MedicalXpress

Insulin-secreting cells report on insulin resistance

February 22 2016

Diabetes researchers at Sweden's Karolinska Institutet have developed a novel technique that makes it possible to monitor insulin resistance in a non-invasive manner over time in mice. The new method, presented in the journal *Scientific Reports*, can be used to assess insulin resistance during progression and intervention of metabolic diseases.

Insulin resistance is a key contributing factor to a variety of metabolic diseases, including cardio-vascular disease, the metabolic syndrome and diabetes type 2. A major challenge in the field of insulin resistance is to be able to monitor this process dynamically in individual cell types of insulin target tissues, such as fat, liver, brain, kidney or pancreatic islets in the living organism.

The researchers behind the new study have previously shown that the insulin-secreting beta-cell, situated in the pancreatic islet of Langerhans, not only produces the hormone insulin but is also a target for insulin signaling. Consequently, beta-cell insulin resistance can contribute to the development and progression of type 2 diabetes.

"The problem is that the islets are embedded in the pancreas and therefore not accessible for direct monitoring", says lead author Meike Paschen, doctoral student at the Rolf Luft Research Center for Diabetes and Endocrinology, Department of Molecular Medicine and Surgery at Karolinska Institutet. "However, by equipping beta-cells with a fluorescent biosensor that reports on insulin resistance and transplanting these reporter islets into the anterior chamber of the eyes of mice, we are

now able to study beta-cell insulin sensitivity over months in the living mouse."

This novel technique utilizes the cornea as a natural body-window to allow the investigators to non-invasively monitor insulin resistance in islet of Langerhans transplanted to the anterior chamber of the eye. The biosensor expressed by the engrafted islets makes it possible for the researchers to differentiate insulin-resistant cells from those that have a normal response to insulin. The biosensor signal is measured non-invasively by fluorescence microscopy at single-cell resolution in the living animal.

"This technique allows monitoring of cell type specific insulin sensitivity or resistance in real-time in the context of whole body insulin resistance during progression and intervention of disease", says Professor Per-Olof Berggren, who led the current study together with Associate Professor Ingo Leibiger at the Rolf Luft Research Center for Diabetes and Endocrinology.

More information: Meike Paschen et al. Non-invasive cell type selective in vivo monitoring of insulin resistance dynamics, *Scientific Reports* (2016). DOI: 10.1038/srep21448

Provided by Karolinska Institutet