The Effects of Cell-Cell Crosstalk on Glucose Stimulated Insulin Secretion

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Currently, there is no cure for Type 1 Diabetes; however, a potential lead in the field of Juvenile Diabetes research is the Bio-Artificial Pancreas. This system essentially encapsulates mature beta cells, which are transplanted subcutaneously in order to carry out its primary functions, both secreting a hormone called insulin and increasing glucose responsiveness. This process would revive and emulate the normal functioning of the pancreas. Presently, most Type 1 research is conducted using two dimensional planar conditions, to culture these beta cells. While it has been proven to be successful for the cells' functions, the 2D or adherent cells are unable to function at length. Three dimensional culture has not been thoroughly investigated; however, this culture condition might provide information into the mechanistic insight and longevity of the system. For experimentation, the cells were cultured and prepared to form both 2D and 3D aggregate cell lines. They were exposed to glucose conditions (high versus low) in order to analyze cell function through a plate reader. The plate reader demonstrated that the 3D cells had a greater stimulation index, the effectiveness of how well the signaling and interactions were between the distinct substances. This means the 3D cells had more cell-cell junctions and crosstalk interactions, which enabled them to secrete more insulin and have better glucose responsiveness.

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