Nesting & Thermoregulation
by Andrea Gay - The Andersons Bedding Products

What is thermoregulation?

Webster says that thermoregulation is the ability of an organism to keep its body temperature within certain boundaries, even when the surrounding temperature is very different. So basically thermoregulation is putting a jacket on when you are cold and taking it off when you are warm.

This is great for humans, but it doesn't work very well for rodents in the lab. Currently most facilities keep their rooms at the 20 - 24C temperature where humans are comfortable, yet studies have shown that mice are comfortable at 26 - 34C. Mice become stressed at temperatures of 18 - 26C and at temperatures of less than 18 C their growth rate is compromised (Moberg 2000).

Thermoregulation is very important for rodents.
The Guide says at lower temperatures, building nests and huddling for resting and sleeping helps with thermoregulation. Mice prefer a warmer ambient temperature during the light phase, and the light phase is when mice tend to sleep the most. Laboratory rooms are temperature controlled for human comfort which is cooler than what mice prefer.

Less stress equals better research.
To compensate, mice may congregate to help regulate their body temperatures during a period of inactivity when their body heat lowers or because housing conditions are too cold (Gordon, 2004). Burrowing and nesting behaviors help the mice maintain their body temperature. With a macro-environment at 20c rodents expend energy and thus consume more food just to maintain their body temperature. Mice eat less when they are warm.

They will use up to 2/3 less feed per day. As a general rule, when animals are warm they eat less. We all know about the extra 10 pounds humans can put on in the winter when it is cold, likewise, mice need to eat more to maintain their temperature when they are cold. Providing nesting materials is advantageous as it decreases food intake with no effect on growth (Lacy et al. 1978, Stephenson & Malik 1984). Lactating mothers and pups present other behavior attributed to thermoregulation. Pups huddle in the nest to keep warm while lactating mothers will leave the nest after feeding the pups as they tend to get hot.

Nesting materials help rodents with their thermoregulation in the unnatural and cold laboratory cage environment. In the wild, mice build complex burrows and nests for predator avoidance and thermoregulation. In the lab they are often given materials for enrichment that do not allow for nest building. It is very important to make an unnatural environment more natural with biologically relevant nest building materials. Mice can’t build nests with enrichments that they don’t identify as suitable nest building materials (Garner et al 2008).

Studies have shown that providing nest building materials and promoting nesting behaviors in rodents reduces stress, and in some strains, cannibalization. Being given relevant nesting materials that stimulates their nesting behaviors of gathering, burrowing, sorting and fluffing decreases some abnormal behaviors.

Mice naturally build nests to provide shelter from the elements and predators, but also as a way to compensate for changes in external temperatures. Therefore, nests provide external insulation and create a less thermally stressful habitat. (Garner et al 2008).

Mice will alter the quality of their nests in response to ambient temperature. They cannot build a nest if given inappropriate materials. They will build a complex multilayered nest if given the right materials which stimulate their natural instincts. When mice can control their environment they will be less stressed. Being cold and not being able to get warm increases stress. Macro environments do not allow the mice control over the temperature of their cages. IVC racks can put what feels to mice like a gale force wind through their cage. This will add stress behaviors without appropriate nesting materials being given to them.
There are products on the market today that promote nesting behaviors. Enrich-o'cobs is one of the products that encourage the natural instincts of mice to build nests and provide operational efficiencies in the lab. Enrich o'cobs is a cob bedding and twisted paper nesting material combined in one bag. Enrich-o' cobs provides the base behaviors of gathering and sorting as an intermittent step in nesting behavior.

Enrich-o'cobs aids in the construction of a quality nest by providing appropriate nesting material. Mice are highly motivated to build nests. It has been studied quite a bit recently that having a variety of nesting materials is important in nest building and thermoregulation. Offering more than one nesting material allows the animal to mimic more of the complex multilayered nests that their wild counterparts build naturally.

Offering more than one nesting material gives a choice to the animal which empowers them and allows them some control over their environment. Enrich-o'cobs is designed to guarantee every cage gets nest building material and enrichment along with providing the "right" amount of nesting material to bedding ratio. This allows each component of enrich o'cob to perform the necessary functions. The nests mice build using Enrich-o'cobs with other commercially available nesting materials helps the animals regulate their temperature and stimulate their species specific behaviors along with allowing them to control their environment.

We are all aware that mice in the labs are in an unnatural environment in which they have no control of temperature, enrichment products, roommates, and other factors. Nesting material not only helps them regulate their body temperature, but it allows them some control over their environment. It has been suggested that letting mice regulate their own temperatures by building nests might be more effective than trying to alter room temperatures in the lab. The bottom line may actually be, that animals from enriched environments may be more physiologically and psychologically stable and better representatives of the specie and thus ensure better data collection and scientific results (Benn 1995, Scharmann 1991, Markowitz & Gavazzi, 1995). 

**Less stress equals better research.**