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October 24, 2016 | By Yadira Galindo

UC San Diego School of Medicine Researchers Receive $5 Million in Type 1 Diabetes Grants

In the United States, 1.25 million people live with type 1 diabetes, an autoimmune disease that destroys insulin-secreting beta cells of the pancreas. Past research has led to the development of treatments that make type 1 diabetes a chronic but manageable disorder.

Still, there are many unanswered questions about the mechanisms that contribute to the onset of type 1 diabetes. Researchers at University of California San Diego School of Medicine hope to answer some of them with two Type 1 Diabetes Special Statutory Funding Program grants from the National Institutes of Health totaling more than $5 million.

Two research teams are tackling the condition from different angles. Leading one effort are Maike Sander, MD, professor in the Department of Pediatrics and Cellular and Molecular Medicine, and Kelly Frazer, PhD, professor in the Department of Pediatrics, who have brought together investigators in human genome sciences, type 1 diabetes biology and human pluripotent stem cells (hPSC).

“We know there is a genetic component to type 1 diabetes,” said Sander, director of the Pediatric Diabetes Research Center. “Some people have bad genetics leading them to be more prone to develop this disease. The key is to study the human condition and human cells to understand type 1 diabetes from the genes up.”

Sander and colleagues were awarded $3.3 million to link type 1 diabetes to its genetic origins. Previous studies have identified heritable risk factors, but the complexity of the disease allows for many different genetic variants among people with diabetes. This research will focus on identifying where the genetic risks are expressed, what variants are associated with them and what cellular processes are regulated. To do this, the team proposes to combine the latest computational methods, high-throughput molecular assays and human pluripotent stem cells-based cell models.

“No one has done this before,” said Sander. “We want to identify new therapeutic targets for the prevention and treatment of type 1 diabetes by mapping out the mechanisms by which this disease begins. This is an approach that requires collaboration between researchers from multiple disciplines.”

Neal Devaraj, PhD, associate professor in the Department of Chemistry and Biochemistry, was awarded a $1.9 million innovator award to develop imaging methods to measure beta cell numbers in the pancreas. Molecular imaging tools are needed to monitor the progression of type 1 diabetes, the effectiveness of treatment and to track the viability of transplanted cells.

Developing a tool that can measure cells that compromise 1 to 2 percent of the pancreas has been challenging, said Devaraj. Using existing positron emission tomography (PET) technology, he plans to capitalize on enzymes to amplify signals that sensitize beta cells for improved imaging. Before the onset of disease, this information could inform physicians if a patient is at risk of developing type 1 diabetes.

“This is a new and exciting direction for our lab,” said Devaraj. “The development of methods that amplify PET signals could lead to valuable imaging tools for monitoring beta cell mass. It could have an enormous impact on the diagnosis, treatment and understanding of type 1 diabetes. Moreover, the same concept might enable us to image very small targets like tumors when they may be invisible by other means. This method has potential to be more broadly applied to other diseases.”

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