on us.

(Based upon the presentation "Cherchez the Enrichment? Models for achieving implementation of effective enrichment. How it happens; why it doesn't". New Jersey Association for Biomedical Research & Merck & Co., Inc Second Annual Enrichment Extravaganza: Friday, April 17, 2009)

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Making Optimal Use of Scarce Resources

G. Scott Lett, Ph.D.

It is exciting to be part of the launch of this web adventure.

Like researcher time and funding dollars, animals used in biomedical research are a precious resource; it behooves us to use the best tools available through every study. Further, integrating quality animal care can improve research and funding success; not just create a regulatory hurdle. It makes sense that good animal care leads to better research results, but how do we measure this impact? I expect future articles to highlight thought and practice leaders and the metrics they use to measure success.

As a data analyst and software toolbuilder, I am always enthused to learn more about tools and techniques laboratories are using to optimize their use of animals. One of my favorite resources is the United States Department of Agriculture (USDA) Animal Welfare Information Center site (<http://tinyurl.com/usdaalt>). They provide a wealth of educational material about animal welfare, and the USDA website provides tools for performing a literature search for alternatives. I just love tools, especially if they contribute to successful proposals and research projects!

One interesting alternative to animal testing is to use computational tools and techniques. A useful website devoted to this approach is the Swiss The Biographics Laboratory 3R (<http://www.biograf.ch/index.php?id=home>). I hope to write more in the future about this and other related efforts. Meanwhile, I invite readers to let us know about similar topics they would find interesting.

It is a great time to write about these topics. With today's advancements in computerized records, data management and analytical systems, the research community is poised to make probably the greatest strides in this area since the 1950s when Russell and Burch suggested the "3Rs": reduction, refinement, replacement.

Addressing the Environmental Enrichment Needs of Mice: *Thinking Outside the Cage*

Karen M. Froberg-Fejko, VMD

Environmental enrichment has been an essential consideration for species such as primates and dogs for many years. More recently, however, many institutions are proactively addressing the environmental needs of mice in the research environment. In the *Guide for the Care and Use of Laboratory Animals*, natural behaviors are highlighted as a crucial measure of success for an animal program¹. Environmental enrichment can be defined as altering the living environment of captive animals in order to provide opportunities for them to express more of their natural behavioral repertoire².

FORAGING

To provide effective enrichment, we must first understand the normal behavioral needs of mice. In the wild, mice spend the majority of their time foraging for food³. An easy method of providing valuable foraging enrichment is to scatter small treats or crumbs into the bedding so that the animals can spend time searching for it. There are assortments of highly palatable foraging treats available in many sizes, textures and flavors to accommodate a variety of protocol considerations. Examples include the following: nutritionally complete, purified formula fruit flavored treats made into 190-mg pellets; nutritionally complete, grain-based crumbles that encourage normal foraging behavior when placed directly into the bedding; sweet dried fruit cubes which are excellent for operant training; low-calorie flavored treats for overweight mice; sugar-free (calorie-free), fiber-rich, treats for obese or diabetic mice; bacon-flavored soft-textured pellets for anorectic, impaired or disabled mice; and highly aromatic, nutritionally complete treats which placed into the cage shortly after birthing will dissuade cannibalism by

dams. The use of edible enrichment can also be expanded to include delivery of medications or test articles.

It is beneficial to both the mice and researchers if the mice willingly consume the drug or medication so that the researchers can avoid using stressful and potentially harmful dosing

methods. An array of edible products are



available that can be utilized as sole-source medicated diets or medicated treats for all laboratory animals including mice.

SHELTER

Mice are a nocturnal prey species and, therefore, have a strong innate need to seek shelter^{4,5}. A shelter offers mice an opportunity to withdraw from perceived threats both inside and outside the cage. There are many different types and shapes of sheltering devices designed to inherently offer flexibility in satisfying the needs of the mice, the technical staff and the cage design. Polycarbonate shelters come in red and amber tints, both of which provide a sense of privacy to the mice, but offer good visibility for daily cage exams. Mice are social animals and form kin groups; however, when mice are crowded, they may establish a dominance hierarchy leading to fighting, especially in males^{4,5}. Because levels of aggression can vary widely in different strains, it can be important to monitor the types of shelter that are introduced. Sheltering devices can be a solution to aggressive behavior or can exacerbate the situation. A change as simple as using a disposable paper shelter, instead of a non-disposable one, such as a polycarbonate type, can have a positive result. Other suggestions for reducing aggression include adding an exercise opportunity such as a running wheel and placing two shelters in the cage to provide places of refuge for both the aggressive and the submissive mice. The main consideration when introducing an enrichment device is to evaluate the response of the mice and respond accordingly. Mice have touch-sensitive body hairs and are thigmotaxic, meaning that they prefer to stay in close contact with walls or objects⁵. Even in a safe environment, they will hug walls when they move about. Their fur can feel the presence of surfaces against their bodies, and their whiskers are highly sensitive and can detect the slightest tactile changes. Providing them a sheltering device encourages them to move about the microenvironment of the cage. Mice also have an aversion to drafts and to cold and will seek shelter to secure warmth⁵. The *Guide* dictates that the temperature range for rodents should be



maintained at 68–79°F¹. Mice become thermally stressed at 64–68°F and will huddle when they are chilled⁶. Providing mice a shelter or nesting opportunity allows for better thermoregulation and reduces stress as a research variable.

