

Preface

Laboratory animals have become increasingly important for biomedical research, and it is estimated that approximately 70% of biomedical research is associated with the use of experimental animals. For just over a century the Nobel Prize has been awarded each year in recognition of the world's greatest biomedical advances. Of the 106 Nobel Prizes awarded for physiology or medicine, 95 were directly dependent on animal study. Animal experiments not only expand our knowledge of science, but also greatly improve human and animal health. Since 1900, animal research achievements have helped extend the longevity of Americans by approximately 25 years. However, there are those who disapprove of animal research because they believe such experiments to be expensive and harmful to animals. Therefore, it is incumbent on researchers to find a way to effectively implement animal study based on the 3Rs (reduction, replacement, and refinement) principle and animal welfare.

The curriculum of Laboratory Animal Science is provided in the majority of medical schools and agriculture universities in the world. However, a suitable and practical textbook that contains state-of-the-art techniques is still lacking. In 2004, 2008, and 2014, with the assistance of the Chinese Ministry of Health, we successfully published two books in Chinese titled *Medical Laboratory Animal Science* and *Animal Models of Human Diseases*, which have been used as the standard textbooks for graduate school students in China and have become best sellers in medical schools in China. Recently, after consultation with professionals who perform biomedical studies using laboratory animal models, we feel that it is necessary to publish a textbook of *Laboratory Animal Science* in English for readers worldwide. For this purpose, we decided to compile the current textbook, which will be useful for teaching and training in this field. This book focuses on theoretical instruction, experimental operation, and skills training, and systematically covers both basic information of laboratory animals and techniques for animal experiments.

This book is divided into eight chapters. Chapter 1 provides an overview of laboratory animal science, summarizing some basic concepts and categories of laboratory animals and animal experiments. In addition, it introduces a brief history, applications in biomedicine, and management of laboratory animals. The welfare of laboratory animals has attracted increasing attention in recent years. Chapter 2 describes in detail the definition of animal welfare and the measures taken to ensure protection of experimental animals. Chapter 3 discusses the standardization of laboratory animals and stresses its importance for animal experimentation. This chapter outlines several key elements that are closely related to animal experimentation such as animal genetics, health, facilities, nutrition, and the like. Chapter 4 introduces the most commonly used laboratory animals, such as mice, rats, hamsters, guinea pigs, rabbits, dogs, pigs, rhesus monkeys, chickens, and fish and mainly discusses and compares animal anatomy, biology, husbandry, and applications in biomedical research. Chapter 5 discusses models of human disease and introduces how to select and create an animal model for studying specific human diseases. Information about

the newest genetically modified animals is also included in this chapter. Chapter 6 provides a summary of the technologies used in animal experimentation. All of these skills ensure research goes smoothly while greatly reducing animal pain and distress. Chapter 7 discusses how to design a suitable animal experiment. It introduces the content and procedure of animal experimental design. Chapter 8 in which readers will learn the whole process and protocol of an animal experiment, summarizes the organization and management of animal experiments. We believe that this book will become not only a standard textbook for undergraduate and postgraduate students, but also a life tool on the bookshelf for veterinarians, researchers, animal-care staff, and other professionals who are involved in animal experiments.