Mouse Pressure Application Measurement 小鼠壓痛覺測定

1. Purpose

1.1 Pressure Application Measurement (PAM) is used to assess nociception. A non-anesthesia mouse is restrained, and the operator wears a special force sensor on his/her thumb, specially designed to apply force to a point, and measures the force that elicits the animal response (normally, limb withdrawal). This service applies to the study of pain, hyperalgesia, the efficacy of anti-inflammatory and analgesic drugs, and central and peripheral pain caused by damage to nerves, joints, muscles, and bones.

2. Scope

2.1 Individuals who have been trained, and are competent in performing the procedures described herein must follow this procedure.

2.2 Any queries, comments, or suggestions, either relating to this SOP in general or to a specific problem encountered during a procedure, should be addressed to the Behavioural Neuroscience Project Leader.

2.3 Any deviances from this protocol must be reported to the Neuroscience Project Leader. Testing is conducted following standard animal handling procedures.

3. Safety Requirements

3.1 General laboratory procedures should be followed, which include: no eating, no chewing gum, no drinking, and no applying 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.

4. Notes

4.1 When restraining a mouse, ensure it remains calm, immobile, and relaxed to allow for observation of pain responses.

4.2 Mice's behavior can be affected by the rearing environment. Therefore, the environmental influences must be as consistent as possible.

4.3 The validity of results obtained from behavioural phenotyping is largely dependent on methods of animal husbandry. Individuals following this procedure must be experienced and aware of the animal's welfare, and be familiar with the animal being tested, to reduce the anxiety levels of the animal before testing.

4.4 Most mouse behavioural studies are age/sex/strain dependent. It is important to keep these parameters comparable throughout a single experiment.

5. Equipment

5.1 Commercially available PAM apparatus (38500 PAM, Ugo Basile, Italy).

5.1.1 Pressure transducers
The PAM device comes with a transducer which tested and validated.

5.1.2 Electronic Unit
The compact PAM controller connects to the mains or can be battery-operated.

5.1.3 Foot pedal switch
A foot pedal switch is provided for a manual score of the peak force.

5.2 Probe

A custom 3D-printed probe is used to apply force to a point.

6. Supplies

6.1 Pens
6.2 Marker pen
6.3 Datasheet
6.4 Gloves
6.5 Paper towels
6.6 Disinfecting ethanol

7. Procedures

7.1 Training

7.1.1 Before measurement, the mice must undergo training in restraint.

7.1.2 This involves familiarizing the operator with the correct techniques for capturing and handling the mice to ensure they remain calm and immobile during the procedure.

7.1.3 Restraint of the mice should be performed in a way that promotes a relaxed state, while still allowing for pain responses.

7.1.4 The duration of the training period can vary from 2 to 7 days, depending on the individual characteristics of each mouse cohort. Some mice may acclimate to the handling procedures within two days, while others may require a longer training period.

7.2 Equipment installation

Install the pieces of equipment introduced in the previous section such that they are easy to use.

7.3 Measurement

7.3.1 Restrain the mouse. Ensure it remains calm and immobile throughout the procedure while maintaining a relaxed state that allows for pain responses.

7.3.2 A probe was placed on the target area by the operator’s thumb.

7.3.3 Slowly increase the force until a withdrawal response or any behavioral signs of discomfort or distress, at which point the pressure is immediately released.

7.3.4 Record the force from the monitor.