

Volume 8, JULY 2011

THE Enrichment RECORD

Global Research Education and Training, LLC
Email: mackta@gr8tt.com • Website: <http://enrichmentrecord.com>

Environmental Enrichment: High on the Agenda!

- **Sheep Enrichment**
- **Int'l Ethology Congress to Feature Lab Animal Topics**
- **Free-Range Rabbits:
The Environmental Transformation**
- **Enrichment Rising Star**
- **Bio-Serv Enrichment Award**



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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 members of the bioscience community who promote the 4 Rs: reduction, replacement, refinement and respect.

Share your story ideas with Rhoda Weiner, Editor at
rmbw19@verizon.net

Guidelines for authors can be accessed at
<http://enrichmentrecord.com/contribute/>

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.

The Enrichment Record is published in October, January, April and July. If you are interested in advertising in *The Enrichment Record*, please visit:
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Jayne Mackta, President & CEO

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Join the Discussion!

To facilitate informed discussion about environmental enrichment, we have joined the LinkedIn Group called **Laboratory Animal Sciences**. This group allows members of the laboratory animal science community and our readers to interact over a web-based platform to compare ideas and methods. To participate, you will need to create a LinkedIn account and then join the Laboratory Animal Sciences Group.

It's easy! It's free! It's a safe and secure place where you can say what's on your mind. [Click here to get started.](#)

New Resource

National Institutes of Health • Office of Extramural Research

Office of Laboratory Animal Welfare (OLAW) has a new online resource for information on nonhuman primate enrichment and social housing. This resource is provided to assist institutions in enhancing the care and well-being of nonhuman primates. You can find new FAQs, a special online seminar, the OLAW report visits to Chimpanzee facilities, a bibliographic guide developed by USDA, NAL, AWIC and more.

Nonhuman Primate Enrichment and Social Housing Resources

http://grants.nih.gov/grants/olaw/primate_enrichment-social_housing.htm
Contact: hamptonl@OD.NIH.gov

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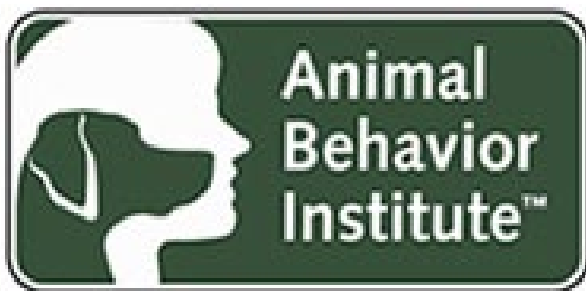
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In Other Words



A QUARTERLY E-ZINE/FORUM FOR:

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

This year's Enrichment Extravaganza had something for everyone. The chatter started over breakfast and grew louder and more excited with each presentation. People were enjoying themselves and were happy to spend time with colleagues who share their passion for the animals in their care. Best of all, everyone had something to contribute.

Contrast the good energy at the EE with the negative voices raised by the few uncaring protestors, who assembled outside the Convention Center. They were rallying "against the unspeakable horrors of the vivisection industry" at the Enrichment Extravaganza, which they described as a "perverted convention." Their harsh words and meager turnout had no real impact and did nothing to dampen our enthusiasm. If anything, their ignorance is a sad reminder of how much educating remains to be done.

Inside, we were learning from one another. Everyone looked for tips to convey the importance of environmental enrichment to investigators who worry about the effect on their data and management concerned with rising costs. Outside, protestors looked for signs of rain and worried about protecting their hand-made signs from the elements.

There were no sticks and stones; only nasty names being thrown about. In the end, the protest didn't hurt, but it sure didn't help either.

Jayne Mackta

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



SHARING CAN ADVANCE ANIMAL WELFARE

The Enrichment Record wants to create a searchable database containing policies, protocol questions and SOPs for environmental enrichment. Our success depends on your willingness to share this kind of information.

To learn more, contact
Jayne Mackta, Publisher:
mackta@gr8tt.com

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July Issue—June 1
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Casey Acklin

2011 Enrichment Rising Star Award Winner

Where will our future science leaders come from? Fortunately, we don't have to look too far! Casey Acklin is the brightest shining star on the research horizon. At fifteen, this gifted student has a remarkable set of accomplishments, and his unending natural curiosity has led him on an exciting scientific journey. Casey has an extensive body of work, but it is his latest project, *The Effects of Cage Naturality on the Scientific Viability of Mouse Models in Relation to Stress and Cognition*, that earned him the 2011 Enrichment Rising Star Award.

Since his first science experiment in early elementary school, Casey Acklin has been hooked on research. He realized that scientific research could be applied to a host of different questions about how the world works, and could be used to increase understanding of various phenomena. At the Davidson Academy of Nevada, a public school for profoundly gifted students, Casey has been pursuing his passion for science and research.

Casey's interest in animal enrichment began while observing the complexity of a field mouse's nest in his garage. He noticed how dissimilar the natural habitat was compared to typical laboratory housing. Working with faculty advisor Dr. Ruth Gault, Research Scientist, Department of Microbiology and Immunology and Laboratory Animal Care Services at the University of Nevada, Reno campus, Casey began his research project. "We have a certain obligation to help the next generation through the system and to encourage them,"

Dr. Gault said.
SUMMER 2011 | THE ENRICHMENT RECORD

Casey has consistently engaged in furthering his interest in scientific research. He is honored to receive this award, and we agree that he is a rising star in the area of scientific research.

— Colleen Harsin, Director, The Davidson Academy




Dr. Ruth Gault, faculty advisor and research scientist in the Department of Microbiology and Immunology, University of Nevada with Casey Acklin, 2011 "Enrichment Rising Star" Award winner.


Casey's research attempts to increase the scientific viability of laboratory mice by designing laboratory cages to mimic the natural environment of mice. Since studies have shown that enrichment is beneficial, he hypothesized that a more natural setting would result in more natural behaviors, increasing scientific viability. Results of his research pointed to natural enrichment contributing to a better mouse model for scientific research.

Casey presented his work at the Enrichment Extravaganza on June 13 in Atlantic City, where he was recognized for his achievement with the *Enrichment Rising Star Award*. Recently, Casey also received the *2011 Special Award for Excellence in Biomedical Research* presented by States United for Biomedical Research (SUBR) at the Intel International Science & Engineering Fair, in Pittsburgh, PA.


The *Enrichment Rising Star Award* was created by the *Enrichment Record* to recognize exceptional students conducting research in the field of laboratory animal enrichment. Like other scientific fields, enrichment is ever evolving with new and better ways of contributing to animal welfare—the ultimate goal being to provide the best possible environment for the animals in our care. Funded by Huntingdon Life Sciences and Pfizer, the *Enrichment Rising Star Award* is designed to encourage and inspire the next generation of our "caring community."



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THE BIO-SERV ENHANCEMENT OR IMPROVEMENT OF ANIMAL WELFARE AWARD

Sponsored by Bio-Serv, this award is presented annually to a person who has exhibited a positive impact to enrich, enhance, and or improve the lives of animals or the environment in regard to animal welfare.

CRITERIA:

- a) Has enriched the lives of the animals they work with.
- b) Has enhanced the living environment for the animal colonies they work with.
- c) Has positively impacted research and the morale of the animal care staff with improvements.
- d) Has displayed the 3 Rs (Reduction, Refinement, Replacement) in their plan for Enhancement and Improvement.
- e) Has reduced or eliminated distress or created other benefits for the animals they work with.

QUALIFICATIONS:

- 1. A person from within the AALAS Branch must nominate the candidate.
- 2. The person nominated does not need to be a member of the AALAS Branch, but must be within the branch area.

The award consists of a plaque and monetary honorarium. The deadline for nominations is determined by the branch.

Award Winners!



Left to right: Karen Froberg-Fejko, V.M.D., President, Bio-Serv, Michelle Pitre, R.L.A.T., University of Guelph, Ontario, Canada

2010
Rebecca Krumnow, SWAALAS
Carol Burns, DVB, AALAS
Cheryl Dann, Upstate NY AWARD
April Ward, NMB AALAS
Karen Lieber, SE/AALAS
Susan Hinklein, METRO AALAS
Rebekah Boan, RTB, AALAS

2009
Sarah Wall, RTB, AALAS
Anita Coburn, RTP, AALAS
Barbara Shields, DVB, AALAS
Carol Barriere, Upstate NY
Cheryl Dudley, SNEAALAS
Charles Brown, NMB, AALAS
Dawn Conover, Metro AALAS
Kristin Mayfield, SE/AALAS

2008
Sharon Grant, DVB, AALAS
Cheryl Moore, Upstate NY AALAS
Ben Arts, NMB, AALAS
Anthony Ferraro, SNEAALAS
Xiomara Santiago, Metro AALAS

“We make a living by what we get.
We make a life by what we give.”
—**Winston Churchill**

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The 2011
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Award

Congratulations to this year's
recipient, Casey Acklin,
for your efforts to enrich
lives of laboratory animals.

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Int'l Ethology Congress to Feature Lab Animal Topics

The Annual Congress of the International Society for Applied Ethology, returning to the United States in 2011 for only the 3rd time in its 45-year history, will be held at the Indianapolis Hyatt Regency Hotel, July 31—August 4. The Congress attracts researchers, educators, students and policy-makers with diverse yet common interests from around the globe. Their shared goal is to share information on the well-being and behavior of companion, farm, laboratory, wildlife and zoo animals and their interface with society.

