

# Injection Techniques, Restraint, & Handling for Mice and Rats



Research

*Division of Laboratory  
Animal Resources*

# Purpose

The purpose of this workshop is to inform and instruct personnel on the safe and the least stressful way to restrain and inject mice and rats.

This workshop will illustrate proper restraint while administering injections to commonly used sites.



# Handling and Restraint

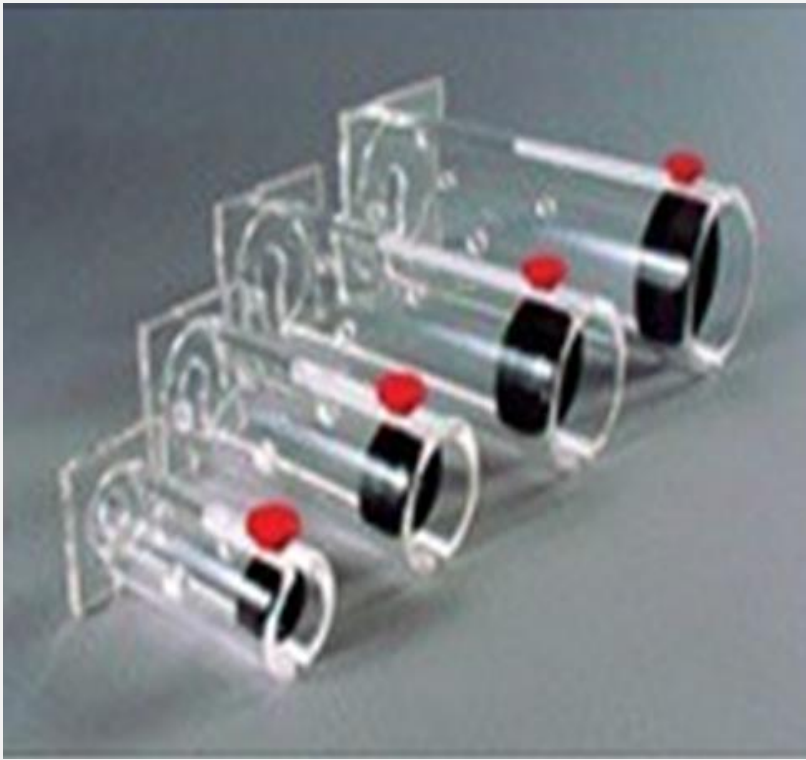
Proper handling and restraint is one of the most important factors in being able to give an injection properly while limiting the amount of stress and/or discomfort to the animal or the handler.



# Types of Restraints

Two types of restraint:

Physical



Chemical

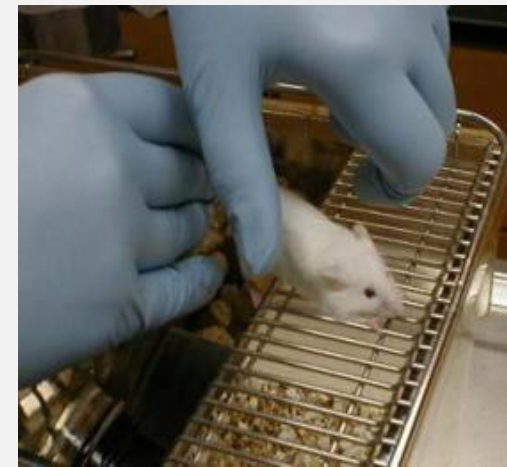


# Types of Restraints

## Physical Restraint

Physical restraint can be achieved by many means:

