Diabetes

Heather Lee Williams

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What is diabetes? Diabetes contains a group of diseases relating to sugar in the blood of an individual. The most common types of diabetes is type one diabetes, type two diabetes, gestational diabetes, and pre- diabetes. Both type one and two diabetes are chronic conditions. Type one diabetics are insulin dependent; their pancreas does not produce or produces a small amount of insulin. Type two diabetics are insulin resistant; the body processes blood glucose differently when the cells in your muscles, fat, and liver ignores the insulin hormone signal and the body doesn’t respond properly.

The pancreas has cells that release insulin and glucagon into the body to help regulate blood glucose levels. Beta cells are a huge component to diabetes. These are unique cells within the pancreas that help produce, store, and ultimately release the insulin hormone into the blood stream (Woodfield, 2019). When blood glucose levels rise, beta cells in the pancreas secrete stored insulin while also producing more of the hormone.

In type one diabetics, the beta cell dies after an attack on the body’s immune system. In type two diabetics, the body becomes resistant to its own insulin and tries to produce a higher amount of insulin circulating in the body. Farack et. all’s article focuses on pancreatic beta cells being heterogeneous. They had developed an optimal protocol for single-molecule transcription imaging within a pancreas and used it to find extreme beta cells. These extreme beta cells have and increase in mRNA levels of insulin (Farack et. all, 2019). The initial figure shown within the article had an extreme beta cell with higher levels of insulin mRNA, ribosomes, and proinsulin than a non-extreme beta cell. The Non-extreme beta cell did have higher levels of insulin proteins versus the extreme beta cell. The extreme beta cells were seen as basal secretors due to the lower insulin protein levels and suggested as a sub-specialization in basal insulin secretion.

Figure one of *Transcriptional Heterogeneity of Beta Cells in the Intact Pancreas* depicts the SmFish within an intact pancreas revealing heterogeneity in the mRNA content of insulin. The pancreatic tissue has hybridized with smFISH probes for Actb mRNA (depicted by red dots) and Acly mRNA (depicted by green dots) with the DAPI-blue-stained nuclei. There were dashed white marks to show the border between an islet and exocrine tissue. They had defined extreme beta cells as “cells for which insulin expression exceeded 2-fold the median expression within the containing islet (n = 1,074 cells; 27 islets; 6 mice; all scale bars; 10 μm) ( Farack et. all, 2018).

The results stated that single-molecule fluorescence in Situ hybridization in the intact pancreas reveals transcriptional heterogeneity of insulin, extreme beta cells have significantly higher expression levels of genes related to insulin processing and secretion, and extreme cells have higher levels of ribosomal components and proinsulin but lower levels of mature insulin protein (Farack et. all, 2019). They found that the islets in db/db mice were much larger and exhibited a significant increase in the proportion of extreme cells.

The research from the article has a relation to what we had learned in our cell biology course this semester. The article will also help us better understand diabetes more and the relationship of the beta cell. The first course objective was to be able to understand and be able to describe basic cell metabolism. The second was to have students to develop an understanding of how genetic information is regulated and used by cells. The third was to learn how cells sense and respond to their environments and interact with other cells (C. Steele, Cell Biology, 2019). The beta cell helps regulate blood glucose metabolism, the article helped explain how they regulate glucose levels, and I had learned how beta cells respond to glucose levels in order to release insulin into the blood stream.

References

Farack, Lydia, et al. (2018). “Transcriptional Heterogeneity of Beta Cells in the Intact Pancreas.” *Developmental Cell*. doi:10.1016/j.devcel.2018.11.001.

Woodfield, Jack. (2019) “Beta Cells.” *Beta Cells - What They Do, Role in Insulin*.

 www.diabetes.co.uk/body/beta-cells.html.