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## Preface

Since the publication of the first edition of *Mitochondrial DNA: Methods and Protocols* in 2002, the number of unique heritable mtDNA mutations recognized as being associated with bioenergetic dysfunction, cell death, and disease has grown apace. At the same time, our understanding of the basic biology of somatic mtDNA mutations has improved. These ongoing advancements are due largely to the continuous development and improvement of techniques and approaches for studying the biology of mitochondria and their DNA. In this second edition of *Mitochondrial DNA: Methods and Protocols*, specialists from eight countries share their expertise by providing detailed protocols for studying many aspects of mtDNA.

This volume is divided into three sections. The first contains protocols that can be used to study the transduction of information from mtDNA to functionally active respiratory complexes. Included in this section are protocols for investigating the nucleoid proteome, mtDNA packaging, replication, transcription, and respiratory complex synthesis. In this section, methods for studying polymerase gamma mutations associated with mitochondrial disorders are also provided. The second section focuses on mitochondrial reactive oxygen species (ROS) production, mtDNA damage, and its repair. Included are descriptions of unique experimental systems for manipulating mtDNA repair capacities and evaluating the outcome. The application of such methods will improve our understanding of the basic biology of mtDNA damage, repair, and mutation. Finally, in the third section, in recognition of the observation that debilitating somatic mtDNA mutations underlie some of the bioenergetic deficits observed in age-associated disease, exciting new approaches for identifying and quantifying heteroplasmic mtDNA mutations are presented.

This volume contains detailed descriptions both of established techniques that continue to be usefully applied, and of some very recently developed approaches that hold great potential to improve our understanding of mtDNA biology. As such, graduate students, postdoctoral fellows, and established investigators should all find herein useful information presented in a straightforward manner with sufficient detail to be replicated in their own laboratories. I thank all of the authors who contributed their expertise and detailed protocols to this volume for their hard work, dedication, and patience.

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