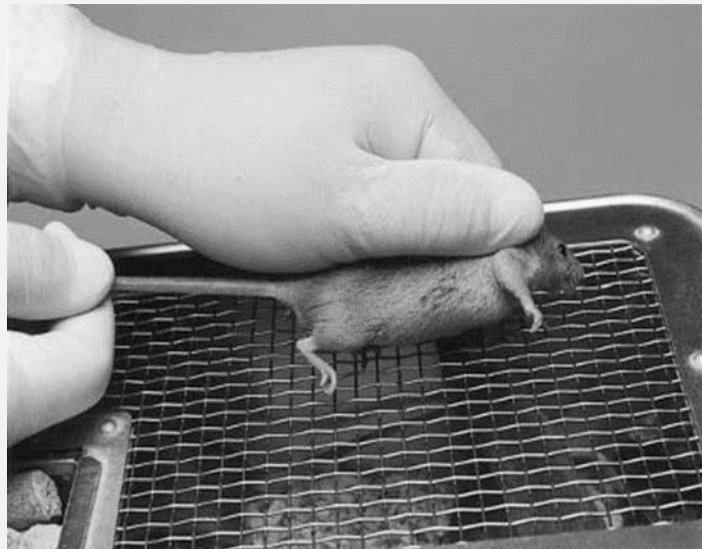
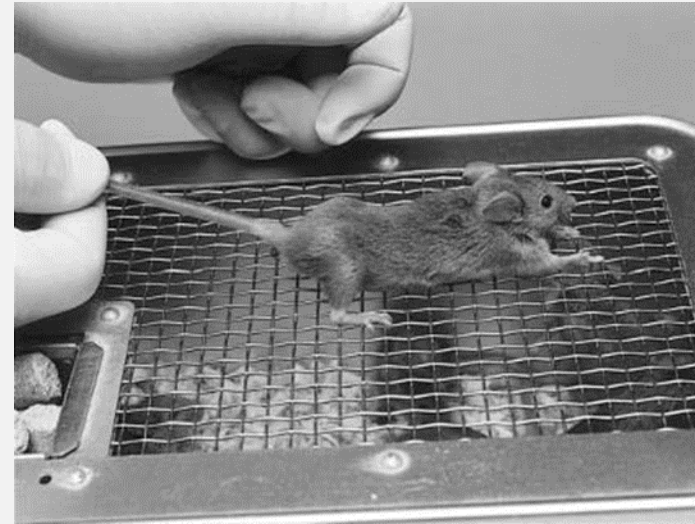
- Holding the animal with gloved hands
- Commercial type restrainers may be purchased from laboratory equipment suppliers
- Towels can be used
- Wire bar lid



# Types of Restraints

## Physical Restraint (Double Hand Method)

(a) The mouse is placed on the cage lid with the preferred hand, The tail is pulled gently back by the hand



(b) The mouse is quickly and firmly picked up by the scruff of the neck behind the ears with thumb and index finger of other hand

# Types of Restraints

## Physical Restraint (Double Hand Method)



(c) The tail is transferred from the preferred hand to between palm and little or ring finger of the other hand, then held firmly.

(d) The mouse is restrained.



# Types of Restraints

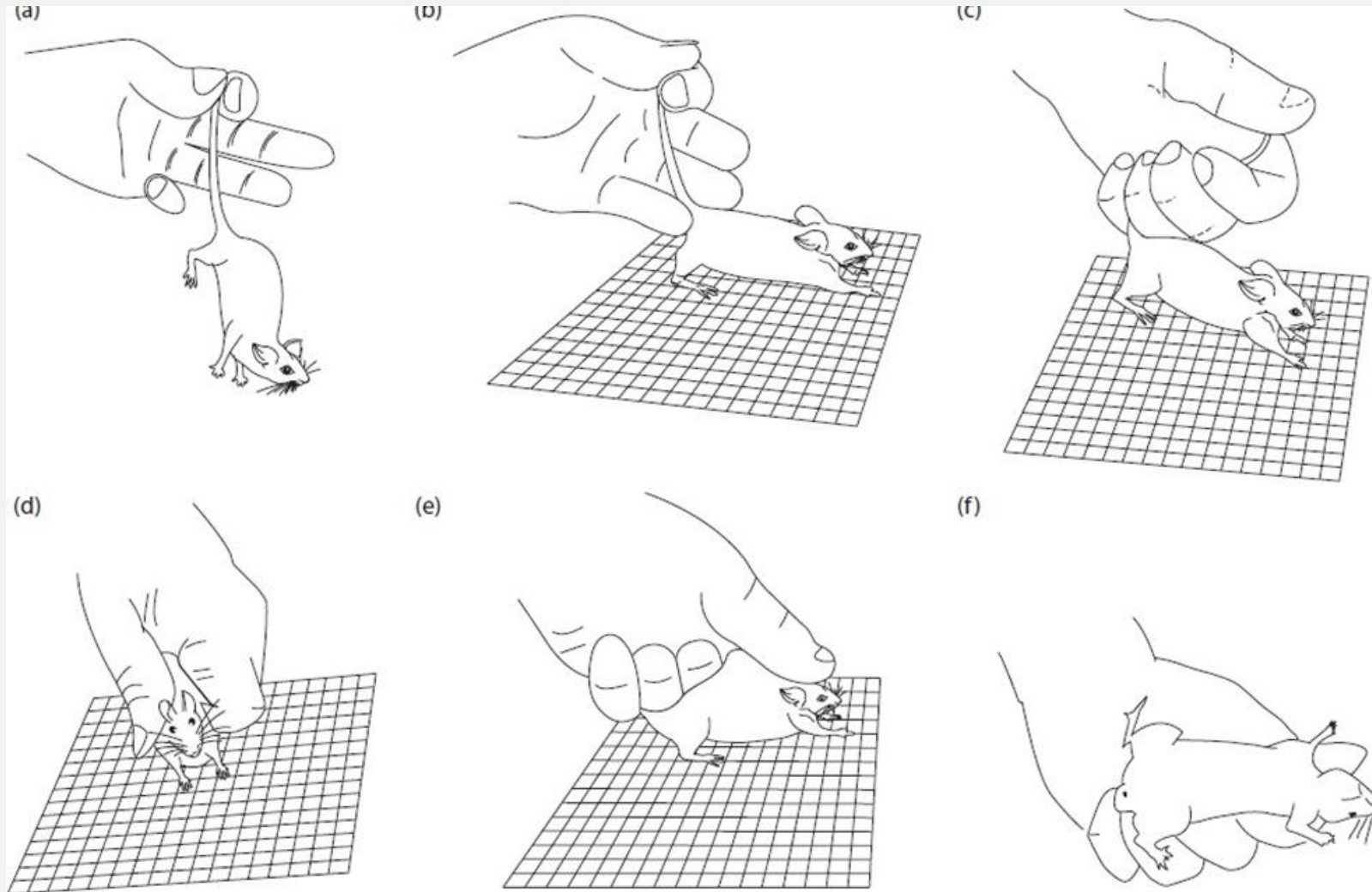
## Physical Restraint (Single Hand Method)

