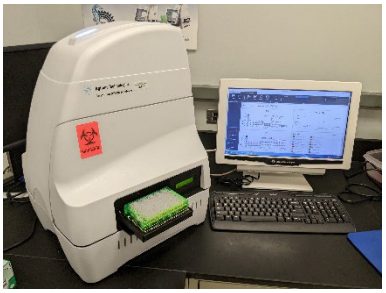
MEDICAL COLLEGE OF WISCONSIN
CANCER CENTER

Translational Metabolomics Shared Resource
Redox and Bioenergetics Instrumentation and Scientific Examples

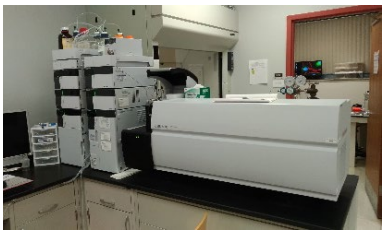
Instrumentation

The Translational Metabolomics Shared Resource (TraMSR) Redox and Bioenergetics unit provides state-of-the-art instrumentation, cutting-edge techniques, and sophisticated expertise dedicated to investigating cancer cell metabolism and redox signaling, and for designing custom probes for reactive oxygen species.



Agilent Seahorse XF96, Seahorse XFe96, Seahorse XFe24

Seahorse XF instruments enable researchers to interrogate cellular bioenergetics function in real time by simultaneously monitoring oxygen consumption and extracellular acidification rates in a 24- or 96-well plate format.



Shimadzu UHPLC LCMS8030 system

The Shimadzu LCMS8030 is a liquid chromatograph coupled with UV-Vis absorption and mass spectrometry detection. It allows selective detection and absolute quantification of small molecules (endogenous metabolites, drugs, chemical probes) in chemical mixtures and cell or tissue extracts.

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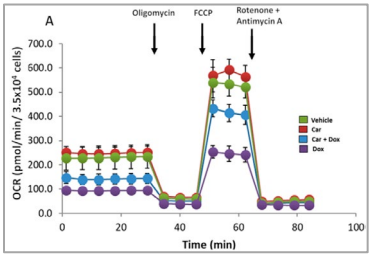
Scientific Examples

Mitochondrial stress assay

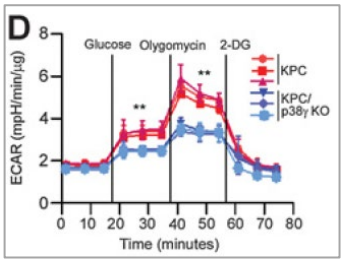
Analysis of the protective effects of carvedilol against doxorubicin-induced loss of mitochondrial function in iPSC-derived cardiomyocytes



In: Carvedilol Phenocopies PGC-1α Overexpression to Alleviate Oxidative Stress, Mitochondrial Dysfunction and Prevent Doxorubicin-Induced Toxicity in Human iPSC-Derived Cardiomyocytes. https://doi.org/10.3390/antiox12081585

Glycolysis stress assay

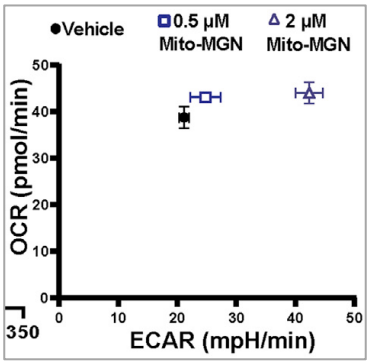
Role of p38γ MAPK in aerobic glycolysis (Warburg effect) in KPC cells.



In: p38γ MAPK Is Essential for Aerobic Glycolysis and Pancreatic Tumorigenesis. https://doi.org/10.1158/0008-5472.CAN-19-3281

Bioenergetic status

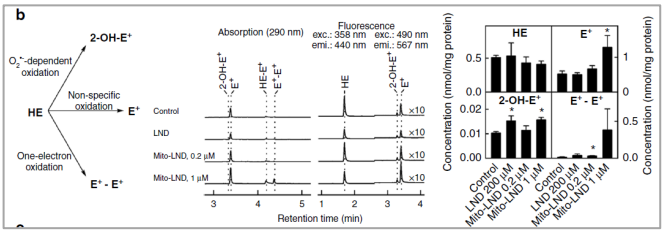
Mitochondria-targeted magnolol improved bioenergetic function in T-cells mostly via increased glycolytic (ECAR) function.



In: Synchronous effects of targeted mitochondrial complex I inhibitors on tumor and immune cells abrogate melanoma progression. https://doi.org/10.1016/j.isci.2021.102653

Superoxide ($O_2^{\bullet-}$) measurements

Stimulation of mitochondrial superoxide production by mitochondria-targeted lonidamine.



In: Targeting lonidamine to mitochondria mitigates lung tumorigenesis and brain metastasis. https://doi.org/10.1038/s41467-019-10042-1

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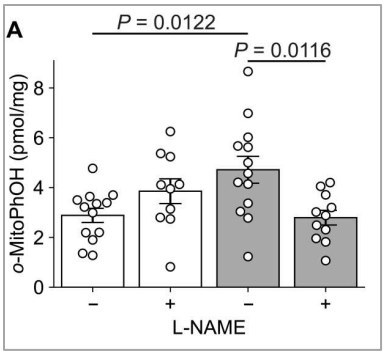
Hydrogen peroxide (H_2O_2) measurements

Role of Notch4 in controlling H_2O_2 levels in blood vessels.

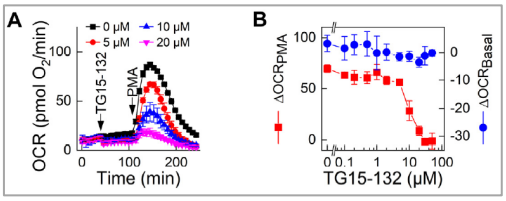
In: Nitric oxide synthase and reduced arterial tone contribute to arteriovenous malformation. https://doi.org/10.1126/sciadv.ade7280



NADPH oxidase 2-mediated oxygen consumption

Identification of NADPH oxidase-2 inhibitors by monitoring Nox2-dependent oxygen consumption.

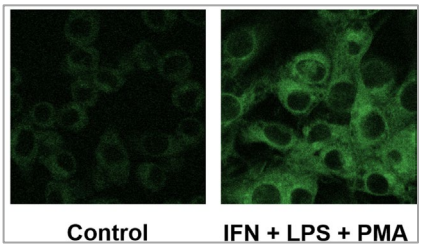
In: Novel NADPH Oxidase-2 Inhibitors as Potential Anti-Inflammatory and Neuroprotective Agents. https://doi.org/10.3390/antiox12091660



Peroxynitrite ($ONOO^-$) measurements

Development of two-photon fluorescent probe for peroxynitrite.

In: Two-photon fluorescent probe for cellular peroxynitrite: Fluorescence detection, imaging, and identification of peroxynitrite-specific products. https://doi.org/10.1016/j.freeradbiomed.2021.04.011



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