NESTING

Several studies have shown that the addition of nesting material to mouse cages is a highly effective form of enrichment⁷. Nest building is a very detailed activity that includes digging or hollowing the material, warming the substrate with their body heat, hollowing or burrowing, sorting the materials, expanding the substrate and weaving the material methodically^{2,7}. Nesting materials that allow for all these activities are commercially available. Nest building is not only for breeding females who construct nests for their offspring, but also for non-breeding rodents, including males. Nesting material allows the mice to alter their surroundings to suit their needs and offers them a sense of control over their environment; two key objectives in reducing stress with successful enrichment. The challenge of providing effective enrichment to mice is to ensure that it allows for normal behavioral opportunities. Studies are ongoing to further identify the behavioral needs of mice in the laboratory environment. Many innovative choices of environmental enrichment devices and edibles are available to fulfill the present and future needs of mice and other laboratory animal species.

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Research protocols may require dietary manipulation of micronutrient and macronutrient profiles to induce or alleviate a physical condition. Bio-Serv provides published standard and custom diets to meet your research objectives.

Enrichment:

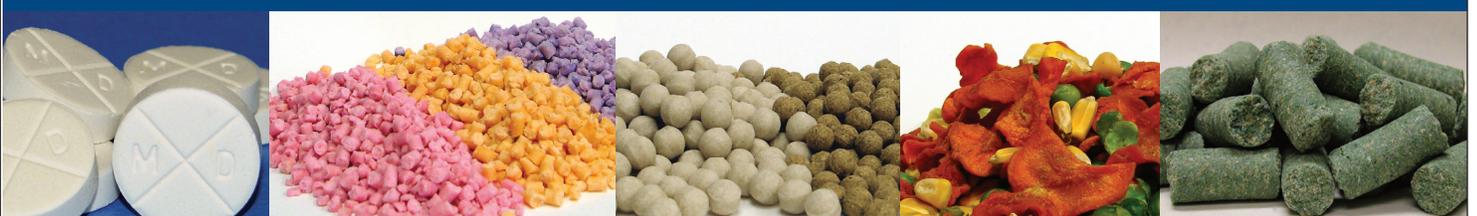
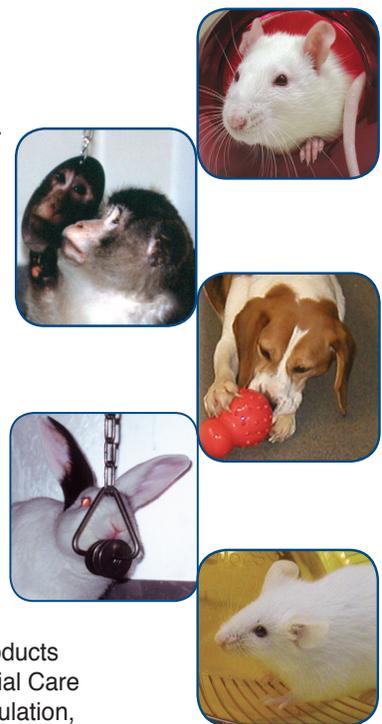
An effective Environmental Enrichment program is a vital component of your research, reducing stress on both the animals and their caregivers. Whether you employ edible treats, shelters, foraging, or hand held devices, Bio-Serv has a wide variety of items to fit your specific requirements.

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know what percentage of a mouse colony is barbered, or how many minutes per day the dogs spend pacing. The next step is to determine how to provide opportunities for the animals to engage in a positive behaviour. This part of the process will rely heavily on creativity. Generate many ideas, evaluate each idea on its own merits and identify potential pros and cons.

IMPLEMENTATION

When introducing new enrichment, every attempt should be made to minimize the impact on existing research projects underway. Limit the pilot project to one or two rooms of animals. Investigators may be more open to the idea than you would expect and it is important to communicate to them what is happening. Set a definite time period for the project. Provide technicians with a way to record their observations, which will be made at certain times. Evaluation may be as complex as scientific behavioural observation and recorded on video, or by simpler animal technician check sheets¹. Observation is perhaps the single most important tool for assessing efficacy³. Observations need to be made at the time of introduction of enrichment, during the initial minutes and hours following the introduction, and after the animals have habituated to the item². Some observation should occur during the animal's natural active periods. Observations made during the normal business hours may inaccurately reflect the animals' true reaction to and use of enrichment devices². When they become more active in the evening, the animals may well be exploring the new hut or chewing the hay cube that was untouched earlier that day.

EVALUATION

This is perhaps the area with the most room for improvement. Too often enrichment is provided because "it always has been" and is not necessarily based on animal use or benefits provided. Are the rodents making good use of their chew toys? Would another chew toy be used more often? The assessment of many enrichment techniques has been incomplete. More time needs to be devoted to obtaining objective data on how the animals are using devices and whether the incidence of positive behaviour has increased.



In today's research facilities, environmental enrichment is considered to be a key component to animal welfare

Data collected during observations can reveal the success of an enrichment strategy². Written evaluations of the enrichment and its results are important in determining effectiveness, but also any unexpected safety concerns¹. Even seemingly innocuous enrichment practices may have unexpected health consequences³. A well-managed enrichment program will undergo continual assessment. Perhaps the amount of barbered mice has been reduced, but the amount of back-flipping behaviour has been increased. We cannot possibly estimate every possible outcome, so it is worth re-visiting

all strategies on a regular basis and being prepared to make alterations as required.

