

Laboratory Animal anaesthesia

A Practical Introduction for
Research Workers and Technicians

P. Flecknell

SECOND EDITION
FULLY REVISED

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Preface

The majority of laboratory animals are anaesthetized by staff who have not received specialist training in this field. Unfortunately, most textbooks of human or veterinary anaesthesia assume that the reader has a basic knowledge of the subject. Because of this, a good deal of published information has remained relatively inaccessible and this has limited the introduction of new techniques into the field of laboratory animal anaesthesia.

This handbook attempts to provide a basic guide to anaesthesia for research workers and animal technicians. It is not intended to be a comprehensive text on animal anaesthesia, but concentrates on those areas that are of greatest practical importance when anaesthetizing laboratory animals.

The first sections of the book deal with the general principles of pre-operative care, anaesthetic techniques and anaesthetic management. The most important properties of the anaesthetic and other agents used are outlined, but a detailed description of their pharmacology has been deliberately excluded. These sections also provide details of some of the equipment that the author has found useful when anaesthetizing laboratory animals.

These general sections of the book should be read before using any of the anaesthetic regimens described in the final sections. In particular, it is hoped that the reader will study the sections on post-operative care and the provision of effective pain relief before carrying out any operative procedures on animals.

In order to provide rapid, easily accessible guidelines a list of recommended anaesthetic regimens for each of the common laboratory species is given in Appendix 1. For research workers who require alternative techniques, a wider range of anaesthetic regimens is discussed together with an extensive list of dose rates for each species in Chapter 7.

In addition to providing guidance on basic anaesthetic technique, an introduction to more specialist procedures such as long-term anaesthesia and the use of neuromuscular blocking agents has been included. These sections provide only initial guidance and it is recommended that, whenever possible, an experienced veterinary anaesthetist should be consulted before attempting these techniques.

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Preface to the second edition

Since writing the first edition of this book there has been a welcome increase in concern for the welfare of laboratory animals. One result of this has been the introduction by a number of countries of formal training requirements for new research workers. This increased interest in animal welfare has also led to the improved dissemination of information regarding 'best practice' in many aspects of laboratory animal science. The second edition of *Laboratory Animal Anaesthesia* has benefited from this exchange of information, and the additions and revisions which have been included owe much to comments from my colleagues around the world. A major addition to this new edition is the inclusion of illustrations of techniques and equipment. The format of the book remains relatively unchanged, except for Chapter 7, which now incorporates some of the information previously included in the Appendices. This enables more of the information relating to a particular species to be accessed quickly and easily. Brief descriptions of anaesthetic techniques for fish, amphibia, reptiles and birds have also been included, to provide some guidance for dealing with these species.

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Glossary

Inevitably, a number of specialist terms are used throughout this book and these are defined below.

Anaesthesia	a state of controllable, reversible insensibility in which sensory perception and motor responses are both markedly depressed
Analgesia	the temporary abolition or diminution of pain perception
Analeptic	drug which stimulates respiration
Anoxia	complete deprivation of oxygen for tissue respiration
Apnoea	temporary cessation of breathing
Arrhythmia	(cardiac) arrhythmias are alterations in the normal rhythm of the heart
Asystole	lack of cardiac muscle contractions
Ataxia	lack of co-ordination, 'wobbliness'
BMR	basal metabolic rate
Bradycardia	slowing of the heart rate
CNS	central nervous system
CNS depressant	any agent that modifies function by depressing sensory or motor responses in the CNS

Cyanosis	blue or purple colouring of the skin or visible membranes due to the presence of an increased concentration of reduced haemoglobin in capillary blood, symptomatic of hypoxia.
Dosages	all dosages are expressed as milligrams of drug per kilogram of body weight (mg kg^{-1}), except for the neuroleptanalgesic combinations which are more conveniently expressed as ml of commercial or diluted premixed solution per kg body weight (ml kg^{-1})
Dosage schedules	u.i.d. — once daily b.i.d. — twice daily t.i.d. — three times daily q.i.d. — four times daily
Dyspnoea	laboured breathing
ECG	electrocardiogram
Hypercapnia	elevated blood carbon dioxide content
Hyperpnoea	fast or deep breathing
Hypertension	elevated (arterial) blood pressure
Hypnotic	a drug that induces a state resembling deep sleep, but usually with little analgesic effect
Hypocapnia	reduced blood carbon dioxide content
Hypopnoea	slow or shallow breathing
Hypotension	a fall in (arterial) blood pressure
Hypothermia	a fall in body temperature
Hypovolaemia	a fall in circulating blood volume

Hypoxia	depressed levels of oxygen
Induction (of anaesthesia)	the initial establishment of a state of anaesthesia
Injections	routes of administration are abbreviated as follows: i/v — intravenous i/m — intramuscular i/p — intraperitoneal s/c — subcutaneous
Laryngospasm	spasm of the vocal cords, producing complete or partial obstruction of the airway
Minute volume	the volume of gas breathed in 1 minute, i.e. the product of tidal volume and respiratory rate
Narcosis	a state of insensibility or stupor from which it is difficult to arouse the animal
Normovolaemic	having a normal circulating blood volume
P_{CO_2}	partial pressure of carbon dioxide
per os	by mouth
P_{O_2}	partial pressure of oxygen
Polypnoea	rapid, panting breathing
Pulmonary ventilation	the mechanical expansion and contraction of the lungs in order to renew alveolar air with fresh atmospheric air
Tachycardia	an increase in heart rate
Tachypnoea	rapid respiration
Tidal volume	the volume of gas expired with each breath

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