University Animal Care Committee Standard Operating Procedure		
Document No: 7.8	**Subject:** Gavage Techniques in Small Animals (Mice)	
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Location: Queen's University

Responsibility: Principal Investigators, Research Staff, Veterinary Staff

Purpose: The purpose of this Standard Operating Procedure (SOP) is to describe the method of oral gavage in mice.

1. **Introduction and Definitions:** Gavage is used to administer precise amounts of liquid diet, drugs or test compounds by mouth directly to the stomach of the mice. To minimize stress to the animal, the person performing gavage must be skilled before starting the study.
   The choice of whether to use a rigid or flexible gavage needle or to use a straight or curved gavage needle is according to operator preference and the needs of the study. Gavage needles are available in disposable plastic or reusable stainless steel. All gavage needles have a ball or pear-shaped smooth rounded tip to prevent injury to the esophagus and other tissues.

Abbreviations: Animal Care Services **ACS**, Principal Investigator **PI,** subcutaneous **SC**, intravenous **IV**, intraperitoneal **IP,** intramuscular **IM**, per os **PO,** per rectum **PR**

2. **Materials:**
   - Appropriate feeding needles (also known as gavage needles or feeding tubes)
   - 1 mL sterile syringe
   - Weight scale
   - Marker

Mouse Gavage Needle Sizes:

Weight range (g)	Gauge	Length (inches)	Ball diameter (mm)	Shape
<14g	24	1"	1 ¼ mm	Straight, curved
15-20g	22	1", 1 ½"	1 ¼ mm	Straight, curved
20-25g	20	1", 1 ½", 2"	2 ¼ mm	Straight, curved
25-30g	18	1", 1 ½", 2"	2 ¼ mm	Straight, curved
30-35g	18	2", 3"	2 ¼ mm	Straight, curved

3. **Procedures:**
   - Weigh the animal and determine the maximum volume that can be administered. The maximum volume will depend on the body weight of the animal. The volume should not exceed 1% (10ml/kg) of the animals' body weight (e.g. 20g = 0.2ml).
   - Set up work surface with the above materials.
   - With the feeding needle in place, draw the desired amount of liquid compound into the syringe.
   - Identify the animal and pick up with a slightly modified scruffing technique. A hold that is mainly focused on restraining the scruff on the back of the neck while leaving the rest of the body mobile works best. Ensure the grasp on the scruff is tight enough to maintain head control of the animal but not so tight that its breathing is impaired.
   - Prior to performing the procedure, measure the distance from the oral cavity to the tip of the xyphoid process. This is where the stomach lies. Mark this distance on the feeding needle with the marker. Do not advance the needle further than this point to avoid perforation of the stomach. When gavaging, the tip of the needle is to be positioned just below the stomach's cardiac sphincter.
   - With the mouse's head moderately extended in vertical alignment, gently insert the ball of the needle into the lateral side of the mouth, behind the teeth.
   - The needle is then advanced gently along the upper palate towards the back of the throat. Slight pivoting of curved needles will help feed the needle past the epiglottis and fall into its correct midline placement (esophagus).
   - The mouse may exhibit a swallowing reflex at this point.
   - Once the esophagus is reached, gravity should be used to help guide the needle as it slips down into the esophageal tract.
   - Forcing the needle can cause damage to the esophageal wall or force the needle

into the trachea. If the animal is struggling, it may not be inserted properly and should be carefully removed. Allow the animal to rest before trying the procedure again. No more than three attempts are allowed.

- Once in position, inject the fluid slowly to prevent it from coming back up into the oral cavity or rupturing the esophagus. If the animal starts to cough or choke, stop injecting (do not attempt again for a minimum of 24 hours). Remove the needle and allow the animal to recover in its cage. Monitor closely for the next hour, if there is any respiratory distress euthanize the animal (see section 5 below).
- Once administered, remove the needle gently, following the same angle as insertion.
- Place animal back in cage and monitor for 10 minutes.
- Frequency of gavage to be determined by the UACC.

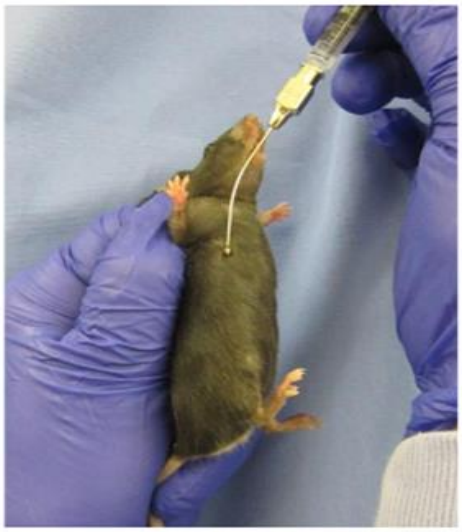

Image 1: Measure the length of the gavage needle from the tip of the nose to the last rib

Image 2: Administer the solution upon verification of proper placement

Photo Credit: Washington State University

4. Complications

Improper gavage technique can lead to several complications, acute or delayed. These may include:

- Esophagitis (inflammation of the esophagus)
- Perforation of the esophagus, trachea or lungs
- Damage to the cardiac sphincter (upper stomach sphincter)
- Insertion of needle and solution into the lungs/inadvertent tracheal administration
- Lung perforation
- Damage to the oral cavity
- Aspiration of solution into the lungs from regurgitation (needle is too short)
- Traumatic injuries related to improper restraint
- Gastric rupture
- Esophageal impaction
- Aspiration pneumonia

5. Clinical Signs of Complications

Requiring close monitoring and possible euthanasia if not resolved, or at the recommendation of the Veterinarian team:

- Respiratory distress/dyspnea (increased respiratory rate and effort/rapid abdominal breathing)
- Blood on the needle
- “Noisy” breathing or clicking when breathing
- Cyanosis (pale or blue extremities)
- Hunched appearance
- Squinted eyes
- Piloerection
- Blood at nose or mouth
- Swelling of neck or under front legs (due to air or fluid escaping from damaged esophagus)
- Loss of weight due to inability to swallow

References:

1) https://www.kentscientific.com/products/productView.asp?productID=6224&Mouse_Rat=Surgical&Products=Feeding+Needles
2) https://iacuc.wsu.edu/documents/2016/06/wsu_sop_10.pdf/
3) Vol 55, No 6 Journal of the American Association for Laboratory Animal Science November 2016, **Carissa P Jones,* Kelli L Boyd, and Jeanne M Wallace,** Evaluation of Mice Undergoing Serial Oral Gavage While Awake or Anesthetized

SOP Revision History:

Date	New Version
July 11th, 2013	SOP Created
February 28th, 2019	Triennial Review
February 28th, 2022	Triennial Review
June 10th, 2024	Triennial Review – Update format, update wording, check links,