A growing body of research is investigating the potential contribution of mitochondrial function to the etiology of type 2 diabetes. Numerous in vitro, in situ, and in vivo methodologies are available to examine various aspects of mitochondrial function, each requiring an understanding of their principles, advantages, and limitations. This review provides investigators with a critical overview of the strengths, limitations and critical experimental parameters to consider when selecting and conducting studies on mitochondrial function. In vitro (isolated mitochondria) and in situ (permeabilized cells/tissue) approaches provide direct access to the mitochondria, allowing for study of mitochondrial bioenergetics\ and redox function under defined substrate conditions. Several experimental parameters must be tightly controlled, including assay media, temperature, oxygen concentration, and in the case of permeabilized skeletal muscle, the contractile state of the fibers. Recently developed technology now offers the opportunity to measure oxygen consumption in intact cultured cells. Magnetic resonance spectroscopy provides the most direct way of assessing mitochondrial function in vivo with interpretations based on specific modeling approaches. The continuing rapid evolution of these technologies offers new and exciting opportunities for deciphering the potential role of mitochondrial function in the etiology and treatment of diabetes.

Reference: Perry CG, Kane DA, Lanza IR, Neufer PD.Methods for assessing mitochondrial function in diabetes. Diabetes. 2013 Apr;62(4):1041-53. doi: 10.2337/db12-1219.

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