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Title: Modelling the Electrical Activity of Pancreatic Beta Cells

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Abstract: The aim of this thesis project was to study the evolution of single cell mathematical models of the electrical activity of pancreatic beta cells, find a candidate model that best matched experimental data present in the existing literature, and to use it to model gap-junction coupled beta cells present in pancreatic islets. This study found that the Dual Oscillator Model is currently the best model for the electrical activity of a single beta cell. It was found that the behaviour of a 1D ring of cells with nearest neighbour coupling depends upon the number of cells in the ring, the percentage composition of each of the cell types and the coupling strength (gc) between neighbouring cells. Also, when multiple cells are coupled, synchronization of the burst goes from 180° anti phase (low gc) to out of phase (intermediate gc) to in phase (high gc).


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