A special session on **Laboratory Animal Behavior, Welfare and Enrichment** will take place on Wednesday, August 3. Plenary 3 will feature a presentation by Marina Ponzio: *Modifications induced by an enriched environment on reproductive physiology and postnatal development of Albino Swiss Mice.*

Dr. Joseph Garner, Associate Professor, Department of Animal Sciences, and Courtesy Associate Professor, Department of Speech, Language, and Hearing Sciences at Purdue University, served on the Organizing Committee of the ISAE Congress. "The entire committee wanted a special session on laboratory animals," he said. "While most researchers have been replacement-directed, the reality is that we are using more animals than ever before, and there is a disproportionately small focus on housing, husbandry and enrichment."

One of the major goals of this ISAE Congress has been to introduce the ISAE community to lab animal issues. "Our committee's objective," Dr. Garner says, "is to expose both veterinary researchers and applied ethologists to animal well-being and enrichment. When enrichment research is done really well, it involves veterinary physiology, behavior and psychology. Hopefully, we'll learn from each other!"

<http://www.ars.usda.gov/meetings/ISAE2011/>

Following Plenary 3, Session 8 presentations will include:

Daniel Gottlieb

Effects of predictability on feeding and aversive events in captive rhesus macaques (Macaca mulatta)

Lena Lidfors

Exercise pens as an environmental enrichment for laboratory rabbits

Shelly Deboer

Does the presence of a human affect the preference of enrichment items in young isolated pigs?

Sylvie Cloutier

Playful handling before an intra-peritoneal injection induces a positive affective state in laboratory rats

Devina Wong

Rat aversion to isoflurane and carbon dioxide

John Bradshaw

Sociality in domestic cats: hierarchical, territorial, or learned?

Jessica Lockhart

Effects of conditioning on blood draw in cats

Giovana Vieira

Is hair and feather pulling a disease of oxidative stress?

Hetty Boleij

Implications for animal welfare: Habituation profiles of 129S2, 129P2 and 129X1 mouse strains

Magda Joao Castelhana-Carlos

Identification methods in newborn C57BL/6 mice: A developmental and behavioural evaluation

Brianna Gaskill

Behavioral and physiological thermoregulation in mice with nesting material



Enrichment Question

Some colleagues and I are looking to start an enrichment committee here within our organization. I was curious if anyone has any experiences, good and bad, with starting up such a committee that they would be willing to share? Any information would be helpful as we begin this process.

Thank you,

David Cawston, MHA
Veterinary Services Manager
Boston University
dwc01@bu.edu



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This group allows members of the laboratory animal science community and our readers to interact over a web-based platform to compare ideas and methods. To participate, you will need to create a LinkedIn account and then join the Laboratory Animal Sciences Group.

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Congratulations to this year's winner

Casey Acklin

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Introducing The Enrichment Record Poster Repository

The Enrichment Record, together with the Veterinary Bioscience Institute, is excited to introduce the **Enrichment Record Poster Repository**. This open access poster repository will provide a structured and safe environment for the deposition of enrichment posters. Often, enrichment information presented as posters at conferences is not published and is lost once a conference is over. If it is published, it is published at a much later date. This repository will provide Laboratory Animal Science community members with access to early enrichment information presented at conferences while allowing authors to maximize the value of their posters by dramatically increasing availability and by helping to prevent lengthy delays before others can benefit from their new enrichment research.

The Enrichment Record Poster Repository is subdivided into categories by species, making it easy to locate information for the viewer.

The submission process is simple and has safeguards in place to ensure applicability and maintain quality standards. After a poster is submitted, there is a 24-hour delay, which allows time for review of submitted information to confirm that it is appropriate for the site.

The Enrichment Record Poster Repository is an open access repository, meaning that anyone will be able to view these posters. We believe open access promotes transparency and supports outreach efforts that help educate both internal and external audiences. Sharing is the optimal way to distribute information to the Laboratory Animal Science community and beyond. There is the ability to post posters anonymously as long as you provide your authorship information to *The Enrichment Record*.

We are looking forward to your submissions and feedback. Visit the site: <http://www.vetbiotech.com/posters2.php>



Now you see it; now you don't. If you did not attend the recent Tri-Branch Symposium in Atlantic City, NJ, you will not have seen a terrific poster on a novel delivery device for rabbit hay. This poster created quite a stir, and we hope it will eventually find a home in our new Poster Repository.

Shown is Leslie Sheppard Bird.

SHEEP ENRICHMENT

USE OF SHEEP IN RESEARCH

There are several reasons why sheep make an excellent experimental model for physiological studies. Their body weight and size approximates that of a human and their long life span of 10-15 years (*Allen and Borkowski, 1999*) makes progressive research possible when compared to rodent models. Sheep adapt rapidly and extremely well to a laboratory situation, have a docile nature and relate positively to handlers. Sheep have been used as experimental models in broad areas of research such as endocrinology, reproductive physiology, cardiovascular,

fluid and electrolyte homeostasis, immunology, neurophysiology and neuroanatomy, thermoregulation, hematology, nutrition, gastrointestinal physiology, and orthopedic surgery (*Adams, et.al., 2009; Tovar, et.al., 2010*).

NORMAL BEHAVIOR

Although there is significant individual and flock variation, sheep in general are non-aggressive, gregarious animals. During mating season, ewes will become more active and rams can display aggression. Certain breeds, such as the popular Dorset and Finn sheep, cycle year round, have no specific

breeding season and can be more aggressive at all times. A ram should never be trusted, even if it is friendly or was raised as a pet, as rams have no fear or respect for humans. Since we move rams from group to group and place to place, they consider us rivals and will act accordingly. It is important to always know where the ram is and to never turn your back on him. Sheep are best known for their strong flocking (herding) and following their instincts. They flock, walk, run, graze, and bed down together.

Such activities are usually initiated and led by the oldest ewe (*Bryson, 1984*).



Animal behaviorists note that sheep require the presence of at least 4 or 5 sheep when grazing together to maintain a visual link to each other (*Schoenian, 2011*).

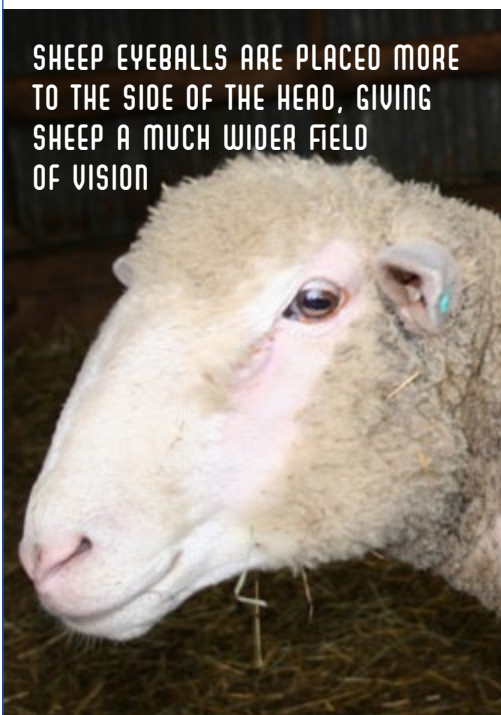
SHEEP SENSES

Vision: Sheep depend heavily upon their vision. Behavior scientists speculate that the placement and structure of the sheep's eyes are due to nature's designation of sheep as a prey animal. Sheep have a very large pupil that is somewhat rectangular in shape. The eyeballs are placed more to the side of the head, which give sheep a much wider field of vision, ranges from 191 to 306 degrees (*Schoenian, 2011*). Sheep have poor depth perception (three dimensional vision), especially if they are moving with their heads up. This is why they will often stop to examine something more closely. Sheep have difficulty picking out small details, such as an open space created by a partially opened gate. They tend to avoid shadows and sharp contrasts between light and dark, and are reluctant to go where they can't see. Research has shown that livestock possess the cones necessary for color vision (*Jacobs, et.al., 1998*). Sheep can recognize the faces of other sheep and can distinguish breed and sex as well as species from facial recognition (*Broad, et. al., 2000*).

Hearing: Sheep have excellent hearing. They can amplify and pinpoint sound with their ears. In fact, sound arrives at each ear at a different time. Sheep are frightened by sudden loud noises, such as yelling, barking or clanging of metal caging and doors. (*Schoenian, 2011*). In response to loud noises and other unnatural sounds, sheep become nervous and more

difficult to handle. In a laboratory setting, sheep should be housed away from noisy animals such as dogs and primates. It is recommended to speak in a calm voice when entering the room, especially when sheep are housed in cages and unable to see people. The surprise of suddenly seeing a person show up in front of the door to their cage can cause the animals to suddenly jump up.

SHEEP EYEBALLS ARE PLACED MORE TO THE SIDE OF THE HEAD, GIVING SHEEP A MUCH WIDER FIELD OF VISION



This can cause injury, especially during post-op recovery period. To minimize stress, the handler should speak in a quiet and calm voice and avoid sudden movements.

Smell: Sheep have an excellent sense of smell and know what predators smell like. Smell helps rams locate ewes in heat and helps ewes locate and identify their lambs. Sheep use their sense of smell to locate water and detect differences in feed and pasture plants. Sheep are more likely to move into the wind than with the wind, so they can use their sense of smell (*Schoenian, 2011*).

Touch: Since most of their body is covered with wool or coarse hair, only the sheep's lips and mouth (and maybe ears) lend themselves well to feeling behavior. This is why electric wires on a fence need to be placed at nose height of the sheep. Also, sheep should be newly shorn prior to their first introduction to an electric fence. A full coat of wool will insulate them as they begin rubbing on an electric wire until it reaches the skin. Sheep in long wool have been known to get tangled and severely injured in such cases. The sense of touch is important in the interaction between animals. Lambs seek bodily contact with their mothers. Groups of animals that have body contact remain calmer (*Schoenian, 2011*).

