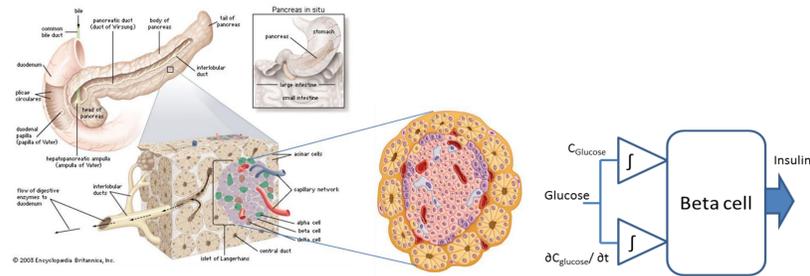# Model of Pancreatic Islet Insulin Secretion in Response to Oxygen and Glucose Consumption in a Microfluidic Chip

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INTRODUCTION AND METHODOLOGY
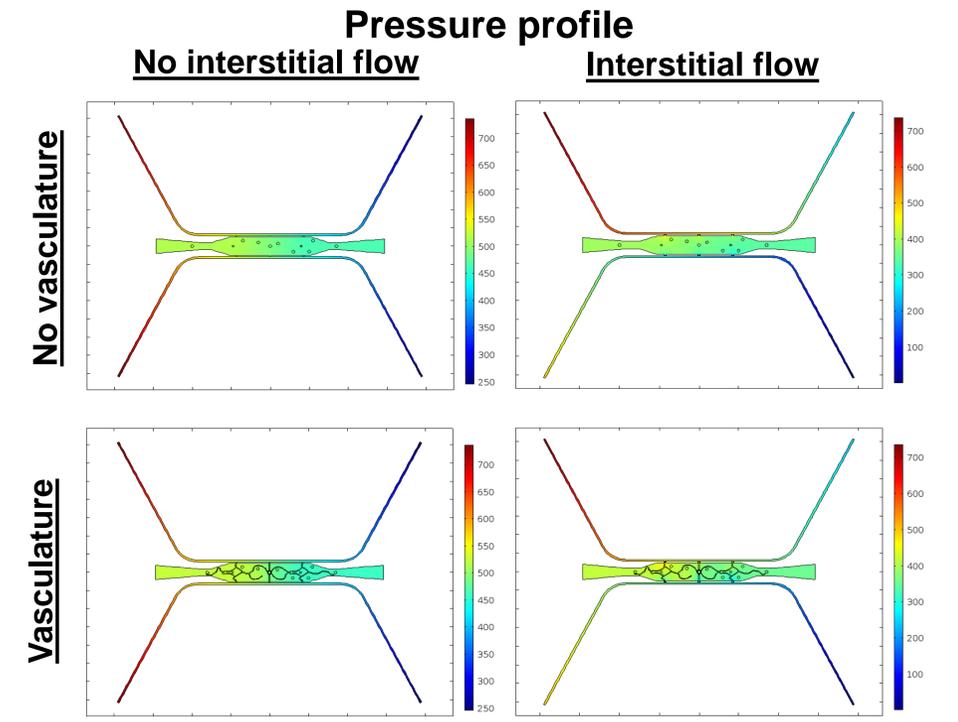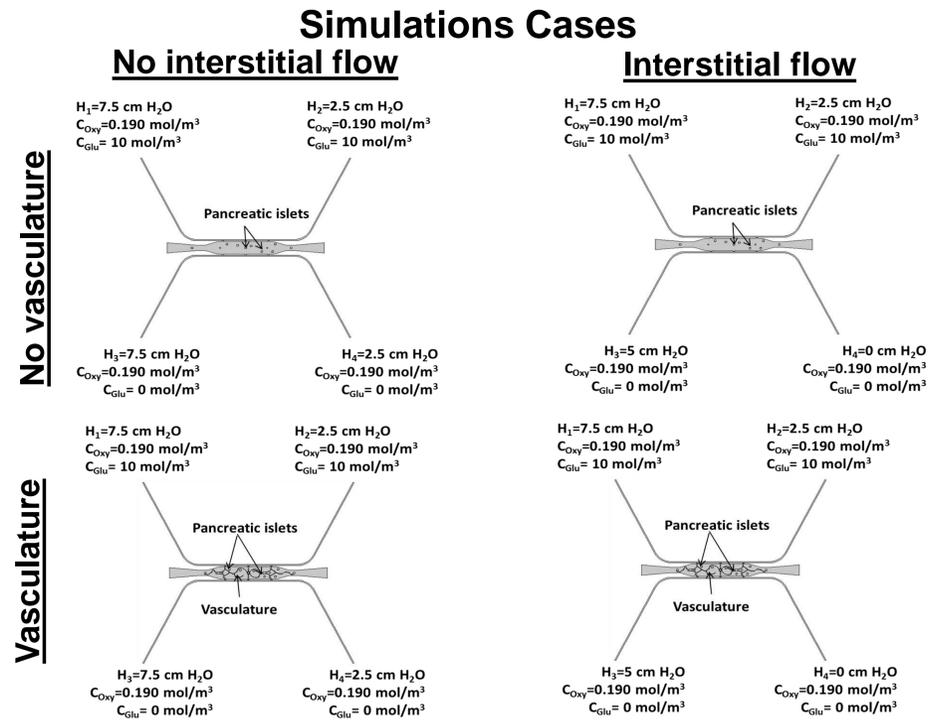
Anatomy of pancreatic islet