CONCLUSION

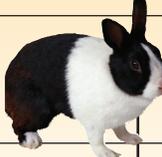
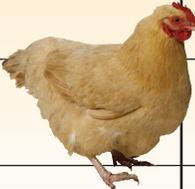
Environmental enrichment is widely regarded as a cornerstone to good animal care practices. The steps to a successful enrichment program are planning, implementation and evaluation. The simple provision of enrichment does not guarantee that the animals are going to use it, nor that they will necessarily benefit from it. Objective reporting of the success of strategies is scarce³, although an excellent article appeared in the September 2007 Journal of the American Association for Laboratory Animal Science. The article documented the reduction in bite wounds and cannibalism in a Xenopus colony based on the introduction of PVC tubing⁶. It is important to share and document strategies that work as well as strategies that do not work. Controlled observations at multiple sites provide usable data that many institutions would benefit from, which would in turn facilitate the establishment of best practices.³ There is no arguing the benefit of allowing research animals to engage in normal species-specific behaviour. We need to take a more pro-active approach to determine what these particular behaviours are and investigate whether or not our current techniques are facilitating their expression.

APPENDIX 1

Table 2. Natural Behavior and Habitat of Species Housed in the Animal Facility Species

As taken from Bayne, K. and K.L Stewart's Article "Environmental Enrichment for Laboratory Animals" April 2004

RETHINKING ENVIRONMENTAL ENRICHMENT *continued from page 7*

Species	Normal Behaviors Exhibited in Captivity	Abnormal/Maladaptive Behaviors
Mice 	Nocturnal, nest building, and burrowing, thigmotaxis, foraging, gnawing	Barbering, fighting especially in males, food grinding
Rats 	Nocturnal, nest building and burrowing, thigmotaxis, foraging, coprophagic, gnawing	Barbering
Hamsters 	Nocturnal, exploratory, hoarding food, foraging, gnawing, burrowing, and escape artists.	Cannibalism, fighting
Guinea pigs 	Social, vocalizing, foraging, gnawing, coprophagic	Fighting, stampeding
Gerbils 	Exploratory, gentle, burrowing, gnawing, jumping, and hind limb thumping	Scratching at the cage corners
Rabbits 	Crepuscular, non-aggressive, exploratory	Barber or hair pulling, cage nosing or mouthing, digging, "frisky hopping", chin rubbing (scent marking)
Chickens 	Roosting, foraging, pecking	Feather pecking, aggression, cannibalism, excessive fearfulness
Cats 	Investigative, social, allogrooming and allorubbing	Excessive vocalization, excessive grooming, pacing, paw shaking, staring
Dogs 	Exploratory, social	Excessive aggression, excessive barking, pacing, self-biting, excessive grooming, coprophagia
Non-human Primates	Social, foraging, exploratory	Pacing, back flipping, rocking, self-biting, head banging, and hair plucking ²

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ENRICHING PROFILES

Introducing....

Steven M. Niemi, DVM, DACLAM
Director

Jennifer N. Camacho, LVT, RLATg
Enrichment Program Manager

Center for Comparative Medicine
Massachusetts General Hospital

The Center for Comparative Medicine (CCM) is the central laboratory animal care service for investigators at Massachusetts General Hospital (MGH), in Boston, MA. MGH is a teaching hospital affiliate of Harvard Medical School and has the largest research budget of any independent hospital in the world, with over \$590 million in annual funding and over 1 million sq. ft. of research space. CCM's 105 employees perform routine animal husbandry and research support services for over 800 active protocols in 90,000 square feet of animal housing and research space. The average daily animal census at MGH includes 90,000 mice, 35,000 zebrafish, hundreds of frogs and rats, dozens of pigs and sheep, and a colony of 130 macaques.

Under Dr. Steven Niemi's leadership, CCM established an emphasis on environmental enrichment. "Compliance with regulations is not an end but a beginning," Steve observes. "We should move beyond compliance and look at animals as patients instead of just experimental subjects, with innate behaviors that don't go away just because they've been bred for research for decades. Enrichment of the animal's immediate environment is a good way to allow those behaviors to be expressed."

According Jennifer N. Camacho, CCM's Enrichment Program Manager, "design, implementation and continuing assessment of environmental enrichment initiatives are integral to effective research. CCM animal care personnel are expected to support

Steven M. Niemi has more than 34 years experience in biomedical research and commercial biotechnology as both a scientist and executive. He earned an AB in biology from Harvard College, a DVM from Washington State University, and received a US Public Health Service National Research Service Award while a Postdoctoral Fellow at the Massachusetts Institute of Technology. Dr. Niemi later completed the Program for Management Development at the Harvard Business School. His current research interests include developing new animal models of human diseases and detecting and alleviating distress in lab animals.



Ms. Jennifer N. Camacho is a graduate of the veterinary technician program at SUNY-Delhi and a Registered Laboratory Animal Technologist with over 14 years of experience, 8 of which have been focused on lab animal care and behavior. Her research interests include applying human medical technologies to diagnose and treat behavioral pathologies in non-human primates.

species-specific behavioral needs with the same level of attention as their husbandry chores and daily health checks." Jennifer adds, "Our animals' structural and social environments, as well as cognitive and physical activities, are fundamental to a successful enrichment program."

