Webinar Q&A Report

Place Cell Mapping and Stress Monitoring in Head-Fixed Mice Navigating an Air-Lifted Homecage

Questions in this Q&A Report were submitted during the live webinar, Place Cell Mapping and Stress Monitoring in Head-Fixed Mice Navigating an Air-Lifted Homecage.

Answers have been provided by Leonard Khirug, PhD, Chief Scientific Officer at Neurotar and Adjunct Professor at the University of Helsinki.

1. **How do I make the mouse get used to head fixation more quickly?**

L. Khirug: The best practice that we use and recommend to other Mobile HomeCage users is as follows: once the mouse has fully recovered from the cranial window implantation surgery, start preparing it for head fixation by acclimating the mouse to the room (several exposures over 3 days), then handle the mouse in a calm but confident way and gently guide the mouse around holding its head by the metal head plate (several short sessions over 2 days), and finally train the mouse to get habituated to the head clamp (several short sessions over 3 days).

2. **Are there animals which fail to be habituated? If so, what could be the reason for that?**

L. Khirug: We find that, on those rare occasions a mouse fails to get habituated to head fixation, this is either due to improper handling of this mouse (e.g., by the animal house personnel) or because this mouse is sick. With proper handling by a calm, confident and well-trained person, all healthy mice would typically get habituated to head fixation.

3. **How long are your recording sessions?**

L. Khirug: In our lab, we typically limit recording/imaging sessions to 2 hours, during which the head-fixed mouse is supplied regularly with drinking water (either through the automated liquid delivery via a lick-port, or manually through a plastic pipette); no food needs to be provided during these 2-hour sessions.

4. **Do you see a reduction in the animals' activity over the duration of the training/recording sessions?**

L. Khirug: In our experience, when properly handled mice (habituated to head fixation) are exposed to the air-lifted cage for the first time, they tend to explore the cage actively for the first 20-30 minutes, after which their locomotor activity typically decreases. On a second exposure and all subsequent exposure to the same cage, mice tend to move around most actively for the first 3-5 minutes, after which they move less for the rest of the session.

5. **How does the activity and task engagement of head-fixed animals compare to that in freely moving animals?**

L. Khirug: In our limited experience, the average path travelled per time window is somewhat shorter for head-fixed mouse moving around the air-lifted cage as compared to non-head-fixed mice in the same cage. However, their motility level is sufficiently high for testing them in several behavioral tasks, such as open field exploration, novel object recognition and maze navigation.

6. **Is it possible to couple head fixation with noninvasive brain stimulation in awake mice?**

L. Khirug: To my knowledge, transcranial stimulation (magnetic or direct current) has not been tested in mice head-fixed in Mobile HomeCage. However, a relatively large and bulky probe has been placed above the skull of head-fixed mice while they were navigating an air-lifted cage during functional ultrasound imaging experiments. Hence, I do not see any reasons why other non-invasive stimulation/imaging methods could not be used in the Mobile HomeCage.

7. **Does the air pressure used to lift the platform make a lot of noise? I'm curious about the potential for an additional source of stress from the sound.**

L. Khirug: The measured acoustic noise inside the air-lifted platform peaks around 35-40 dB, which is below an average home noise (40 dB) and is below the acoustic level of a normal conversation (60 dB). Therefore, the acoustic noise associated with operating the Mobile HomeCage is unlikely to cause stress to the mice.

Contact Information

If you have additional questions for Leonard Khirug or Neurotar regarding content from this webinar, or if you would like to receive additional information about this technology, please contact them at:

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