TYPE 2 DIABETES

Understanding type 2 diabetes
Type 2 diabetes is a disorder of the metabolism. People with the disorder are not able to convert the sugar in their blood into energy. This is because they do not produce enough insulin, which results in excess glucose in their blood, combined with a condition known as ‘insulin resistance’ where muscles become resistant to the effects of insulin. The majority of diabetics nationwide suffer from type 2 diabetes, with more than half a million Australians estimated to be suffering from the disorder.

Type 2 diabetes results from a combination of genetic and environmental factors. Although there is a strong genetic predisposition towards the disease, risk is greatly increased when associated with factors such as high blood pressure, excess weight or obesity, insufficient physical activity and poor diet.

The number one risk factor for type 2 diabetes is obesity. Overcoming obesity and type 2 diabetes is difficult because the natural control mechanisms that maintain the body’s energy balance are impaired. For these people, new treatments need to be developed.

The role of AMPK
The body’s ancient energy-sensing pathway is controlled by an enzyme called AMP-activated protein kinase (AMPK). Simply put, AMPK passes a “make more energy” message to the cell when needed. By doing so, it regulates the burning and storage of fats and sugars, and affects the level of sugars and cholesterol in the blood stream.

Big pharma saw the potential of the enzyme early on and has spent the last 10 years investigating it in search of the pharmaceutical Holy Grail – a drug to activate the AMPK pathway, the so-called 'fat pill'. Drugs that activate AMPK have been touted as a panacea against type 2 diabetes, cardiovascular disease, cancer and neurodegeneration, including Alzheimer’s disease.

Bruce admits that his initial work on AMPK was a curiosity-driven side project, part of the bigger picture of trying to understand how a certain family of enzymes, called kinases, work.

“Following its purification and sequencing it became apparent that AMPK formed the crux of metabolic control at the whole animal level through appetite regulation, as well as at the cellular level.”

Since that time, work in Bruce’s lab has focused on three major questions:
• how AMPK is regulated
• how the structure of the enzyme influences its function
• the physiological effects of the enzyme at a whole body level.

Type 2 diabetes research at SVI
Professor Bruce Kemp, head of SVI’s Protein Chemistry & Metabolism Unit, and the first to purify the protein, is loathe to buy into the hyperbole. “While development of a drug to activate the AMPK pathway may lead to a wonderful vista of metabolic control, there is still a huge amount we don’t know about the enzyme and its mechanisms.”

Bruce is most excited about the prospect of using AMPK drugs intermittently to improve metabolic control and enhance exercise capacity.
Type 2 diabetes in Australia
(statistics from Diabetes Australia)

- 280 Australians develop diabetes every day.
- Over 100,000 Australians have developed diabetes in the past year.
- Diabetes is the fastest growing chronic condition in Australia
- For every person diagnosed with diabetes there is usually a family member or carer who also ‘lives with diabetes’ every day in a support role. This means that an estimated 2.2 million Australians are affected by diabetes every day.
- The total number of Australians with diabetes and pre-diabetes is estimated at 3.2 million
- Indigenous Australians are 3 times more likely to have type 2 diabetes compared with non-Indigenous Australians
- At least 2 million Australians have pre-diabetes and are at high risk of developing type 2 diabetes.
- Up to 58% of cases of type 2 diabetes can be prevented in the high risk (pre-diabetes) category.