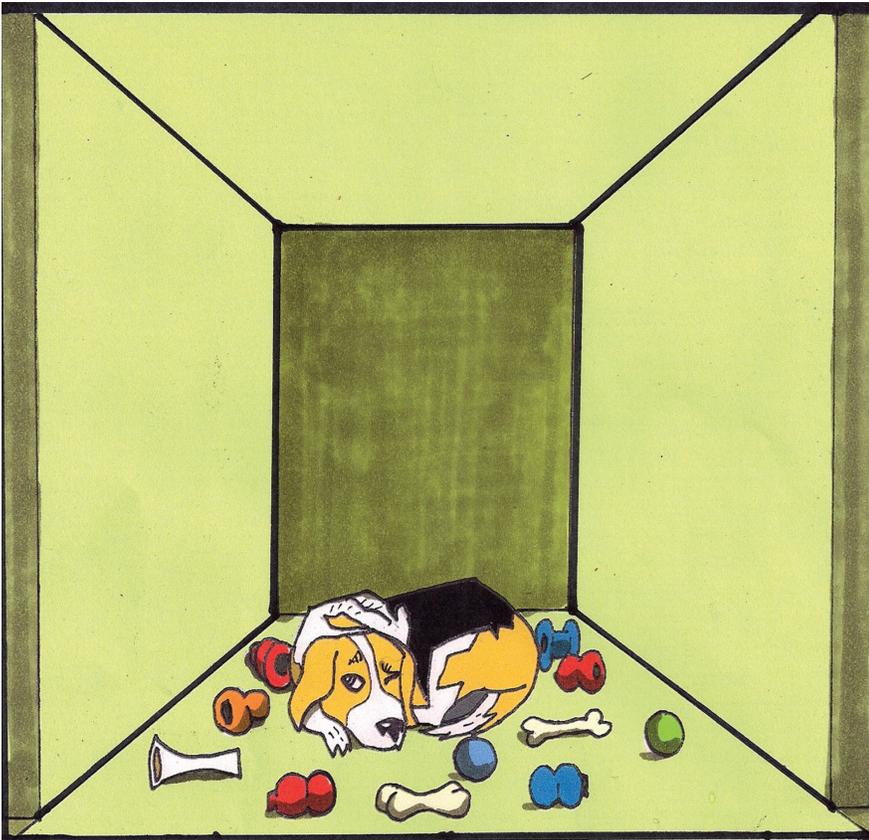
Motivated to stimulate awareness and engage the broader bioscience community, Jennifer organized CCM's *Annual Innovative Environmental Enrichment Symposium*, now in its third year. Designed to bring folks together to discuss, collaborate and compare, this internationally recognized symposium—scheduled for Sunday, November 8, 2009, at the Hyatt Regency Convention Center Hotel in Denver, CO.—is held immediately before the annual national meeting of the American Association for Laboratory Animal Science (AALAS). More details and registration forms are available at www.virtualvivarium.com.

The symposium features innovative enrichment strategies and encourages animal care providers and investigators to consider enrichment beyond mere compliance with regulations and accreditation standards. Open to all and featuring presentations and discussions in animal behavior and enrichment, the symposium's goals include: Education, Sharing Information, Highlighting innovative programs, Individualizing enrichment plans, Evaluating the effectiveness of initiatives, Identifying what works & what does not!

Steve is optimistic that future generations of scientists will have an even greater sensitivity to animals' needs while continuing to rely on animals for research. He also believes that as the intellectual and economic value of laboratory animals continues to increase, upgrades in environmental enrichment become even more essential to protect that value. "Environmental enrichment has had a good beginning," he says, "and we must continuously challenge ourselves to move beyond the minimum."

"Our *Annual Symposium* is designed to stimulate people to think creatively, develop greater sensitivity towards animals' needs, and better appreciate their worth," Steve says. "We don't know how far we can go until we try."

FUNNY STUFF: CAPTIONS WANTED!



In every edition of *The Enrichment Record*, we'll publish an original cartoon. We encourage you to submit creative, insightful captions that reflect the lighter side of animal research. Please send your captions to rmbwl@verizon.net. We'll print the "winners" for everyone to enjoy!

Cartoonist: Danny Kelly

What Do You Think?

Please answer a few questions to help us understand our readers and your interests.

Please click here

<http://tinyurl.com/EnrichF09>

and take a moment to complete this very short survey.

Impact of Environmental Factors and Enrichment on Beagle Dogs

(*Canis familiaris*)

E.A. Garofalo, J.M. Ogbin,
L. Shulder, T.L. Koban, T. Kuszniir
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East Millstone, New Jersey, USA

INTRODUCTION

To help promote species-specific activity and maintain a high standard of animal welfare, social and physical enrichment is routinely provided for all canines at Huntingdon Life Sciences. Enrichment includes, but is not limited to, social housing with conspecifics and a variety of durable chew toys. A considerable amount of time and resource is required, particularly when separating paired dogs for feeding procedures, to ensure that each animal has at least one toy at all times. The goal of this study was to observe whether animals utilize their enrichment toys in various housing situations, as well as to determine if there were any effects on stress indicators when enrichment is absent.



