Using total body PET to elucidate whole-body metabolism in the tissue-specific level

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Introduction: Perturbations of energy homeostasis (such as obesity and cachexia) are global public health issues worldwide as they affect the health and quality of life of the population. Understanding the pathophysiology of this systemic diseases is of critical importance for the development of future therapeutic interventions to improve clinical outcomes. The multi-organ nature of the pathophysiology of obesity and cachexia presents a unique challenge. Total body positron emission tomography (PET) imaging provides an important tool to understand multi-organ metabolic function in the whole-body level with tissue-specific resolution and to study organ crosstalk.

Planned Collaboration: To this end, faculty from the UC Davis Departments of Radiology and Nutrition have agreed to develop, test, and apply total body PET imaging in conjunction with ^{18}F-fluorodeoxyglucose (^{18}F-FDG) administration to assess glucose kinetics in the whole-body level with tissue-specific resolution in participants with metabolically unhealthy obesity, patients with cancer cachexia, and healthy individuals. The steps involved in establishing the final workflow are the following: i) 60-min dynamic PET after intravenous ^{18}F-FDG administration followed by a low-dose computed tomography (CT); ii) automated organ segmentation using existing software applications, iii) parametric analysis of the PET imaging data and calculation of kinetic parameters in each tissue, and iv) network analysis to elucidate organ crosstalk.

Impact: Developing and establishing the methods needed for the visualization and quantification of whole-body metabolic function with tissue-specific resolution using total body PET will provide essential information to better understand disease physiology and potentially develop diagnostic and therapeutic modalities.