

**LETTER TO EDITOR****Routes of Administration: Injection Techniques in Mice**

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Mice are the most widely used animals for a range of experiments including medical, chemical, pharmacological, toxicological, biological, and genetic. The administration of test substances, such as chemical elements, compounds, drugs, antibodies, cells or other agents, to mice is one of the major methods for evaluating their biological activity.

The route of administration is largely dependent on the property of the test substance and the objective of the experiment. All administration should be performed with knowledge of the chemical and physical characteristics of the substance.

A knowledge of available methods and techniques of administration as well as knowledge of the disposition and fate of the administered substance will help the scientist/ investigator to select the most appropriate route for her/his purpose. This route must be selected before the start of any experiment. Proper restraint is the most important technique when mice were treated as this decreases stress and increases successful treatment.

**Types of Restraint:**

When working with lab animals the two types of restraint that are utilized most often are physical and chemical.

## **Chemical Restraint**

Chemical restraint is recommended if there will be great distress or discomfort to the animal. This can be achieved by using a gas anesthesia such as isoflurane or by a type of injectable sedation such as Ketamine/Xylazine mix.

## **Physical Restraint**

Physical restraint can be achieved by many means. Holding the animal with gloved hands is very common. There is also the use of commercial type restrainers that can be purchased from laboratory equipment suppliers. Towels can be used; the wire bar lid can be utilized as well.

## **Injection Site:**

The injection sites include Sub-Cutaneous (SQ), Intraperitoneal (IP), and Tail vein injections. I will also briefly touch on needle and syringe sizes, volumes that can be administered, and commonly used restraint.

## **Subcutaneous**

Subcutaneous administrations are easy. As they are rarely painful a conscious mouse can usually be used. SQ injections are usually given in the scruff (access skin) of the neck or using the scruff back by the hind quarters by tenting the skin and making your injection. The rate of absorption is lower than from intraperitoneal or intramuscular injections. A volume of less than 0.2 ml/site is recommended.

## **Intraperitoneal**

This is the most common route being technically simple and easy. It allows quite long periods of absorption from the repository site. The rate of absorption by this route is usually one-half to one-fourth as rapid as from the intravenous one. Limitations are the sensitivity of the tissue to irritating substances, less tolerance to solutions of non-physiological pH. These should be isotonic and quite large volume can be administered by this route. When making an IP injection good restraint and good injection technique will help minimize any secondary problems that may occur with this type of injection.

Restrain your animal using either the scruff and holding the tail with pinky or ring finger in mice. If using rats gently grabbing them over the shoulders causing the legs to cross over the chest to help

prevent getting bit is common restraint. Once animal is restrained turn over so abdomen is exposed. Please monitor chest movements to make sure the animal is doing ok. On the mouse you want to make your IP injection in the lower right or left quadrant of abdomen trying to avoid hitting bladder, liver, or other internal organs. The recommended volume is more than 3.0 ml. Supplies: Tuberculin 1cc syringe, 25g needle(s)

### **Intravenous injection**

Intravenous injection has advantages over other routes. Solutions at a high concentration, high or low pH or irritating can be administered intravenously provided that the rate of injection is kept slow and precautions are taken to avoid getting the solution outside the vein.

Compounds that are poorly absorbed by the digestive tract may be given intravenously but intravenous administrations require technical expertise and skill. The syringe plus needle or the catheter must first be filled with the solution to remove air bubbles. Administrations are usually made into the lateral tail veins not into the dorsal tail vein, as it is not straight.

The lateral veins are readily visualized, but have quite small diameters. If anaesthesia is not used, it is usually necessary to have one of the commercial restraint devices available. This could be the plastic restrainers or DecapiCones. Supplies: 1cc Syringe, 27-30g needle(s), Restraint Tube, Heating Source, Max Volume 0.2ml

### **Intramuscular administration**

This should usually be avoided, as mouse muscles are small. If necessary, it may be given into the thigh muscle with injection volumes less than 0.05 ml. The tip of needle should be directed away from the femur and sciatic nerve. The mouse is anesthetized or is manually restrained by another person. The needle tip is inserted through the skin and into the muscle. Aspirate briefly with the syringe before injection. If blood or body fluid reverses, stop the procedure. The needle must be moved or a fresh attempt must be made.

### **Intradermal administration**

This route is not recommended in general and should be restricted to cases of absolute necessity. It is very difficult in the mouse due to the very thin skin. Using a fine needle (29 G or smaller) is

recommended. The mouse is anesthetized, the fur clipped or hair removed from an area on the back, ventral abdomen, or hind footpad, which is wiped with 70% ethanol on a gauze sponge or swab. The skin is held tautly with thumb and index finger and the needle inserted, bevel up and at a shallow angle, just under the superficial layer of epidermis. The volume should be less than 0.05 ml per site. Resistance should be felt both as the needle is advanced and as the compound is injected. A hard bleb will be seen upon successful intradermal injection of even a small quantity of fluid.

**References:**

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