Standard Operating Procedure
for
The Challenging Beam Test for Mice

1.0 PURPOSE

This procedure describes how to acclimate and test mice in the challenging beam test. The challenging beam test has been used to assess locomotor deficits in animal models of Parkinson's disease (Drucker-Colin and Garcia-Hernandez 1991; Fleming 2009). Performance on the challenging beam test does not improve with practice, allowing the same animal to be tested many times. Damage to dopamine neurons in the substantia nigra or lesions of the striatum disrupt performance on this test.

2.0 SCOPE (Should include which Cores this SOP applies to)

This procedure applies to all personnel who will test mice on the challenging beam test within the Stem Cells Engraftment and *in vivo* Analysis Core.

3.0 PROCEDURE

3.1 Apparatus

The training beam is fabricated using clear Plexiglas. There are four 25-cm long segments in the beam. The first segment is 3.5cm wide. The second is 2.5cm wide. The third is 1.5cm wide. The fourth is 0.5cm wide. The beam's incline is 15°.

The testing beam is fabricated using clear Plexiglas. There are four 25-cm long segments in the beam. The first segment is 3.5cm wide. The second is 2.5cm wide. The third is 1.5cm wide. The fourth is 0.5cm wide. The beam's incline is 15°. A wire mesh (1cm square mesh) is affixed 1cm above the beam. The wire mesh is the width as the Plexiglas beneath it.

3.2 General Procedures

All testing occurs during the dark-phase (the active phase) of the light cycle. Testing is conducted under dim white-light illumination (about 150 lux). The subjects are moved from their housing room to the testing room and allowed to acclimate for at least 10min before testing. After testing is completed, the mice are immediately returned to the housing room. The training phase is not recorded. The testing phase is recorded using digital video cameras.

3.3 Day 1: Training

Objective: Subjects are trained to ascend the beam. Once the mice learn that their home cage is accessible from the top of the beam, they are highly motivated to ascend the beam.
Procedure:
1. Place the training beam on the test table with the narrow end to left.
2. Place the base of the subject's home cage at the end of the beam such that the brim of the cage is flush with the end of the beam.
3. Place the subject at the base of the beam's widest segment facing toward the top of the beam.
4. Once the subject has ascended the beam and enters its home cage, the trial is over.
5. If the subject does not move up the beam after 30s on its own, the subject is encouraged to ascend the beam with a gentle touch to its flanks.
6. After three trials, the subject is returned to the housing room.

3.4 Day 2: Training

Objective: Subjects are trained to ascend the beam. Once the mice learn that their home cage is accessible from the top of the beam, they are highly motivated to ascend the beam.

Procedure:

1. Place the training beam on the test table with the narrow end to left.
2. Place the base of the subject's home cage at the end of the beam such that the brim of the cage is flush with the end of the beam.
3. Place the subject at the base of the beam's widest segment facing toward the top of the beam.
4. Once the subject has ascended the beam and enters its home cage, the trial is over.
5. If the subject does not move up the beam after 30s on its own, the subject is encouraged to ascend the beam with a gentle touch to its flanks.
6. After three trials, the subject is returned to the housing room.

3.5 Day 3: Testing

Objective: Performance on the challenging beam test is assessed by quantifying and rating slips made by the subject as it ascends the challenging beam.

Procedure:

1. Set up the video camera.
2. Place the challenging beam on the test table with the narrow end to left.
3. Place the base of the subject's home cage at the end of the beam such that the brim of the cage is flush with the end of the beam.
4. Begin recording.
5. Hold the sign stating the test name, test date, name of the tester, and trial number in front of the camera for 3s.
6. Hold the subject's cage card in front of the camera for 3s.
7. Place the subject at the base of the beam's widest segment facing toward the top of the beam.
8. Once the subject has ascended the beam and enters its home cage, the trial is over.
9. Stop recording.
10. Repeat steps 4-9 two more times. After at total of three trials, the subject is returned to the housing room.

3.6 References

Drucker-Colin, R. and F. Garcia-Hernandez (1991). "A new motor test sensitive to aging and dopaminergic function." J Neurosci Methods **39**(2): 153-161.

Fleming, S. M. (2009). "Behavioral outcome measures for the assessment of sensorimotor function in animal models of movement disorders." Int Rev Neurobiol **89**: 57-65.

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