**CLICK HERE
TO SEE POSTER**

<http://www.gr8tt.com/docs/huntingdonposter.pdf>

CURRENT RESEARCH

Effects of Environmental Enrichment for Mice: Variation in Experimental Results

Van de Weerd HA, Aarsen EL, Mulder A, Kruitwagen CL, Hendriksen CF, Baumans V. Department of Laboratory Animal Science Utrecht University
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This study focused on the effects of different enriched environments for mice in a number of behavioral and physiological parameters in 2 routine laboratory testing procedures: potency testing for tetanus vaccine and stress-induced hyperthermia. The variability in the results was studied by calculating and analyzing mean absolute deviations. Mice from enriched conditions weighed more and consumed more food than mice from standard housing conditions. However, mice from enriched conditions lost more body weight after being housed individually. Other physiological parameters showed no differences. Mice from standard conditions were more active in an open field, suggesting a tendency to overrespond to various stimuli in a testing environment. Mice from enriched environments were more tranquil and easier to handle. The enrichment did not influence the variability in any of the parameters measured, although earlier results and results of other studies suggest that the effects on the variability in results are parameter dependent. When enrichment does not influence variability, there is no reason for not introducing cage enrichment and by doing so contributing to the animals' welfare.

http://www.psyeta.org/jaaws/full_articles/5.2/vandeweerd.pdf



Improving Housing Conditions for Laboratory Mice: A Review of "Environmental Enrichment"

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Laboratory animal facilities have been designed to provide a standard environment where animals can be kept in good physical health at the same time as economic and ergonomic considerations are met. Recognizing the potential welfare problem associated with behavioural restriction in such housing systems, a number of attempts have been made to improve this environment, generally described under the term "environmental enrichment". Modifications of cages for mice usually consist of providing material for nest building and structures which can serve as hiding places and/or for climbing. We have reviewed 40 studies carried out between 1987 and 2000, in which preferences as well as the effect of housing modifications have been studied. Mice will work for access to nesting material and make use of this material to make nests in which they rest. They prefer a more complex cage to the standard cage and will also work for access to cages with shelter and raised platforms. On the basis of present knowledge, it is recommended that mice should have access to nesting material. Strategies for future research are outlined in the article.

<http://la.rsmjournals.com/cgi/reprint/36/3/243?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=Improving+Housing+Conditions+for+Laboratory+Mice%3A+A+Review+of++%22Environmental+Enrichment%22&searchid=1&FIRSTINDEX=0&sortspec=relevance&resourcetype=HWC>

Stereotypies and Other Abnormal Repetitive Behaviors: Potential Impact on Validity, Reliability, and Replicability of Scientific Outcomes

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Normal behavior plays a key role in facilitating homeostasis, especially by allowing the animal to control and modify its environment. Captive environments may interfere with these behavioral responses, and the resulting stress may alter many physiological parameters. Abnormal behaviors indicate that an animal is unable to adjust behaviorally to the captive environment and, hence, may be expressing abnormal physiology. Therefore, captive environments may affect the following aspects of an experiment: validity, by introducing abnormal animals into experiments; reliability, by increasing interindividual variation through the introduction of such individuals; and replicability, by altering the number and type of such individuals between laboratories. Thus, far from increasing variability, enrichment may actually improve validity, reliability, and replicability by reducing the number of abnormal animals introduced into experiments. In this article, the specific example of abnormal repetitive behaviors (ARBs) is explored. ARBs in captive animals appear to involve the same mechanisms as ARBs in human psychiatry, which reflect underlying abnormalities of brain function. ARBs are also correlated with a wide range of behavioral changes that affect experimental outcomes. Thus, ARBs in laboratory animals may compromise validity, reliability, and replicability, especially in behavioral experiments; and enrichments that prevent ARB may enhance validity, reliability, and replicability. Although many links in this argument have been tested experimentally, key issues still remain

in the interpretation of these data. In particular, it is currently unclear (1) whether or not the differences in brain function seen in animals performing ARB are abnormal, (2) which common behavioral paradigms are affected by ARB, and (3) whether enrichment does indeed improve the quality of behavioral data. Ongoing and future work addressing these issues is outlined.

http://dels.nas.edu/ilar_n/ilarjournal/46_2/pdfs/v4602garner.pdf

Environmental Enrichment for Laboratory Rodents

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Modernization of housing and husbandry techniques for rodents has minimized confounding variables. The result has been vastly improved health maintenance and reproducibility of research findings, advances that have decreased the numbers of animals needed to attain statistically significant results. Even though not all aspects of rodent manipulation have been strictly defined, as housing and handling procedures have become increasingly standardized, many animal care personnel have recognized the lack of complexity of the rodents' environment. Concern for this aspect of animal well-being has led many research facilities to provide "environmental enrichment" for rodents. Additionally, regulatory agencies in the United States and Europe have also been increasingly concerned about this issue relative to laboratory animal husbandry. However, little is known about the influence such husbandry modifications may have on biological parameters. In this article, laws and guidelines relating to rodent enrichment are reviewed, the natural behaviors of select rodent species are discussed, and an overview of widely

used types of enrichment in laboratory rodent management is provided. The literature evaluating effects of rodent enrichment is reviewed both in terms of neurological development and as an experimental variable, and results of a study evaluating the effect of enrichment on immune and physiological parameters are reported. Survey data on current enrichment practices in a large multi-institutional organization are presented, and practical aspects requiring consideration when devising a rodent enrichment program are discussed.

