Florida State University
Blood Collection in Laboratory Animals

Some research protocols require single or multiple blood samples to be collected. It is important to remember that blood volume must be maintained within normal range in order to maintain normal physiologic function. Different species have different ratios of blood volume to body weight. On average, total body blood volume is equal to 6-10% of the body weight. Unless otherwise required (or as part of a terminal procedure), no more than 10% of the total body blood volume should withdrawn in a 2 week period.

If larger amounts are needed, then up to 20% may be withdrawn provided double the amount is given as fluid volume replacement (lactated ringers solution) at the time of withdrawal. In addition, if the animal is being bled routinely, the red blood cell packed volume (PCV) should be checked weekly to determine when blood collection should be suspended in order for the animal to recover from potential anemia. While healthy adult animals can recover their blood volume within 24 hours, it may take up to 2 weeks for all the other blood constituents (e.g. cells, proteins) to be replaced. Animals that are aged, very young or stressed from experimental procedures will not be able to experience the same amount of blood withdrawal as a normal healthy adult animal.

Things to be aware of when planning blood collection include:

- how much blood will be collected
- how the animal will be restrained
- what blood vessel(s) will be used

To calculate the amount of blood which can be safely withdrawn you can use one of the following formulas:

- Animal's weight (in grams) X 0.06 X 0.20 = safe amount of blood to draw
- Animal's weight (in grams or kilograms) X 0.10 = safe amount of blood to draw
- Animal's weight (in kilograms) X 0.06 X 0.20 X 1000 = safe amount of blood to draw
- Animal's weight (in pounds) X 0.06 X 450 X 0.20 = safe amount of blood to draw

At a minimum the animal 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 appropriately restrained provided the person performing the procedure is skillful. Physical restraint can be done using arms and hands or with actual restraint devices. Sedation may be required for some animals or particular routes chosen for bleeding. Certain chemical combinations may also make peripheral blood vessels easier to utilize. 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 associated with these routes (eye injury or cardiac tamponade).

Blood vessels that can be used for collection include:

Mouse - lateral tail veins, retro-orbital sinus, heart
Rabbit - lateral ear vein, jugular vein, medial ear artery, heart
Rat - lateral tail veins, saphenous veins, jugular vein, retro-orbital sinus, heart

Animals may not be returned to their home cage until the technician is assured that bleeding has stopped.

Note - All cardiac punctures must be done under anesthesia as a terminal procedure. As an estimate it is expected that a skilled technician can collect up to 5% of an animal's body weight (in mls) during a terminal blood collection.

The department of Laboratory Animal Resources is happy to assist and train all research personnel in blood collection.

Circulating Blood Volume in Selected Laboratory Animals[1]

Species	Blood Volume (ml/kg; adults)
Chicken	60
Gerbil	67
Guinea Pig	67-92
Hamster	78
Mouse	78-80
Rabbit	44-70
Rat	50-70

[1] Values taken from *Removal of blood from laboratory mammals and birds.* First Report of the BVA/FRAME/RSPCA/UFAW Joint Working Group on Refinement. Laboratory Animals (1993) 27, 1-22