

Preface to the third edition

In 2000, Cambridge University Press first published *Animal Experimentation: A Guide to the Issues*. A second edition was published in 2009. It is appropriate to reflect on what has happened since then in animal research, product testing and education within the accepted ethical framework of the 'three Rs' principles (Replacement, Reduction and Refinement: Russell and Burch 1959). What advances, for example, have been made in the search for alternatives to the use of vertebrates in biomedical research? Are there fewer animals used in research today? Or more? Has there been a continuation of the impetus to refine experimentation with animal welfare as the priority? Answering such questions requires a thorough reappraisal of where biomedicine, product testing and education are presently placing their emphases.

Twenty-first-century technological advances have resulted in an extraordinary increase in the number of procedures involving laboratory mice in genetic and molecular research. The enormous breeding programmes required to generate heterozygous strains of mice with genetic modifications has brought to bear entirely new welfare and ethical concerns regarding husbandry and 'surplus' animals. Are steps being taken in Britain, Europe, North America, China, South Korea, Brazil, Australasia and elsewhere to address these concerns? Were existing regulatory frameworks adequate, or have relevant statutes been necessarily updated?

In product and chemical safety testing, a trend towards fewer animals being used in toxicological screening is emerging in some countries. In Europe, there have been legislative changes that specifically prohibit newly animal-tested cosmetic products and ingredients being sold (European Commission 2009). In the United States, a toxicology vision document (National Research Council 2007) has urged the rapid adoption of cell-based assaying and other *in vitro* methods to replace *in vivo*

testing. This has resulted in an acceleration in the uptake of *in vitro* and computer-based (*in silico*) methods with an associated reduction in laboratory animal use. Where else might such advances see a reduction in overall animal use?

Could discoveries in converging technologies such as interactive biotechnology, genome editing, synthetic biology and organ-on-a-chip biomimicry also point to a rapid replacement of animals in biological and medical research? Or will the technological advances that are making genetic alteration easier and less expensive result in a continued upsurge in animal use in experiments in these fields?

When *Animal Experimentation: A Guide to the Issues* was first written, general knowledge of computers and the internet was nowhere near as sophisticated as it is today. The acceptance of online applications such as 'Frog Dissection' as legitimate teaching tools has facilitated moves towards fewer classroom dissections. How widely has such smart device technology been adopted?

With such questions in mind, Cambridge University Press has published a completely updated third edition of *Animal Experimentation: A Guide to the Issues*. It is, once again, aimed at life science students, some of whom will follow careers as tomorrow's researchers, but at the same time its clarity of style and balanced treatment will enable lay people and experts to read it with equal ease. Students and researchers will find a non-intimidating, easy-to-read and readily understood introduction to the principal issues in the animal experimentation debate.