http://dels.nas.edu/ilar_n/ilarjournal/46_2/html/v4602hutchinson.shtml

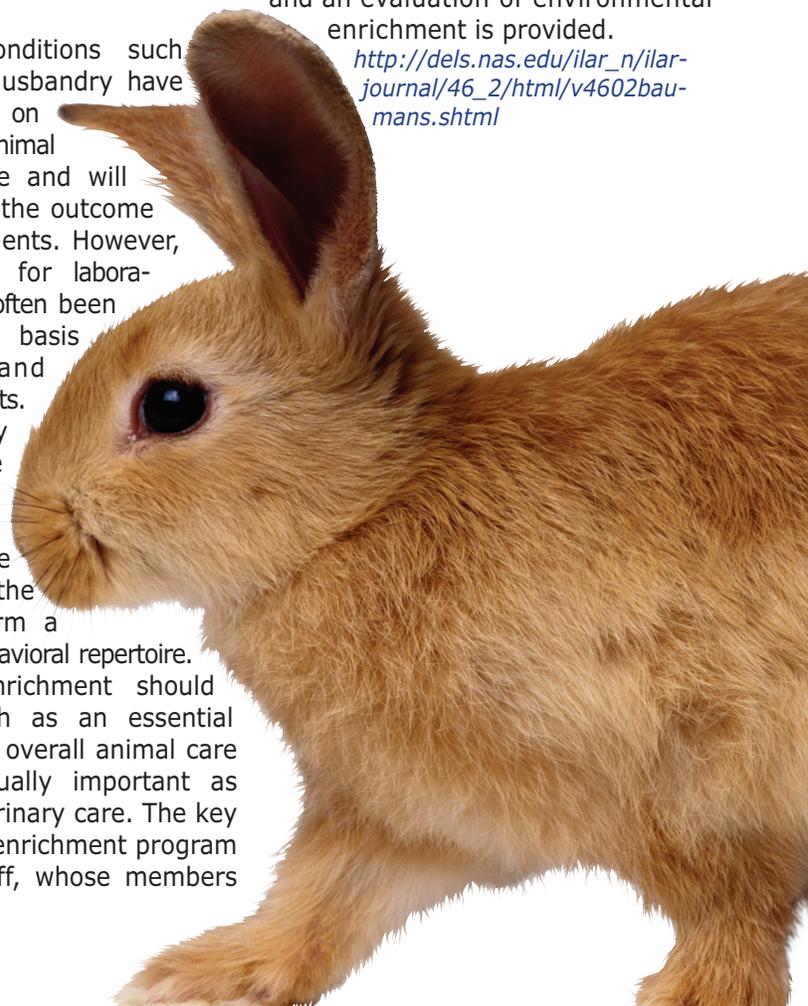
Environmental Enrichment for Laboratory Rodents and Rabbits: Requirements of Rodents, Rabbits, and Research

Baumans V. Karolinska Institutet, Stockholm, Sweden.

Environmental conditions such as housing and husbandry have a major impact on the laboratory animal throughout its life and will thereby influence the outcome of animal experiments. However, housing systems for laboratory animals have often been designed on the basis of economic and ergonomic aspects. One possible way to improve the living conditions of laboratory animals is to provide opportunities for the animals to perform a species-specific behavioral repertoire. Environmental enrichment should be regarded both as an essential component of the overall animal care program and equally important as nutrition and veterinary care. The key component of an enrichment program is the animal staff, whose members

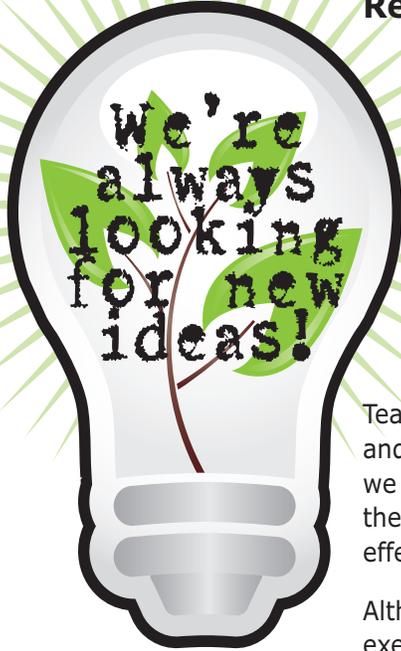
must be motivated and educated. It is critically important to evaluate environmental enrichment in terms of the benefit to the animal by assessing the use of and preference for a certain enrichment, the effect on behavior and the performance of species-typical behavior, and the effect on physiological parameters. At the same time, it is necessary to evaluate the impact on scientific outcome, how the enrichment influences the scientific study, and whether and how the statistical power is affected. The result will depend on the parameter measured, the type of enrichment used, and the animal strain. In this article, goals of enrichment are defined and discussed. Animal behaviors and needs are described, along with the translation of those needs into environmental enrichment programs. Specific types of environmental enrichment are outlined with examples from the literature, and an evaluation of environmental enrichment is provided.

http://dels.nas.edu/ilar_n/ilarjournal/46_2/html/v4602baumans.shtml



IDEA EXCHANGE

An Overview of the New Jersey Association for Biomedical Research's Annual Enrichment Competition



Please send
your great ideas to:
rmbw1@verizon.net

Since 2005, the New Jersey Association for Biomedical Research has sponsored the Annual Enrichment Competition at the TriBranch AALAS meeting. This event has seen many successes, the most important being it is a fun way to increase enrichment awareness. It is a great medium for exchanging ideas and refinements, and many times is a catalyst for new enrichment ideas. In summary, the competition is a simple concept; gather together a group of laboratory animal professionals, provide them with raw materials to create an enrichment device, and give them a chance to express their creativity and show their knowledge of the species under their care.

