Preface

The mouse displays fundamental similarities in anatomy, physiology and genome organization to humans. This makes the mouse model one of the most important tools to understand gene function and their possible role in human disease. Specific advantages of the mouse as a model system include: 1) the mouse genome is >95% identical to the human genome, 2) there are powerful toolkits available for the manipulation of the mouse genome, 3) mice breed rapidly, with about ten weeks per generation, and are relatively inexpensive to feed and house, and 4) the mouse is a model used for drug discovery and to test therapies, including cell and gene therapy. All these reasons, in addition to the start up of large scale global mouse functional genomics projects, such as the International Mouse Phenotyping Consortium (IMPC), which aims to create more than 20,000 strains with one specific deactivated gene, mean that mice literally dominate biomedical laboratories worldwide.

The bottleneck in the process of establishing suitable mouse models for human diseases is quite often appropriate mouse phenotyping. Whilst novel gene editing methodologies like CRISPR/Cas9 represent an easy and fast way to produce mouse models, the ability of mouse researchers to make morphological phenotyping remains slower and more complicated. In addition, there is a growing appreciation of imaging technologies for mouse morphological phenotyping. The reason for this is that if we aim to develop mouse models for human diseases, we should have the same diagnostic imaging capabilities for mice and humans.

In this scenario, unfortunately few books, atlases or internet resources explain in detail mouse morphology. Furthermore, to date a complete comprehensive set of images that describe mouse morphology with an integrative vision has not been generated. The different levels of mouse morphology, cellular, tissular, organic, or systemic have no boundaries. In fact, they form a continuum that researchers must go over to accomplish an accurate morphological phenotyping of mouse models.

Here we present a complete and integrative description of mouse normal morphology. More than 2,200 original images have been specifically produced for this atlas in the Mouse Imaging Platform (Center for Animal Biotechnology and Gene Therapy, Universitat Autònoma de Barcelona). These images show the anatomy, histology and cellular structure of mouse organs. In addition, correlative X-ray, Computed Tomography, Magnetic Resonance and Ultrasound images complete this integrative vision of the mouse morphology. Classical anatomical techniques such as conventional dissection, skeletal preparations, vascular injections, as well as histological, immunohistochemical and electron microscopy techniques have been employed to prepare this atlas.

This book is the culmination of twelve years of work. The interaction established during this time with European (EUMORPHIA, EUMODIC, INFRAFRONTIER) and global (IMPC) mouse consortia has allowed us to learn firsthand the evolution of mouse phenotyping and the specific morphological knowledge demands from mouse researchers. This book, basically an atlas, but also containing explanatory diagrams and text, guides the reader through normal mouse anatomy, histology and imaging, and is aimed at the mouse researcher as well as the veterinary and human pathologists.

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