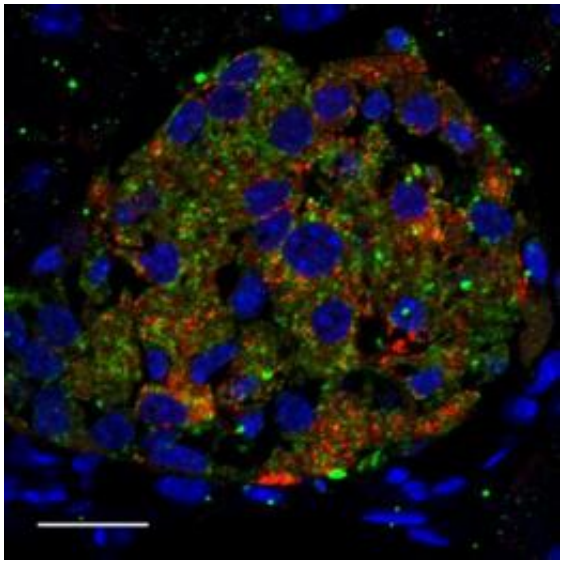
Tasting fructose with the pancreas

6 February 2012



These are taste receptors (green) in pancreatic insulin-producing beta cells (red). Cell nuclei are shown in blue. Credit: Tyrberg lab, Sanford-Burnham Medical Research Institute

Taste receptors on the tongue help us distinguish between safe food and food that's spoiled or toxic. But taste receptors are now being found in other organs, too. In a study published online the week of February 6 by the *Proceedings of the National Academy of Sciences*, researchers at Sanford-Burnham Medical Research Institute (Sanford-Burnham) discovered that beta cells in the pancreas use taste receptors to sense fructose, a type of sugar. According to the study, the beta cells respond to fructose by secreting insulin, a hormone that regulates the body's response to dietary sugar.

"Before this study, fructose's effect on insulin release was not appreciated. Fructose, and especially high-fructose corn syrup, is found in everything from sodas to cereals, but it remains to be seen whether dietary fructose is good or bad for beta cells and human metabolism," said Björn Tyrberg, Ph.D., adjunct assistant professor in the Diabetes and Obesity Research Center at Sanford-Burnham's Lake Nona campus in Orlando and senior author of the study.

After a meal, beta cells in the pancreas typically respond to the suddenly high levels of glucose, another type of sugar, in the blood by releasing insulin. Insulin then binds to receptors present on many cells in the body. Like a key unlocking a door, insulin binding allows glucose to enter the cell and be used for energy. But most meals are a mix of different types of sugar. This study shows that glucose is not the only sugar that triggers insulin secretion-fructose also plays a role.

Using human and mouse pancreatic cells, Tyrberg, along with postdoctoral researchers George Kyriazis, Ph.D. and Mangala Soundarapandian, Ph.D., found that fructose activates sweet taste receptors on beta cells. Together with glucose, fructose helps amplify insulin release. To substantiate this observation, the team took a look at cells genetically engineered to lack the taste receptor gene. Without the gene, fructose did not stimulate insulin release, underscoring the role beta cell taste receptors play in insulin signaling.

"These findings are interesting because we know that insulin affects blood glucose levels, indicating that these newly identified beta cell taste receptors might play a role in metabolic diseases such as obesity and diabetes," said Kyriazis, first author of the study. "We're now trying to understand how beta cell taste receptors are regulated and how their expression might differ between healthy and disease states. We're also now designing human studies to substantiate what we've found in mice."

Provided by Sanford-Burnham Medical Research Institute