



STANDARD OPERATING PROCEDURE 305 SUBSTANCE ADMINISTRATION

1. PURPOSE

This Standard Operating Procedure (SOP) describes the recommended volumes, injection sites, and needle sizes for common routes of substance administration.

2. RESPONSIBILITY

Principal investigator (PI) and their research staff.

3. MATERIALS

- 3.1. Needles
 - 3.2. Syringes
 - 3.3. Administration volumes chart
 - 3.4. Substance to be administered
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4. CONSIDERATIONS

- 4.1. The substance:
 - 4.1.1. Verify that solutions injected subcutaneously or intramuscularly have a pH of 7.3 to 7.45 and that solutions are isotonic (same tonicity as blood; 280–310 mosm/L). Non-isotonic solutions must be injected slowly if the intraperitoneal or intravenous routes are used.
 - 4.1.2. Warm the solutions to body temperature (or at least room temperature) immediately before administration.
 - 4.1.3. Verify the solubility of the substance. Precipitation may cause the formation of large particles, which, if injected, can be painful. For intravenous and intraperitoneal injections and solutions, do not administer suspensions.
 - 4.1.4. Inject separate substances at different sites to avoid cross-reaction of chemicals.
 - 4.1.5. Avoid injecting highly viscous liquids as they can cause discomfort and require a larger needle size.
 - 4.1.6. Substances to be injected must be sterile, as contamination can lead to infection or irritation of the injection site. Sterilize solutions by autoclaving or microfiltration and use an aseptic technique for injection.
- 4.2. Injections:
 - 4.2.1. Do not inject into inflamed or damaged tissue.

- 4.2.2. Limit the number of intravenous puncture attempts to 3. After three unsuccessful attempts, request the assistance of another trained person.
- 4.2.3. Check the proper placement of the needle before injection. Withdraw the syringe plunger; if blood enters the needle hub, the needle has entered a blood vessel. Without an IV injection, withdraw the needle slightly and redirect it.
- 4.2.4. No resistance should be encountered during the injection. Do not apply overt pressure on the syringe plunger; the injected substance should flow freely to prevent unnecessary pain and tissue damage.
- 4.2.5. Give injections at a constant slow flow rate.
- 4.2.6. If bleeding occurs after injection, apply pressure with gauze until bleeding stops.

4.3. Needles:

- 4.3.1. Always use sharp/new needles.
- 4.3.2. Use the smallest gauge of needle possible that allows accurate substance injection.
- 4.3.3. Recommended needle sizes (G):

SPECIES	INTRADERMAL	SUBCUTANEOUS	INTRAMUSCULAR	INTRAPERITONEAL	INTRAVENOUS
Mouse	30-31	25-27	not recommended	25-27	25-31
Rat	27-31	25-27	not recommended	23-27	24-27
Rabbit	27-31	23-25	25	Not recommended	23-25
Guinea pig	27-31	23-25	25	23-25	25-27
Sheep	25-27	19-23	21	19-21	19-21

4.4 Volumes:

- 4.4.1 Use the smallest possible volume for injection.
- 4.4.2 Recommended volumes for substance administration:

SPECIES	ORAL (ml/kg)	SUBCUTANEOUS (ml/kg)	INTRAMUSCULAR (volume/site)	INTRAPERITONEAL (ml/kg)	INTRAVENOUS BOLUS (ml/kg)	INTRADERMAL (ml/site)
Mouse	> 10	> 10	not recommended	> 20	> 5	0.05 – 0.1
Rat	> 10	> 5	not recommended	> 10	> 5	0.05 – 0.1
Rabbit	> 10	> 1	0 - 1 ml	not recommended	> 2	0.05 – 0.1
Guinea pig	> 10	> 5	> 0.1 ml	> 10	> 5	0.05– 0.1

- 4.4.3 If the volume administered must exceed the recommended volumes listed in section 4.4.2, justification must be provided and will require approval by the BGU Ethical committee.
- 4.4.4 Possible maximal administration volumes:

SPECIES	ORAL (ml/kg)	SUBCUTANEOUS (ml/kg)	INTRAMUSCULAR (ml/kg/site)	INTRAPERITONEAL (ml/kg)	INTRAVENOUS SLOW INJECTION (ml/kg)
Mouse	50	40	not recommended	80	25
Rat	40	10	not recommended	20	20
Rabbit	15	2	1	not recommended	10
Guinea pig	40	10	0.2	20	20
Sheep	15	2	0.5	20	5

5. PROCEDURES

5.1. Oral route (gavage):

- 5.1.1. Food withdrawal before oral gavage is not required if administering the recommended volume. Food withdrawal of up to 4 hours is preferable using a higher volume.

5.2. Intranasal administration:

- 5.2.1. Unilateral drop on the mucous membrane.
 5.2.2. Brief anesthesia may be administered (e.g., isoflurane anesthesia).
 5.2.3. Administer a maximum of 20ul to a mouse and 50µL to rats, Guinea pigs, or rabbits.

5.3 Intradermal injections:

- 5.3.1 Intradermal injection should be limited to 6 sites.

5.4 Intramuscular injections:

- 5.4.1 Intramuscular administration should be avoided in mice and rats and limited to 2 sites daily.
 5.4.2 Injection sites should be rotated.

5.5 Intraperitoneal injections:

- 5.5.1 This technique is not recommended for pregnant animals or birds.
 5.5.2 Limit intraperitoneal injections to once per day.
 5.5.3 Osmotic minipumps can be surgically implanted intraperitoneally when repeated dosing is required.

5.6 Subcutaneous injections:

- 5.6.1 Subcutaneous administration should be limited to 2 to 3 sites per day.
 5.6.2 Osmotic minipumps can be surgically implanted subcutaneously when repeated dosing is required.
 5.6.3 Recommended injection sites.

SPECIES	SITE
Mouse	Scruff, flank
Rat	Scruff, flank
Rabbit	Scruff, flank, back
Guinea pig	Scruff, back
Birds	Medial thigh

5.7. Intravenous injections:

5.7.1. Rotate injection sites.

5.7.2. Limit the number of punctures to 3 per site per day.

5.7.3. For continuous infusion, indwelling catheters may be surgically implanted.

5.7.4. Recommended injection sites:

SPECIES	SITE
Mouse	Lateral tail vein
Rat	Lateral tail vein
Rabbit	Marginal ear vein, central ear artery
Guinea pig	saphenous vein

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Approved by the BGU Animal Policy and Welfare Oversight Committee