

Subject: Policy for Substance Administration and Blood Collection

Source: Institutional Animal Care and Use Committee (IACUC)
 Effective Date: 04/08/2024
 Replaces: 03/093/2020
 Applies to: Personnel involved in research or teaching studies involving animals
 Reference: Animal Welfare Act; PHS Policy on Humane Care & Use of Laboratory Animals; Guide for the Care & Use of Laboratory Animals

Introduction

The Institutional Animal Care and Use Committee (IACUC) maintains oversight review for federally mandated rules and regulations with regard to animal research, ethics, misconduct and biomedical research for the University of Colorado Denver | Anschutz Medical Campus (CU Denver | Anschutz).

Policy Statement

This policy is intended to provide guidance and parameters for the administration of substances and establish limits on safe blood collection in laboratory animal species.

Maximum Injectable Volumes by Route of Injection in Adult Animals*

Species	IP	IM	SC	IV	ID	ROS
Mouse	2 mL	0.05 mL	3 mL	0.2 mL	N/A	0.15 mL
Rat	5 mL	0.1 mL	5 mL	0.5 mL	0.05 mL	N/A
Guinea Pig	10 mL	0.3 mL	5 mL	0.5 mL	0.1 mL	N/A
Hamster	4 mL	0.1 mL	3 mL	0.3 mL	0.05 mL	N/A
Gerbil	3 mL	0.1 mL	3 mL	0.3 mL	0.05 mL	N/A
Rabbit	50 mL	1.5 mL	100 mL	5.0 mL	0.1 mL	N/A

(Abbreviations: IP=intraperitoneal; IM=intramuscular, SC=subcutaneous; ID=intradermal; IV=intravenous, ROS = retro-orbital sinus)

* Volumes listed above are based on the administration of isotonic saline. Experimental compounds that vary in osmolarity, viscosity, pH, etc. may not be appropriate at the volume listed above. All administered substances will be reviewed by the IACUC at the time of protocol review.

Common Parenteral (Inject or Infusion) Routes of Administration

Mouse: IP, IM, SC, IV, ROS

Rat: IP, IM, SC, IV, ID

Guinea Pig: IP, IM, SC, IV, ID

Chinchilla: IP, IM, SC, IV, ID

Hamster: IP, IM, SC, IV, ID

Gerbil: IP, IM, SC, IV, ID

Rabbit: IP, IM, SC, IV, ID

Cat: IM, SC, IV

Pig: IM, SC, IV

Sheep: IM, SC, IV



(Abbreviations: IP=intraperitoneal; IM=intramuscular, SC=subcutaneous;
ID=intradermal; IV=intravenous, ROS = retro-orbital sinus)

Common Venous Access Points for Injection or Blood Collection

Mouse: submandibular vein, submental vein, retro-orbital sinus, lateral saphenous vein, lateral tail vein, tail tip snip (< 0.5 mm) and scab removal

Rat: sublingual vein, jugular vein, retro-orbital sinus, lateral saphenous vein, lateral tail vein

Hamster: jugular vein, retro-orbital sinus, lateral saphenous vein

Gerbil: jugular vein, retro-orbital sinus, lateral saphenous vein, lateral tail vein

Guinea pig: jugular vein, lateral metatarsal vein

Chinchilla: jugular vein, cephalic vein, lateral saphenous vein

Rabbit: jugular vein, cephalic vein, lateral saphenous vein, lateral ear vein, central ear artery

Cat: jugular vein, cephalic vein, medial saphenous vein, ear tip prick

Pig: jugular vein, cephalic vein, medial saphenous vein, peripheral ear vein

Sheep: jugular vein, cephalic vein, medial saphenous vein, peripheral ear vein

Blood Collection Volumes

The total blood volume in an adult mammalian laboratory animal species is approximately 7% of body weight. The volume of blood that can be removed at one collection should not exceed 10% of total blood volume without further care. [Example: 25 g mouse = 0.175 mL, 200 g rat = 1.4 mL, 75 g hamster = 0.52 mL, 4 kg rabbit = 28 mL].

- 15% of blood volume can be removed at one time if collected slowly, and warm replacement fluids are administered SQ, IP, or IV to replace the blood volume collected.
- For repeated blood sampling, up to 7.5% of the total blood volume can be taken per week, or 10% of the total blood volume may be removed every two weeks.
- To collect blood at a more frequent interval or in larger volumes, a higher level of physiologic monitoring will be required, and approved by the Institutional Animal Care and Use Committee.

Oral Administration (ORL, PO, Per os)

Commonly performed with non-sterile solutions in all species. Experimental compounds should not be caustic to mucus membranes. Confirmation of complete consumption is difficult using this route.

Oral-Gastric Gavage

Oral gavage is the administration of fluids directly into the lower esophagus or stomach using a feeding needle introduced into the mouth and threaded down the esophagus. Feeding needles can be made of plastic or stainless steel.

- Stainless feeding needles are autoclavable, and thus reusable. They have a stainless-steel ball-tip that makes them atraumatic on delicate oral and esophageal tissues and reduces the chance of introducing the ball-tip into the trachea.
- Plastic feeding needles are typically pliable (bend) and disposable. Plastic models also have a rounded plastic tip to decrease trauma. Typically, plastic models can only be used for a limited number of animals before cuts from teeth make the shaft friable and rough which can cause irritation to the oral cavity and esophagus.
- The guideline for volume of administration are:
 - 10 mL/kg (10 uL/g) body weight for mice



- 20 mL/kg (20 μ L/g) body weight for rats.
- Repeated oral gavage in mice and rats should not be repeated more frequently than every 6-8 hours to allow for gastric emptying.
- For information on oral gavage volume limitations in other species, please contact the veterinary staff.

Inhalational Administration

Intranasal (IN) – Administration of fluids or fluid suspensions of particulates into the nasal cavity

- May require anesthesia to facilitate restraint and mitigate sneezing
- Substances should be nonirritating to minimize sneezing and rhinitis
- Systemic absorption is rapid across nasal mucous membranes
- The recommendations for volume of administration are:
 - 30 – 50 μ L per nostril for mice and rats

Intratracheal (IT) - Administration of fluids or fluid suspensions of particulates into the trachea via the oral cavity or directly into the lungs by intubation or tracheotomy

- This route of administration requires anesthesia
- Care should be taken to minimize trauma to the tongue and oral structures
- The recommendations for volume of administration are:
 - 50-75 μ L per injection for mice
 - 200 μ L per injection for rats

Note: IACUC approval for fluid administration and blood collection that falls outside of the above parameters will be reviewed and considered for approval by the IACUC on an individual basis.

References

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