



Animal Program Policy

Title: Blood Collection

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Introduction

Blood collection or sampling is a common and important procedure used by animal researchers. IACUC approval and training is necessary prior to blood collection as mandated by the Animal Welfare Regulations (AWR) and the Public Health Service Policy (PHS).

Excessive frequency or volume of blood collection may cause anemia or even hypovolemic shock in animals. This policy governs the volume of blood removed, the time course over which blood can be collected, and the method of blood collection. The goal is to minimize the effect of the procedure and associated blood loss on the animal in normal healthy adult animals. Animals that are aged, stressed, have undergone research procedures, or are suffering from systemic disease may not tolerate the recommended blood collection volumes. Such factors may require that less blood is taken at longer intervals or parenteral fluids may be indicated immediately following blood collection to minimize the consequences of blood collection on the animal's welfare.

Blood collection should be listed as a separate procedure on the Forsyth protocol form.

Training and experience of those collecting blood from animals is critically important and must be described in the protocol form.

Acceptable Blood Collection Volume

For all species:

- For one time blood collection, 10% of the circulating blood volume (CBV) can be collected; with fluid replacement, this can be increased to 15%.
- CBV is approximately 6% of body weight.
- For repeated sampling, 1% of CBV can be collected at intervals of 24 hours, 7.5% every 7 days and 10% can be collected every 2-4 weeks.

Table 1 below lists approximate volumes that can be collected from animals of different weights over various time periods.

Calculation of total blood taken must include any blood that is not captured (i.e., additional uncollected drops) or the volume that remains in the needle or syringe.

Body weight (g)	*CBV(ml)	1% CBV every 24 hrs†	7.5% CBV every 7 days†	10% CBV every 2 - 4wks†
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
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
*CBV = Circulating blood volume (1ml = 1000µl)	†Maximum sample volume for that sampling frequency			

Exsanguination is a terminal procedure that must be performed in anesthetized animals and should be listed as a procedure in the protocol. The volume collected is typically half of the total blood volume.

For additional information: <http://www.nc3rs.org.uk/our-resources/blood-sampling>

<https://www.jax.org/news-and-insights/2005/october/how-much-blood-can-i-take-from-a-mouse-without-endangering-its-health>

https://oacu.oir.nih.gov/sites/default/files/uploads/arac-guidelines/rodent_bleeding.pdf

Recommended blood collection methodsMouse/Rat

Collection Site	Advantages	Disadvantages
Submandibular vein	<ul style="list-style-type: none"> Anesthesia not required Excellent technique for serial blood sampling Moderate volume of blood can be collected 	<ul style="list-style-type: none"> Must be securely restrained Requires some specialized training Some specialized equipment required. Only useful for volumes >100 ul/collection
Lateral Saphenous Vein	<ul style="list-style-type: none"> Anesthesia not required Excellent technique for serial blood sampling Moderate volume of blood can be collected 	<ul style="list-style-type: none"> Requires some specialized training Some specialized equipment required.
Lateral tail vein	<ul style="list-style-type: none"> Anesthesia not required Vein is easily accessed 	<ul style="list-style-type: none"> Must be securely restrained Yields only small quantities Some specialized equipment needed Training required
Orbital Sinus or Plexus	<ul style="list-style-type: none"> Large volumes of blood can be collected 	<ul style="list-style-type: none"> Anesthesia is required Requires demonstrated ability For repeated collections, alternate eyes should be used No more than 2 collections can be made per eye over the life of the animal
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
Tail Snipping		<ul style="list-style-type: none"> Not permitted

Guinea Pig/Hamster

Blood collection from the lateral saphenous vein is recommended.

Terminal blood collection in anesthetized animals must be included as a procedure in the protocol.

Rabbits

Blood collection from the ear vein is recommended.

Terminal blood collection in anesthetized animals must be included as a procedure in the protocol.