The goal of our laboratory work is to understand the role of mitochondrial ion channels, including channels formed by members of the Bcl-2 family, in the regulation of apoptosis and metabolic control of neurons and other cells. We use a variety of techniques to investigate the function of mitochondria. One of these is a technique I developed for recording the activity of mitochondrial ion channels in intact neurons and synapses. We have recently studied the role of a leak channel within the ATP synthase in the regulation of cellular metabolism and cell death. We find that in neurons, regulation of mitochondrial ion channels including the ATP synthase leak channel, is important for the development of enhanced metabolism required for learning and memory formation. Regulation of mitochondrial ion channels also protects presynaptic integrity and may be key for prevention of neurodegenerative disease states such as ALS and Parkinson’s Disease but also may play an important role in acute neurological diseases such as stroke.

References