- (a) The tail is picked up using thumb and forefinger of the preferred hand.
- (b) The mouse is placed on the cage lid or other solid surface pulling gently back by the hand.
- (c) The tail is immediately grasped by the palm and middle finger, ring finger and/or little finger and then, the tail held between thumb and forefinger is released.
- (d) and (e) The fold of skin from the scruff of the neck down the back is immediately gripped using the thumb and forefinger.
- (f) The mouse is restrained.



# Types of Restraints

## Physical Restraint (Single Hand Method)



# Types of Restraints

## 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.



# Injections

Injection types covered here can be used for mice and rats:

- ❑ Sub-Cutaneous (SQ)
- ❑ Intraperitoneal (IP)
- ❑ Tail vein injections

**Intramuscular (IM) injections are not recommended because of how small the muscles are**

# Injections

## Sub-Cutaneous (SQ)

- ❑ Administered by tenting the skin and making your injection:
- ❑ The scruff (access skin) of the neck
- ❑ The scruff back by the hind quarters



## Sub-Cutaneous (SQ)

- ❑ Depending on what is being injected (the viscosity) can help determine the size needle
- ❑ The smallest gauge that can be used is preferable for the comfort of the animal
  - ❑ For a thin substance a small gauge needle (27g, 26g, 25g) can be used
- ❑ When injecting something like tumor cells use a larger gauge needle (25g) as to not lyse the cells that are being injected

[Recommended Dosages See Slide 22](#)

## Intraperitoneal (IP)

When giving 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.

## Intraperitoneal (IP) “Mouse”

Once animal is restrained turn over, so abdomen is exposed. 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.

Supplies:

- ❑ Tuberculin 1 cc syringe
- ❑ 25g needle(s)

[Recommended dosages see slide 22](#)



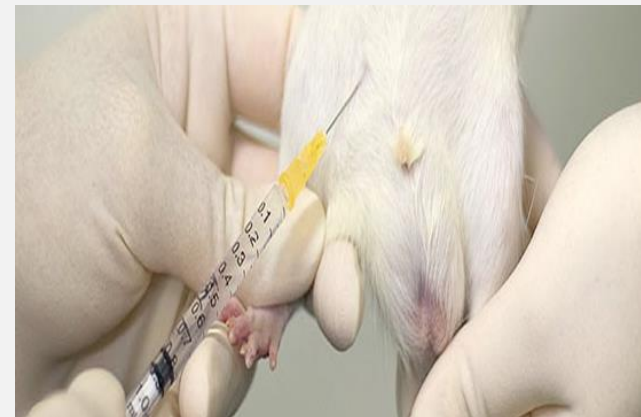
# Injections

## Intraperitoneal (IP) “Rat”

When performing the IP injection on the rat you should inject into the lower right quadrant of the abdomen to avoid hitting such organs as liver, bladder, and cecum.

