

**BACKGROUND**

The purpose of this policy is to clarify the requirements for blood collection to ensure the health status of the animal and maintain the validity of experimental results based on blood samples. Excessive blood collected at any one time may cause hypovolemic shock, physiological stress and death. If smaller volumes are collected too frequently, anemia may result.

The guidelines provided are for healthy, normal adult animals. Animals that are young, aged, stressed, have undergone experimental manipulations, or are suffering from cardiac or respiratory disease may not be able to tolerate this amount of blood loss.

**POLICY AND PROCEDURE**

All non-terminal blood collection without replacement fluids is limited to 10% of the total circulating blood volume of a healthy animal during a 2 week period. As a general rule, 10% of the circulating blood volume (CBV) can be collected at one time every 2-4 weeks. The CBV is approximately 6% of body weight (BW). Volumes exceeding 10% of the CBV or more frequent sampling need to be scientifically justified and approved by the IACUC and fluid replacement may be necessary.

**RECOMMENDATIONS**

**Blood Collection Sites**

<b>Mice</b>		
<b>Collection Site</b>	<b>Advantages</b>	<b>Comments</b>
Submandibular/Facial	<ul style="list-style-type: none"> <li>Anesthesia not required</li> <li>Vein is easily accessed</li> <li>Large volume of blood can be collected</li> </ul>	Lancet of 18-22 G needle
Lateral tail vein	<ul style="list-style-type: none"> <li>Anesthesia not required</li> <li>Vein is easily accessed</li> </ul>	<ul style="list-style-type: none"> <li>Yields only small volume of blood</li> <li>A restraint holder is helpful</li> </ul>
Orbital Sinus	<ul style="list-style-type: none"> <li>Large volume of blood can be collected</li> </ul>	<ul style="list-style-type: none"> <li>Anesthesia required</li> <li>Topical ocular anesthetic may be used</li> <li>If eye or conjunctiva damage occurs</li> <li>use must be ceased</li> </ul>
Lateral Saphenous Vein	<ul style="list-style-type: none"> <li>Anesthesia not required</li> <li>Excellent for serial blood sampling</li> <li>Moderate volume of blood can be collected</li> </ul>	
Cardiac Puncture	<ul style="list-style-type: none"> <li>Maximum volume of blood can be collected</li> </ul>	<ul style="list-style-type: none"> <li>Requires deep anesthesia</li> <li><b>Non-survival procedure only</b></li> </ul>

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**IACUC POLICY  
BLOOD COLLECTION**

<b>Rats</b>		
<b>Collection Site</b>	<b>Advantages</b>	<b>Comments</b>
Lateral tail vein	<ul style="list-style-type: none"> <li>Anesthesia not required</li> <li>Vein is easily accessed</li> <li>Moderate volume of blood can be collected</li> </ul>	<ul style="list-style-type: none"> <li>A restraint holder is helpful</li> <li>Goldenrod® or similar lancet may be helpful</li> </ul>
Ventral Tail Artery	Large volume of blood can be collected	Anesthesia is required
Lateral Saphenous Vein	<ul style="list-style-type: none"> <li>Anesthesia not required</li> <li>Excellent for serial blood sampling</li> <li>Large volume of blood can be collected</li> </ul>	
Anterior Vena Cava	Large volume of blood can be collected	Anesthesia is required
Cardiac Puncture	Maximum volume of blood can be collected	<ul style="list-style-type: none"> <li>Requires deep anesthesia</li> <li><b>Non-survival procedure only</b></li> </ul>
<b>Rabbits</b>		
<b>Collection Site</b>	<b>Advantages</b>	<b>Comments</b>
Marginal Ear Vein	<ul style="list-style-type: none"> <li>Anesthesia not required</li> <li>Vein is easily accessed</li> <li>Small – moderate volume of blood can be collected</li> </ul>	<ul style="list-style-type: none"> <li>A restraint holder is helpful</li> <li>Topical anesthetic is required</li> </ul>
Central Ear Artery	Large volume of blood can be collected	<ul style="list-style-type: none"> <li>Topical anesthesia is strongly required</li> <li>Restraint holder helpful</li> </ul>
Lateral Saphenous Vein	Anesthesia not required	Small volume of blood can be collected
Cephalic Vein	Anesthesia not required	<ul style="list-style-type: none"> <li>An assistant is helpful</li> <li>Small volume of blood can be collected</li> </ul>
Jugular Vein	Large quantities of blood can be collected	Anesthesia is recommended
Cardiac Puncture	Maximum quantity of blood can be collected	<ul style="list-style-type: none"> <li>Requires deep anesthesia</li> <li><b>Non survival procedure only</b></li> </ul>
<b>Large Animals</b>		
Jugular Vein (Ruminants, Swine)		
Anterior vena cava		
Marginal Ear Vein		

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**Restraint**

Animals will need to be physically restrained to prevent any movement that would result in lacerating the blood vessel or other potentially serious complications. Blood may be collected from awake animals that are appropriately restrained provided that persons performing the procedure are skilled.

**Anesthesia**

Anesthesia is required if blood collection is being performed either via the retro-orbital sinus or by cardiac puncture due to the distress and pain which can be caused and for the serious complications (injury to the eye, cardiac tamponade and death) associated with these routes. For survival procedures requiring anesthesia isoflurane is recommended as it is short-acting and allows replacing the rodent in its cage within minutes.

**Fluid Replacement**

Lactated Ringer's Solution (LRS) is recommended as the best for fluid replacement. For mice administered 1 ml of warmed LRS IP or SC. For rats administer 5 -10 ml warmed LRS ½ via IP and ½ via SC administration.

**Nutritional Supplementation**

When larger volumes are withdrawn, especially when there are repeated sampling, it is recommended that the animal receives Nutrical, a dietary supplement. For rats and mice, this can easily be done by smearing Nutrical on a few pellets and placing those on the cage floor.

**Training**

Training is required for blood collection in any species and by any route. Please contact the Attending Veterinarian to schedule training.

**REFERENCES**

NIH Guidelines for Survival Bleeding in Mice and Rats, 2007.

Boston University IACUC Policy for Blood Collection Guidelines

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