RESEARCH AND INNOVATION
ANIMAL RESOURCES AND CARE
VIRGINIA TECH

Standard Operating Procedure: Mouse Intravenous Injections

These SOPs were developed by the Office of the University Veterinarian and reviewed by Virginia Tech IACUC to provide a reference and guidance to investigators during protocol preparation and IACUC reviewers during protocol review. They can be used as referenced descriptions for procedures on IACUC protocols.

However, it is the sole responsibility of the Principal Investigator to ensure that the referenced SOPs adequately cover and accurately represent procedures to be undertaken in any research project. Any modification to procedure as described in the SOP must be outlined in each IACUC protocol application (e.g. if the Principal Investigator plans to use a needle size that is not referenced in the SOP, simply state that alteration in the IACUC protocol itself).

Table of Contents

I. Procedure Summary and Goal

Describes procedure for the administration of fluids or compounds intravenously.

Considerations:

a. Technique provides the fastest absorption rate, as fluids are administered directly into the venous system.

b. Primary intravenous (IV) injection site for the mouse is the right and left lateral tail vein. Other sites (e.g., retro-orbital [RO] sinus) require sedation and/or analgesia.

c. Please refer to the Guidelines for Injections in Rodents and Rabbits, Virginia Tech Office of the University Veterinarian for recommended volumes and needles sizes.

   i. Tail Vein - 0.2ml

   ii. Retro-orbital Sinus - < 0.15ml

II. Personal Protective Equipment (PPE) and Hygiene

a. Ensure appropriate PPE is used to protect individual from accidental exposure to blood and other body fluids, such as:

   i. Gloves

   ii. Eye protection

   iii. Mask

   iv. Other PPE as required by protocol/facility

b. Hands should be washed and/or gloves changed between animals.

c. Promptly dispose of used sharps in the provided leak-proof, puncture resistant sharps container.

III. Supply List

a. Mechanical restraint device

b. Needles (26-30 gauge; ½ - ⅝ inch)

c. Prefilled syringes

d. Heat source (e.g., heating pad, warm water bath or heat lamp)

e. Antiseptic solution

f. Gauze pads

g. Anesthetic agents

   i. Inhalant

      1. Isoflurane – inhaled to effect

      2. 70% CO_2 + 30% O_2 Gas – inhaled to effect

ii. Injectable

1. Ketamine (90-120mg/kg) + Xylazine (8-12mg/kg) combination

a. Intramuscular, subcutaneous, or intraperitoneal injection

iii. Topical opthalmic anesthetic (e.g., Proparacaine Hydrochloride Ophthalmic Solution)

h. Opthalmic ointment

i. Clotting agents (e.g., styptic powder, silver nitrate sticks, cautery pen)

IV. Detailed Procedure

a. Anesthesia

i. Tail vein – no anesthesia required but requires effective mechanical restraint.

ii. Retro-orbital sinus – general anesthesia prior to injection.

1. Additionally, apply a single drop of topical opthalmic anesthetic (Proparacaine Hydrochloride) prior to procedure.

2. Allow a minimum of 30 seconds for the medication to take effect prior to injection.

b. Procedure

i. Tail Vein IV Injection

1. The mouse has two lateral tail veins and a tail artery located on the ventrum of the tail (Figures 1 and 2).

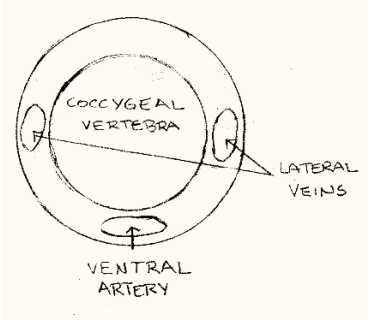

Figure 1. Cross-section Schematic of Tail

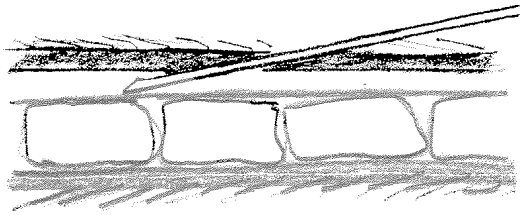

Figure 2. Transection Schematic of Tail

2. Restrain the animal using the mechanical restraint device of your choice with the tail protruding (Figure 3).

Figure 3. Mechanical Restraint

3. Warming the mouse (or tail only) causes vasodilation and provides better vein visibility. This may be done using a heating chamber, heating pad or a heating lamp, or dipping tail in warm water.

   CAUTION: do not overheat; animal should be under a heat lamp no longer than three minutes with heat lamp at least 12 inches away.

