

## Environmental Enrichment in Chinese Research Facilities

The phrase "Environmental enrichment (EE)" is defined in many ways. As early as 1925, Robert Yerkes introduced the concept, saying: "The greatest possibility for improvement in our provision for captive primates lies with the invention and installation of apparatus, which can be used for play or work." However, environmental enrichment has only recently become a popular topic in laboratory animal facilities in China. Progress is largely due to the increasing international collaboration of new drug discovery and development between China and western countries. With more and more research projects being outsourced to China, and an increasing number of facilities getting AAALAC accreditation, the environment of laboratory animals is being enhanced. This article tracks the progress of environmental enrichment in China's laboratory animal facilities.

Investigators who use animals in biomedical and behavioral research have an obligation not only to conduct high-quality research but also to promote the health and well-being of their animal subjects. "Regulations for the Administration of Affairs Concerning Experimental Animals (RAACEA)," China's first legislation for the research animals, was issued by the State Council in 1988. It regulates the basic animal welfare protection standards such as facility construction, diet, drinking water, housing space, microbiology, nutrition, etc. Although there is little description in RAACEA about



environmental enrichment, the physiological and psychological needs of the research animals are taken into account when the facility is designed and the management program for animal housing and handing is prepared. Over the years, there have been substantial efforts to improve the housing conditions of laboratory animals.

The first item introduced to research facilities was the perch for non-human primates, which was followed by the stainless steel mirror. Primates are no longer housed in barren living quarters in the majority of research laboratories. Sensory enrichment such as television, background music,

and videotapes have appeared in some canine and primate facilities. Some facilities provide canines with a common playground where the animals have the freedom to get out of primary enclosures and move around for a half-hour of daily exercise.

The importance of animal-animal and animal-human interactions is being recognized. Research technicians understand that the positive relationships that develop between facility personnel and laboratory animals may result in an overall reduction in stress for the animals and may serve to buffer the potential stress of certain experimental situations resulting from the novelty of the procedure area, disease conditions, or certain experimental procedures. Conversely, they are beginning to see that rough handing is stressful for animals. Canines and non-human primates recognize individuals and become frightened of those who handle them aggressively.

Recently, the boom in drug discovery and development in China has accelerated animal study technology as well as animal welfare protection. The impetus comes from the global pharmaceutical companies establishing R&D centers in China. Equally important, thousands of Chinese researchers who have been trained abroad are returning with state-of-the-art research techniques grounded by the concept of

humane treatment of animal subjects. Importantly, more researchers and management are adopting international standards and best practices. In 2005, the laboratory animal facility of Nanjing Medical University School of Public Health was the first research facility accredited by AAALAC in China. By end of 2011, the number increased to 36, and more than 50 other facilities are applying or have a plan to apply as soon as possible. International conferences and training programs are increasingly relevant to improving laboratory animal welfare. Exposure to programs like the AALAS Learning Library and GR8's introductory course in laboratory animal care and use motivates technicians to pursue a career path in a profession that is young but highly promising in China. Both the animals and the people engaged in research are benefitting.

Today in China research facilities support 5 kinds of enrichment programs:

1. Social enrichment, which can involve either direct or indirect (visual, olfactory, auditory) contact with conspecifics (other individuals of the same species) or humans.
2. Occupational enrichment, which encompasses both psychological enrichment (e.g., devices that provide animals with control or challenges) and enrichment that encourages exercise.
3. Physical enrichment, which can involve altering the size or

complexity of the animal's enclosure or adding accessories to the enclosure such as objects, substrate, or permanent structures (e.g., perches, nest boxes, bio-huts, etc.).

4. Sensory enrichment, or stimuli that are visual (e.g., television), auditory (music), or in other modalities (e.g., olfactory, tactile, taste).
5. Nutritional enrichment, which can involve either providing varied or novel food types or changing the method of food delivery (e.g., vegebites, sunflower feeds).

The IACUC plays an increasingly important role as environmental enrichment is introduced into a facility. They are developing standard operating procedures (SOPs) detailing every aspect of the process from choosing the appropriate device to evaluating its impact on the animals and the science. Studies are being conducted to evaluate the animals' physiological and psychological status with and without EE, and findings are being published.

Although progress has been made in the last decade, there is still a long way to go to improve the housing environment of research animals in China. For instance, in some of primate facilities, cages are stacked on top of each other in double-tiers to accommodate a maximum number of animals in windowless rooms. Non-human primates, intelligent and social

creatures that need compatible companions for emotional well-being and behavioral health, are suffering from boredom and depression in a monotonous, relatively unchanging environment. Rodents are social animals too; however, in some toxicity studies, they are singly housed without even bedding in the cage. Reasons for such deficiency can be summarized as following,

1. Lack of local regulations governing environmental enrichment for laboratory animals in China.
2. Lack of management support. Facility management does not routinely consider housing conditions and other animal welfare issues. The budget for laboratory animal husbandry is always inadequate.
3. Lack of adequate training. Animal welfare training lags behind the advance of the facility construction and research capability growth.
4. The lack of data tracking enrichment usage in Chinese local facilities.

Serious efforts are being made to overcome these challenges. Documentation of enrichment usage is accumulating, and more researchers are realizing the benefits of using enrichments to promote animal welfare and advance science. As more researchers are exposed to environmental enrichment, we can expect a dramatic improvement in research animal welfare and in the husbandry environment as well.

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