- Oxygen and glucose consumption by pancreatic islets is modeled after the Michaelis Menten equation

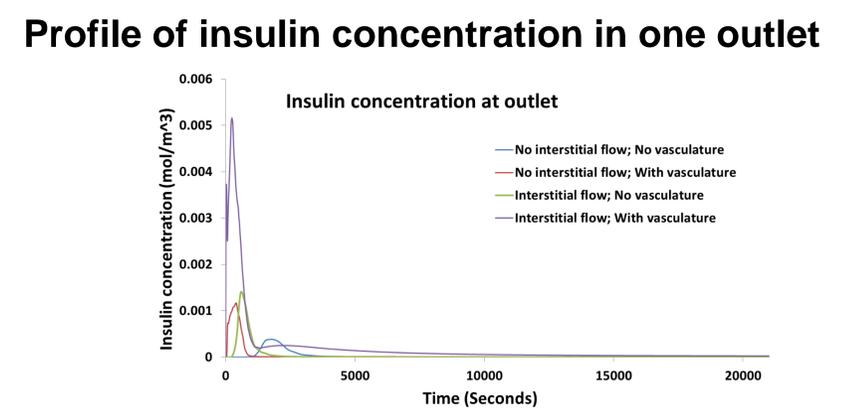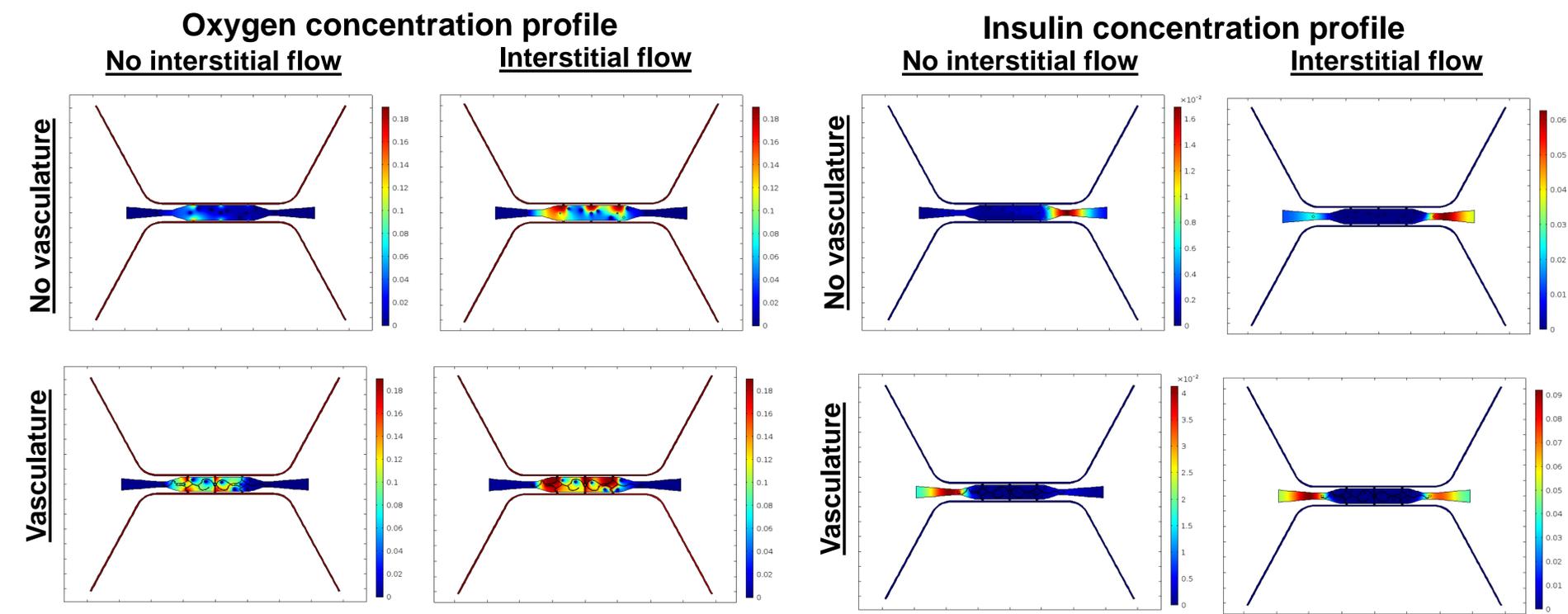- Insulin is secreted by beta cells as a function of glucose consumption and oxygen tension

$$C_{ins} = V_{m,ins,2} \frac{c_{glu}^{n\_ins\_2}}{c_{glu}^{n\_ins\_2}+K_{m\_ins\_2}^{n\_ins\_2}} + V_{m,ins,1} \frac{(\frac{\partial C\_glu}{\partial t})^{\wedge n\_ins\_1}}{(\frac{\partial C\_glu}{\partial t})^{\wedge n\_ins\_1}+K_{m\_ins\_1}^{n\_ins\_1}}$$

* Buchwald Theoretical Biology and Medical Modelling 2011, 8:20

Simulations Cases

RESULTS

Pressure profile

RESULTS

Oxygen concentration profile

Insulin concentration profile

Profile of insulin concentration in one outlet

Insulin concentration at outlet
- No interstitial flow; No vasculature
- No interstitial flow; With vasculature
- Interstitial flow; No vasculature
- Interstitial flow; With vasculature

CONCLUSIONS

Model of a pancreatic islet insulin secretion in response to oxygen and glucose

ACKNOWLEDGMEMENTS