Supplies:

- ❑ 1-3cc syringe
- ❑ 21-25g needle(s)



[Recommended Dosages See Slide 22](#)

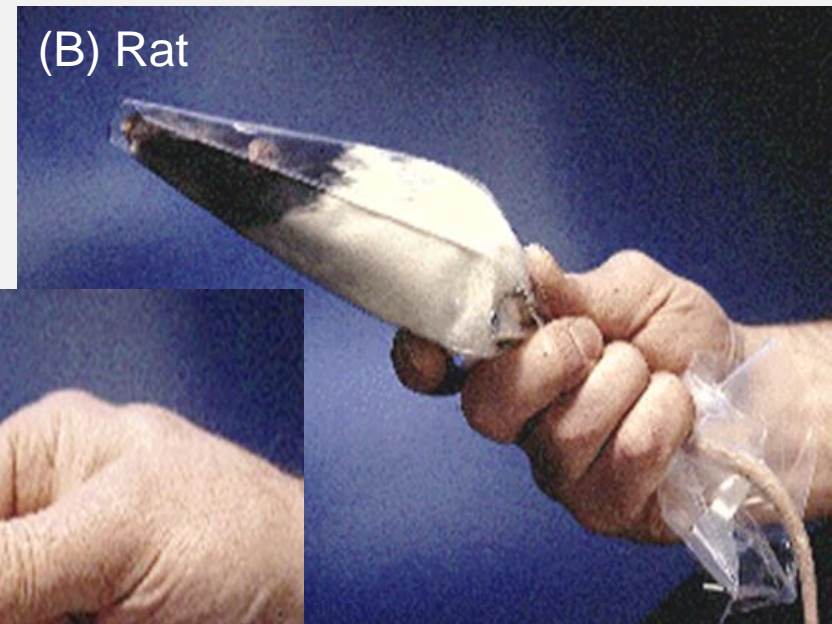
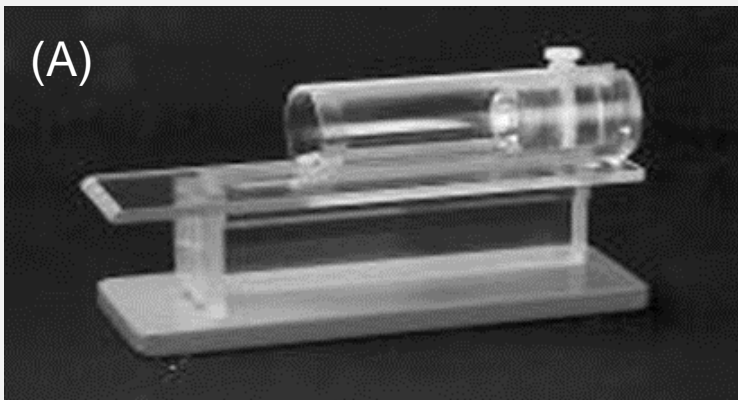


# Injections

## Intravenous (IV) “Lateral Tail Vein”

When doing an IV injection using the tail vein it is very convenient to have one of the commercial restraint devices available

This could be:  
Plastic Restrainers (A)  
DecapiCones (B)

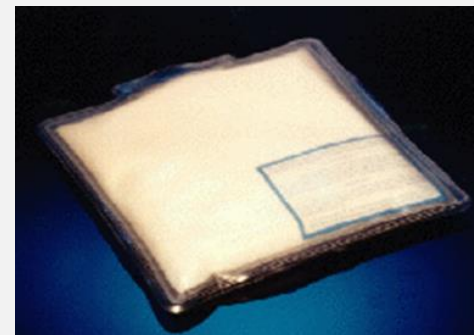


## Intravenous (IV) “Lateral Tail Vein”

Once the animal is restrained the tail vein is located laterally on both the right and left side of the tail

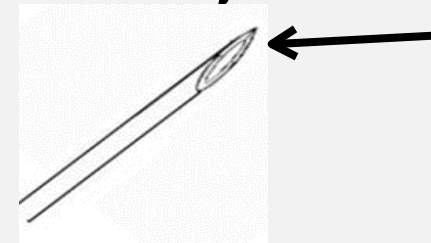
You always want to start your injection at the lower portion of the tail ~ 1/3 from the tip, this allows you to move up the tail if the injection was unsuccessful

The tail should be warmed to help dilate the veins, this can be done by using a small heating source or placing tail in warm water for 1-3 minutes



## Intravenous (IV) “Lateral Tail Vein”

You have your animal restrained and vessels dilated. The next step take your syringe with needle and substance to be injected. Hold needle parallel to the tail with bevel side up.



