

# Investigate optical redox ratio and macrophage infiltration of adipose tissue in high fat diet induced diabetic mice

**Lun-Zhang Guo<sup>1</sup>, Tzung-Dau Wang<sup>2,4</sup>, Ying-Ping Wang<sup>2</sup>, Yi-You Huan<sup>1</sup> and Tzu-Ming Liu<sup>3,4\*</sup>**

<sup>1</sup> *Institute of Biomedical Engineering, National Taiwan University, Taipei 10617, Taiwan*

<sup>2</sup> *Cardiovascular Center and Division of Cardiology, Department of Internal Medicine, National Taiwan University Hospital and College of Medicine, Taipei 10002, Taiwan.*

<sup>3</sup> *Institute of Translational Medicine, Faculty of Health Sciences, University of Macau, Macao SAR, China.*

<sup>4</sup> *Molecular Imaging Center, National Taiwan University, Taipei 10617, Taiwan*

\*Corresponding author: tmlu@umac.mo

**KEY WORDS:** Multi-photon (MP) fluorescence microscopy, Optical redox ratio (RR), Macrophage infiltration (MI), Adipose tissue (AT), Type 2 Diabetes mellitus (T2DM), LysM-eGFP mice

## ABSTRACT

Type 2 Diabetes mellitus (T2DM) has high correlation with obesity. There are growing evidences show that the macrophage infiltration (MI) of adipose tissue (AT) contribute to insulin resistance [1]. AT have been seen as a regulating center of energy metabolism and storage. Although our past work did not find significant variation of optical redox ratio (RR) in the patients with DM [2], in this article, we want to furthermore precisely investigate the evolution of RR and MI of AT in development of T2DM in mice. For studying MI, we employed LysM-eGFP mice in which monocytes, macrophages and neutrophils abundantly express GFP [3]. The mice were induced T2DM through high fat diet. The ATs biopsy were obtained from ear, leg, epididymis, pericardiac, abdomen and dorsum, then used multi-photon (MP) fluorescence microscope to obtain metabolic auto-fluorescence image (NADH, FAD) with macrophages (EGFP) and collagen (Second harmonic generation, SHG). RR were calculated through intensity ratio of NADH/FAD, while MI were counted by pixels. The preliminary result showed that the RR and MI both increase in T2DM mice.

## REFERENCE

- [1] Kohlgruber A, Lynch L. "Adipose Tissue Inflammation in the Pathogenesis of Type2 Diabetes". *Curr Diab Rep* 15(11):92, Nov 2015.
- [2] Lun-Zhang Guo, Tzung-Dau Wang, Jong-Wei Lin, and Tzu-Ming Liu "Investigate the variation in optical redox ratio of epicardial adipose tissue in patients with CAD through auto-fluorescence metabolic molecular image (Conference Presentation)", *SPIE* 9711, April 2016.
- [3] Osaka M, Ito S, Honda M, Inomata Y, Egashira K, Yoshida M. "Critical role of the C5a-activated neutrophils in high-fat diet-induced vascular inflammation". *Scientific Reports* 6:21391, Feb 2016.