

## Oral Communication Abstract

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### **Metabolic images using fluorescence lifetime imaging reveals metabolic alteration in proximal tubular epithelial cells in type 2 diabetes**

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**Objectives:** Although there is a massive metabolic alteration of the kidney in diabetes, it is difficult to detect and measure the single-cell nicotinamide adenine dinucleotide hydrogen (NADH), flavin adenine dinucleotide (FAD) production, and redox potential. In particular, proximal tubular epithelial cells (PTECs) are the most laborious and affected cells under high glucose environments. We investigated this study to evaluate quantitative PTECs-specific metabolic images in the diabetic kidney using fluorescence lifetime imaging (FLIM).

**Methods:** Kidney sections of 20 week-old db/db and db/m mice were used for FLIM. FLIM images are analyzed using the phasor approach. The FLIM image and phasor plot representing FLIM data in vector space were measured through Leica TCS SP8 SMD and LAS-X software. The NADH, FAD, and ATP levels in diabetic kidneys were measured using LC-MS analysis by Q-trap 5500.

**Results:** NADH and FAD located at the different subcellular levels in PTECs. The NADH phasor analysis of PTECs revealed a right-ward shift toward shorter lifetimes from the db/m to the db/db, while there was no significant alteration of FAD between the two groups. It could be indicative of an increase in the NADH-to-FAD ratio that alters metabolic flux. In addition, the levels of NADH in diabetic kidneys were significantly increased than db/m, while the levels of FAD were reduced in diabetic kidneys. Finally, ATP level decreased in the diabetic kidney compared to db/m.

**Conclusions:** NADH and FAD FLIM in PTECs is an optimal approach to characterize and monitor metabolism in diabetic kidneys. Quantitative metabolic imaging using FLIM enables to measure and analyze metabolic alteration with spatial information.

Figure 1. db/m and db/db images of One-photon fluorescence, FLIM mapping and Phasor plot

