

**General guidelines:**

- The acceptable quantity and frequency of blood sampling is determined by the circulating blood volume and the red blood cell (RBC) turnover rate. Excessive blood collection may result in hypovolemic shock, physiological stress and even death.
- For optimal health, blood draws should be limited to the lower end of the range. Maximum blood volumes should be taken only from healthy animals (1).
- The approximate blood volume of a mouse is 77-80  $\mu\text{l/g}$ . For a 25 g mouse this is equivalent to 1.9-2.0 ml (2,3).
- **Single sample:** Without fluid replacement, the maximum blood volume which can be safely removed for a one time sample is 10% of the total blood volume or 7.7-8  $\mu\text{l/g}$ . For a 25 g mouse, this is equivalent to 193-200  $\mu\text{l}$ . With fluid replacement, up to 15% of the total blood volume or 12  $\mu\text{l/g}$  can be removed. For a 25 g mouse this is equivalent to 300  $\mu\text{l}$ . Generally, fluid replacement should be warmed and given subcutaneously (1).
- **Multiple samples:** If it is necessary to take multiple samples, smaller blood volumes should be drawn. The maximum blood volume that may be drawn per week is no more than 7.5% of the total blood volume or 6  $\mu\text{l/g}$ . For a 25 g mouse, this is equivalent to 145-150  $\mu\text{l}$  per week. If sampling will occur every 2 weeks, up to 10% of the total blood volume may be drawn or 8  $\mu\text{l/g}$  (4). For a 25 g mouse, this is equivalent to 200  $\mu\text{l}$  every 2 weeks. For repeated blood collection, fluid replacement does not allow for a larger blood volume or more frequent blood collection.
- **Exsanguination:** Approximately half of the total blood volume can be collected at exsanguination. This is equivalent to 40  $\mu\text{l/g}$  or approximately 1 ml for a 25 g mouse (1).
- Take into account the total blood volume yielded from the chosen blood collection technique when calculating frequency and volume of blood collection.
- If you are not experienced in blood collection technique and would like training contact: [trainerIACUC@ucsf.edu](mailto:trainerIACUC@ucsf.edu)

<b>Collection Site</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>Submandibular Sampling</b>	<ul style="list-style-type: none"> <li>• Preferred blood collection method</li> <li>• Maximum allowable sample volume with minimal trauma</li> </ul>	<ul style="list-style-type: none"> <li>• Must be securely restrained</li> <li>• Anesthesia recommended</li> <li>• Yields a large sample so should not be used for frequent small sampling</li> </ul>
<b>Lateral Tail Vein or Ventral/Dorsal Artery Sampling</b>	<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>• Must be securely restrained</li> <li>• Yields only small quantities</li> <li>• Some specialized equipment needed</li> </ul>
<b>Retro-orbital Sinus</b>	<ul style="list-style-type: none"> <li>• Yields a greater volume of blood</li> </ul>	<ul style="list-style-type: none"> <li>• Anesthesia is required</li> <li>• Is a discouraged technique</li> <li>• Risk of injury to the eye and surround structures</li> </ul>
<b>Saphenous Sampling (medial or lateral approach)</b>	<ul style="list-style-type: none"> <li>• Anesthesia not required</li> <li>• Excellent technique for serial blood sampling</li> <li>• Moderate volume of blood can be collected</li> </ul>	<ul style="list-style-type: none"> <li>• Requires some specialized training</li> <li>• Specialized equipment required</li> </ul>
<b>Cardiac Puncture</b>	<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>• Non-survival procedure only</li> </ul>

#### References:

1. [http://jaxmice.jax.org/faq/withdrawingblood\\_amounts.html](http://jaxmice.jax.org/faq/withdrawingblood_amounts.html)
2. Mitruka BM, Rawnsley HM. 1981. Clinical, biochemical and hematological reference values in normal experimental animals and normal humans. New York: Masson Publishing; 413 p.
3. Harkness JE, Wagner JE. 1989. Biology and husbandry. In: Harkness JE, Wagner JE, editors. The biology and medicine of rabbits and rodents, 3rd ed. Philadelphia: Lea & Febiger; 372 p.
4. McGill MW, Rowan AN. 1989. Biological effects of blood loss: implications for sampling volumes and techniques. *ILAR News* 31:5-20
5. Guidelines for the Survival Bleeding of Mice and Rats. 2010: [oacu.od.nih.gov/ARAC/documents/Rodent\\_Bleeding.pdf](http://oacu.od.nih.gov/ARAC/documents/Rodent_Bleeding.pdf)