Taste: Sheep have the ability to differentiate feedstuffs and taste may play a role in this behavior. There is no evidence to suggest that sheep can balance their own ration when provided with a variety of feedstuffs; however, they may be able to seek out plants that make them feel better. Sheep will certainly avoid moldy feed. (*Schoenian, 2011; Gill*)

DIETARY PRECAUTION

Aside from young lambs that are acclimated to unlimited feed, sheep generally will not self-limit consumption of feed concentrates such as corn and commercial grain. They should always be fed hay ad libitum, but concentrates must be carefully limited. Overeating of molasses laden concentrates or whole corn will result in loose stools and, in extreme cases, gut bacteria will overgrow, producing gases that can cause bloating and death. Changes in the diet must be

continued on page 14

made gradually over several days so that gut bacteria can adjust. The most dangerous items include fruit, high protein forages such as clover and alfalfa and high caloric grains such as whole corn. These must be introduced slowly. Animals being transferred from the lab to the farm setting must be carefully introduced to lush pastures, especially if legumes or fruit trees are present.

HANDLING

Sheep have a short flight distance, meaning that it is possible to get quite close to a sheep before it tries to run away. In a confined area, sheep should be approached very calmly while talking to them and holding arms at their head level or below. In open spaces, hands-off control of sheep is much more effective; moving and waving an arm in one direction will cause the sheep to move in the opposite direction. Once a sheep has been moved in the desired direction, other sheep will generally follow. However, if a

single animal, especially the leader, breaks away from the group, that animal needs to be brought back into the flock before continuing to move the group. Eye contact is also an important technique for guiding sheep. Looking directly at the face of the sheep will cause them to stop and avoid you. Looking down and away will encourage them to walk past you, especially if you also drop your arms. Eye contact can be used effectively for sorting individuals from a group. Sheep prefer to move from dark toward light, and this can be exploited when trying to load animals onto vehicles or moving them from one room to another (*Allen and Borkowski, 1999*).

ENRICHMENT:

Social interaction: Social housing is the most important enrichment for sheep. Due to the strong flocking behavior of sheep, social isolation from other sheep is very stressful. Animal behaviorists note that sheep require the presence of at least 4 or 5 sheep when grazing together to maintain a visual link to each other (*Schoenian,*

2011). The minimum group size of sheep should be three, so the removal of one will not leave a single individual (*Mellorand & Hemsworth, 2005*).

SHEEP ENJOY WALKING AND GRAZING TOGETHER



Open field: Sheep enjoy walking and grazing together. In our institution, after surgical recovery, sheep will be transferred to a local farm for rehabilitation and remain on the farm until the experimental endpoint.

Enrichment objects: If due to the experimental condition, sheep must be housed alone, placing an object such as a large mirror or a surrogate object such as a cardboard box covered with sheepskin in the cage may lessen the stress of the isolation (*Mellor and Hemsworth, 2005*). A radio can be used to calm isolated animals. The constant background noise, especially talk radio or classical music, covers sudden noises and reduces loneliness.



SHEEP HAVE A SHORT FLIGHT DISTANCE




FOOD TREATS CAN BE USED FOR HABITUATION

Food treats: Food treats can be used for habituation, halter training and oral medication. A mixture of alfalfa, grains and molasses is very appealing to sheep. In our experience, sheep readily take tablets mixed with food treats. Care must be taken, however, to avoid overeating of such treats.

Acknowledgement:

The authors would like to thank Mr. Juan Lopez for his daily observation and special care of sheep.



SHEEP CAN BE ADAPTED TO HUMANS

Human interaction: Sheep can be adapted to humans by regular positive human contact and conditioning using rewarding experiences such as offering food treats. Sheep enjoy having their necks and chins stroked but seem to dislike stroking on the ventral abdomen and touching on top of the head. Because sheep appear to be able to discriminate between people, aversive and positive procedures should be conducted by different personnel, if possible, and exposure to strangers should also be minimized (Mellor and Hemsworth, 2005).

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Courtesy of www.zazzle.co.uk



The Year of the Rabbit

The Chinese calendar consists of the year's presiding animal zodiac and its earthly branches. For 2011, Chinese New Year brings us The Year of the Rabbit. Officially begun on February 3, this year will be, according to some interpretations, a year for slowing down and focusing on home and family. I imagine we will feel this energy as we move throughout each season with our family of furry or not so furry laboratory friends.

If the qi advises slow down and focus—and the animal zodiac is the rabbit—what better way to unite these two elements than focusing on the rabbits? I can happily say—focusing has been a lot of fun. It has led me to new adventures in developing a rabbit environmental enrichment program.

We all are trying to make informed and healthier decisions regarding our own health and well-being. The same should hold true for our rabbits. It is a well-known fact that free-range versus conventional/caged food is better. Free-range is also better when it comes to the welfare of agricultural animals. So why not put this theory to the test with our laboratory rabbits?

Free-Range Rabbits: The Environmental Transformation

The Laboratory Environment

Although the quality and number of laboratory rabbits has improved over the last few decades, their behavioral and physiological well-being has essentially been inadequate, potentially harmful and neglected. There have been improvements in several areas of rabbit health—breeding, general enhanced overall health status, a standardized diet (Clough 1982). However, one essential area of animal welfare that has not improved (although claims of improvements have been made in this area) is the caging environment, which has negative effects on animals (Gunn and Morton 1994). To offer a comparison—if one looks at the cage space for a mouse or rat compared to the cage space for a rabbit—the mouse and rat have a great deal more space by surface area than a rabbit! Put a rat in a cage next to a rabbit in a cage and the difference is evident. The rat can run around, get up on its hind legs, go from one side to the opposite side of the cage. The rabbit...well, the rabbit can thump, charge the cage door, lay down, turn around and get in a hop—maybe two—that is about it! That could make for one very disgruntled rabbit.



Conventional Environment

Rabbits are traditionally housed in single caging units. The cage designs vary but all are similar in their general design—single units, with solid walls on 3 sides, a slatted door and floor. These types of cages are limited in surface area with minimal floor space and height—a severe restriction in space which limits exercise, normal ambulation and rearing activities. (Gunn and Morton 1994, BVAAWF/FRAME/RSPCA/UFAW 1993)

The *Guide* (1996) recommended 1.5 feet squared floor area with 14 inches cage height for a rabbit weighing less than 2 kg, singly housed. The updated *Guide* (2011) recommends 1.5 square feet squared floor space with 16 inches cage height for a rabbit that weighs less than 2 kg, singly housed. The only thing this 2 inch height difference has created is a dilemma for facilities that now need to purchase new equipment to meet the new height requirement or develop a new housing environment all together. These cages are isolating both physically and mentally, resulting in harmful behavioral abnormalities and stereotypes. (Stauffacher 1992, BVA AWF/FRAME/RSPCA/UFAW 1993).

Such abnormalities of caged rabbits have included:

- Physical/social isolation (Huls et al. 1991)
- Lack of mental stimulation (Huls et al. 1991)
- Boredom with the standardized pellet diet (BVAAWF/FRAME/RSPCA/UFAW 1993)
- Discomfort, mental suffering and distress (Lawrence and Rushen 1993, Gunn 1994)
- Abnormal behavior patterns—bar-biting, clawing of the cage (Stauffacher 1992, Gunn and Morton 1994)

- Frustration, anxiety, depression, destructive behavior
- Hunched posture, back bone distortions, osteoporosis (Gunn and Morton 1994; Lehmann 1984, Wieser 1984),
- High percentage of intestinal disorders
- Weight loss or obesity
- Abnormal ambulation
- Abnormal rearing activity

If these abnormalities are the result of a poor caging environment, imagine how they can and have affected rabbit experiments. Unintentional variables could be affecting experimental results—unknowingly! Again, if one examines other laboratory species—mouse,

rat, dog, pig, primate—none of these species have such limiting spatial and exercise restrictions as the rabbit. Since the revised *Guide* only allots for a 2 inch height increase for caging, the benefits are arguable. Essentially, the same caging environment exists, producing the same negative physiological and behavioral effects.

Contemporary Physical and Social Environment

To solve the issue of such a restrictive caging environment, a transformation needed to occur. With our new rabbit studies approaching, the perfect opportunity presented itself. Developing an environmental enrichment program was an exciting and entertaining challenge.

continued on page 18

Our Conventional Original Physical Environment:

ANIMALS	WEIGHT LESS THAN OR EQUAL TO 5 KG	FLOOR AREA ANIMAL SQUARE FEET	HEIGHT
Rabbits	Single Housed Rabbit	5.06	18"

Our Contemporary Physical Environment: 2011

ANIMALS	WEIGHT LESS THAN OR EQUAL TO 5 KG	FLOOR AREA ANIMAL SQUARE FEET	HEIGHT
Rabbits	Single Housed Rabbit	29.003	Floor to ceiling
	2-5 rabbits per pen	46.209	Floor to ceiling

Our Conventional Social Environment:

- Singly housed
- Stainless steel mirrors, shapes and/or plastic balls
- Radios in the rooms to provide background sound
- Food treats

Our Contemporary Social Environment—NOW:

- Floor pen housing
- Singly housed (only when necessary); otherwise group housed 2-5 (maximum) animals per floor pen (determined by mathematical calculations)
- Stainless steel chew toys, shapes, plastic balls
- Wood logs, sticks
- Radios in the room to provide background sound
- Tunnels, ramps, steps
- Bunny Cardboard cottages
- Scratching ramps (for digging)
- Red hiding huts
- Litter pans for litter training
- Willow baskets, willow sticks
- **Hay:** (timothy, timothy hay with marigolds, herb blended barley and oat hay with rosemary, bay leaves, and chamomile)
- **Garden treats:** organic rose petals, rose leaves, hibiscus petals, fresh grapevine with leaves, mint, herbs (parsley, oregano)
- **Fresh vegetables:** organic kale, broccoli, turnip/beet/carrot greens, carrots, spinach
- **Food treats:** pineapple bite blocks, dried fruits and vegetables, black oil sunflower seeds, yogurt treats (plain yogurt drops, yogurt covered fruits and nuts), fresh whole shelled nuts (almonds, walnuts, peanuts)
- **Human interaction**—petting, hand feeding



- **Exercise:** the floor pens now allow for ample exercise, movement without height restriction and an additional exercise program that allows the rabbits to venture out of their floor pen units and into an open room to participate in an agility course and to hop, run, jump, play and explore for 30-60 or more minutes 2-3 times/weekly

Rabbit Language

After creating a new environment and enrichment program, it is important to spend time observing the animals and their behaviors. You will be surprised at what rabbits teach us!

