



# GOOD PRACTICE GUIDELINES

## Administration of Substances (Rat, Mouse, Guinea Pig, Rabbit)

*Members of the working Group:*

*Dr H B Waynforth (Chairman); Professor P Brain; Mr T Sharpe; Mr D F Stewart;  
Mr K A Applebee; Dr P G G Darke (Home Office Observer)*

*Other articles in the series include:*

- Selection of Animals for Scientific Purposes
- Collection of Blood Samples (Rat, Mouse, Guinea Pig, Rabbit)
- Polyclonal Antibody Production in Rabbits
- Standards of Rodent Surgery
- Euthanasia
- Handling and Restraint (Rat, Mouse, Guinea Pig, Rabbit)
- Record Keeping for the Personal Licence Holder
- Laboratory Animal Allergy

*Articles were contributed by scientists and technologists established in the field and were peer reviewed.*

**Series 1/Issue 1 – October 1998**

**Laboratory Animal Science Association, PO Box 3993, Tamworth, Staffordshire, B78 3QU  
Telephone: 01827 259 130 Fax: 01827 259 188 – e-mail: [lasa@globalnet.co.uk](mailto:lasa@globalnet.co.uk)**

**ADMINISTRATION OF SUBSTANCES**  
**(RAT, MOUSE, GUINEA PIG, RABBIT)**

**Introduction**

Many research programmes require the administration of substances to laboratory species. The effect of this on the animals concerned may be minimal or profound, depending on the substance itself, the formulation, the volume, the frequency of dosing and the skill of the operator. Practical expertise in a particular method should be gained by guidance from an experienced person and carried out under supervision until competence is attained. A good skill level then needs to be maintained by regular use of the method.

**Substance and formulation**

Every effort should be made to find out as much as possible about likely toxicity and to choose a dose which will avoid unnecessary toxic effects.

Solubility problems are not uncommon. Therefore information and advice should be sought in order to ensure that formulations are effective, of minimal toxicity and compatible with the route of administration required.

**Dosing technique**

Recommended sites and methods in rats, guinea pigs and rabbits are outlined in the table below. General recommendations include:

1. Firm but sympathetic restraint is essential for all methods.
2. Always use the smallest needle diameter which will allow reasonably swift injection of the substance. Make certain the needle is only long enough to reach the intended site of injection.
3. Always use the smallest possible volume compatible with the solubility of the substance.
4. Use aseptic technique for injections wherever possible.
5. Always observe the animals carefully after dosing for any adverse effects.

**Common sites for dosing**

	<b>Mouse</b>	<b>Rat</b>	<b>Guinea-pig</b>	<b>Rabbit</b>
<b>Oral</b>	Gavage, or in food or water	Gavage, or in food or water	Gavage, or in food or water	Drench (small volumes) or gavage
<b>Subcutaneous</b>	Scruff or flank	Scruff or flank	Scruff or flank	Scruff or flank
<b>Intramuscular</b>	Anterior thigh	Anterior thigh	Anterior thigh	Anterior thigh
<b>Intravenous</b>	Tail vein	Tail vein	Ear vein or saphenous vein	Ear vein

### A) Oral dosing

Key points include:

1. Gavage using a flexible catheter attached to a syringe is a practical method in the species listed. Inflexible cannulae can be used, but great care is required to avoid trauma. The gavage catheter is passed via the mouth, which induces swallowing movements so that the catheter passes down the oesophagus into the stomach. Proper restraint of the animal is critical.
2. It is essential that the catheter does not pass into the trachea, as "lung dosing" is likely to be fatal. Pre-measure the length of catheter required to reach the stomach, on the outside of the animal. There should be no resistance to passing the catheter and any encountered may indicate that it is in the trachea - withdraw it and reintroduce the catheter no more than once or twice only.
3. Administration via the food or water is less stressful than by gavage, but many substances are not palatable and there is also less certainty about the amount of substance which is received by the individual animal.

### B) Subcutaneous dosing

Key points include:

1. Use sites where the skin is loose and mobile.
2. Keep the angle of the injection needle shallow to avoid damage to underlying tissues.

### C) Intramuscular dosing

Intramuscular injection in small laboratory species can be difficult because of the lack of big muscles. It is a route which is not recommended unless there are good scientific reasons for using it.

Key points include:

1. Use very small volumes in small laboratory species (see table).
2. Make certain the substance is not irritant.
3. Be certain about the local anatomy: avoid veins, arteries and nerves.

### D) Intravenous dosing

Key points include:

1. Aseptic technique is essential.
2. Dilate the vein to aid visualisation and needle entry. Avoid the use of xylene for this purpose.
3. Penetrate the vessel with a hypodermic needle and check for evidence of blood at the hub of the needle before injecting.
4. Apply haemostasis after removing the needle and ensure bleeding has stopped before returning the animal to its housing.

## E) Intraperitoneal dosing

Key points include:

1. Use short needles to avoid damaging abdominal organs.
2. Aim to make the injection into one of the posterior quadrants of the abdomen.
3. Aspirate on the syringe to ensure that the gut has not been penetrated

### Recommended maximum volumes for dosing

	Mouse	Rat	Guinea-pig	Rabbit
<b>Oral</b>	20 ml/kg	20 ml/kg	20 ml/kg	10 ml/kg *
<b>Subcutaneous</b>	20 ml/kg	5 ml/kg	5 ml/kg	1 ml/kg
<b>Intramuscular</b>	0.05 ml total	0.1 ml total	0.1 ml total	0.25 ml/kg/site
<b>Intravenous **</b>	10 ml/kg	5 ml/kg	5 ml/kg	2 ml/kg
<b>Intraperitoneal</b>	20 ml/kg	10 ml/kg	10 ml/kg	4 ml/kg

\* for doses by gavage.

\*\* limits quoted are for bolus injection carried out over a relatively short period of time (less than 1 minute).

The limits described are for once daily dosing on a routine basis. Exceptions are certainly possible, but may need special care and supervision.

## References

Bivin WS, Smith GD (1984) Techniques of Experimentation . In: Laboratory Animal Medicine, (Fox JG, Cohen BJ, Lowe FM, eds). Orlando: Academic Press.

Hull RM (1995) Guideline limit volumes for dosing animals in the preclinical stage of safety evaluation. Human and Experimental Toxicology 14, 305-307.

Waynforth HB, Flecknell PA (1992) Experimental and Surgical Technique in the Rat, 2nd ed. London: Academic Press.

Wolfensohn S, Lloyd M (1998) Handbook of Laboratory Animal Management and Welfare. 2<sup>nd</sup> ed, Oxford: Oxford University Press.