



Cornell University
Cornell Center for Animal Resources and Education

CARE401.01 Recommended Volumes
for Administered Substances

The intent of this SOP is to describe the recommended volumes and needle sizes for substances administered to the animals. This SOP is intended for use by all personnel administering such substances. This procedure is approved by the Cornell Institutional Animal Care and Use Committee (IACUC) and the Cornell Center for Animal Resources and Education (CARE). Any exemption must be approved by the IACUC prior to its application.

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1. **Introduction:** This document provides information about administration volumes and needle sizes for the commonly employed routes of fluid administration in various animal species. These are consensus figures based on published literature and guidelines. The volume limits are set up to maintain animal welfare and prevent potential complications such as muscle damage with high volume intramuscular injection, or aspiration & pulmonary injury with high volume oral administration.
 2. **Materials:** Fluid administration set (e.g. needle, syringe, etc...)
 3. **Procedures:**
 - a. Verify that the pH of 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 intraperitoneal or intravenous routes are used.
 - b. Give injections at a constant flow rate. No resistance should be encountered during injection. Do not apply overt pressure on the syringe's plunger. The

- injected substance should flow freely to prevent any unnecessary pain and tissue damage.
- c. Warm the solutions to 70-100°F before administration.
 - d. For recommended volume and needle size, see appendix.

Volumes¹ and needle size per routes and per species

Precautions:

- a) Do not inject into inflamed or damaged tissue unless medically indicated.
- b) Inject separate drugs/compounds at different sites to avoid cross reaction of chemicals.
- c) Subcutaneous administration should be limited to 2-3 sites per day.
- d) Intramuscular administration should be limited to 2 sites at one time. Exceptions apply when medically indicated.

4. Safety:

- a. Follow guidelines of **CARE SOP 715.02-Personal Protective Equipment** when working with animals.
- b. Follow guidelines of **CARE SOP 711.01-Sharps Precautions** for handling and disposal of needles and syringes.
- c. Follow guidelines of **CARE SOP 707.01-Animal Related Injury** for any personal injuries caused by an animal.

5. **Contingencies:** Emergency veterinary care is available 24/7. This includes after working hours, weekends and holidays. For veterinary assistance, contact the CARE pager: 1-800-349-2456.

6. References

- a. CARE SOP 715.02-Personal Protective Equipment:
<http://www.research.cornell.edu/care/documents/SOPs/CARE715.pdf>
- b. CARE SOP 711.01-Sharps Precautions:
<http://www.research.cornell.edu/care/documents/SOPs/CARE711.pdf>
- c. CARE SOP 707.01-Animal Related Injury:
<http://www.research.cornell.edu/care/documents/SOPs/CARE707.pdf>
- d. Brown, A.P., Dinger, N., and Levine, B.S. Stress produced by gavage administration in the rat. *Contemp. Top. Lab. Anim. Sci.*, 39, 17-21 (2000).
- e. Diehl, K.-H. et al., "A Good Practice Guide to the Administration of Substances and Removal of Blood, Including Routes and Volumes", *J. Applied Toxicol.*, 21, 15-23 (2001).
- f. Fox, G.F. et al., Laboratory Animal Medicine. 2nd ed. San Diego: Elsevier, 2002.

7. Appendix:

Species and wt.	per os (oral) mL per Dose		Subcutaneous mL		Intramuscular mL per Site		Intraperitoneal mL		Intravenous mL	
	Recommended	Maximum Limit	Recommended	Maximum Limit	Recommended	Maximum Limit	Recommended	Maximum Limit	Bolus	Slow injection
Rat 200 g	2	4 ²	1, ≤20G	2	0.1, ≤21G	0.2	2, ≤21G	4	1, ≤23G	4
Mouse 25 g	0.25	1	0.25-0.5, ≤20G	1	0.05, ≤22G	0.1	0.5, ≤21G	2	0.125, ≤25G	0.5
Hamster 100 g	1	2	0.5, ≤20G	2	0.05, ≤21G	0.1	1, ≤21G	2	0.5, ≤25G	2
Guinea pig 200 g	2	3	1, ≤20G	2	0.1, ≤21G	0.2	2, ≤21G	4	1, ≤23G	4
Rabbit 4 kg	40	60	40, ≤20G	60	1, ≤20G	2	20, ≤20G	80	8, ≤21G	40
Cat 5 kg	15	45	50, ≤20G	100	0.75, ≤20G	1.5	3, ≤20G	60	5, ≤21G	15
Dog 10 kg	50	150	50, ≤20G	200	2.5, ≤20G	3	10, ≤20G	200	10-15, ≤20G	50
Pig 25 kg	125	375	25, ≤20G	50	3, ≤20G	5	25, ≤20G	250	62.5, ≤20G	125
Ferret 1 kg	5	15	10, ≤20G	20	0.25, ≤21G	0.5	5, ≤21G	20	2, ≤23G	10

- 1) Volumes and administration rates can be altered for medical conditions as determined by a veterinarian.
2) Max. limit with oil based vehicles should be 2 ml.

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