Rabbits actually have a wide range of expressions and methods of communicating. It is wrong to think of rabbits or other animals as not having language or culture, just because we have never taken the time to learn it. It is important to recognize the differences between a happy rabbit and an angry rabbit. This recognition will help us to understand a rabbit's response to its new environment and the changes needed to keep the rabbit content. A happy rabbit is a healthy rabbit.

A happy, relaxed rabbit will often lie on its stomach with forepaws and hind legs extended (we have been getting a great deal of that). Sometimes, rabbits lay with their legs extended but more to the side, as opposed to the bread loaf position where all limbs are tucked under the body. These extended feet indicate a happy rabbit, a rabbit that is feeling comfortable and safe in its environment.

The flop is another way of expressing contentment and happiness. The rabbit goes quickly from a sitting or standing position to lying on its side, like a tree falling in the forest. Eyes roll back and the rabbit appears lifeless, but it is not. The flop is different from a rabbit gradually lying down to nap. The motion is quick; it is actually a sign of bunny bliss.

Rabbits enjoy a variety of ways to play. They push or toss objects around, bunch up towels, or shred and tear cardboard or paper. Some play hide and seek or chase games. (*San Diego HRS, 2010*) Other indications of happy bunny syndrome include: tossing items, balancing on hind legs, thrusting little front feet in the air, a



classic begging pose which the rabbit will use if it can grab that food out of your hand (they are very good at grabbing food quickly and all of it—apparently all the fresh kale belongs only to them), teeth grinding, and honking (for attention).

An unhappy bunny might exhibit behaviors such as a partial stance, thumping (the rabbit senses danger), kicking, stomping (fear, distress), biting things that are generally off limits, loud sniffing (they are angry—provide chew toys to divert their aggression) and throwing items (different from playful tossing—could mean they are hungry—so you better indulge their food cravings).

Environment is Everything

My rabbits run to me when I call them. It is wonderful how they greet me when I enter the area. They get excited for treats. Not only are they able to enjoy a new and stimulating environment, they are relaxed, accustomed to tolerant handling, have decreased heart rate and respiratory rates and have considerable social interaction with people and their housemates.

The biometrics was another interesting but logical discovery—instead of gaining predominantly weight mass (common in a cage unit), we noticed minimal weight gain—but healthy growth of their long bones and physical anatomy. This is an effect of the significant increase in exercise, diet and simulated natural environment. They now have an environment more conducive to behavior like that of bunnies in the outside world.

Rabbits not only have physiological needs but behavioral needs as well. Rabbits are very social (contrary to popular belief) and love enrichment just as much as people do. Enrichment items give them something to occupy their mind and encourage them to be more active.

The goal of enrichment is to increase activity and stimulation levels in the captive or limited environment. It helps animals demonstrate their natural behavior. In the rabbit's case, foraging, social grooming, exercise, nesting, burrowing and digging add variety to their day, give them choices in their environment, and enhance their well-being.

Enrichment generally enhances the animal's life pleasures and should be an integral part of the daily care of laboratory animals. Enrichment also gives us the chance to study and observe the animals' behavior. Our rabbits' response was remarkable. They have definitely turned me into a rabbit person. I will be so bold as to claim—our rabbits are HAPPY at last. Indeed, it seems to be the Year of the Rabbit after all!

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Environmental Enrichment Reduces the Likelihood of Alopecia in Adult C57BL/6J Mice

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Barbering (incessant grooming) is an abnormal behavior causing alopecia and commonly affects various strains of laboratory mice, including C57BL/6J. Barbering-induced alopecia is a potential symptom of brain impairment and can indicate a stressful environment. We compared alopecia prevalence and severity in mice housed in enriched or standard cages. Providing an enriched environment delayed the onset and reduced the prevalence and overall severity of alopecia in C57BL/6J mice. Husbandry methods that reduce adult alopecia are likely to promote the well-being of the animals. We suggest that environmental enrichment is a simple and economic way to reduce alopecia in mouse colonies.

Effects of Enrichment Items on Activity and Social Interactions in Domestic Horses (*Equus caballus*)

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The aim of this study was to investigate the use of items intended to provide enrichment during turnout, both for individual and group kept horses in an attempt to reduce the amount of passive behaviours. The study was divided into two parts, where study 1 involved eight horses rotated through eight individual paddocks, each containing one of seven enrichment items and one paddock being kept without items, functioning as a control. The horses' item-directed behaviours, passive behaviours or other non-item related activities were scored using instantaneous sampling, every minute for 1h at the beginning and the end of the turnout period. Study 2 involved six horse groups (3–6 horses) and the same scoring methods and ethogram as in study 1. The four items that the horses interacted the most with

during study 1 (straw STRA, ball filled with concentrates CBALL, branches BRAN and scratching pole POLE) are investigated in study 2. In addition, the amount of social interactions was recorded.

Both horses kept individually ($P < 0.05$) and in groups ($P < 0.0001$) performed significantly more item-directed behaviours towards edible items like STRA and CBALL than other objects. There was, however, no overall relation between the numbers of item-directed behaviours and the number of passive behaviours observed, indicating that the enrichment items did not alone reduce the amount of passive behaviours during turnout periods. Such a reduction was, however, only apparent when horses spent more time eating green leaves growing on the paddock surface ($R = -0.97$ study 1, $R = -0.67$ study 2, $P < 0.0001$). Access to STRA in group kept horses also seemed to reduce the amount of agonistic behaviours ($P < 0.0001$). In conclusion, if grass is not available in paddocks, the provision of roughage reduces the amount of passive behaviours in singly kept horses and it also reduces the risk of agonistic interactions between horses kept in group.

Positive Reinforcement Training As Enrichment for Singly Housed Rhesus Macaques (*Macaca mulatta*)

Baker, K.C.; Bloomsmith, M.A.; Neu, K.; Griffis, C.; Maloney, M.

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<http://www.ingentaconnect.com/content/ufaw/aw/2010/00000019/00000003/art00012>

Positive reinforcement training is one component of behavioural management employed to improve psychological well-being. There has been regulatory promotion to compensate for restricted social housing in part by providing human interaction to singly caged primates, implying an efficacy standard for evaluating human interaction. The effect of positive reinforcement training on the behaviour of 61 singly housed laboratory rhesus macaques (*Macaca mulatta*) was evaluated at two large primate facilities. Training involved body part presentation and basic control behaviours. Baseline data were compared to two treatment phases presented in varying order across individuals, six minutes per week of positive reinforcement training and six minutes per week of unstructured human interaction. While a MANOVA involving behavioural categories and study conditions across study subjects was significant, univariate ANOVAs found no effect of phase within any behavioural category. Categorising subjects according to rearing, housing facility, or baseline levels of abnormal behaviour did not reveal changes in behaviour with positive reinforcement training or human interaction. This study failed to detect, to any degree, the types of behavioural changes documented in the scientific literature to result from pairing singly housed monkeys. Implementing short durations of positive reinforcement training across large numbers of singly housed animals may not be the most effective manner for incorporating positive reinforcement training in the behavioural management of laboratory macaques. Rather, directing efforts toward individuals with specific behavioural, management, clinical, research or therapeutic needs may represent a more fruitful approach to improving psychological well-being with this technique.

Decline in Aggression in Cotton Rats through the Use of Enrichment

ABSTRACT

The cotton rat (*Sigmodon hispidus*) presents a unique susceptibility toward human pathogens and is currently used in studies of human respiratory syncytial virus, adenovirus and parainfluenza virus. Though very valuable, this animal model has earned a bad reputation with husbandry, veterinary and research personnel. Cotton rats tend to be hyperactive and aggressive in the lab setting and are likely to leap from their cages or bite when handled. Frequent fighting between cage mates, particularly males, is often brutal and deadly, compromising study results. Our researchers were very concerned about the aggression and fighting in their colony and asked us for a solution. An internet search revealed nothing helpful, so we suggested the addition of cardboard tubes (3.2" x 5" x 0.30") to the cages for shelter and enrichment. We pair-housed the animals and provided one tube per male to prevent competition. The change in the animals' behavior has been overwhelming and our technicians, veterinarians and researchers are thrilled with the outcome! Prior to the addition of the tubes, it was necessary to handle the rats wearing heavy leather or HexArmor gloves for protection from biting. We now wear latex gloves during cage changing with no more fear of biting than from other common rodents. In one year, fight wounds in our cotton rats have decreased by 77% and the animals are typically seen resting peacefully with their cage mates in or near their tubes.

Natural History

Hispid Cotton Rats (*Sigmodon hispidus*) prefer to live in cotton fields or other tall, thick grasses to protect them from birds of prey. Their range extends from the United States southward to Mexico and as far as Northern South America. Their last 2 molars form an "S" shaped pattern, hence the genus name, *Sigmodon*, which means "S tooth". (*Wikipedia*, 2009) These small, brown rats are primarily herbivores but will eat insects and even the carcasses of dead animals. The females are monogamous, giving birth to 5-6 pups after a 27 day gestation. Breeder pairs may produce 1 litter a month.

