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香港浸會大學理學院
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Distinguished Lecture Series

Quantitative Flux Analysis of Energy Metabolism

18 May 2021 (Tuesday)
11:00 a.m.-12:00 noon GMT+8 (Hong Kong Time)

Online via Zoom
(Meeting ID: 945 6859 0727)

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Sheng (Tony) Hui received a BSc and an MPhil in physics, both from Hong Kong Baptist University, and a PhD in biophysics from the University of California, San Diego. He completed postdoctoral work in the Lewis-Sigler Institute for Integrative Genomics at Princeton University. Dr Hui is currently an assistant professor in the Department of Molecular Metabolism at the Harvard T.H. Chan School of Public Health.

ABSTRACT

Mammalian organs are nourished by nutrients carried by the blood circulation. These nutrients originate from diet and internal stores, and can undergo various interconversions before their eventual use as tissue fuel. Here we develop isotope tracing, mass spectrometry, and mathematical analysis methods to determine the direct sources of circulating nutrients, their interconversion rates, and eventual tissue-specific contributions to TCA cycle metabolism. Experiments with fifteen nutrient tracers enabled extensive accounting for both circulatory metabolic cycles and tissue TCA inputs, across fed and fasted mice on either high-carbohydrate or ketogenic diet. We find that glucose feeds the TCA cycle via circulating lactate. A majority of circulating carbon flux is carried by two major cycles: glucose-lactate and triglyceride-glycerol-fatty acid. Futile cycling through these pathways is prominent when dietary content of the associated nutrients is low, rendering internal metabolic activity robust to food choice. The presented in vivo flux quantification methods are broadly applicable to different physiological and disease states.

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