Florida State University

Standard Operating Procedure

ORAL GAVAGE IN THE MOUSE

This technique should only be performed by experienced personnel. Inexperienced personnel must obtain training and be certified as proficient prior to using the technique for research.

Materials:

- Correctly sized metal or plastic feeding needle (see table below), preferably with ball tip
- Appropriate sized syringe
- Permanent marker or etching tool
- Solution/compound to be administered (concentration to allow for small volume to be administered)

1. The procedure can be performed in either an awake or anesthetized animal. Awake is preferred as administration complications are usually immediately observable. Use only an approved feeding/gavage needle or vinyl tube.
2. Weigh the mouse to determine the appropriate dosing volume. The volume should not exceed 0.10 ml/10 grams body weight (max. of 0.30 ml). If working with a group of mice, an average volume based upon the group's weight or largest and smallest animals in group may be used. Pregnant animals should only receive 25% of the maximum volume. (Larger volumes require specific justification to and approval by the ACUC.)
3. Restrain the mouse by scruffing the dorsal neck fold. Scruffing is accomplished by grasping the skin over the shoulders with the thumb and middle fingers. Do not restrain so tightly as to induce a panic response or cause respiratory distress.
4. Measure the gavage needle externally from the tip of the nose to the last rib. This is the length needed to insert the tube into the stomach. Mark the needle at the point where it reaches the tip of the nose. If working with a large group of animals of the same size, the needle can be permanently etched (if stainless) to avoid having to re-mark but should be checked periodically. (Note – this is the maximum point of insertion to avoid risking perforation of the stomach).
5. Draw up the calculated volume and attach syringe to feeding needle.
6. Lubricate the gavage needle lightly with water, KY or similar jelly.
7. Grasp the skin over the shoulders so that the front legs are extended out to the side, keeping the front feet from pushing the gavage tube away. Hold the mouse upright, then, using the scruff, gently pull the head backward —this extension of the head creates a straight line from the head through the neck and esophagus and to the rest of the body.
8. Slide the needle into the mouth behind and to the left of the incisor teeth and over the tongue. If necessary, with the aid of the needle, gently insure the position of the mouse's head upward and back to approximate a straight body line in order to

straighten the neck and esophagus. This helps to avoid entering the trachea instead of the esophagus.

9. Slowly advance the needle into the oral cavity, walking it along the roof of the mouth and then into the esophagus. Do not rotate the needle except slightly during insertion. Avoid rotating needle once in the esophagus or during removal to avoid damage to the esophagus. Watch for the swallowing reflex as the animal should swallow as the needle is advanced. The needle should pass freely into the esophagus. DO NOT FORCE. IF ANY RESISTANCE IS MET, REMOVE THE NEEDLE AND REINSERT. In most mice the needle can be seen passing down the esophagus into the stomach as a bulge under the skin moving downward.
10. When the desired length of insertion is achieved, administer the solution slowly. If the mouse coughs, chokes, struggles violently or appears to have trouble breathing, stop immediately and remove the needle.
11. Once the volume is administered, smoothly remove the feeding needle. Return the mouse to its cage.
12. Observe the mouse for no less than 15 minutes after the procedure for signs of pain or distress, such as gasping for breath, other unusual respiratory rate or pattern, bleeding or frothing at the mouth or poor mucus membrane color. If any if these signs are noticed contact the veterinarian right away for assistance. A mouse that shows severe signs of respiratory distress or is suspected of having a perforation or lung administration must be euthanized immediately.
13. Monitor animals again at least once between 12-24 hours after dosing. Look again for difficulty breathing, lethargy or lack of food/water intake. Contact LAR veterinary staff if such signs are noted.

Note: Dosing may be repeated up to 3 times within a 24 hour period – if additional dosing is necessary this must be justified in the protocol.

Clinical signs associated with procedural complications (requires consultation with veterinarian or euthanasia):

- Respiratory distress
- Noisy breathing (wheezing, clicking or rattling)
- Pale or bluish ears, feet or tail
- Hunched posture
- Swelling of neck, thoracic inlet or under front legs
- Lethargy
- Blood, bloody froth or fluid at nose or mouth
- Eyes squinted
- Weight loss

Potential adverse effects to be considered: Perforation of the esophagus, trachea or stomach. Inflammation of the esophagus. Damage to the oral cavity. Damage to the cardia (gastroesophageal sphincter). Incorrect administration of fluid into lungs.

Demonstration videos:

Penn State: https://www.research.psu.edu/arp/training/videos/oral-gavage-in-mice.html

Procedures With Care: http://www.procedureswithcare.org.uk/oral-gavage-in-the-mouse/

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Feeding needle selection size guide (based upon information from AALAS Learning Library and South Pointe Surgical)

Animal Weight	Gauge	Feeding Needle Length (inches)	Ball Diameter	Shape
Up to 14 grams	24	1	1.25	Straight
15-20 grams	22	1, 1.5	1.25	Straight
20-25 grams	20	1, 1.5, 3	1.25, 2.25	Straight, curved
25-30 grams	18	1, 1.5, 2, 3	1.25, 2.25	Straight, curved
30-35 grams	18	1, 1.5, 2, 3	1.25, 2.25	Straight, curved

Note: Shaft length and ball diameter may vary with company product.

Various feeding needles sources: Braintree Scientific, Cadence Inc, Instech Labs, South Pointe Surgical, VWR, Kent Scientific and others.

Oral gavage is considered a potentially painful or stressful procedure. Literature Search Key Words:
Oral gavage in rodents, oral dosing in rodents, alternatives to oral gavage in rodents

Alternative Methods:
Gonzales et.al. Alternative method of oral administration by peanut butter pellet formulation results in target engagement of BACE1 and attenuation of gavage-induced stress responses in mice. Pharmacol Biochem Behav Sep 19; 126C:28-35, 2014.
Hoggatt et. al. A Spoonful of Sugar Helps the Medicine Go Down: A Novel Technique to Improve Oral Gavage in Mice. JAALAS 49(3): 329–334, 2010.
Huynh et.al. Utilizing an Orally Dissolving Strip for Pharmacological and Toxicological Studies: A Simple and Humane Alternative to Oral Gavage for Animals. *J. Vis. Exp.* (109), e53770, doi:10.3791/53770 (2016).
Kuster et. al. Voluntary Ingestion of Antiparasitic Drugs Emulsified in Honey Represents an Alternative to Gavage in Mice. JAALAS 51(2): 219-223, 2012.
Walker et. al. A less stressful alternative to oral gavage for pharmacological and toxicological studies in mice. Toxicology and Applied Pharmacology, Volume 260 (1):65–69, 2012.
Zhang, Lei. Voluntary oral administration of drugs in mice. Protocol Exchange. doi:10.1038/protex.2011.236. Published online 11 May 2011; 2011.

References:
AALAS Learning Library, Working With the Laboratory Mouse, Lesson 12. Oral Gavage
Jones, Andrews and McErlane. TECH 09 Oral Dosing (Gavage) in Adult Mice and Rats.
UBC Animal Care Guidelines. Revised Feb 2015. Downloaded October 5, 2016
UCSF IACUC / LARC Standard Procedures, Oral Gavage in Mice, May 2008
University of Delaware Office of Laboratory Animal Welfare SOP #A-106, Oral Gavage – Mouse & Rat, revised January 2015. Downloaded October 5, 2016.
University of Minnesota. Oral Gavage in Rodents, April 2014. Downloaded September 27, 2016.

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