Use in Research

During the polio epidemic in the later 1930's, investigators at the NIH were looking for a suitable animal model to study the disease. Many species were live-trapped in the Southern United States, brought back to the NIH and inoculated with the polio virus. Only the cotton rat developed paralytic disease. A breeding colony was established to provide cotton rats for study in other laboratories and important advances were made in polio research due to work with cotton rats. (*Prince*, 1994) Their most important contribution in the study of human disease has been their use as a small animal model of (RSV) Respiratory Syncytial Virus, which is the primary cause of pneumonia in infants.

Problem

Researchers in the Department of Molecular Virology and Microbiology at Baylor College of Medicine are currently working with the cotton

rat model to develop medications and vaccines for treatment and prevention of RSV. This model is a USDA covered species and has earned quite a reputation for being aggressive and difficult to handle. Commercial breeders recommend handling them with heavy gloves or restraint devices to prevent bite wounds to handlers. (*Niewiesk*, 2009) Also, brutal fighting results in severe wounds, separation, treatment and often death, adversely affecting data. Our researchers recently approached us to help them find a solution to the fighting among cage mates in their breeding colony.

Solution

- Provide 2 (3.2" x 5" x .30") cardboard tubes (Jonesville Paper Tube Corp., Jonesville, MI.) to paired male cages to prevent competition for a single tube.
- Provide 1 tube to breeder cages and paired female cages.
- Reuse the tubes during change caging if they are not chewed up.
- Wean offspring, no more than 2/cage at 3 weeks.
- Set up breeder cages at weaning.

Results

- 77% reduction in morbidity/mortality reports for fight wounds/injuries in the past year.
- Calmer animals spend time chewing on tubes or hiding in tubes with their cage mate instead of fighting.
- Technicians change cages using double latex gloves instead of the cumbersome gloves worn previously.
- Happy, healthy animals, great research model, happy staff!

Conclusion

- Cardboard enrichment tubes provide shelter and nesting material to cotton rats which allows them to exhibit species specific behaviors.
- Aggression and stress in cotton rats is drastically reduced by providing enrichment.

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Mollie Bloomsmith, Ph.D.

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Senior Behavioral Scientist, Zoo Atlanta**

"Environmental Enrichment reduces stress, improves animal welfare and improves the quality of research. It is our responsibility to do the best we can because we are responsible for our animals. In an enriched environment, caregivers can enjoy the animals and have fun!"—Mollie Bloomsmith

Teacher, author, researcher, consultant, keynote speaker at NJABR's 2011 Enrichment Extravaganza and dedicated volunteer (think not only literacy and landscaping but Cub Scouts, Boy Scouts and Little League!) Mollie Bloomsmith is totally committed to improving the well-being of captive animals. As Head of Behavioral Management at Yerkes National Primate Research Center, Mollie strives to ensure a firm scientific foundation underlies improvements in the care of nonhuman primates. Behavioral Management focuses on the application of environmental enrichment, animal training, environmental design, socialization and operational procedures for improving animal welfare.

In recent years, Mollie has published articles on many topics related to behavioral management, including evaluating environmental enrichment, analyzing positive reinforcement training, treating behavioral problems in nonhuman primates and describing environmental enrichment programs for nonhuman primates in the United States.

The Yerkes National Primate Research Center conducts essential basic science and translational research to advance scientific understanding and to improve the health and well-being of humans and nonhuman primates. Yerkes-based research programs are seeking ways to develop vaccines for infectious and noninfectious diseases,



treat drug addiction, interpret brain activity through imaging, increase understanding of progressive illnesses such as Alzheimer's and Parkinson's diseases, unlock the secrets of memory, determine how the interaction between genetics and society shape who we are, and advance knowledge about the evolutionary links between biology and behavior.

The Center houses nearly 3,400 nonhuman primates as well as 12,000 rodents. These animals are critical to the Center's research in the fields of microbiology and immunology, neurologic diseases, neuropharmacology, behavioral, cognitive and developmental neuroscience, and psychiatric disorders.

Mollie was inspired by her first boss, Dr. Michale E. Keeling of the Veterinary Sciences Division of The University of Texas M.D. Anderson Cancer Center (renamed the Michale E. Keeling Center for Comparative Medicine and Research in 2004). "He helped me understand and appreciate the science of animal welfare," she says. "One of the first to focus on behavioral management, he was a vet who always realized behavior matters. He helped me see how my expertise in behavior could fit into managing laboratory primates."

Mollie believes we should use science as a way of solving practical—not esoteric—problems. "Animal welfare science is useless," she says, "unless it is translated into things that people do!"

Mollie grew up loving animals and now holds a Ph.D. and an M.S. in Experimental Psychology from Georgia Institute of Technology and a B.S. in Animal Behavior from University of California, Davis. Prior to assuming her current position in 2003, Mollie served as Director of Research and Director of TECHlab at Zoo Atlanta and Assistant Experimental Psychologist at The University of Texas M.D. Anderson Cancer Center. Her experience includes working on behavioral research studies with chimpanzees, rhesus monkeys and gorillas as well as giant pandas, giraffes, lions, tigers, rhinoceros, orangutans and elephants.

In addition, she assisted in the development of Chimp Haven in Keithville, LA. Chimp Haven serves as The National Chimpanzee Sanctuary, an independent, nonprofit organization whose mission is to provide lifetime care for chimpanzees who have been retired from medical research and the entertainment industry, or are no longer wanted as pets.

Mollie conducts yearly primate training and enrichment workshops for animal care staff, investigators, and veterinarians. She encourages participants to integrate positive reinforcement training into their programs. "Reinforcing good behavior, reducing stress and encouraging animals to cooperate voluntarily," she notes, "improves the science and can be great fun!" She is also a frequent presenter at national meetings, where she shares best practice information to help further the animal care programs at other research facilities.

As for the future of the field of environmental enrichment, Mollie Bloomsmith sees bright days ahead. She is hopeful primates will soon be socially housed in larger enclosures and will be given more frequent opportunities to make choices and exercise control. She is also hopeful research centers will further their community outreach programs to educate the public and that her efforts will contribute to the continuing improvement of laboratory animal welfare.

45th Congress of the International Society for Applied Ethology

July 31-August 4, 2011, Hyatt Regency, Indianapolis, IN

The Annual Congress of the International Society for Applied Ethology (ISAE) returns to the United States in 2011 for the 3rd time in its 45-year history. A truly international forum, the Congress attracts researchers, educators, students and policy-makers with diverse yet common interests to disseminate, gather and discuss vital information on the well-being and behavior of companion, farm, laboratory, wildlife and zoo animals and their interface with society.

The meeting is approved for 16 CEUs for members of the American Registry of Professional Animal Scientists.

<http://www.ars.usda.gov/meetings/ISAE2011>

10th International Conference on Environmental Enrichment

August 14-19 2011, Benson Hotel, Portland, Oregon

Hosted by the Oregon Zoo and the Oregon National Primate Research Center, OHSU events at the Oregon Zoo and the Oregon National Primate Research Center.

"Meeting of the Minds: Working Together to Enrich the Lives of Animals"

The International Conference on Environmental Enrichment is a meeting for the exchange of ideas about both theoretical and applied research on enrichment for animals in captivity. The original conference, held in 1993, was hosted by the Oregon Zoo. For the first time, this conference is being co-hosted by a research facility, the Oregon National Primate Research Center (ONPRC). This combination of the zoo and laboratory communities will bring together caretakers, researchers and veterinarians of differing backgrounds, but with a similar goal; providing for the well-being of the animals in their care.

Registration for the conference is \$450, which includes continental breakfasts and coffee breaks for all conference days, as well as admission to the Ice Breaker, Closing Banquet, Zoo Day at the Oregon Zoo (including meals), and a social gathering at the ONPRC.

The Benson Hotel is offering special room rates of \$149 per night for ICEE participants. To reserve a room, go to Benson Hotel Reservations. For more information, or to register or submit an abstract, please go to the ICEE 2011 home page or contact the ICEE 2011 hosts at icee.2011@hotmail.com

Annual Innovative Environmental Enrichment Symposium

October 2, 2011, San Diego, CA

Marriott Hotel and Marina (Satellite to National AALAS)

The Massachusetts General Hospital, Center for Comparative Medicine hosts an annual Innovative Environmental Enrichment Symposium.

This event is for individuals in the field of animal behavior, enrichment and welfare who are passionate about providing quality laboratory standards that exceed regulations and meet animal welfare needs.

The objective of this symposium is to provide a forum at which participants can compare notes on innovative animal enrichment and conditioning programs and how to best determine the effectiveness of those versus current practices.

The symposium will include a variety of highlights:

- Developing an enrichment program
- Social housing
- Behavioral conditioning
- Human-animal interaction and socialization
- Enrichment in a GLP environment
- Determining economic costs and benefits of enrichment strategies
- Regulatory considerations in enrichment programs

http://www.virtualvivarium.com/about%2Dus/upcoming-events/environmental_Enrichment_Symposium.asp

There's an old saying that "You can't dance at two weddings at once."

You also can't attend all the meetings and conferences taking place that offer the latest information in the field of laboratory animal science. **Meeting Up** will provide summaries of panels, workshops and symposia covering topics relevant to Environmental Enrichment. If you want more information about any of the presentations described or want to contact the presenters, let us know and we will be happy to connect you: info@theenrichmentrecord.com

Enrichment Extravaganza June 13, 2011

Atlantic City Convention Center

Organized by *The Enrichment Record*,
New Jersey Association for Biomedical
Research, NJAALAS

Summary of Morning Plenary Sessions

By *Jodi Carlson Scholz*

Effects of Cage Naturality on the Scientific Validity of Mouse Models

*Casey Acklin, The Davidson Academy,
University of Nevada, Reno, Winner of the first
"Enrichment Rising Star" Award sponsored by
Pfizer and Huntingdon Life Sciences*

Casey presented the results of a project that he conducted at the University of Nevada, Reno. He sought to determine whether mice that were provided with natural enrichment would be a better research model compared to mice housed in standard cages or cages with more commonly utilized enrichment devices.

