1039-92-138 **Jiaxu Li*** (jiaxu.li@louisville.edu), Department of Mathematics, University of Louisville, Louisville, KY 40292, **Yang Kuang** (kuang@asu.edu), Department of Mathematics and Statistics, Arizona State University, Tempe, AZ 85281-1804, and **Clint C. Mason** (masonclint@niddk.nih.gov), NIH/NIDDK, Phoenix, AZ. *Modeling Glucose-Insulin Regulatory System with Two-Time Delays.*

In the glucose-insulin regulatory system, ultradian insulin secretory oscillations are observed to have a period of 50-150 minutes. Several mathematical models have been proposed during the last decade to model these ultradian oscillations as well as the metabolic system producing them. These models still lack some of the key physiological aspects of the glucose-insulin system. Applying the mass conservation law, we introduce two explicit time delays and propose a more robust alternative model for better understanding the glucose-insulin endocrine metabolic regulatory system and the ultradian insulin secretory oscillations. With explicit delays, the model is more realistic in physiology, more accurate in mathematics, and more robust in potential applications. We study this model analytically and perform carefully designed numerical simulations by allowing one or two parameters to vary. Our analytical and numerical results confirm most current existing physiological observations and reveal more insightful information, for example, to ensure the sustained oscillation: both the time lag for insulin secretion stimulated by glucose and the newly synthesized insulin becoming 'remote insulin', and the delayed effect of hepatic glucose production are critical. (Received March 10, 2008)