

# Fluid and Drug Administration

When drugs, vaccines, injectable anesthetics or other agents are to be administered, one or more of several different routes may be selected. The routes selected are governed by the nature of the agent being administered, the animal, the purpose of the administration and other factors. The more common routes of administration used for laboratory animals are classed as follows:

## Guidelines for fluid and drug administration

### **Gastro-intestinal Tract:**

- Oral or per os (PO) - through the mouth
- Gavage - into the stomach via tube

### **Parenteral:**

- Intravenous (IV) - directly in the vascular system through a vein
- Intraperitoneal (IP) - injected into the abdominal cavity
- Subcutaneous (SQ) - injected under the skin
- Intramuscular (IM) - injected into a muscle
- Intradermal (ID) - injected between the layers of the skin

**Gastro-intestinal Tract:** Substances may be admitted orally by addition to the food or drinking water, by use of a capsule or pill or by instillation into the mouth using a mechanical device, such as a syringe. Capsules or coated pills are rarely used in rabbits or rodents. When used, capsules or pills are placed in the mouth near the back of the tongue, and the animal is induced to swallow by stroking the throat.

Stomach tubes or gastric feeding needles are inserted through the mouth into the stomach or lower esophagus (Figure 7). Care must be taken that the tube does not enter the trachea or the needle puncture the esophagus. In most cases, introduction of the tube toward the rear of the mouth will induce swallowing and the tube readily enters the esophagus. A violent reaction (coughing, gasping) usually follows accidental introduction of the tube into the larynx or trachea. Flexible or plastic tubes may be bitten or chewed and some care must be taken to prevent this. With rabbits, a dowel of wood or plastic with a hole in the center is inserted behind the incisors. This prevents chewing and permits easy entrance of the stomach tube. Rabbits should be placed in a restraining device before attempting this procedure to avoid unnecessary struggling and injury. A small, curved, metal tube, usually with a ball on the end (feeding needle) is often used with small rodents. Entrance may normally be obtained without anesthesia using ordinary hand restraint and the ball prevents trauma to the esophagus and oral cavity. With the stomach tube fitted to a syringe or aspirator, material may be administered or withdrawn as required. A safe volume to gavage rats and mice is 10 ml gavage solution per kg body weight. DLAM technical staff offers instruction with these techniques.



**Figure 7:** Rodent Gavage Needle

**Parenteral:** Parenteral routes of administration involve injections into various compartments of the body. Sites used for collection of blood from veins may also be used for intravenous administration. Intraperitoneal administration is one of the most frequently used parenteral routes, but other commonly used locations are the musculature and the subcutis. Materials given intramuscularly must be small in amounts. Absorption via this route, however, is more rapid than subcutaneous administration. Regardless of the route to be used, it is essential that the subject be securely restrained to avoid injury to personnel, caused by dislodged needles, and to animals because of struggling.

The investigator should know the physiological properties of the substance for injection. Considerable tissue damage and discomfort can be caused by irritating vehicles or drugs. The use of the rabbit foot pad as an injection for antigens, with or without adjuvant, is expressly prohibited since it is a needless and painful procedure. A more suitable site for antigen injection is subcutaneously or intradermally over the dorsal body trunk. In general volumes must be limited to a maximum of 0.1 ml per Intradermal or 0.25 ml per subcutaneous injection site.

The following outline provides basic information on equipment and techniques for parenteral injections in rodents and rabbits. Demonstration/instruction sessions may be arranged with DLAM.

### **Mouse**

**Intravenous:** Equipment - 27-30g needle, 1 ml syringe, mouse holder, warming lamp. The lateral veins of the tail are the most frequently used veins. Best results are obtained if the tail is immersed in warm water or the mouse is warmed in the cage with a warming lamp. The veins can be seen when the tip of the tail is lifted and rotated slightly in either direction. The tip of the needle can be followed visually as it penetrates the vein. Trial injection soon discloses whether or not the needle is in the vein. Practice and training are essential. This is not an easy technique to master quickly.

**Intraperitoneal:** Equipment - Syringe and 23-27g 1/2 to 1 inch needle, preferably with a short bevel. The mouse is held as described in Figure 1 and is held in dorsal recumbency in a head-down position. The injection is made in the lateral aspect of the

lower left quadrant (Figure 8). The use of a short bevel needle and its insertion through the skin and musculature followed by immediately lifting the needle against the abdominal wall aids in avoiding puncture of the gut lumen. Rapid injection with a large syringe may cause bruising of tissue and hemorrhage from the pressure of the spray and should therefore be avoided. Unless the left leg is immobilized, there is considerable risk of the mouse's movement causing puncture of the viscera. The maximum volume injected IP into a 20 gm mouse should not exceed 2 ml.



**Figure 8:** Intraperitoneal Injection of the Rat

**Intramuscular:** Equipment - 26-30 g, 1/2 inch needle with 1 ml syringe. The back and hind leg muscles are the usual sites selected. Due to the small muscle mass available, the volume of drug injected should be limited.

**Subcutaneous:** Equipment - 25-27 g, 1/2 to 3/4 inch needle and 1 ml syringe. The site usually chosen is the area between the shoulder blades. This route is useful for administration if isotonic replacement fluids (0.9% saline) in the dehydrated animal.