ATP-sensitive potassium (K\textsubscript{ATP}) channels are metabolic sensors that couple the metabolic state of the cell to the electrical activity of the plasma membrane. They play important roles in many tissues, including neurones, muscle and endocrine cells, and in pancreatic beta-cells they are involved in insulin secretion. Gain-of-function mutations in the genes encoding both the pore-forming Kir6.2 (\textit{KCNJ11}) and regulatory SUR1 (\textit{ABCC8}) subunits cause neonatal diabetes (ND). Some mutations additionally cause motor and mental developmental delay, epilepsy, muscle weakness and neonatal diabetes (DEND syndrome). All mutations impair the ability of metabolism to close the channel, either by reducing the inhibitory effect of ATP (at Kir6.2) or by enhancing the stimulatory effects of Mg-nucleotides (at SUR1). In most patients, sulphonylurea drugs (which close K\textsubscript{ATP} channels) can treat the diabetes, and in some individuals the neurological symptoms are also partially alleviated.

This lecture will show how knowledge of K\textsubscript{ATP} function has led to new therapy for neonatal diabetes patients and how identification of ND mutations has illuminated our understanding of channel function. It will discuss how nucleotides modulate K\textsubscript{ATP} channel activity, how ND mutations alter K\textsubscript{ATP} channel function, how alterations in channel activity cause the diabetes and the neurological problems, and the effects of sulphonylurea therapy. The extent to which mouse models of ND recapitulate the human phenotype will also be considered.