Science Education Collection

Basic Mouse Care and Maintenance

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Abstract

Mice (*Mus musculus*) are small rodents that breed and sexually mature quickly, making them perfectly suited to generating large animal colonies for biological research. As compared to other mammalian species, mice are simple and inexpensive to maintain in the laboratory. Nevertheless, mouse colonies do have specific husbandry needs that are critical to preserving animal health and safety as well as experimental reproducibility.

This video demonstrates standard practices that ensure mice are treated as humanely as possible within the laboratory animal facility, or vivarium. The discussion begins by reviewing a typical mouse housing setup, consisting of a plastic cage equipped with a layer of soft bedding and nesting material. The preformulated food pellets (also known as chow) that comprise the typical mouse diet are also introduced. In order to facilitate experiments performed on mice, safe animal handling practices are demonstrated, including common restraint techniques like “scruffing,” and the strategies used by researchers to keep track of individual mice within the facility. Finally, experimental manipulations of mouse housing and diet are discussed, in addition to one of the most common applications of the scruffing technique — performing injections.

Transcript

Proper mouse husbandry is essential for animal health and productivity. Maintaining clean and stable conditions keeps the animals free of infection and contamination. It also provides a stress-free environment for mice, which is not only humane, but also encourages normal mouse behavior. This video will discuss how mice are housed and fed in a research animal facility, or vivarium, as well as proper handling procedures to prevent injury and infection.

In order to understand how to create a happy and healthy mouse facility, we must first understand the organism’s natural environment. So what does a mouse’s natural habitat look like?

Mice are among the most adaptable mammals and are found almost everywhere on Earth. In nature, these environmentally flexible creatures feel most safe and snug inside a nest or burrow. Mice spend most of the day in their burrows because they are nocturnal, which means that their circadian rhythm, or natural sleep/wake schedule keeps them up and partying when you are snuggled in your burrow.

So how do we make mice feel at home in the vivarium? Rodents are typically kept in small, plastic cages with solid bottoms and sides. To absorb waste and provide insulation, the cages are equipped with a layer of bedding composed shredded corncobs or wood shavings. This material should be changed often to keep it clean and dry. Ideal housing conditions also incorporate some loose nesting material, which allows the mice to build a burrow, just as they would in the wild.

Try as we may to make their home comfortable, mice have a habit of wandering. To prevent escape, a metal lid is placed on top of the cage. Conveniently, lids are usually equipped with a food dispenser or “hopper” and a water bottle holder. A plastic lid cover with air filters is also added to protect the mice from outside contaminants.

Due to their social nature, multiple mice can be housed together. For example, up to 5 females can share one cage comfortably. Males, however, can only share a cage if they are introduced early in life. Male mice that are introduced as adults will fight over their cage territory, leading to injury and possible death.

Mouse research usually requires many more animals than will fit into a single cage. Large numbers of mice are kept in a vivarium, where cages are placed on racks, allowing more mice to be stored in a minimum amount of space.

Within the mouse facility, the natural circadian rhythm of the mice is maintained by setting the lights in the facility on a 14-hour light/dark cycle.

Now that you know where lab mice live, let’s discuss how they’re fed. In their natural habitat, mice are primarily vegetarians. They are fond of carbohydrates, and will choose cereal grains over most other foods.

In the lab, mouse chow is provided in the form of pellets. In addition to delicious carbohydrates, the pellets include a balance of fat, protein, vitamins, and minerals. The precise composition of the chow may vary depending upon the strain and experimental condition. Typically, food and water are available to the mouse ad libitum: they have access to food and water anytime they want it.

Next, let’s discuss how to properly handle mice for your experiments. Before beginning any experiments, approval to work with mice must be granted by IACUC: your Institutional Animal Care and Use Committee. IACUC exists to ensure your experiments are conducted under the most humane circumstances possible.

Once approved important research can begin! Most mouse facilities are SPF, or specific pathogen free, meaning that great care is taken to keep infectious agents and contaminants out of the facility.

To avoid introducing new pathogens (or being exposed to experimental ones), always put on PPE, or personal protective equipment, before entering the facility. Gloves are also a must when handling mice both in the vivarium and in the lab. For certain experiments, like those that assess mouse behavior, mice must first become accustomed to being handled by humans.

Mice that aren't used to being handled are easily stressed, which can lead to injury to you — ouch! — or to the mouse. Stressed mice also tend to exhibit atypical behavior, such as heightened aggression, which can confound your data.

Even acclimated mice must be handled carefully to avoid injury. To remove a mouse from the cage, pick the mouse up at the base of the tail and then allow the animal to grip the bars of the metal cage lid. To hold the animal more securely, lift the backend of the animal slightly, grip the tail with your ring and pinky fingers, and grasp the mouse across the shoulders at the "scruff" of its neck.

Once you get more comfortable, you may find it easier to grab the animal by scruff first and then tuck the tail.

To keep track of mice, cages are labeled to indicate who lives inside. To distinguish individuals within a cage, researchers use many strategies, including ear punches, ear tags, and tail markings.

When conducting experiments in mice like the ones you are about to see, it is often necessary to identify specific animals.

Now that you know some of the basics of mouse husbandry, let's take a look at how these principles are tweaked for laboratory protocols.

Many experiments utilize modified mouse enclosures for testing memory, reward based behavior, or olfactory preference. In this experiment, the ability of wildtype or knockout mice to remember the exit from this shallow water maze is compared to determine if a specific gene influences spatial memory.

The mouse diet can also be adapted to suit the conditions of an experiment. These researchers take advantage of the mouse's fondness for carbohydrates to measure manual dexterity. Older mice take longer to consume the pasta due to age-related deteriorations in dexterity, like inefficient one-paw handling and dropping.

Some studies require the administration of experimental agents to the mouse, which is often carried out by injection. Holding mice by the scruff provides clear access to the abdomen, making it easy to administer experimental treatments by intraperitoneal injection directly into the body cavity.

You just watched JoVE's introduction to mouse husbandry. In this video we reviewed how mice are housed and fed in the laboratory, how to handle mice carefully (for their sake and your own) as well as some different applications that require a good knowledge of mouse care. Thanks for watching!