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Scientists explain how insulin secreting cells maintain their glucose sensitivity

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Scientists at the leading Swedish medical university Karolinska Institutet have now disclosed the mystery how the insulin-secreting cells maintain an appropriate number of ATP sensing ion channel proteins on their surface. This mechanism, which is described in the latest number of Cell Metabolism, explains how the human body can keep the blood glucose concentration within the normal range and thereby avoid the development of diabetes.

Blood sugar absorbed from food has to timely enter muscles as energy supply as well as the liver and fat tissue for energy storage. Otherwise, diabetes occurs. Such glucose transport is precisely controlled by insulin, the body's only hormone capable of lowering blood sugar. This hormone is released from insulin-secreting cells in the pancreas.

The ion channel proteins that are regulated by ATP and that transport potassium ions (KATP channels) are situated on the surface of the insulin-secreting cells to sense blood sugar and control sugar-stimulated insulin secretion. However, it has been a long-standing mystery how the insulin-secreting cells keep an appropriate number of KATP channels on their surface. Scientists at the the Rolf Luft Research Center for Diabetes and Endocrinology, Karolinska Institutet, have now disclosed a new traffic route whereby sugar promotes the insulin secretion controller KATP channel to march to its post.

Dogmatically, only two routes were believed to operate in insulin-secreting cells to deliver the macromolecules newly manufactured or

modified inside cells to the cell surface where they

release or reside to function. One is referred to as a regulated insulin secretory pathway. The other is termed a constitutive pathway to renew cell surface lipids and proteins including KATP channels.

“We have now found that the newly manufactured KATP channels in insulin-secreting cells reside in a non-insulin-containing structure, which contains the regulated secretory granule marker chromogranin,” says Per-Olof Berggren. “Such a structure moves to the cell surface subsequent to elevation of sugar concentration in a Ca2+- and protein kinase A-dependent fashion.”

According to Professor Berggren the discovery is very important. This entirely new traffic route endows insulin-secreting cells with an efficient way to maintain an appropriate number of KATP channels on their surface and thereby being able to adequately keep the blood glucose concentration within the normal range thus avoiding the development of diabetes.

Source: Karolinska Institutet