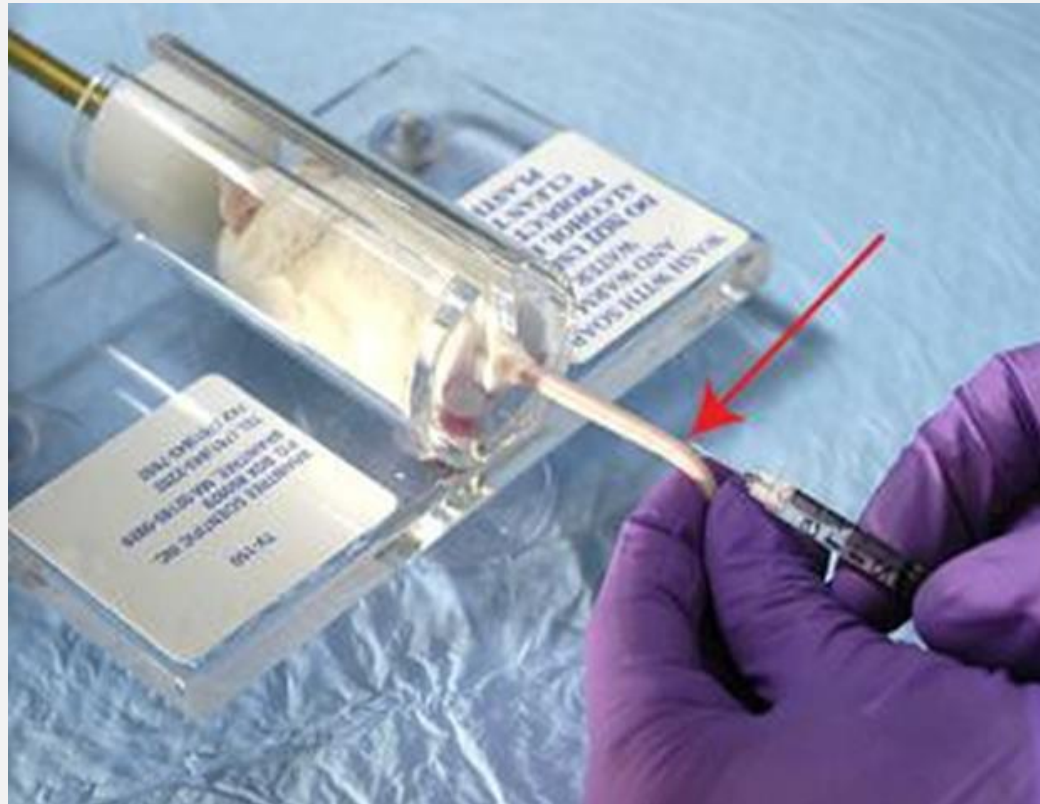
Gently insert needle into vein while pulling back on plunger. You will get a flash of blood into needle hub when in the vein. Begin injection if bubble or bleb appears under skin remove needle and inject closer to the base of the tail. Needle needs to be changed if this is done. When needle is removed apply light pressure to stop bleeding.

