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New insights into the role of mitochondrial dysfunction in diabetic nephropathy

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The primary interest of our research group is to delineate the molecular mechanisms through which diabetic nephropathy progresses, and to identify and characterize novel molecular targets that could potentially prevent progression of diabetic kidney disease. We utilize animal models of diabetes to accomplish these ambitious goals. Along these lines, we aim to examine the novel regulatory factors that lead to the development and/or progression of diabetic nephropathy. We are currently testing two broad objectives. The first is to gain insight into the pathobiology of mitochondria in the kidneys. In particular, we want to understand the biological functions of mitochondrial dynamics and how disrupting the functions of mitochondria contribute to the pathogenesis of diabetic kidney disease. Our group discovered that mitochondrial dynamics is a major molecular mechanism implicated in glucose-mediated microvascular organ damage (Wang W et al. Cell Met. 2012,15:186-200). This has created a paradigm shift in the field. The second is to understand the regulatory effects of microRNAs in microvascular complications of diabetes. Our laboratory has been on the forefront of identifying multiple miRNAs and their downstream effectors in the kidney. We have recently published novel observations on the potential effects of miRNAs in diabetic nephropathy (Badal SS et al. Nat Commun 2016, 28:12076, and Long J. et al. J Clin Invest 2016, 126:4205). These collective efforts have significantly accelerated the process of assessing the role of miRNAs in the pathobiology of diabetic nephropathy. Collectively, our research paradigm uses a combined approach of molecular genetics, genomics and epigenomics to understand the underlying pathological and molecular basis of diabetic nephropathy.