THE UNIVERSITY OF ALABAMA IN HUNTSVILLE
MATHEMATICAL SCIENCES COLLOQUIUM

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A Dynamic Model of Glucose, Insulin, and Free Fatty Acids Following Bariatric Surgery with Time Delay

Date: Friday, October 19, 2018

Time: 3:45 p.m. – 4:45 p.m.

Place: Shelby Center 218

The role of free fatty acids (FFA) on the progression of type 2 diabetes (T2D) has been widely studied. Prior studies suggest that individuals with shared familial genetic predispositions to metabolic-related diseases may be vulnerable to dysfunctional regulation of plasma FFA. A vicious cycle arises when FFA is not regulated properly leading to the development of insulin resistance, a key indicator for T2D as prolonged insulin resistance results in hyperglycemia. We propose a hypothesis-driven model to theoretically evaluate the role of FFA on the progression of insulin resistance. The nonlinear dynamics among glucose, insulin, and FFA are numerically evaluated using delay differential equations, and compared to well-known minimal model consisting of ordinary differential equations. Model validation and parameter estimation utilizing clinical data of patients who underwent bariatric surgery, serve as the quantitative measures used to evaluate the regulation of lipolysis by insulin action within a metabolically heterogeneous population (nondiabetic to diabetic). Results show that key metabolic factors for insulin, glucose, and FFA regulation improve post-bariatric surgery, results that match prior clinical studies of bariatric surgery. In conclusion, the insulin action is essential for regulating plasma FFA and glucose levels; and thus, may have a key role in preventing the manifestation of metabolic-related diseases.

Refreshments will be served at 3:15 p.m. in SST 201 suite landing.