

Homecage 飼養籠內行為分析

1. Purpose

1.1 A fully automatic analyze system is used to study unconstrained mouse behaviors in a home cage. Such device monitors daily life behaviors of mice when placed in a safe and comfortable environment same as TMC mouse hotel during the study. For example: 12:12-h light–dark cycle(lights on at 07:00 h), constant control of temperature($21 \pm 2^{\circ}\text{C}$) and humidity(40–70%).

This non-stressful and non-invasive method is suitable to perform phenotyping for gene manipulations or drug administration, and to understand the correlation between pathological changes of nerve systems and external behaviors, such as monitoring the process of nerve degeneration diseases and side effects of drugs in nerve system. Abnormalities may also result from deviation caused by the irregular circadian rhythm of normal behaviors. This analyze system is able to monitor the subject twenty-four hours a day to detect and record abnormal behaviors that do not normally occur. Such device can also generate analysis report and data to investigators for study.

2. Safety Requirements

2.1 General laboratory procedures should be followed, which include: no eating, no chewing gum, no drinking, and no applying of cosmetics in the work area. Laboratory coats and gloves must be worn at all times in the work area, unless the protocol specifically describes the appropriate attire for the procedure.

3. Notes

- 3.1 The validity of results obtained from behavioural phenotyping is largely dependent on methods of animal husbandry. It is important that individuals following this procedure are experienced and aware of the animal's welfare, and be familiar with the animal being tested, in order to reduce the anxiety levels of the animal prior to testing.
- 3.2 The majority of mouse behavioural studies are age/sex/strain dependent. It is important to keep these parameters comparable throughout a single experiment.
- 3.3 Environmental factors may contribute to the levels of mouse anxiety. The temperature, humidity, ventilation, noise intensity and light intensity must be maintained at levels appropriate for mice. It is essential that the mice be kept in a uniform environment before and after testing to avoid anomalous results being obtained. In particular, background noise and illumination levels should be measured and documented for each room. Ideally, all mice should be exposed to the same illumination levels in the holding room. For example, in conventional housing, mice housed on the top of the racks may have up to 10 times more Lux than mice on the bottom of racks. No additional experiments which are either noisy or emit odours should be performed during acclimation and testing in the antechamber and the testing room. Ensure that during the test animals are not exposed to any distracting visual signals.
- 3.4 It is recommended that all phenotyping experimentation is conducted at

approximately the same time of day because physiological and biochemical parameters change throughout the day. The ideal testing time for all animals is during the first half of the lights-on period (in the morning until early afternoon). If animal groups are tested at different times of the day it is necessary to perform subsequent tests analogous to the initial test in the experimental design.

- 3.5 Light is an important anxiogenic factor that will strongly influence the ambulation in a U-shaped way (Gray, Fentrop). Experiments under various illumination intensities and factor-analysis have shown that locomotion under dim light is a measure of activity rather than of fear (e.g. Trullas & Skolnik 1993). Most pharmacological studies have shown that anxiolytic agents are more likely to have an effect on the area of the activity rather than on the amount of activity itself (Crawley & Paylor 1997; Choleric et al. 2001) [Results are still discussed controversially].

4. Equipment

- 4.1 Luxmeter, 25W red light source and 4 Channel color guard
- 4.2 A General cage to measure activity.
- 4.3 TMC core uses Clever System, which contains a single platform –digital video- for different behavioral analyses. The system is easy to use and different from other video tracking systems. , Clever System provides a more accurate behavioral analysis by using information of tested rodent's full body, body part, and temporal relations, not just a point in space (Clever Sys. Inc., U.S.A).
- 4.4 Data collection and data analysis software: Home Cage Scan (Clever Sys. Inc., U.S.A).

5. Supplies

- 5.1 Pens
- 5.2 Marker pen
- 5.3 Datasheet
- 5.4 Gloves
- 5.5 Paper mask
- 5.6 Ethanol 70%
- 5.7 Detergent (Windex)
- 5.8 Hand towels
- 5.9 Kimwipes
- 5.10 Color paper
- 5.11 Camera oil
- 5.12 Battery
- 5.13 Absorbent bench top
- 5.14 Sponge
- 5.15 Chow food
- 5.16 Bedding
- 5.17 No.3 battery
- 5.18 Luxmeter

6. Procedures

- 6.1 Please arrange a behavior test before any invasion experiment.

- 6.2 Please arrange home cage scan before other neuroscience experiments.
- 6.3 Minimum n=6 mice per experimental group.
- 6.4 Wipe the wire rack and cage clean with detergent (Windex) and 70% ethanol; allow time for it to dry.
- 6.5 On the day before testing mice should be individually marked to be easily identified on the test day. One suggestion is to mark their tails.
- 6.6 Place mice individually in measuring cages for more than 16hrs to habituate mouse to experimental environment. Food and water are available ad libitum.
- 6.7 Provide chow food 60g, RO water 250ml, bedding 100ml (30g).
- 6.8 Start recording mouse behaviors by DVD encoder software for a total of 48 hours. In the dark phases, a 25W red light source is used.
- 6.9 When recording is finished, mouse will be back to the Mouse Holiday Hotel.
- 6.10 Wipe the wire rack and cage clean with detergent (Windex) and 70% ethanol; allow time for it to dry.
- 6.11 After 2-day recording period, set up an appropriate database with arena ranges in the program, so that mouse behaviors can be analyzed by Clever System software.
- 6.12 After 1-day analysis period, save data from the experimental sessions onto a disc.
- 6.13 The results are presented in 3 excel files. Informative data should include behaviors that have accuracy rates of 80% and above.

