Procedures for Injections and Blood Collection

Volume Recommendations

Exceeding 0.1 ml per 10 grams of body weight, or about 10% of total blood volume for collections produces a hypovolemic shock even when performing multiple collections over time. The regeneration time for blood cells is approximately two weeks. When removing large quantities of blood, it may be necessary to administer warmed physiological fluid to replace the volume of blood collected. For more information, see volume recommendations.

The recommended gauge size of a needle in blood collection and fluid administration is 23 to 27. Larger needles (meaning smaller gauged number) may be necessary for injecting large volumes or thick materials. When accessing the tail, lateral saphenous, and cheek veins anesthesia is not required and sedation may be used to increase vein visibility by peripheral vein dilation and may help immobilize the animal. For hands-on training, contact the UAB ARP Veterinarian Staff.

Volume recommendations for intravenous (IV) administration and blood collection in adult rats (average weight 200 grams) are listed below.

<table>
<thead>
<tr>
<th>Body Weight (g)</th>
<th>*CBV (ml)</th>
<th>1% CBV (ml) every 24 hours†</th>
<th>10% CBV (ml) every 2 weeks†</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>6.88 – 8.75</td>
<td>.069 -.088</td>
<td>.69 -.88</td>
</tr>
<tr>
<td>150</td>
<td>8.25 – 10.50</td>
<td>.082 -.105</td>
<td>.82 – 1.0</td>
</tr>
<tr>
<td>200</td>
<td>11.00 – 14.00</td>
<td>.11 -.14</td>
<td>1.1 – 1.4</td>
</tr>
<tr>
<td>250</td>
<td>13.75 – 17.50</td>
<td>.14 -.18</td>
<td>1.4 – 1.8</td>
</tr>
<tr>
<td>300</td>
<td>16.50 – 21.00</td>
<td>.17 -.12</td>
<td>1.7 – 2.1</td>
</tr>
<tr>
<td>350</td>
<td>19.25 – 24.50</td>
<td>.19 – 24.50</td>
<td>1.9 – 2.5</td>
</tr>
</tbody>
</table>

*CBV – Circulating Blood Volume
†Maximum sample volume for that sampling frequency

Other information you should know about volume recommendations:
Blood Collection and Injections for Rats

- Total blood volume – 64 ml/kg
- Safe blood collection – 5.5 ml/kg
- Adult rat bleed-out volume – 6-14 ml/kg (Animals should be exsanguinated only under anesthesia.)
- IV fluid administration volume – 0.5 – 1.0 ml

Methods Commonly Used for Blood Collection or Fluid Administration

If you are not trained in blood or fluid collection techniques, contact the UAB ARP Veterinary Staff before attempting the procedure.

**Tail Vein**

Anesthesia is not required with proper restraint. Volumes allowed are approximately up to 1 ml. A tourniquet at the tail base is helpful to dilate the vessel. Dipping the tail in warm water also helps vessel dilation. Sedation can be used to enhance vein visualization by peripheral vasodilation (drug effect) and reduce the animal’s struggle due to distress.

**Lateral Saphenous Vein**

Anesthesia is required. Volumes collected are approximately up to 1 ml. The vein is punctured percutaneously after fur removal. Then blood is passively collected in capillary tubes as it pools on the skin. The collection is aided by applying petroleum jelly or stopcock grease to the area so that the blood creates a bubble instead of spreading out on the skin.

**Jugular Vein**

Anesthesia is required. You may remove volumes up to 10% of the blood volume from multiple collections over two weeks.

**Cardiac Puncture**

This method requires anesthesia and is a terminal procedure. There are two methods of collection: ventral midline and left lateral recumbency.
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*Retro-Orbital Puncture*

Anesthesia is required and using a topical ophthalmic anesthetic is recommended. Volumes up to 1 ml are allowed. The optic nerve and other nearby structures are at risk of injury when using this method. Alternating the puncture site between eyes and corners reduces injury and discomfort for repeated collections.

**Procedures for Injections**

If you are not trained for proper injection techniques, contact the UAB ARP Veterinary Staff before attempting the procedure.

*Intraperitoneal (IP)*

Inject the fluid into the lower quadrant of the abdomen. Both sides are acceptable (right or left). Avoid the midline to avoid the bladder. Enter approximately at the level of a relaxed knee to avoid the inguinal fat pad.

*Subcutaneous (DQ or SC)*

Tent the skin – typically over the back of the neck area. Insert the needle at the base of the tent. Pull back on the plunger to check for a flash of blood in the hub of the needle. If blood is present, reposition and try again.

*Oral Gavage*

Oral gavage requires a specialized gavage needle. The needle design helps to prevent instillation into the lungs. Contact the UAB ARP Veterinary Staff for specific training before attempting this technique.

*Intramuscular (IM) Injections*

The recommended injection location is in the cranial thigh muscles (quadriceps femoris). This muscle group is the largest available for injection. Also, it avoids complication of involvement of the sciatic nerve. Muscle mass is limited in rats; therefore, use this method only when necessary or required.