Teams are challenged with the task of creating an enrichment device within 30 minutes and then describe their device. The description of the device is particularly important, we stress that they include details such as: intended species it is to be used for, what the advantages would be, what cleaning methods would be useful, ways to evaluate the effectiveness of the device.

Although the competition is a lot of fun and we offer prizes to the winners, it is also an exercise in developing creative enrichment concepts and reinforces that enrichment is important. The competition also highlights the knowledge of the professionals in the laboratory animal science field by showcasing their understanding of the species under their care, and stresses their commitment to providing the best care possible to their animals.

UPCOMING EVENTS

Annual Innovative Environmental Enrichment Symposium

On Sunday, November 8th, 2009, Massachusetts General Hospital's Center for Comparative Medicine will be hosting the 3rd annual satellite symposium on environmental enrichment. The Symposium, an all-day event scheduled for the Sunday prior to National AALAS, will be held from 10:00am - 4:00pm at the Hyatt Regency Convention Center Hotel in Denver, CO.

The purpose of this symposium is to highlight innovative animal enrichment and conditioning programs and to identify interesting leads for further investigation that may improve enrichment strategies in the laboratory research environment.

If you wish to attend, please visit
<http://www.virtualvivarium.com>

UPCOMING EVENTS

Third Annual Enrichment Extravaganza

SAVE THE DATE!

The Third Annual Enrichment Extravaganza, An Environmental Enrichment and Behavioral Management Symposium, will be held April 15, 2010 at the National Conference Center at the Holiday Inn, East Windsor, NJ. This event, sponsored by the New Jersey Association for Biomedical Research and Merck & Co., Inc, will feature speakers, workshops and vendors.

Please send upcoming event notices to
Rhoda Weiner, Editor at rmbw1@verizon.net

HUMAN ENRICHMENT

Advice for distressed animal care staff

The Challenge:

I have been working in a large facility for five years and have responsibility for environmental enrichment of the many species in my care. I love my job and take great joy in keeping my little guys unstressed, particularly the non-human primates. I have overcome many obstacles over the years, including budget cuts and lack of training support for enrichment within the Department. I was demoralized recently when the attending vet confessed that she feels that enrichment is a waste of time in most situations. Color me devastated. What can I do?—Sad in Seattle

A Solution:

Dear Sad in Seattle,
 Anyone who has worked with non-human primates knows that they are intelligent animals. When housed singly or in unenriched enclosures, non-human primates develop stereotypic and self-destructive behaviors. Environmental enrichment prevents development of these problems and is helpful in treating them when they do develop. In fact, environmental enrichment is now recognized as a requirement for all mammalian laboratory animals. That said, not all additions to an animal's enclosure are enrichment so it's important to use proven enrichments and to evaluate the effects of new enrichments to be sure that they are beneficial to the animals. As a veterinarian, I do not believe in "enrichments" that don't work. Maybe the attending vet was referring to those "enrichments" that require more evaluation.

Indeed, there is a pretty substantial literature that describes the problems enrichment creates for some species (such as rodents), to include confounding experimental data. So, perhaps the vet is actually concerned about some of the confounding effects of enrichment for some species, but may support it for others (e.g., primates). If the vet does not believe in the positive effects of enrichment for NHPs, I suggest you compile some key articles/book chapters that demonstrate the beneficial effects (health, behavior, etc.) beyond a shadow of a doubt.—*Helpful in Houston*

Send your questions or answers to
info@TheEnrichmentRecord.com

We'd love to hear from you!

We welcome your comments, observations and contributions to *The Enrichment Record*. Contributors include lab animal veterinarians, principal investigators, animal care staff, animal behaviorists, animal technologists and other members of the bioscience community who promote the 4 Rs: reduction, replacement, refinement and respect. Share your story ideas with Rhoda Weiner, Editor at rmbw1@verizon.net

Guidelines for authors can be accessed at www.gr8tt.com

Please give credit where credit is due

Outstanding animal care is truly a team effort, and we ask you to credit colleagues, published reports, articles, and other reference materials that have contributed to your enrichment article. Great ideas don't happen in a vacuum, and we encourage you to list all sources of inspiration.

