Argonne NATIONAL LABORATORY

Office of Technology Transfer

EcoNest

An Ecologically Based System to Enhance Research into Women's Health Issues

We live in a time of increasing focus on women's health issues and animal care issues. Important questions are being asked regarding whether medicines are safe for pregnant or nursing women. To answer these questions, metabolic studies need to be conducted in animals during pregnancy and lactation without excluding the periods immediately before, during, and after birth of the offspring.

Using current technologies, excreta cannot be continuously collected in pregnant mice without interruption during the period surrounding delivery of their offspring, because of the special housing requirements of dams with newborn pups. Consequently, researchers traditionally interrupt their studies to remove pregnant dams to a birthing area, and return the family to the metabolism cage when the pups are about a week old. This complication means that potentially valuable data are lost for that part of the reproductive cycle.

Our EcoNest is a nest box to be placed inside of a standard metabolism cage that facilitates collection of excreta from mouse dams. It provides the only way to continuously collect excreta throughout pregnancy and lactation, without interruption during the birthing period.

In a conventional plastic rodent cage, which is suitable for housing pregnant mice during delivery, excreta are not easily and quantitatively collected from the finely divided bedding. Mice housed in standard "metabolism" cages have as the floor of the cage a wire grating with openings about 1.5 cm per side. These wire grates allow the excreta to fall into a tray for collection and analysis. Unfortunately, the wire grating creates a problem for newborn mouse pups, which are so small that they fall through the space between the wires and into the collection tray, out of reach of the dam. There they can die from starvation and hypothermia. Consequently, most studies now stop shortly before the birth of the mouse pups, and studies of responses to toxic substances often are limited to studying effects that occur prior to the birth of the litter, in both dams and pups. The EcoNest eliminates this obstacle. We can now study effects of substances and their metabolic pathways throughout the entire pregnancy and lactation period, including birthing and immediately afterwards.

The natural behavior of mice directed the design of the EcoNest. Following their nesting instincts, mouse dams are enticed to use an artificial burrow – our nest box – in which to deliver and raise their young within the metabolism cage setting. The EcoNest in nearly all ways mimics conditions that small rodents have been shown to prefer through experi-

mentation. For example, the top of the EcoNest is dark and its sides are translucent rather than transparent. The off-center exit opening creates a secluded, covered area for nesting at the other end of the box, where the dams invariably go to nest their pups. The exit is sized so that its edges gently brush off nursing pups as the dam exits the EcoNest, keeping the pups safely inside. Most importantly, the dams keep the nest box meticulously clean, producing excreta only outside of the box and within the metabolism cage, providing for the first time a way to achieve total recovery of feces and urine throughout the prepartum, birth, and postpartum periods.

This invention has a significant potential for application by pharmaceutical companies examining the effects of drugs using an animal model. With the EcoNest, drug metabolism and pharmacokinetic studies can be easily and safely conducted in a standard metabolism cage setting with pregnant and lactating animals during the time period when their young are neonates.

The EcoNest adds an important dimension to any comprehensive animal study designed to provide insight into the mechanism of action or potential effects of medicines in women who are pregnant or nursing a child. In addition, the needs of animals housed in laboratory settings are being more closely scrutinized than ever before. Nest boxes simply for environment enhancement within the laboratory animal cage setting (not necessarily usable in a metabolism cage setting) are currently being designed. Our EcoNest takes advantage of and meets the needs dictated by natural mouse behavior.

The EcoNest was developed jointly by Argonne, Oregon State University (Corvallis, OR), and Benedictine College (Lisle, IL). Research was funded by the National Institute of Environmental Health Sciences.

Patents and Licensing

Argonne's patented EcoNest is available for licensing.

6,234,115, Nesting Box for Excreta Collection from Nesting Dams Through Parturition and Lactation

Abstract. A nesting box is provided for use with a metabolism cage. The nesting box comprises an enclosure for receiving a nesting dam. The enclosure has a top wall, a bottom wall and sidewalls. Either the top wall or one of the sidewalls includes an entrance/exit aperture. The entrance/exit aperture has a selected size that is selectively provided relative to a defined size of the nesting dam. The nesting box is formed of a substantially transparent material allowing observation of the nesting dam and pups without opening the box. The nesting box is adapted for use with different laboratory animals, such as mice, hamsters, gerbils, rats, guinea pigs, and rabbits.

For More Information

For more information, contact Argonne's Office of Technology Transfer (800-627-2596, partners@anl.gov)