

## BLOOD COLLECTION FROM LABORATORY ANIMALS

Most animals will go into shock if 25-30% of their blood volume (equal to approximately 2% of the animal's body weight) is removed over a short period of time. Removal of 30-40% of the blood volume will lead to death in at least 50% of animals. Most animals would die following removal of more than 40% of total blood volume. Additionally, stressed, sick, or otherwise abnormal animals could not be expected to tolerate blood collection as well as healthy animals.

**Adherence to the following guidelines will optimize survival following blood sampling from healthy animals:**

1. For most species, the blood volume in milliliters (mls) is equal to approximately 6-8% of the body weight in grams.
2. 1% of the body weight (gm) can be collected safely at one time without fluid replacement. This volume should be collected at a slow and steady rate. The following are blood collection numbers for various species.

Species	Adult blood Volume (ml)	Single sample Volume (ml)	Exanguination Volume (ml)
Mouse	2.5	0.3	1.2
Hamster	9	0.5	3.0
Rat	30	2.5	12.0
Guinea pig	60	5.0	30
Rabbit	150-400	25-50	100-180
Goat (45 kg)	3000	400	1200
Sheep (60 kg)	4000	600	1500
Chicken	240	20	160

3. Although the blood volume is restored within 24 hours after blood withdrawal, up to two (2) weeks are required for all constituents of the blood to return to normal. Therefore, if the maximum amount of blood (1% of the body weight) is withdrawn, a 2-week recovery period should be allowed between subsequent blood collections.
4. If less than the maximum amount of blood is withdrawn, the following rule of thumb can be applied to determine safe intervals for subsequent blood collections: After blood withdrawal, an animal will replace approximately one (1) ml/kg/day.
5. If replacement fluids are given at the time of blood withdrawal, up to 2% of the body weight can be removed at one time. This volume should be withdrawn at a slow, steady rate and should be replaced promptly with warm sterile fluids given at a slow and steady rate.
6. Approximately 50-75% of the blood volume (3-4% of the body weight) can be obtained from an animal by exsanguination. The total volume of blood cells obtained can be increased by giving fluids during bleeding to maintain the animal's blood pressure. The animal should be anesthetized before exsanguination, but the amount of blood obtained will be increased substantially if the heart is beating during the bleeding procedure.

7. Bleeding techniques:

- a. Restraint devices may be utilized provided adequate care is used to prevent injury.
- b. Periorbital bleeding
  1. May be performed in mice and rats, but not other species.
  2. Requires anesthesia.
- c. Tail snipping in neonatal and/or juvenile mice should be followed by sealing of the tail in wax, or other measures, to prevent maternal cannibalism (see policy on tail snipping).
- d. Blood withdrawal from vessels of the tail pinna (e.g., in rabbits or rats) may be facilitated by dilation of blood vessels by
  1. increasing body temperature by use of a heat lamp or an increase in room temperature
  2. use of a tranquilizer such as Innovar-Vet
  3. gentle finger-tapping of the skin overlying the vessel
  4. the use of a local anesthetic crème such as EMLA®
- e. Cardiac puncture may only be used for terminal collection of blood because of the danger of cardiac tamponade, pulmonary hemorrhage, and pneumothorax. Anesthesia is required.
- f. Sites for blood collection:
  1. Cat and dog: cephalic, jugular, femoral, and saphenous veins
  2. Cow and ferret: jugular and tail veins
  3. Bird: heart\* and jugular and wing veins
  4. Fish: heart and tail vein
  5. Small rodents: heart, tail vessels, periorbital sinus, saphenous vein, puncture of foot or toe or tail clip.
  6. Guinea pig: vena cava, ear vein
  7. Rabbit: ear artery and vein, heart
  8. Pig: vena cava, and ear\* vein
  9. Sheep and goat: jugular vein

\* cardiac bleeding under anesthesia and terminal