Institutional Animal Care & Use Committee

Policy for Rat and Mouse Blood Collection Techniques (P6.11)

It is often necessary to collect blood from rats and mice used in biomedical research in order to obtain valuable physiological data. Several methods of blood collection are described in the scientific literature, and each method has benefits and drawbacks regarding the amount of blood that can be collected, the physical risks of the procedure to the animal, and the degree of distress that the procedure might induce in the animal as a result of handling, restraint, and pain. The IACUC has established guidelines of all of the commonly used and recommended methods to collect blood from individual rodents. To avoid complications (e.g. hemorrhagic shock, anemia, etc.) and to minimize pain and distress to the animals, blood collection procedures must be carried out within the recommended guidelines. These guidelines cannot be articulated satisfactorily to cover every research proposal; therefore, the IACUC reserves the right to evaluate protocols and blood collection techniques on an individual basis. Any modifications to this policy must be described and justified in an IACUC protocol.

Maximum for multiple blood withdrawals:

- A maximum volume equal to 1.5% of an animal’s body weight may be taken over a span of 14 days. Example: 200-gram rat would have a maximum blood withdrawal volume of 3ml and these can be taken in six 0.5 ml quantities.
- A maximum volume equal to 0.1% of an animal’s body weight may be taken at a maximum frequency of once every 24 hours. Example: 30-gram mouse could have 30 microliters removed daily.

Maximum for a single blood withdrawal:

- A maximum volume equal to 1% of an animal’s body weight can be taken in a single withdrawal, after which the animal requires a 14-day recovery period. Example: 25-gram mouse can have 0.25mls collected in a single withdrawal.

Acceptable blood collection techniques

1. Saphenous vein puncture – This form of blood collection involves using a 25-ga needle to puncture the saphenous vein in order to obtain a small volume of blood.
   - Anesthesia not required
   - Scab may be removed for serial blood collections
   - Low yield of blood volume relative to the amount of time and effort

2. Tail vein puncture – This form of blood collection involves using a needle to puncture the lateral tail vein in order to obtain a small volume of blood.
   - Anesthesia not required
   - May be performed repeatedly for serial blood collections
   - Low yield of blood volume

3. Tail cut – This form of blood collection involves using a scalpel blade or sharp scissors to remove 1-2mm of tail distal to the coccygeal vertebrae
   - Requires anesthesia
   - Scab may be removed for serial blood collections
   - May be performed during genotyping procedures
• Low yield of blood volume
• Places the animal at risk for fighting with cagemates
• Risk of trauma to cartilage and coccygeal vertebrae
• May only be performed one time

4. **Submandibular cheek bleed** – This form of blood collection involves using a lancet to puncture the vascular bundle that drains the face while the rodent is gently restrained.
   • Anesthesia is not required
   • Requires a significant amount of training and experience to master the technique
   • Risk of puncturing the ear canal if improperly performed
   • A large volume of blood may be obtained during each collection, and supplies are inexpensive

5. **Jugular vein puncture or cannulation (rats only)** – This form of blood collection involves using a 22-ga needle and a 1mL syringe to withdraw blood from the jugular vein from an anesthetized animal. Cannulation involves surgically inserting tubing into the jugular vein and creating an acute or chronic implant to administer drugs or collect blood.
   • Requires anesthesia
   • Requires a significant amount of training and experience to master the technique
   • A large volume of blood may be obtained during each collection

6. **Retro-orbital venous sinus (mouse) or plexus (rat)** – This form of blood collection involves using a fine-walled Pasteur pipette or microhematocrit tube to collect blood from the retro-orbital venous sinus or plexus. Animals are anesthetized, the animal is restrained, the eye is protruded, and the appropriate volume of blood is collected. Artificial tears can be used to aid in lubrication of the eye.
   • Requires anesthesia
   • Requires training to perform the technique
   • Should only use the same eye once every 2 weeks, blindness can result from damaging the optic nerve, ocular ulcerations, puncture, infections, and keratitis can result from poor technique
   • A large amount of blood may be obtained during each collection

7. **Cardiac puncture** – This form of blood collection involves using a 22-ga needle and a 3mL syringe to withdraw blood from the heart from an anesthetized animal.
   • Requires anesthesia
   • Requires training to perform the technique
   • A large volume of blood may be obtained

References:

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