4. Wipe tail with antiseptic solution.

5. Immobilize the tail with the non-dominant hand and rotate ¼ turn to access the lateral tail vein.

6. Align the needle parallel to the tail with the beveled edge of the needle facing up (Figure 4).

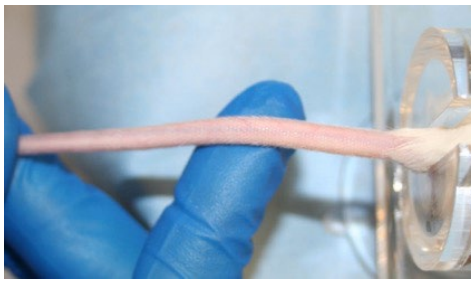

Figure 4. Visualize Vein

7. Insert needle into vein starting at the tip of the tail (distally) at about a 30° angle.

   NOTE: If placement is successful, blood should flash to the hub (Figure 5), and the vein will blanch and compound will flow easily during administration. In an unsuccessful injection, the material will not move through the vein and there will be resistance. If proper placement cannot be confirmed, attempt to place the needle in a more proximal position (i.e., towards the base of the tail). The vein is deeper the closer you move towards the body and can be more difficult to access.

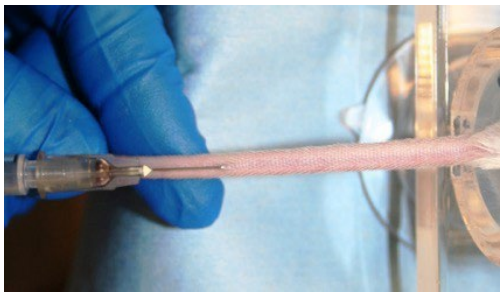

Figure 5. Observe Flash and Advance Needle into Vein

Figure 6. Administer Injection

8. Administer compound slowly and evenly, and remove needle when complete (Figure 6).

9. Dispose of the needle into the approved sharps container.

10. Apply gentle pressure with gauze (30-60 seconds) until bleeding has stopped. Clotting agent may be used to facilitate the stop of blood flow.

11. Monitor animal for 5 to 10 minutes to ensure hemostasis.

ii. Retro-Orbital Sinus IV Injection

1. Considerations

   a. Utilize small gauge needle and syringes (e.g., tuberculin syringe with 27 g needle)

   b. Volume to be injected should not exceed 0.15ml

2. Anesthetize the animal with the selected anesthetic agent prior to sample collection procedures.

3. Apply a single drop of topical opthalmic anesthetic (Proparacaine Hydrochloride) prior to procedure. Allow a minimum of 30 seconds for the medication to take effect prior to injection.

4. Place animal in lateral recumbency, and scruff the animal such that the eyeball partially protrudes from the socket.

5. Introduce the needle, bevel down so as to not damage the surface of the eye, into the medial canthus of the eye at a 45° angle, between the globe and the eye bony orbit (Figure 7 and 8).

6. Advance needle following the edge of the eyeball down until the needle tip is at the base of the eye.

7. Slowly inject, do not aspirate; once administration complete, slowly withdraw needle. Dispose of needle in approved Sharps container.

8. Observe mouse for full anesthetic recovery.

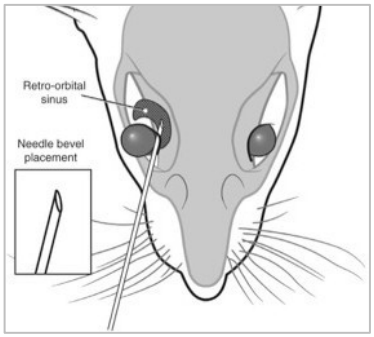

Figure 7. Correct placement of the needle relative to the retro-orbital sinus, the eyeball and the back of the orbit. (Darryl Leja; Lab Anim (NY). 2011 May; 40(5): 155–160)

Figure 8. Insert Needle into Medial Canthus of Eye

V. Variations

None

VI. Potential Adverse Events, Mitigation, or Treatment

a. Potential adverse effects related to tail vein injections

   i. Tail necrosis secondary to extravasation of injected substances

   ii. Bruising, hematoma, continued bleeding

      1. Apply pressure until active bleeding has stopped

      2. Recheck within 24 hours

   iii. Distress due to hyperthermia if animal is warmed

b. Potential adverse effects related to retro-orbital injections

   i. Anesthetic respiratory distress

ii. Eye infection, loss of eye, blindness

iii. Peri-orbital swelling, redness and/or hematoma formation

iv. Death

VII. References

American Association of Laboratory Animal Science. Laboratory Animal Technician Training Manual. (Memphis, TN: Drumwright and Co, 2007)

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