

SYNCHRONIZATION OF ISLETS OF LANGERHANS BY GLUCOSE WAVES.

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Oscillatory blood insulin levels induce more effective glucose uptake compared to stable insulin levels. Diabetics have perturbed in vivo insulin oscillations potentially hindering the ability to lower blood glucose levels. One mechanism of how the numerous islets within a pancreas become synchronized is via oscillatory glucose levels acting to synchronize the population.

A microfluidic system was developed to test this mechanism by producing waveforms of glucose and delivering to populations of islets. Glucose oscillations entrained single islets, and synchronized populations of islets, lending evidence towards this mechanism. This talk will center on development and characterization of the microfluidic system and the challenges associated with delivering temporal waveforms to cell chambers. The results of an optimized system capable of synchronizing groups of islets will also be presented. The system should be applicable to a wide range of cell types to aid in understanding cellular responses to temporally changing stimuli.