



Institutional Animal Care & Use Committee

Blood Collection in Rodents Guideline

I. Purpose

The purpose of this guideline is to provide recommended blood sampling volumes and guidance on a variety of acceptable blood collection techniques in rodents.

II. Scope

This guideline applies to all personnel collecting blood samples from laboratory rodents.

III. Guidance

A. General Information

1. Factors to consider when selecting the appropriate blood collection technique for research purposes include, but are not limited to:
 - a. The species to be bled
 - b. The size and age of the animal to be bled and the estimated total blood volume
 - c. The type of the sample required (e.g., serum, whole blood cells, etc.)
 - d. The quality of the sample required (sterility, tissue fluid contamination, etc.)
 - e. The quantity of blood required (taking into account extraneous blood loss due to a selected method)
 - f. The frequency of sampling
 - g. The health status of the animal being bled
 - h. The training and experience of the phlebotomist
 - i. The size and type of capillary tube is appropriate
 - j. The effect of the site, restraint, or anesthesia on the blood parameter measured.
2. The acceptable quantity and frequency of blood sampling is dependent on the circulating blood volume of the animal and the red blood cell (RBC) turnover rate. The approximate circulating blood volume of adult rodents varies with species and body weight. For purposes of calculating the maximum blood volume that may be sampled, the following reference mean total blood volume (TBV) values may be used:
 - a. Mouse 72 ml/kg
 - b. Rat 64 ml/kg
 - c. Hamster 78 ml/kg

- d. Guinea pig 75 ml/kg
3. Approximately 10% of the total blood volume can be safely removed every 2 to 4 weeks, 7.5% every 7 days, and 1% every 24 hours.
 4. The guidance provided below is for healthy adult animals. Animals that are young, aged, stressed, have cardiac or respiratory disease, or are otherwise compromised may not tolerate recommended amounts of blood removal.
 5. If the experimental design requires blood volumes and/or frequency of collection that fall outside the recommendations within this guideline, consultation with the AV and justification in the IACUC protocol is required.

Table 1: Calculated Blood Sample Volumes for Species and Range of Body Weights					
Species	Body weight (g)	*CBV (ml)	~1% CBV every 24 hrs.†	~7.5% CBV every 7 days†	~10% CBV every 2 - 4wks†
Mouse	20	1.10 - 1.40	11 - 14 µl	90 - 105 µl	110 - 140 µl
	25	1.37 - 1.75	14 - 18 µl	102 - 131 µl	140 - 180 µl
	30	1.65 - 2.10	17 - 21 µl	124 - 158 µl	170 - 210 µl
	35	1.93 - 2.45	19 - 25 µl	145 - 184 µl	190 - 250 µl
	40	2.20 - 2.80	22 - 28 µl	165 - 210 µl	220 - 280 µl
Rat	125	6.88 - 8.75	69 - 88 µl	516 - 656µl	690 - 880 µl
	150	8.25 - 10.50	82 - 105 µl	619 - 788 µl	820 - 1000 µl
	200	11.00 - 14.00	110 - 140 µl	825 - 1050 µl	1.1 - 1.4 ml
	250	13.75 - 17.50	138 - 175 µl	1.0 - 1.3 ml	1.4 - 1.8 ml
	300	16.50 - 21.00	165 - 210 µl	1.2 - 1.6 ml	1.7 - 2.1 ml
	350	19.25 - 24.50	193 - 245 µl	1.4 - 1.8 ml	1.9 - 2.5 ml
	*Circulating blood volume (1ml = 1000µl)		†Maximum sample volume for that sampling frequency		

B. Collection site requirement and advantages / disadvantages

Collection Sites	ADVANTAGES	DISADVANTAGES
Submandibular Sampling	<ul style="list-style-type: none"> • Preferred blood collection method • Maximum allowable sample volume with minimal trauma 	<ul style="list-style-type: none"> • Anesthesia recommended • Must be securely restrained • Yields a large sample so should not be used for frequent small sampling
Tail Nick or Tail Vein Sampling	<ul style="list-style-type: none"> • Anesthesia not required • Multiple samples can be taken • Vein is easily accessed 	<ul style="list-style-type: none"> • Must be securely restrained • Yields only small quantities
Sublingual Vein	<ul style="list-style-type: none"> • Multiple samples can be taken 	<ul style="list-style-type: none"> • Anesthesia required • Must be securely restrained • Yields a large sample so should not be used for frequent small sampling
Saphenous Sampling (medial or lateral approach)	<ul style="list-style-type: none"> • Excellent technique for serial blood sampling • Moderate volume of blood can be collected • Multiple samples can be taken by alternating sites 	<ul style="list-style-type: none"> • Requires specialized training • Specialized equipment required
Cardiac Puncture	<ul style="list-style-type: none"> • Maximum volume of blood can be collected 	<ul style="list-style-type: none"> • Requires deep anesthesia. • Non-survival procedure only
Retro-orbital Sinus	<ul style="list-style-type: none"> • Yields a greater volume of blood • For multiple sampling, see IACUC standard procedure 	<ul style="list-style-type: none"> • Requires anesthesia • Involves risk of injury to the eye and surrounding structures and therefore use is discouraged. • Use must be justified in the protocol.

C. References

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Sci. 2016; 55(5):570-6.