Specifically, the three caging conditions he evaluated were: **Standard** (corn cob bedding plus a Nestlet); **Enriched** (corn cob bedding, Nestlet, a paper hut, wood chew, and synthetic materials such as a running wheel and plastic igloo); and **Natural** (woodchip bedding, coconut nesting material, shredded paper, willow sticks,



Casey Acklin, The Davidson Academy, University of Nevada, Reno and Genevieve Andrews-Kelly, Co-Chair, Enrichment Extravaganza Planning Committee

pine cones, and hay). He then analyzed his mice by fecal corticosterone to determine stress levels; a T-maze continuous alternation task to assess spatial working memory; open-field test to measure anxiety, activity and exploration; and litter weights as an overall assessment of well-being. He found that mice housed in cages with natural enrichment demonstrated

less stress, improved spatial memory, more activity and exploration (indicating less stress).

Mice housed in natural cages also produced higher litter weights compared with mice provided standard enrichment and, to an even greater extent, mice provided with a Nestlet only. Although the naturalistic enrichment he used was more expensive than standard enrichment materials, there is potential for a significant decrease in cost if these items were to be available in bulk quantity. Because natural enrichment needs to be replaced more frequently, it drives up the cost.

Casey's findings are consistent with previous studies demonstrating that mice provided with natural materials are more capable of coping with stress in the laboratory and thus are likely to be a more viable scientific model.

Does Positive Reinforcement Training Really Work?

A review of Scientific Assessments of Training Primates

Mollie A. Bloomsmith, Ph.D.

Yerkes National Primate Research Center

Utilization of positive reinforcement training (PRT) is a relatively new concept in the laboratory animal environment as a component of routine management of non-human primates. With PRT, the trainer works with the animal by rewarding behaviors without use of force or coercion. Prior to implementing a PRT program, it is important to understand its benefits and limitations. Dr. Bloomsmith presented five frequently asked questions about PRT and presented examples of studies that have been performed to help answer these questions.

- 1). **When one person trains an animal, will the animal perform this behavior for other Individuals? Yes.** This phenomenon is referred to as transfer. Dr. Bloomsmith presented a study she published in 1998 in which chimpanzees were trained to shift from an outdoor corral to indoor housing. After the animals were trained by one trainer, compliance was essentially the same after the behavior was transferred to a second trainer.
- 2). **Can training save time? Yes.** Dr. Bloomsmith gave a few examples of studies evaluating the time costs and savings with PRT. In one example, chimps were trained to urinate into a specimen container when it was placed in the cage; this process generally takes 2-3 minutes, compared to an hour or more with the conventional way (which also involved separation from the group, which can be stressful). A second example, a study published by Veeder et. al. in 2009, demonstrated shifting of sooty mangabeys from one enclosure to another. Although the training process took 26 hours, the time savings per day was "paid back" in just 35 days.
- 3). **Can training decrease aggression between animals? Yes.** Dr. Bloomsmith described a technique called cooperative feeding and how it has been used in chimps and macaques to mitigate aggression during feeding, both in outdoor corrals and indoor cages. The aggressor is trained to sit still while the others are eating, and this has been shown to be quite successful in decreasing aggression.
- 4). **Does training decrease abnormal behavior? Maybe.** Studies performed to answer this question have reported conflicting results. Some studies have shown that abnormal

behavior is only decreased during the active training process, while other studies have reported that there has been a generalized reduction in behavior.

- 5). **Does training reduce fear? Yes.** Dr. Bloomsmith summarized a study published by Clay, et. al. in 2009 in which rhesus macaques that were desensitized to fear-inducing stimuli in their environment demonstrated less fearful behavior and would actually spend time sitting in the front of the cage.

The studies Dr. Bloomsmith presented highlight the importance of conducting studies to understand the benefits and limitations of utilizing positive reinforcement training for nonhuman primates in the laboratory.

Establishing Performance Standards for Environmental Enrichment

Lisa Leon, Ph.D.

US Army Research Institute of Environmental Medicine

From the perspective of a research physiologist, Dr. Leon discussed the need for standardization and development of performance standards for rodent enrichment. Although the intent of enrichment is to improve well-being, not all enrichment is beneficial to the animals. Additionally, enrichment has the potential to interfere with research outcomes. For her studies in mice, Dr. Leon measures core body temperature, which has been shown to become elevated during periods of stress. She discussed three primary environmental aspects to consider: the micro-environment, the macro-environment, and experimental objectives.

Within the **micro-environment**, bedding can be considered enrichment, particularly if it contains materials for nesting. However, it is important to understand how variables in bedding can affect the physiology of mice; for example, changing bedding, providing deep bedding, and placing running wheels in the cage are all enrichment strategies that affect core body temperature. Another potential concern in the microenvironment is the impact of red shelters on the circadian cycle, but these shelters were shown not to affect circadian rhythm. These findings emphasize the need for standardization and understanding how enrichment and husbandry practices can influence experimental procedures. A major concern of the **macro-environment** is ambient temperature. Animal facilities routinely house rodents at 20-26°C, but at this temperature range, rodents expend energy to maintain their body temperature.

continued on page 26

Preference testing demonstrates that mice prefer temperatures higher than 20–26°C, and this may be additionally impacted by strain, time of day, and absence of fur. She concluded that the standard housing temperatures recommended for rodents is lower than their preferred temperature range.

Lastly, Dr. Leon provided an example of utilizing enrichment to reach **experimental objectives**. After surgery, mice are provided with analgesia, traditionally administered by injection. However, after some preference testing to determine what flavors of treats the animals prefer prior to surgery, the medication can be delivered on the treat and voluntarily consumed by the animal. This method decreases stress to the animal and does not interfere with measurement of core temperature, which is affected by handling and injection.

Environmental Enrichment for Rabbits

Jodi Carlson Scholz, D.V.M., DACLAM
Yale School of Medicine

Dr. Scholz provided an overview of rabbit enrichment in the context of five general categories: nutritional, social physical, activity, and sensory.

Nutritional enrichment can be provided by altering what, when, how, and where food is provided. Rabbits prefer to spend 30–70% of their day foraging, so providing foods that take time to consume or presenting food in a way that the animals have to work to obtain the food is preferred. Hay is a particularly beneficial form of nutritional enrichment for rabbits, as it provides the course fiber that they need in their diet and promotes foraging behavior. Foods high in starch, sugar, and calcium should specifically be avoided.

Rabbits are **social** animals, and pair or group housing should be provided whenever possible. In contrast to individually caged rabbits, studies have shown that group housed rabbits do not exhibit abnormal behaviors. Because rabbits have a strict dominance hierarchy, social housing should be approached with care. It is generally considered too risky to co-house adult male intact rabbits. Because some aggression can occur even with females, it is important to provide an environment that helps prevent aggressive interactions, such as assuring animals have adequate space and shelters. Interaction with humans can also be considered social enrichment and can be used to help prevent stress associated with common techniques (and can itself be enriching).

The **physical** environment can be altered by providing cage furniture, bedding and enrichment devices. The primary environment should take into account natural behaviors of the rabbit, which include rearing on hind legs, stretching out when resting, and locomoting by hopping. Enrichment devices that encourage foraging or gnawing behavior are considered biologically relevant and tend to hold the animal's attention longer than "toys" which rely primarily on novelty and tend to lose the animal's interest quickly.

Activity can be encouraged by providing adequate space, utilizing nutritional enrichment, and by adding cage structures. Rabbits make use of vertical space and will perch in elevated areas if given the opportunity. Pen housing is ideal, but if this is not an option, caging that allows connections of individual cages or use of activity cages can be an effective alternative.

When considering **sensory** enrichment, it is important to understand how the animal senses its environment. For example, the hearing range of rabbits is higher than that of humans, and high-frequency sounds above the human hearing range could potentially affect rabbit behavior.

To minimize impact on researchers, husbandry, veterinary staff, and management, it is important to evaluate the safety of any enrichment strategy and seek input from all involved with animal care prior to implementation.

Poster Presentations

Adding a Little Color to a Monkey's World

Donna Olivo, *Merck*

New Hire Training and Environmental Enrichment—Building the Foundation for a Lifelong Commitment

Michael Savidge, *Huntingdon Life Sciences*

Afternoon Workshops

Practical Primate Enrichment

Dr. Lorna Millen, *Covance*

Enrichment for Mini-Pigs

Michelle Salerno, *Marshall BioResources*

Early Developmental Canine Socialization Program & Enrichment

Dr. Kimberley Cohen, *Covance*

Enrichment in a Tox Environment

Amanda Hobson, *Bristol-Myers Squibb*

Rodent Enrichment: Promoting Natural Behaviors

Dr. Karen Froberg, *Bio-Serv*

Stereotypic & Abnormal Behaviors

Kathryn Galvin, *Merck & Stefanie Nelsen,*
Primate Products

New Guide—Implications for Enrichment

Dr. Elizabeth Dodemaide, *Rutgers University*
Dr. Greg Reinhard, *Merck*

Positive Reinforcement Training for Primates

Dr. Christin Veeder, *U of Penn*
Dr. Mollie Bloomsmith, *Yerkes*

All Creatures Big and Small: Animal Enrichment in a Laboratory Environment

Lynne Walsh
Vice President, Programs and Membership, MSMR

The Massachusetts Society for Medical Research, Merck & Co., New England Branch of AALAS and Massachusetts General Hospital Department of Comparative Medicine sponsored the third annual Enrichment Symposium, *All Creatures Big and Small: Animal Enrichment in a Laboratory Environment* at the Colonnade Hotel in Boston, MA. The event was held on April 14, 2011 and included a national audience, speaker presentations, enrichment posters, raffles prizes and outstanding vendor exhibits.

