

Guidelines on administration of substances and blood collection in RATS

| Procedure | Maximum volume range ^a | Needle size ^a | Sites | Anaesthesia ^{a,b} |
|---|---|--|--|----------------------------|
| ADMINISTRATION OF SUBSTANCES (Adults) | | | | |
| Intradermal | 0.05 - 0.1 mL/site Maximum of 6 sites | 27-30G x 13mm | Shaved skin over dorsal thorax, back | Yes |
| Intramuscular | 0.1 - 0.2 ^{a,b,c} mL/site No more than 2 sites per day ^d | 25-30G x 13mm | Quadriceps muscles / Posterior thigh ^{d,e} | No/Yes |
| Intraperitoneal | 10- 20 ^{b,c} mL/kg Maximum bolus volume is 1% of BW | 23-26G x 13-25mm | Lower right abdominal quadrant | No |
| Intravenous | 5 ^{b,c} mL/kg bolus (injected in 1min) | 23-26G x 13mm | Lateral Tail vein, Saphenous vein | No |
| Oral Gavage | 10 – 40 ^{b,c} mL/kg | 300g: 18G x 76mm; Consider plastic feeding needles; Consider voluntary intake/syringe feeding | Oral (may be necessary to restrict food intake before dosing of larger volumes) ^b | No (gavage needle) |
| Subcutaneous | 2 – 10 ^{b,c} mL/kg Maximum of 4 sites per session ^f | 23-26G x 13-25mm | Loose skin over the intrascapular (scruff), neck, shoulder, back, flank | No |
| Topical - dermal | Less than 500µl ^g | NA | Apply test substances uniformly covering no more than 10% of body surface (e.g. 5 cm x 5 cm). Prepare site 24h previously to allow recovery ^{h,*} | No |
| ADMINISTRATION OF SUBSTANCES in Neonates^{i,j,k} | | | | |
| Oral Gavage | From 0.2 – 0.3 ml From 5 – 6 grams BW | 30G blunt tip attached to size 10 polyethylene tubing, lubricate end, food dye may be added to visualise administration to stomach (up to 10% of total volume) | Oral | No |

| BLOOD COLLECTION (Adults) | | | | |
|----------------------------|--|---|-----------------------------------|---------------|
| Intravenous – single bleed | up to 7% of TBV weekly | 23-26G x 13mm: Lateral tail vein 25-27G: Saphenous vein (for small volume) 25G: Pedal vein (for small volume) | | No No |
| | 10% of TBV Every 2 weeks | 21-25G: Jugular vein ^{h,l,m} | | No/Yes |
| | 15% of TBV Every 3 weeks | | | |
| Intravenous – daily bleed | 0.05% of BW every 24 hours | | | |
| Intra-arterial | Similar to intravenous blood collection guidelines | 23G | Ventral tail artery | |
| Intra-cardiac | Once, terminal bleed | 21G x 25mm | Cardiac puncture | Yes, terminal |
| Retro-orbital | 1x per eye, terminal bleed | 27G needle, microhaematocrit tube | Retro-orbital venous plexus/sinus | Yes, terminal |

General Considerations:

- * Skin area of application for highly toxic substances should be reduced. Avoid eyes and genital areas. Potential welfare impact of tight or adhesive dressings.
- Consider absorption time for non-aqueous or irritating substances before re-dosing.
- Divide large doses and inject into multiple sites.

Abbreviations: TBV = total blood volume; BW = body weight; NA = Not Applicable; min = minute

Techniques: Examples of tutorials

- substance administration: <http://www.procedureswithcare.org.uk/administration-of-substances/>
- compound administration: [JoVE Science Education Database. Lab Animal Research. Compound Administration I. JoVE, Cambridge, MA, \(2023\).](https://doi.org/10.1002/jvbm.10001)
- blood collection: <https://www.nc3rs.org.uk/3rs-resources/blood-sampling>

Normative data for the ratⁿ

| | |
|-----------------------|---|
| Heart Rate | 300 - 500 beats/min |
| Respiration frequency | 85/min |
| Body temperature | 37.5°C |
| Food Consumption | 5.0 gm /100 gm BW / 24 hr |
| Water Consumption | 8 - 11ml /100 gm BW / 24 h |
| Urine Volume | 5.5 ml /100 gm BW / 24 hr |
| Total blood volume | 6 ⁿ -7 ^a ml/100 gm BW |

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