Maximum Injection Volumes and Needle Size Recommendations

The following recommendations are adapted from several sources listed in the references section below. These volumes are for the administration of experimental compounds in order to reduce the likelihood of adverse events from administration. Volumes should be reduced if the injected material is likely to be irritating to tissues. In a clinical setting, higher or lower volumes may be used based on the clinical need of the animal. ACUC proposals that differ from these guidelines must be justified.

Recommended and maximum administration volumes:

Species	SQ		IM		IP		IV Bolus		IV Slow		PO		ID	
	Rec.	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**
Mouse	10 ml/kg/site	40 mL/kg/site	0.05 mL/site	0.1 mL/site	20 mL/kg	80 mL/kg	5 mL/kg	5 mL/kg	25 mL/kg	25 mL/kg	10 mL/kg	20-50 mL/kg	0.05 mL/site	0.05 mL/site
Rat	5 mL/kg/site	10 mL/kg/site	0.1 mL/site	0.2 mL/site	10 mL/kg	20 mL/kg	5 mL/kg	5 mL/kg	20 mL/kg	20 mL/kg	10 mL/kg	20-50 mL/kg	0.05 mL/site	0.05 mL/site
Macaque	5 mL/kg/site	20 mL/kg/site	0.25 mL/kg	0.5 mL/kg	n/a	n/a	2 mL/kg	10 mL/kg	20 mL/kg	20 mL/kg	5 mL/kg	10 mL/kg	0.1 mL/site	0.1 mL/site

Example recommended and maximum administration volumes (mL) by weight:
Mouse:

Weight	SQ		IM		IP		IV Bolus		IV Slow		PO		ID	
	Rec.	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**
10 g	0.1	0.4	0.05	0.1	0.2	0.8	0.05	0.05	0.25	0.25	0.1	0.5	0.05	0.05
15 g	0.15	0.6	0.05	0.1	0.3	1.2	0.075	0.075	0.375	0.375	0.15	0.75	0.05	0.05
20 g	0.2	0.8	0.05	0.1	0.4	1.6	0.1	0.1	0.5	0.5	0.2	1	0.05	0.05
25 g	0.25	1	0.05	0.1	0.5	2	0.125	0.125	0.625	0.625	0.25	1.25	0.05	0.05
30 g	0.3	1.2	0.05	0.1	0.6	2.4	0.15	0.15	0.75	0.75	0.3	1.5	0.05	0.05
35 g	0.35	1.4	0.05	0.1	0.7	2.8	0.175	0.175	0.875	0.875	0.35	1.75	0.05	0.05

Macaque:

Weight	SQ		IM		IP		IV Bolus		IV Slow		PO		ID	
	Rec.	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**	**Rec.**	**Max**
3 kg	15	60	0.75	1.5	n/a	n/a	6	30	60	60	15	30	0.1	0.1
5 kg	25	100	1.25	2.5	n/a	n/a	10	50	100	100	25	50	0.1	0.1
7.5 kg	37.5	150	1.875	3.75	n/a	n/a	15	75	150	150	37.5	75	0.1	0.1
10 kg	50	200	2.5	5	n/a	n/a	20	100	200	200	50	100	0.1	0.1
15 kg	75	300	3.75	7.5	n/a	n/a	30	150	300	300	75	150	0.1	0.1
20 kg	100	400	5	10	n/a	n/a	40	200	400	400	100	200	0.1	0.1

Needle Size Recommendations:

Species	SQ	IM	IP	IV Bolus	PO	ID
Mouse	23 gauge or smaller	25 gauge or smaller	25 gauge or smaller	25 gauge or smaller	Ball end or disposable gavage needle	27 gauge or smaller
Rat	23 gauge or smaller	25 gauge or smaller	25 gauge or smaller	25 gauge or smaller	Ball end or disposable gavage needle	27 gauge or smaller
Macaque	21 gauge or smaller	21 gauge or smaller	n/a	18 gauge or smaller	Nasogastric or orogastric tube	25 gauge or smaller

Note: It is recommended that a new needle be used to inject each animal. Needles may be used for up to 5 animals. A needle that has been used in one animal should not be reintroduced into the vial of substance being injected. These guidelines will reduce the likelihood of transmitting infection between animals, prevent contamination of the vial of material to be injected, and reduce the possibility of needles becoming dull over time resulting in increased pain or discomfort upon injection.

References:

1. Bluemel et al, The Nonhuman Primate in Nonclinical Drug Development and Safety Assessment, 2015

2. Turner et al, Administration of Substances to Laboratory Animals: Routes of Administration and Factors to Consider, JAALAS, 2011
3. Diehl et al, A Good Practice Guide to the Administration of Substances and Removal of Blood, Including Routes and Volumes, Journal of Applied Toxicology, 2001
4. Morton et al, Refining Procedures for the Administration of Substances, Laboratory Animals, 2000