The symposium opened with keynote speaker Emily Patterson-Kane, Ph.D., Animal Welfare Scientist from the American Veterinary Medical Association. Her topic, ***Horizons of Enrichment: the History, Accomplishments and Aspirations of Environmental Enrichment***, was a summary of the history of enrichment, how it started, how it has evolved and where it should go in the future. Throughout the day, local experts treated attendees to presentations on environmental enrichment for zebrafish, mice, rats, rabbits, dogs, swine and primates. Videos were used to demonstrate the difference between normal behavior vs. aggressive behavior as well as the benefits of adding enrichment to zebrafish tanks. Challenges of mice enrichment at a large institution included points such as storage of enrichment, preparation of cages with enrichment and monitoring animals for effectiveness of enrichment. We learned how different environments can affect cognition in rats, and explored different types of enrichment for rabbits, showcasing species favorite items as well as devices with characteristics to avoid! The use of a webcam to observe otherwise unseen dog behavior and their use

of enrichment without caretakers present showed us how technology can improve our enrichment practices. In addition, we learned about a variety of enrichment techniques for different swine management; were shown the benefits of music and video as forms of enrichment with primates; and discussed challenges of enrichment from both a veterinary and study perspective. Case studies demonstrated how enrichment can be customized to benefit most study animals and how to design an enrichment program that challenges and benefits both staff and animals.

All in all, this, MSMR's third Enrichment Symposium has proven to be the best according to participants who were able to spend time viewing posters submitted by their peers, exchange ideas and techniques with colleagues, and spend quality time with vendors while learning about the latest enrichment products and services.

Back to Basics: Rats in Research

Karena Thek, *National Sales Manager, Bio-Serv*

AALAS District 1 Training Seminar, ***Back to Basics: Rats in Research*** was held May 20th and 21st immediately following the Quad Symposium. Lectures were held at Mohegan Sun, Uncasville, CT followed by the wetlab portion at the University of Rhode Island, Kingston, RI. This two-day educational event introduced technicians to basic skills involved in working with rats in our industry.

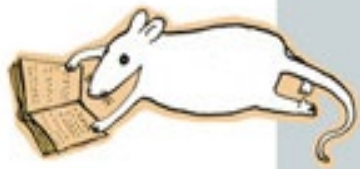
A small segment of this symposium included animal behavior training and enrichment strategies. Karena Thek, Enrichment Specialist and National Sales Manager from Bio-Serv, delivered this seminar. The seminar focused on normal rat behaviors, practical ways to allow such behaviors in our shoebox cages and teaching an understanding of stress behaviors and ways to counter this stress. The seminar included several examples and publications that showed techniques for incorporating this behavior to better both protocols and animal welfare.

Training rats using treats to decrease stress and induce cooperation, understanding when your rat needs special attention, suggestions on keeping your animal eating and hydrated and postoperative recovery practices were all discussed. Real life examples were used and audience participation was encouraged. Ideas not covered in the seminar were shared by participants. Various enrichment products were shown and discussion regarding types, cleanliness, use and practice were discussed.

See website: <http://www.rodentrespect.com/> for complete **Rodent Respect** info and artwork


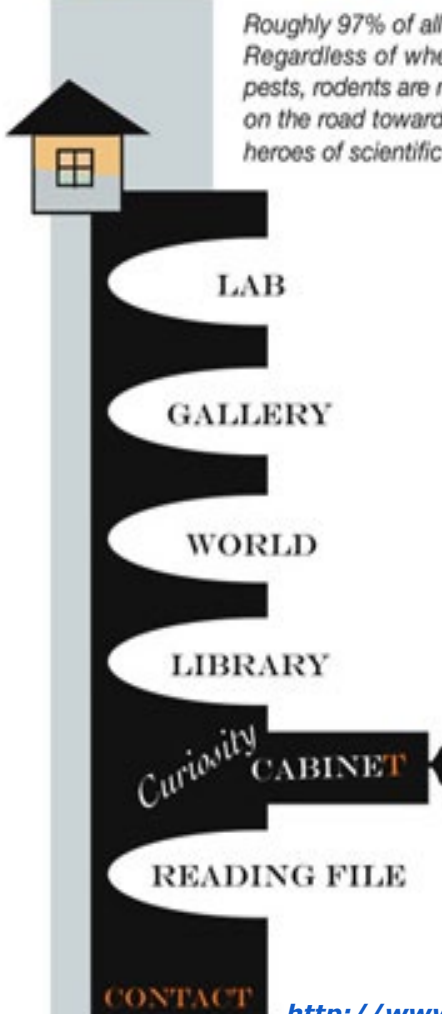
RODENT RESPECT

Roughly 97% of all lab animals are mice and rats. Regardless of whether one views them as pets or pests, rodents are mankind's most constant companions on the road toward a healthier future. They are the unsung heroes of scientific progress. This project is dedicated to them.



FREQUENTLY ASKED QUESTIONS

DEMAND YOUR RODENT RESPECT BUTTONS!



SCIENTISTS TALK ABOUT RODENTS


- INTERVIEWS
- ETHICS
- LINKS

DOWNLOAD POSTER

BLOG

This site was created for scientists who work with rodents and especially for students who are just beginning to get acquainted with their fuzzy experimental subjects. We welcome your input comments and suggestions.

<http://www.rodentrespect.com/>



made possible by
a grant from the
welcometrust

Free-Range Rabbits: The Environmental Transformation



Kimberly A. Wasko, CVT, VTS, RLATg, SRS
Drexel University College of Medicine, Department of Surgery, Philadelphia, PA; USA

Year of the Rabbit

- The Chinese calendar consists of the year's 12 prevailing animal zodiac and its earthly branches. Chinese New Year brings us The Year of the Rabbit for 2011.
- Officially beginning on February 3, and will be, according to some interpretations, a year for slowing down and focusing on home and family of furry or not so furry friends.
- If the Qi advises slow down and focus and the animal zodiac is the rabbit - what better way to unite these two elements than... focusing on the rabbits!



Objective

- Embark on new adventures in growing a rabbit environmental enrichment program.
- Transform the conventional environment to a contemporary environment.
- Increase the animal's general comfort & tolerant handling.
- Provide a dynamic and comprehensive enrichment program to reduce stress and facilitate quality care.

Introduction

- Background**
 - Although the quality and number of laboratory rabbits has improved over the last few decades, their behavioral and physiological well-being has generally been overlooked, potentially harmful and neglected.
- Importance**
 - Two animal areas of animal welfare that have not improved are the cage environment and enrichment which have negative effects on rabbits.
- Prevent Techniques**
 - Rabbits are traditionally housed in single cages/cups.
 - Three types of cups are located in various areas with minimal floor space and height - a severe restriction in space.
 - These cups are isolating both physically and mentally thus, resulting in harmful behavioral abnormalities and microstress.
 - The opportunity for enrichment is critically deficient and ineffective.

Conventional Environment

- OUR Conventional Environment**
 - Physical environment (our standard size was 3.6 square feet by 38 in. high, single wire cage)
 - Social environment (single housed, human interaction consisted of feeding and cleaning)



A. Physical environment: Conventional single cup wire rack



B. Physical Environment: Single cup wire rack with enrichment



C. Physical Environment: Single cup wire rack with enrichment

Contemporary Environment

- OUR NEW Contemporary Environment**
 - Physical environment (our NEW size 46.25 square feet for group housed and 29.00 square feet for single housed) floor is rolling height
 - Social environment: group housed, human interaction 30-45 min for 15-30 minutes minimum: playing, holding, playing various enrichment devices daily
 - Opportunity for physical and mental challenge: after exercise 20-30 min x 30-60 minutes, enrichment (food items 20-30 min)

OUR NEW ENVIRONMENT



A. Physical environment: Contemporary free range group housing



B. Environmental Enrichment: Paper tunnels 1-2.5 ft, used to be for exercise



C. Environmental Enrichment: Food items feeding



D. Environmental Enrichment: Enrichment devices: various enrichment



E. Social Enrichment: Group housed exercise



F. Environmental Enrichment: Food items



G. Handling Enrichment: Hand feeding

Our Types of EE Devices, Treats



A. Contemporary Distribution Treats: Digestive Biscuits and Biscuits



B. Contemporary Food Items: Cabbage (appetite for exercise) and other vegetables they eat naturally - carrots (not appropriate like in other studies)



C. Contemporary Enrichment: Chewy Cornstarch (to nibble on) and other toys with various shapes, textures



D. Contemporary Enrichment: Chewy Cornstarch (to nibble on) and other toys with various shapes, textures

Discussion

- Enrichment is everything!
- The goal of enrichment is to increase activity and stimulation levels in the captive or limited environment.
- Our animals thrived in the new and stimulating environment, were relaxed, accustomed to tolerant handling, experienced decreased heart rate, respiratory rate and considerable social interaction with people and their housemates.
- The most humane habitat possible for all research animals should be provided.

References

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Acknowledgment

The author wishes to express sincere appreciation to the staff of Drexel University, for their support and assistance in the development of this project. The author also wishes to express her appreciation to the staff of Drexel University, for their support and assistance in the development of this project.



