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Preface

Mitochondrial research in Australia: A major player in worldwide trends

Research on the properties and formation of mitochondria has been a strong feature of Australian Biochemistry and Molecular Biology for over 50 years. The biennial AussieMit series of conferences was instituted in 2008 by Professor Michael Ryan at La Trobe University, Melbourne. The third of these meetings, AussieMit2012 held in Melbourne in December of that year, provides the foundation for the collection of articles in this issue of BBA. The articles are written for the most part by Australian researchers; however, there is also a substantial international contribution to the topics reviewed in this issue. The articles represent a selection of the speakers at AussieMit2012 and are organised to cover reviews within the following broad topic areas, namely: formation and cellular roles of mitochondria; metabolic roles of mitochondria and exercise physiology; development, disease and degeneration in relation to mitochondria; models of mitochondrial disease; and, mitochondria and pathology. The variety of individual topics covered in these pages demonstrates both the breadth and detail of the frontiers of mitochondrial research. Australian scientists continue to play major roles in this area, asking many fundamental questions in yeast, animal and plant biology, with powerful implications in health and disease.

Phillip Nagley is Emeritus Professor in the Department of Biochemistry and Molecular Biology at Monash University. He is a graduate in biochemistry from the University of Sydney and received his PhD from Monash University and, later, DSc from the same university. His sustained scientific contributions to the field of mitochondrial research over 45 years have provided important advances in understanding the structure and function of mitochondrial DNA in yeast, the formation of mitochondrial ATP synthase in yeast, the role of mitochondrial DNA mutation and bioenergy deficiencies in the human ageing process, and the role of mitochondria in cell death. His contributions to neuroscience over the past 10 years have been involved with studies on how neurons respond to stress, including pathways of elicitation of various types of cell death in neurons under oxidative stress conditions. Professor Nagley is a former President of the Australian Society for Biochemistry and Molecular Biology, and he is currently Secretary General of FAOBMB. He has received a number of awards including the Boehringer-Mannheim Medal of Australian Biochemical Society and the Lemberg Medal of the Australian Society for Biochemistry and Molecular Biology, to which he was recently elected as Honorary Member.

Justin St. John was awarded his PhD from the University of Birmingham in 1999. Whilst in the UK, he was funded by the Medical Research Council and was appointed Professor of Reproductive Biology at the University of Warwick (2007). Since 2010, he has been the Director of the Centre for Genetic Diseases at Monash Institute of Medical Research. His research focuses on understanding how mitochondrial DNA is transmitted and replicated. Using a variety of assisted reproductive technologies and embryonic stem cell models, he has described mitochondrial DNA replication events in undifferentiated and differentiating embryonic stem cells; and demonstrated why donor cell mitochondrial DNA is transmitted to embryos and offspring following somatic cell nuclear transfer. He has also demonstrated how mitochondrial DNA copy number is regulated in a cell-specific manner by DNA methylation of the nuclear-encoded mitochondrial DNA-specific polymerase; and how mtDNA haplotypes influence chromosomal gene expression patterns. He is using these outcomes to develop mini-pig models of mitochondrial DNA disease and reproductive strategies to prevent the transmission of mutant mitochondrial DNA from one generation to the next. He has published in *The Lancet*, *Nature Chemical Biology*, *Nature Cell Biology*, *Nucleic Acids Research*, *Stem Cells*, *Journal of Cell Science*, and *Genetics*. In 2013, he received the Society for Reproductive Biology's Award for Excellence in Reproductive Biology Research.

Kipros Gabriel is located in the Department of Biochemistry and Molecular Biology at Monash University in Melbourne, Australia. He received his PhD from the Russell Grimwade School of Biochemistry in 2004 for his studies on yeast mitochondrial biogenesis with Professor Trevor Lithgow. He then moved to the laboratory of Professor Nikolaus Pfanner at the University of Freiburg, Germany, as an Alexander von Humboldt Fellow and continued his work on mitochondrial biogenesis. In 2009, he initiated his own research group focused on understanding mitochondrial pathologies with a particular emphasis on understanding the mechanism used by bacterial pathogens to disrupt mitochondrial function.

Matthew McKenzie is an Australian Research Council Future Fellow in the Centre for Genetic Diseases at Monash Institute of Medical Research. He received his PhD from the Department of Medicine, University of Melbourne in 2001. Since this time the central aim of his work has been to understand the mechanisms which underlie mitochondrial disease. His current research interests include the biogenesis of mitochondrial fatty acid oxidation (FAO) and oxidative phosphorylation (OXPHOS) complexes, the generation of induced pluripotent stem (iPS) cells to study mitochondrial disorders, the role of microRNAs in regulating mitochondrial metabolism and the development of new mouse models of mitochondrial DNA disease.

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