

**Meeting:** 1003, Atlanta, Georgia, SS 18A, AMS-SIAM Special Session on Recent Advances in Mathematical Ecology, I

1003-92-1572      **Jiaxu Li\*** (jiaxu.li@asu.edu), Dept. of Mathematics and Statistics, Arizona State University, Tempe, AZ 85287-1804, and **Yang Kuang** (kuang@asu.edu), Department of Mathematics and Statistics, Arizona State University, Tempe, AZ 85287-1804. *Modelling the Ultradian Oscillations of Insulin Secretion with Two Time Delays*. Preliminary report.

Numerous in-vivo and in-vitro experiments have shown that insulin secretion oscillates in two time scales: rapid oscillation with a period of 5-15 min and ultradian oscillation with a period in 50-140 min. Many math models have been developed to understand the mechanisms of insulin secretion and oscillations. In order to better understand the ultradian oscillations and the glucose-insulin endocrine regulatory system, a DDE model with two time delays is proposed. One delay reflects the glucose stimulation to the insulin secretion and the other the hepatic glucose production delay. Our major analytic and numerical results show that 1) when the glucose stimulation delay is within 5.3 min and 6 min, only moderate glucose infusion rate can cause insulin secretion ultradian oscillation; 2) if the glucose infusion rate is large, e.g., 2.16 mg/dl/min, the oscillation disappears even the glucose stimulation delay is in reasonable range from 4.5 min to 15 min. This confirms that the hepatic production is ignorable in IVGTT; and 3) the oscillation period is in the range from 95 min to 140 min and, the larger the glucose stimulation delay, the larger the period significantly; the larger the glucose infusion rate, the smaller the period insignificantly. (Received October 05, 2004)