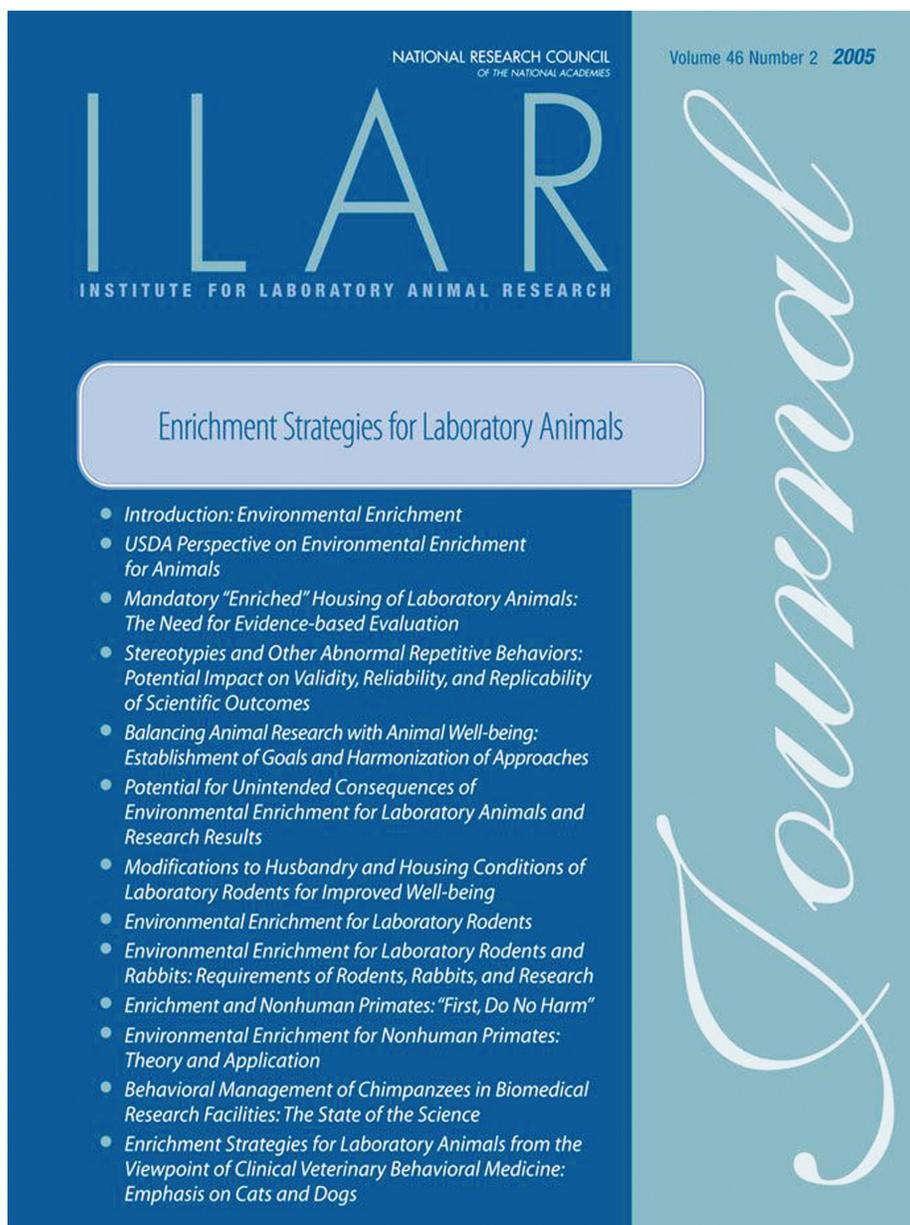
The Enrichment Record is not a peer-reviewed journal. However, the Editorial Board of this E-Zine is composed of dedicated volunteers who have extensive experience and expertise in the care of laboratory animals. Members of the Board are involved with all aspects of this publication.

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 Jayne Mackta, President & CEO

RESOURCES

ILAR's mission is to evaluate and disseminate information on issues related to the scientific, technological, and ethical use of animals and related biological resources in research, testing, and education. Using the principles of refinement, reduction, and replacement (3Rs) as a foundation, ILAR promotes high-quality science through the humane care and use of animals and the implementation of alternatives. Through the reports of expert committees, the ILAR Journal web-based resources, and other means of communication, ILAR functions as a component of the National Academies to provide independent, objective advice to the federal government, the international biomedical research community, and the public.

http://dels.nas.edu/ilar_n/ilarjournal/46_2/html/



Environmental Enrichment for Laboratory Animals (2-Apr-2004)

K. L. Stewart and K. Bayne

In: *Laboratory Animal Medicine and Management*,

J.D. Reuter and M.A. Suckow (Eds.)

Publisher: International Veterinary Information Service

Ithaca, New York, USA.

This chapter addresses the requirement for laboratory animals to live in environments that foster the expression of species-typical behaviors, or in other words, in an enriched environment. The term, "environmental enrichment" has been coined by laboratory personnel as the principal means of improving the welfare of the animals in their care, rather than relying on the more ambiguous term "psychological well-being" used by the federal government in animal welfare regulations. However, environmental enrichment does not fully capture the intended meaning of enhancing the psychological well-being of laboratory animals. Rather, it is one approach to improving animal welfare, but it is not the sole method. Further, the provision of environmental enrichment does not automatically guarantee animal welfare. Conversely, the term psychological well-being is difficult to define, may vary among individuals of the same species, and is unlikely to be static in an individual animal. In addition, making a determination of psychological well-being in a non-verbal animal might be based more on the subjective assessment of the observer than the actual state of the animal.

<http://www.ivis.org/advances/Reuter/stewart/ivis.pdf>