# Injections

## Intravenous (IV) “Lateral Tail Vein Mouse”

### Supplies:

- ❑ 1cc Syringe
- ❑ 27-30g needle(s)
- ❑ Restraint Tube
- ❑ Heating Source



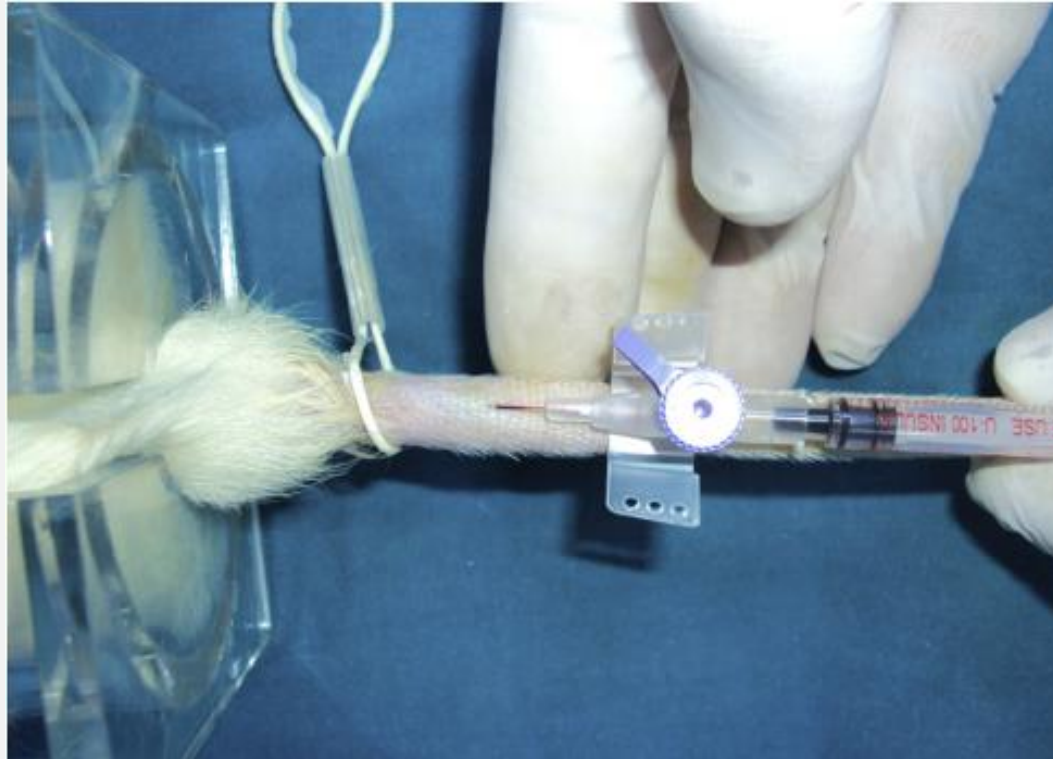
[Recommended Dosages See Slide 22](#)

# Injections

## Intravenous (IV) “Lateral Tail Vein Rat”

### Supplies:

- ❑ 1-3ml syringe
- ❑ 25g Needle
- ❑ Heat Source



[Recommended Dosages See Slide 22](#)

# Injections

## Recommended Dose Volumes for Common Laboratory Animals

Recommended Dose Volumes for Common Laboratory Animals						
Species	Dose Volume	Oral <sup>2,3,4,6</sup> (ml/kg)	*IV Bolus <sup>2,5,6</sup> /Slow Inj <sup>1</sup> (ml.kg)	+IP <sup>1,2,3,6</sup> (ml/kg)	+SC <sup>2,3,6</sup> (ml/kg)	+IM <sup>1,2,3</sup> (ml/kg)
Mouse	Ideal	10	5 Bolus	5-10	5	0.05 total ml/site (2 sites/day)
	Maximum	20	25 Slow Injection	20	20 (Divided in 2-3 Sites)	0.1 total ml/site (2 sites/day)
Rat Hamster Gerbil	Ideal	10	5 Bolus	5-10	5	0.1 total ml/site (2 sites/day)
	Maximum	20	25 Slow Injection	20	10 (Divided in 2-3 Sites)	0.2 total ml/site (2 sites/day)
Guinea Pig	Ideal	10	1 Bolus	10	5	0.1 total ml/site (2 sites/day)
	Maximum	20	5 Slow Injection	20	10 (Divided in 2-3 Sites)	0.2 total ml/site (2 sites/day)

([Ref. IQ 3Rs Leadership Group-Contract Research Organization Working Group](#))

# Injections

## Recommended Dose Volumes for Common Laboratory Animals

\* Bolus injections are typically dosed in less than 1 minute. Slow intravenous injections are typically dosed over 3-10 minutes. Solution properties such as tonicity, pH, etc. must be taken into account when approaching the volume limits or determining the volume to be infused IV. The recommended working range for pH is 4.5 to 8.0. The order of degree of tolerance of pH for different dosing routes is oral > intravenous > intramuscular > subcutaneous > intraperitoneal. Animal health must also be taken into consideration, such as kidney function and cardiovascular function. These systems must be normal to handle increased fluid volumes.

5 When larger volumes are to be administered, consider the rate of metabolism of osmolytes with respect to route of administration since apparently innocuous solutions can be rapidly metabolized leaving an equivalent of water to dilute body fluids, which can result in hyponatremia depending on the rate of administration and/or total volume administered.

+ When administering a solution IP, SC or IM, the viscosity, concentration, tonicity, and pH of the solution need to be taken into account.

# QUESTIONS & SUPPORT

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