

### Transcript Details

This is a transcript of an educational program. Details about the program and additional media formats for the program are accessible by visiting: <https://reachmd.com/programs/diabetes-discourse/beta-cell-dysfunction-immune-activity-early-t1d/67278/>

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## Investigating Beta Cell Dysfunction and Immune Activity in Early T1D

### Announcer:

This is *Diabetes Discourse* on ReachMD. On this episode, Dr. Edward Phelps will discuss his research focusing on beta cell dysfunction in type 1 diabetes, which he spoke about at the 2026 European Association for the Study of Diabetes Annual Meeting. Dr. Phelps is an Associate Professor in the J. Crayton Pruitt Family Department of Biomedical Engineering at the University of Florida. Let's hear from him now.

### Dr. Phelps:

When beta cells sense glucose, they take that glucose up, they start metabolizing it, and they make ATP. The ATP will basically become translated into an increase in calcium in the cell, which leads to insulin secretion. So we're able to visually see that calcium go up with fluorescence from the use of a dye that gets brighter in the presence of calcium. So if you take beta cells from a donor without diabetes and you stimulate them with glucose, the calcium levels increase. And at the same time, you can actually measure the insulin being secreted in relation to that.

Now, in the case of type 1 diabetes, we were actually looking at donors fairly close to diagnosis—within four years. We found there are still remaining beta cells, which we were able to identify in the tissue with a cell surface marker, and we could see them in the living slices. When we stimulate them with glucose, there were very anemic calcium responses that were very weak relative to the controls. So that meant that they basically weren't sensing the glucose well, and they weren't responding to it well like a normal beta cell would.

One of the things that we were able to do is add in an antibody that had a fluorescent tag on it for CD3, which is a T-cell marker, and observe the locations of T cells in the tissue. Of course, insulinitis is the presence of several immune cells that are in and around an islet, which means there's essentially an active immune response against that particular islet. And one of the things we know about human type 1 diabetes is that insulinitis is fairly heterogeneous if you look from one islet to the next or one part of the pancreas to the next. And so it progresses, like this islet over here gets infiltrated with immune cells, and then this one next door to it has way fewer or even no immune cells in it.

So it would make sense to assume that the presence of those immune cells would be causing that dysfunction we were talking about on a local scale. And we found that all the islets were dysfunctional, not just the ones that had a heavy load of T cells. But everywhere we looked, any residual beta cells, whether there were T cells there or not, weren't responding well to glucose.

At face value, the results suggest that the local presence of T cells is not required for beta cells to stop functioning correctly. You may have a combination close to diagnosis where there's still a remaining beta cell mass and those beta cells are not yet being attacked, but they don't really respond to glucose or secrete insulin.

Now, we don't know why that's the case. We don't know what's causing that. Maybe it's the presence of the immune cells, but the proximity doesn't have to be so close in space that they're actually infiltrating that particular islet to cause the dysfunction. It causes more of a global pancreas-wide dysfunction once you start to have an autoimmune attack inside the organ. And we have other hypotheses as well as to what's going on.

### Announcer:

That was Dr. Edward Phelps sharing his research on beta cell dysfunction in type 1 diabetes. To access this and other episodes in this series, visit *Diabetes Discourse* on ReachMD.com, where you can Be Part of the Knowledge. Thanks for listening!