

## **Professor William Russell Fellowship**

**In 2008 UFAW awarded a prestigious research fellowship to commemorate the life and work of Professor William Russell, who with Rex Burch as UFAW fellows in the 1950's, developed the 3Rs principles that have had such an important impact on the welfare of animals used in research worldwide. The award went to Professor Joe Garner of Purdue University, USA, together with his student Brianna Gaskill, to study whether providing nesting material to mice used in research allows them to cope with the chronic cold stress of standard housing conditions, and whether there are practical benefits in terms of physiological variability and animal welfare. The report below is from Dr Brianna Gaskill who was awarded her PhD for her research on the subject.**

### *A Report from Dr Brianna Gaskill*

Before beginning my PhD research at Purdue University on thermal stress in laboratory mice, I had already begun researching this subject in 2005, under the guidance of Dr Joe Garner, through the Purdue masters-by-pass program . One of the four publications resulting from this work was utilized by the US Guide for the Care and Use of Laboratory Animals (2010) for making ambient temperature recommendations. However, it had become apparent that although mice prefer warmer environments, changing laboratory temperatures was not a solution due to increased aggressive interactions and because temperature preference differs between sexes and behavior. This is why we were so pleased to be awarded, in 2008, the inaugural UFAW Professor William Russell Memorial Fellowship to investigate the use of appropriate nesting materials to alleviate thermal stress in mice.

Our research aimed to validate the benefits of appropriate nesting material and to establish the causal chain from enrichment, to behavior, to thermal microenvironment, to physiology, to well-being and Reduction and Refinement of mouse use in laboratories. Nest building is an adaptive behavior that increases survival and reproduction in the wild. We hypothesized that nesting material would allow mice to alleviate cold stress by building insulating nests and creating a unique microenvironment within the cage. The aim of our first experiment was to determine how much material (0-10g) was preferred by mice at different ambient temperatures. Within standard ambient temperatures, all mice preferred 6-10g of nesting material. Thus, mice should receive no less than 6g but may need 10g or more to alleviate thermal stress. We also found some interesting information on primary modes of behavioral thermoregulation. Some mice appear to be primarily nesters, other mice prefer to relocate to a warmer temperature, while the rest seem to combine the two strategies. This work was published in PLoS One in early 2012.

Our second study investigated whether appropriate provision of nesting material altered thermogenesis. We found that dome nests radiate less heat and males showed energetic reductions from nest building. Only one of our three types of mice had reduced non-shivering thermogenesis, based on brown fat protein expression. This study has been accepted for publication by the Journal of Physiology and Behavior. Lastly, we investigated, in collaboration with Charles River Laboratories, whether reduced thermogenesis from insulating nests would free resources and improve reproduction in a large scale breeding facility. All mice provided with nesting material showed improved breeding performance without increased food consumption. One of the three types of mice tested showed an increase in pup survival to weaning. This improvement has the potential to significantly reduce the number of breeding mice needed to achieve a certain level of production for sale or for scientific purposes. Six papers on this and related work have been published or are planned for publication.

The research collaboration with Charles River resulted in a postdoctoral opportunity for me to further investigate behaviour and welfare in laboratory rodents. The company continues to be

interested in researching refinements to common husbandry practices, procedures, and potential enrichments. This position along with my previous research has led to the harmonization of effective and validated nesting enrichment in Charles River's North American breeding facilities, potentially impacting the lives of millions of animals.

It was a tremendous honour to be one of the inaugural recipients of an award that commemorated the work at UFAW of Professor William Russell and Rex Burch that ultimately led to the worldwide adoption of the principles of the 3Rs. Mice represent approximately 90% of the animals used in laboratory research, and I believe that this award has and will lead to the significant refinement of mouse husbandry in laboratories, which in turn will lead to a significant reduction in their use.