

Collecting Blood from Lab Animals Guidelines

I. Overview

Guidelines for safe blood withdrawal for laboratory mammals take into account the fact that each species has a different blood volume to body weight ratio measured in milliliters of blood to kilogram of body weight. These guidelines are for normal, healthy adult animals. Animals that are young, aged, stressed, have undergone experimental manipulations, or are suffering from cardiac or respiratory disease may not tolerate this amount of blood loss.

Blood collection techniques must be described in the animal care and use protocol.

II. Guidelines:

a. Restraint

- i. **Rabbits, Mice and Rats** may be placed in appropriate restraining devices or chemically restrained with anesthetics or sedatives.
- ii. **Birds** usually require only physical restraint to collect blood.

b. Blood Collection Volumes

i. Approximate blood volumes:

- 1 percent of body weight = maximum volume per collection every two weeks.
- 3 percent of body weight = amount expected of exsanguination.
- 5-10 percent of body weight = total blood volume.

c. Single Blood Draw

A maximum of 1% of the animal's body weight may be removed as a single blood draw. For example:

- 0.15 ml from a 15 gram mouse
- 50 ml from a 5 kg cat
- 400 ml from a 40 kg dog.

Approximately 14 days are needed for the average healthy adult animal to completely recover from this blood loss. Although the blood volume is restored within 24 hours, two weeks are needed for all blood constituents to return to normal. As a rule, an animal will replace blood constituents at a rate of 1 ml/kg/day.

d. Multiple Blood Draws

If blood must be drawn more frequently than once every two weeks, 0.5% of the animal's body weight may be removed each week. This volume may be divided into several draws.

e. Monitoring

After blood has been collected, the animal should be monitored, and pressure at the collection site applied, until any bleeding has stopped. Several minutes of pressure may be required following arterial puncture. Monitoring the hematocrit (HTC or packed cell volume-PCV) is a method used to evaluate whether the animal has sufficiently recovered from a single or multiple blood draws. After a sudden or acute blood loss, it takes up to 24 hours for the hematocrit and hemoglobin to reflect this loss. In general, if the animal's hematocrit is less than 35 percent or hemoglobin concentration is less than 10 g/dl it is not safe to remove the volume of blood listed above.

f. Terminal Blood Withdrawal

Terminal bleeds are only allowed under general anesthesia, and the animal's death must be verified at the end of the bleed. An alternative euthanasia method (for example, cervical dislocation or opening of the thoracic cavity) is recommended after the blood withdrawal.

A general rule: An animal's blood volume is 10 percent of its body weight, and only about half of that can be recovered when the animal is bled out. Therefore, as a terminal bleed, 5-6 percent of an animal's body weight is a reasonable amount of blood (ml) that may be collected at exsanguination.

g. Common Sites for Blood Collection in Rodents

Location	Anesthesia	Frequency	Comments
Retro-orbital sinus	Yes, topical	Same eye, once every 2wks; can be performed on same eye if blood collected within 30 minutes of first sample	Good for large blood collection on weekly (monthly) basis
Submandibular vein ("facial vein")	No	Once every 2wks	Good for large blood collection on weekly (monthly) basis
Saphenous vein	No	Multiple	Good for multiple collection of small volumes
Tail vein	No	Multiple	Good for multiple collection of small volumes
Tail nick	No	Multiple	Good for multiple collection of small volumes

Cardiac puncture	Yes; general anesthesia, terminal procedure only	Not applicable	Good for large, one-time collection
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III. References