

# Research findings

*Exploring a new hybrid closed loop insulin delivery system designed to protect against hypoglycaemia*

## ▶ WHAT WAS THE AIM?

Artificial pancreas systems (known as 'closed loop systems') automatically adjust and administer insulin to maintain normal blood glucose levels. Hypoglycaemia is frequently experienced by people with type 1 diabetes and can be a barrier to exercising and result in a lot of anxiety. This study tested an artificial pancreas system in a controlled situation to determine if hypoglycaemia would occur if the system erroneously detected high blood glucose levels and during exercise.

## ▶ HOW DID WE DO IT?

Eight people with type 1 diabetes were observed for four days and three nights at our research facility. They were fitted with a hybrid artificial pancreas system, where basal insulin is controlled by the artificial pancreas but insulin bolusing for meals were administered through the pump as usual. On the first day, the participants relaxed at the facility and got used to the system. On the second day, we purposefully tricked the artificial pancreas' glucose sensor into believing blood glucose levels were 20% higher than they really were (simulating an occasion where glucose sensor is over-reading), forcing the artificial pancreas to deliver more insulin. On the third day, we maintained the erroneous reading while participants exercised on a stationary bike for 45 minutes. On the last day, we changed the sensor so it read blood glucose levels correctly before sending the participants home.

## ▶ WHAT DID WE FIND?

Despite tricking the artificial pancreas into thinking that the blood glucose was higher than it was, there was no overnight hypoglycaemia and no hypoglycaemia during exercise. There were some events of mild hypoglycaemia during the day but this was always following a dose of insulin and was only observed in those participants who had quite an aggressive carbohydrate ratio.

## ▶ WHAT DOES THIS MEAN IN PRACTICE?

These results suggest that artificial pancreas systems will be effective in preventing hypoglycaemia, especially overnight. Care will be needed when bolusing for food, making sure that the carbohydrate ratio is not too aggressive.

## ▶ WHAT'S NEXT?

We are ready to start outpatient trials using this hybrid closed loop system. Specifically, we are starting two trials at the end of 2016. Firstly, is a large multi-site study across Australia comparing the hybrid closed loop system to usual care (injections or standard pump therapy). We will be recruiting people aged 12 – 25 years of age for this study, and the study will run for six months. Secondly, we will also see if this system can help people who have impaired awareness of hypoglycaemia. For this study we will recruit people with type 1 diabetes aged 12 – 55 years of age who specifically struggle to feel their hypoglycaemia.