Cellular Bioenergetics Laboratory

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Victor Chang
Cardiac Research Institute

OUR FOCUS

How do different genes and pathways in the body balance food intake and energy expenditure to maintain a healthy body weight?
What goes wrong with cellular energy metabolism in different disease states?
We aim to better understand the factors that regulate cellular metabolism under normal conditions and in disease.

WHAT CAN YOU LEARN FROM US?

Can metabolic health be improved by modulating sphingolipid biosynthesis?

Intracellular accumulation of toxic lipid intermediates impairs the actions of insulin to regulate carbohydrate and lipid metabolism. This project will test the physiological effects of novel compounds we have developed to target the biosynthesis of different sphingolipid species, with a goal of improving metabolic and cardiovascular health.

Obesity

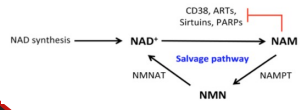
Cardiovascular disease

Diabetes

Our research focuses on **metabolism**

Promoting NAD⁺ biosynthesis to prevent diabetes and cardiovascular disease

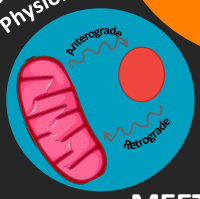
NAD⁺ is an important co-factor for many enzymes, including the family of sirtuin enzymes, which are critical for regulating metabolism and lifespan. This project will use genetic and pharmacological approaches to examine the effect of promoting NAD⁺ biosynthesis in mouse models of ageing, diabetes and cancer.



Understanding mitochondrial stress signaling

Mitochondria are the key site for ATP production, but also participate in many other processes. But how do mitochondria communicate cell-to-cell? This project will examine the intercellular signaling pathways activated in response to mitochondrial bioenergetic stress and determine if there is an associated secretion of bioactive molecules.

Mitochondrial Physiology



Cancer

Targeting metabolism to treat pancreatic cancer?

Cancer cells reprogram their metabolism to use fuel (fat, protein and glucose) that allows them to proliferate and thrive. This project investigates how cellular energy metabolism is altered in pancreatic cancer. This will inform novel anti-cancer strategies to potentially improve treatment for pancreatic cancer.

MEET OUR TEAM ☺

Prof Nigel Turner – Lab Head
Dr Sarah Hancock – Postdoctoral Research Fellow
Linda Garthwaite – Senior Research Assistant
Amy Nguyen – Research Assistant

PhD Students

Jasmine Banks
Thomas Lakeland
Laura Choong
Hemna Govindaraju

Honours Students

Ying Fei Liew
Michael Susetio
Selene Jang

RECENT PUBLICATIONS

- Liu M, Quek LE, Sultani G & Turner N. (2016). Epithelial-mesenchymal transition induction is associated with augmented glucose uptake and lactate production in pancreatic ductal adenocarcinoma. *Cancer Metab* 4:19.
- Turner N, Lim XY, Toop HD, Osborne B, Brandon AE, Taylor EN, Fiveash CE, Govindaraju H, Teo JD, McEwen HP, Couttas TA, Butler SM, Das A, Kowalski GM, Bruce CR, Hoehn KL, Fath T, Schmitz-Peiffer C, Cooney GJ, Montgomery MK, Morris JC, Don AS. (2018). A selective inhibitor of ceramide synthase 1 reveals a novel role in fat metabolism. *Nat Commun* 9:3165.
- Bentley NL, Fiveash CE, Osborne B, Quek LE, Ogura M, Inagaki N, Cooney GJ, Polly P, Montgomery MK, Turner N. (2018). Protein hypoacylation induced by Sirt5 overexpression has minimal metabolic effect in mice. *Biochem Biophys Res Commun* 503:1349-1355
- Liu M, Hancock SE, Sultani G, Wilkins BP, Ding E, Osborne B, Quek LE, Turner N. (2019). Snail-Overexpression Induces Epithelial-mesenchymal Transition and Metabolic Reprogramming in Human Pancreatic Ductal Adenocarcinoma and Non-tumorigenic Ductal Cells. *J Clin Med* 8:822.
- Montgomery MK, Osborne B, Brandon AE, O'Reilly L, Fiveash CE, Brown SHJ, Wilkins BP, Samsudeen A, Yu J, Devanapalli B, Hertzog A, Tolun AA, Kavanagh T, Cooper AA, Mitchell TW, Biden TJ, Smith NJ, Cooney GJ, Turner N. (2019). Regulation of mitochondrial metabolism in murine skeletal muscle by the medium chain fatty acid receptor Gpr84. *FASEB J* 33: 12264-12276.
- Osborne B, Reznick J, Wright LE, Sinclair DA, Cooney GJ, Turner N. (2022). Liver-specific overexpression of SIRT3 enhances oxidative metabolism, but does not impact metabolic defects induced by high fat feeding in mice. Biochem Biophys Res Commun 607:131-137.
- Metcalfe LK, Shepherd PR, Smith GC, Turner N. (2022). Limited Metabolic Effect of the CREBRFR457Q Obesity Variant in Mice. Cells 11:497.