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Introduction

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It is widely accepted, and implicit in the legislation of many countries, that animals used in research should be kept as far as possible in a state of good welfare. This duty of care is not only a legal and ethical obligation but is also very often necessary to achieve high-quality science. Animals housed in conditions that meet their needs are much less likely to be stressed, a state which can bias results or result in increased variation between animals as they attempt to cope with the stressor. Therefore, it is often said that good animal welfare is in both the animals' and the scientists' best interests. From the very first edition of the Handbook in 1947, the UFAW Laboratory Animal Handbook has promoted the importance of high standards of care for animals used in research. Indeed, the 1947 edition was the first manual on laboratory animal care and housing ever to be published and was instrumental in stimulating the development of laboratory animal care as a fundamental component of laboratory animal science. Since then, it has remained an internationally valued resource that has helped to refine laboratory animal use and to advance the Three Rs (3 Rs – replacement, reduction and refinement), originally described in 1959 by the UFAW scholars Russell and Burch in the *Principles of Humane Experimental Technique*, and now generally accepted as the key ethical principles under which animal experimentation should be carried out.

Professor, Sir Harold Himsworth, Honorary Physician to the Queen and a prominent scientist in the study of diabetes, stated in a foreword to the 3rd edition in 1959 that, '*Good intentions and wishful thinking are never enough when faced with natural problems. Knowledge and yet more knowledge is needed.*' Yet it is not always easy to acquire this knowledge. It is hard to shake off the biases of anthropomorphism and anthropocentrism to establish the real requirements of animals. Nonetheless, since the publication of the previous 7th edition, there have been considerable scientific developments in the field of laboratory animal welfare that fully justify the production of this updated volume.

We have included in this edition 10 new chapters on implementing the Three Rs in research, addressing areas that have developed considerably since the last edition and drawing attention to some important general principles. There has been a dramatic increase in the numbers of genetically altered animals used in research, mainly mice, and so we have included a chapter on phenotyping to draw attention to techniques that can be used to better characterise

these animals and identify welfare issues. Good experimental design, which has implications on the numbers of animals used, needs to take account of genetic status and sometimes of housing conditions. Given the importance of these considerations, a general introduction to experimental design is included that we hope will be of use, not only to animal care staff, but also to researchers and those involved in ethical review. The implications of research on wild animals, often not within a closely controlled laboratory environment and in some cases in the field, are not always well understood, and so we have included chapters to address issues relating to these animals. This edition also includes a chapter on the use of non-traditional laboratory animals – those not commonly used in biomedical research.

Since the 7th edition there have been considerable developments in animal welfare research relating to both the methodology of assessing animal welfare and the use of new techniques to judge the importance of environmental provisions aimed at allowing animals to express strongly motivated behaviours. These advances are reflected within the husbandry sections of individual chapters, and in the chapters on assessing welfare and the provision of enrichment. Finally, we have included chapters on: legislation and the oversight of animal experiments – at both local and national level; on training and competence assessment; and on euthanasia.

We have also made other changes. The previous edition was published as two volumes but this time we have reverted to a single volume, which we believe will be more convenient as a source of information. It is not possible to cover all the species used in research around the world but we have provided chapters on the most commonly used species or groups of species. Fish are becoming increasingly used in research, and we have provided updated information in a chapter on general issues common to marine and freshwater fish.

We have endeavoured as editors to ensure that the chapters reflect UFAW's approach to the care and husbandry of animals used in research, however the chapters are the individual authors' work and the views they have expressed should not be taken as UFAW's official opinions. We have included a chapter on chimpanzees although not all countries use or permit their use. As with other species, their inclusion in this book is not meant to imply approval of their use, but is to encourage implementation of high standards of care.

It is very important to us that The UFAW Handbook should be an international resource, so we have tried to ensure that the text is not overly biased towards the European situation. However, at the time of writing there has been a recent review of European standards of housing (Appendix A to Council of Europe ETS 123 and Annex II to European Directive 86/609). In addition, changes to the European legislation (European Directive 86/609) are being debated that might affect both its scope and the regulation of animal care. Many chapters make reference to these changes to draw attention to recent views on minimum appropriate standards and possible future legal obligations. It is, of course, the responsibility of those working with animals to ensure that the practices they adopt comply with national legislation relating to health and safety and animal welfare.

It has been our goal to produce an authoritative resource in the tradition of previous editions of the Laboratory Handbook. The best information about animals' needs and how these can be met, is based on well planned and executed animal welfare science studies published in the refe-

reed scientific literature. However, many aspects of animal husbandry have not yet received such detailed scientific investigation and are based on practices that are considered through practical experience to be suitable. To help us to ensure that as far as possible the chapters reflect good current practice and are a guide for future developments, all the chapters in the Handbook have been peer reviewed by anonymous referees. We are enormously grateful to all those who have undertaken these reviews, for their time and expertise and for their advice which has been of great assistance to both editors and authors.

We are also extremely grateful to the authors for their time and energy in distilling the research literature and their practical experiences into concise and valuable chapters, to AstraZeneca for a generous donation towards the production costs, and to Laboratory Animals Limited for their help in promoting this volume. We hope that this Handbook will be a useful resource for all those caring for and working with animals used in science, and that it will help promote good animal welfare and good science.