Aim: Dose calculation in pharmacological experiments.

References

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2. Reed, M. D. (2018). *Principles of Drug Dosing in Laboratory Animals*. Elsevier.
3. U.S. Food and Drug Administration (FDA). *Guidelines for Drug Dosing in Preclinical Research*. Retrieved from www.fda.gov.

1. Introduction Dose calculation is a fundamental aspect of pharmacological experiments to ensure accurate administration of drugs to experimental animals. The correct dose is crucial for maintaining the validity and reproducibility of results while ensuring ethical considerations. This manual provides guidelines on calculating doses in preclinical and clinical pharmacology.

2. Objectives

- To understand the principles of dose calculation in pharmacological experiments.
- To accurately determine drug doses for different experimental models.
- To convert human doses to animal doses using appropriate factors.
- To apply calculations in practical pharmacological research.

3. MATERIALS REQUIRED

- Scientific calculator
- Drug formulation (powder or solution)
- Standard drug reference
- Weighing balance
- Measuring cylinder and micropipettes

4. Methods of dose calculation

A. Determination of Dose Based on Body Weight

Most drugs are administered based on the weight of the subject (mg/kg body weight). The formula is:

$$\textbf{Dose (mg) = Dose (mg/kg)} \times \textbf{Body weight (kg)}$$

Example: If the required dose is 5 mg/kg and the animal weighs 200 g (0.2 kg), then: Dose = 5 × 0.2 = 1 mg

B. Dose Calculation Based on Surface Area (Human to Animal Dose Conversion)

Human equivalent doses (HED) are converted to animal doses using the formula:

Animal Dose (mg/kg) = Human Dose (mg/kg) × (Km factor for human / Km factor for animal)

Where Km factors:

- Human: 37
- Rat: 6
- Mouse: 3
- Rabbit: 12
- Dog: 20

Example: If the human dose is 10 mg/kg, the equivalent rat dose is:

Rat Dose = 10 × (37/6) = 61.67 mg/kg

C. Dose Calculation for Drug Solution Preparation

When preparing drug solutions, the concentration and volume need to be adjusted appropriately.

Volume (ml) = Dose (mg) / Concentration (mg/ml)

Example: If a rat requires a 5 mg dose and the stock solution is 2 mg/ml, then:

Volume = 5 mg / 2 mg/ml = 2.5 ml

D. Adjusting Dose for Route of Administration

Bioavailability affects the actual dose required when changing the route of administration. If bioavailability (F) for oral administration is 50% and for IV is 100%, then:

Oral Dose = IV Dose / Bioavailability

Example: If the IV dose is 5 mg/kg, the oral dose required is:

Oral Dose = 5 mg/kg / 0.5 = 10 mg/kg

5. Sample data table for dose calculation

Animal	Weight (kg)	Dose (mg/kg)	Total Dose (mg)	Volume (ml)
Rat	0.2	5	1	0.5
Mouse	0.03	10	0.3	0.15
Rabbit	2.5	8	20	10

6. Precautions

- Always verify calculations before administration.
- Use freshly prepared solutions to ensure stability.
- Maintain aseptic conditions to prevent contamination.
- Follow ethical guidelines for animal handling.

7. Conclusion Accurate dose calculation is essential for achieving reliable pharmacological outcomes. By following standardized formulas and conversions, experiments can be conducted effectively, ensuring reproducibility and ethical compliance.