



The New Era of Redox Biology:
from Basic Biochemistry to Redox Omics



Galway, Ireland
2025
June 03 - 06

22nd SFRRI Biennial Meeting

hosted by the Society for Free Radical Research - Europe

Lunchtime Research Workshop

5th June 2025

13:00 – 14:00

Venue: Human Biology Building Lecture Theatre

Keynote Lecture - Prof. Michael Murphy

'The role of oxygen concentration in ischemia-reperfusion injury *in vivo* and *in vitro*'

and

Roundtable Discussion

'Importance of physiological oxygen levels for redox signaling and high throughput screening in live cells'

Overview: The extensive oxygen gradient between the air we breathe (PO₂ ~21 kPa) and its ultimate distribution within mitochondria (as low as ~0.5–1 kPa) is testament to the efforts expended in limiting its inherent toxicity. It has long been recognized that cell culture undertaken under atmospheric oxygen conditions falls short of replicating this protection *in vitro*. Despite this, difficulty in accurately determining the appropriate O₂ levels under which to culture cells, coupled with the difficulty of replicating and maintaining a physiological O₂ environment *in vitro*, has hindered addressing this issue. In this workshop, Prof. Michael Murphy will discuss the oxygen dependence of reactive oxygen species (ROS) production, how that relates to metabolism and ischemia-reperfusion injury *in vivo* and how his team have explored this further *in vitro* establishing a key role of O₂ tension. Following his keynote lecture, Prof. Murphy will chair a roundtable discussion focused on the importance of conducting cell culture experiments under oxygen levels experienced by tissues and organs *in vivo*. We envisage that this workshop will facilitate a paradigm shift, enabling translation of findings under physiological conditions *in vitro* to disease pathology and the design of novel therapeutics.

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Prof. Michael Murphy

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Prof. Mike Murphy received his BA in Chemistry at Trinity College, Dublin in 1984 and his PhD in Biochemistry at Cambridge University in 1987. After stints in the USA, Zimbabwe, and Ireland he took up a faculty position in the Biochemistry Department at the University of Otago, Dunedin, New Zealand in 1992. In 2001 he moved to the MRC Mitochondrial Biology Unit in Cambridge, UK (then called the MRC Dunn Human Nutrition Unit) where he is a programme leader. Murphy's research focuses on the roles of reactive oxygen species in mitochondrial function and pathology. In particular, he has pioneered the targeting of bioactive and probe molecules to mitochondria *in vivo*. This general methodology is now widely used. Prominent mitochondria-targeted compounds are

antioxidants, such as MitoQ, which protects against oxidative damage in ischemia-reperfusion injury. Murphy and Rob Smith developed MitoQ as an oral drug which has been used in two Phase II trials so far. This work established mitochondria as a relevant drug target and opened up the field of mitochondrial pharmacology. The Murphy group has gone on to create MitoSNO, a mitochondria-targeted nitric oxide donor and MitoG to treat diabetes. Recently, his work has extended to determining the mechanism by which mitochondria produce free radicals during ischemia-reperfusion injury in heart attack and stroke which is now leading to potential therapies for cardiac and brain ischemia-reperfusion injury.

Mike Murphy is Professor of Mitochondrial Redox Biology at the University of Cambridge, a Wellcome Trust Investigator, an MRC Investigator, an honorary research Professor at the University of Otago, New Zealand, a recipient of the Keilin Medal from the Biochemical Society, an honorary Fellow of the Royal Society of New Zealand and a Fellow of the Academy of Medical Sciences (FMedSci). He has published more than 450 peer reviewed papers, which have garnered more than 82,000 citations and he has an *h*-index of 144.