ABSTRACT

The cotton rat (*Sigmodon hispidus*) presents a unique susceptibility toward human pathogens and is currently used in studies of human respiratory virus, adenovirus and parainfluenza virus. Though very valuable, this animal model has earned a bad reputation with husbandry, veterinary and research personnel. Cotton rats tend to be hyperactive and aggressive in the lab setting and are likely to leap from their cages or bite when handled. Frequent fighting between cage mates, particularly males, is often brutal and deadly, compromising study results. Our researchers were very concerned about the aggression and fighting in their colony and asked us for a solution. An internet search revealed nothing helpful, so we suggested the addition of cardboard tubes (1.2" x 5" x 0.30") to cages for shelter and enrichment. We pair-housed the animals and provided one tube per male to prevent competition. The change in the animals' behavior has been overwhelming and our technicians, veterinarians and researchers are thrilled with the outcome. Prior to the addition of the tubes, it was necessary to handle the rats wearing heavy leather or HexArmor gloves for protection from biting. We now wear latex gloves during cage changing with no more fear of biting than from other common rodents. In one year, fight wounds in our cotton rats have decreased by 77% and the animals are typically seen resting peacefully with their cage mates in or near their tubes.

Natural History

Hispid Cotton Rats (*Sigmodon hispidus*) prefer to live in cotton fields or other tall, thick grasses to protect them from birds of prey. Their range extends from the United States southward to Mexico and as far as Northern South America. Their tail 2 molars form an "S" shaped pattern, hence the genus name, *Sigmodon*, which means "S tooth". (Wikipedia, 2009) These small brown rats are primarily herbivores but will eat insects and even the carcasses of dead animals. The females are monogamous, giving birth to 5-6 pups after a 27 day gestation. Breeder pairs may produce 1 litter a month.



Fig. 1



Fig. 2

Fig. 1 Female choosing tubes for nest.

Fig. 2 Operator changing cages.



Fig. 3

Fig. 3 Nitrile gloves used prior to touch handle.



Fig. 4

Fig. 4 One female tube.



Fig. 5

Fig. 5 Male cage mates sharing tubes.

Use in Research

During the polio epidemic in the later 1930's, investigators at the NIH were looking for a suitable animal model to study the disease. Many species were tripped in the Southern United States, brought back to the NIH and inoculated with the polio virus. Only the cotton rat developed paralytic disease. A breeding colony was established to provide cotton rats for study in other laboratories and important advances were made in polio research due to work with cotton rats. (Pierce, 1994) Their most important contribution in the study of human disease has been their use as a small animal model of (RSV) Respiratory Syncytial Virus, which is the primary cause of pneumonia in infants.

Problem

Researchers in the Department of Molecular Virology and Microbiology at Baylor College of Medicine are currently working with the cotton rat model to develop medications and vaccines for treatment and prevention of RSV. This model is a USDA covered species and has earned quite a reputation for being aggressive and difficult to handle. Commercial breeders recommend handling them with heavy gloves or restraint devices to prevent bite wounds to handlers. (Nierenski, 2008) Also, brutal fighting results in severe wounds, separation, treatment and often death, adversely affecting data. Our researchers recently approached us to help them find a solution to the fighting among cage mates in their breeding colony.

Solution

- Provide 2 (1.2" x 5" x .30") cardboard tubes (Jonesville Paper Tube Corp., Jonesville, MI) to paired male cages to prevent competition for a single tube.
- Provide 1 tube to breeder cages and paired female cages.
- Reuse the tubes during change caging if they are not chewed up.
- Wear nitrile gloves, no more than 20 cage at 3 weeks.
- Set up breeder cages at weaning.

Results

- 77% reduction in morbidity/mortality reports for fight wounds/injuries in the past year.
- Calmer animals spend time chewing on tubes or hiding in tubes with their cage mate instead of fighting.
- Technicians change cages using double latex gloves instead of the cumbersome gloves worn previously.
- Happy, healthy animals, great research model, happy staff!

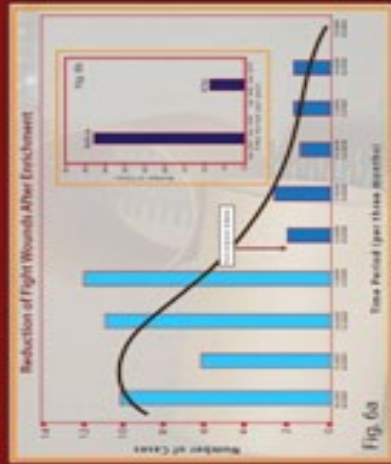


Fig. 6a

Fig. 6a Reduction in Numbers of Fight Wounds Given the 3 Month Period from April 2007 - June 2009
Fig. 6b Total Number of Fight Wound Cases Reported 1 Year Prior and 1 Year After Adding Enrichment

Conclusion

- Cardboard enrichment tubes provide shelter and nesting material to cotton rats which allows them to exhibit species specific behaviors.
- Aggression and stress in cotton rats is drastically reduced by providing enrichment.

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Acknowledgements:

Special Thanks to Dr. Orla Hogen, Center for Comparative Medicine, Baylor College of Medicine for providing excellent husbandry care to our colony until 08/09.

For the analytical data, a big thank you to Dr. Li-Li, PhD., Assistant Director, Center for Comparative Medicine, Baylor College of Medicine.

Abstract

In 2007 poultry at the University of Guelph Isolation Unit were housed in wire bottom battery cages in accordance with the CCAC guidelines. A need was recognized to better the welfare of poultry. Battery cages did not allow for natural behaviour to occur and the welfare of the animals was questioned. Ingenuity and desire led to changes in housing conditions that enabled the birds to exhibit natural behaviour. These behaviours include foraging, perching, dust bathing, socialization and movement. Poultry models are integral to research and it is our ethical responsibility to be proactive and demonstrate that valuable research is obtainable by moving beyond the battery cage. Research inevitably causes stress; mimicking natural living conditions can decrease this stress and improve the welfare of the birds. The implementations and changes of poultry housing at the Isolation Unit will be discussed and illustrated.

Understanding Natural Poultry Behaviour

Chickens will spend 50-90% of their time scratching and foraging in a day. They have a high concentration of touch receptors and sensory nerves in their beaks. If a chicken is not foraging it will more then likely be perching. It is an important action for bone strength and decreases aggression.

Dust bathing, preening and wing flapping are highly motivated behaviours and assist with maintaining good feather condition. Good feather condition is important since it helps regulate body temperature.

Nesting in laying hens is one of the most important rituals a chicken will perform. The desire to nest 2-4 hours before laying eggs is so high, they will strive to nest over gaining access to food.

Chickens are very social animals. They have the ability to visually recognize others by facial features. They have 24 distinct cries and use these to communicate to one another.



Brambell's Five Freedoms and the Use of Wire Bottom Cages

The five freedoms which are ideal states for animals are: Freedom from hunger and thirst, freedom from discomfort, freedom from pain, injury and disease, freedom to express normal behaviour and freedom from fear and distress.

With the use of wire bottom cages and allowable space 4/5 freedoms are not met pertaining to Poultry Welfare.

In wire bottom cages it is recommended that each bird be allowed 600 cm² which is the size of a standard piece of paper. However, a hen requires at least 750 cm² for comfort and 2000 cm² to flap their wings.

The inability to perch in wire bottom caging can cause painful limbs and broken legs. Sores on their feet can occur due to constant contact with wires.

Frustration due to lack of space, the inability to nest, dust bathe or forage can be seen. This can result in increased aggression to cage mates. Feather pecking and cannibalism is often seen.

Being in confined spaces and on wire bottoms, chickens will try and perform what is natural to them even if it causes them or cage mates pain. They will try and dust bathe on the floors, causing feather and wing damage, try to scratch at the wire bottoms, and perch or nest under or on top of their cage mates.

Enrichment Strategies

The use of battery cages should be limited. Social housing poultry on the floor with shavings is ideal for their welfare.

Perches should be provided at different levels. PVC piping is easy to clean and Cage Washer friendly.

Nesting boxes (old barrels) with shavings or hay.

Plastic boxes with sand allows them an area to dust bathe.

Hanging objects such as CD's or red Christmas ornaments allows them objects at which to peck.

Radios can be placed in the room and turned on during the day; providing constant sound leads to less fearful birds when people enter the room.

Selection of enrichment items that can be autoclaved to ensure sterility.

Personnel socializing with the birds is very beneficial. It allows the birds to be less stressed during procedures.

The use of wire bottoms has dramatically decreased. However, due to research requirements they are sometimes inevitable. Improvements can be made to these cages by ensuring a perch is available. If they are not eating you can be sure to find them resting upon their perches.

A rubber mat placed in front of the feeder will allow them to scratch at their feed and peck.

A nesting box can be provided which allows them to get off the wires.

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- Free Betty.com. *The Natural Lives of Chickens.*

Acknowledgements:

Many thanks to Linda Grocock, Mary Fowler, Annette Morrison, Michael Brunt and most of all the Chickens.

Reporters Wanted!



In each issue of *The Enrichment Record* we report on Enrichment meetings and conferences in detail. We are seeking volunteers to write summaries of meetings, workshops, and conferences addressing any aspect of environmental enrichment for lab animals. Meeting organizers are welcome to assign a recorder.

To request "Guidelines for Meeting Up Summaries," send your name, contact and meeting information to info@theenrichmentrecord.com

NAME _____

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EVENT _____

DATE _____

TIME _____

LOCATION _____

Meeting Announcement submission Form

Please submit the following information to Rhoda Weiner, Editor rmbw19@verizon.net

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CONTACT NAME _____

PHONE _____

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DATE OF EVENT _____

TIME OF EVENT _____

EVENT LOCATION _____

TYPE OF EVENT

Conference _____ Workshop _____ Lecture _____

Meeting with featured speaker _____

BRIEF DESCRIPTION OF THE EVENT _____

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- Discussing environmental enrichment in the optimal care of laboratory animals
- Documenting best practices
- Sharing data on the impact of environmental enrichment on the science
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