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Jiaxu Li* (jiaxu.li@louisville.edu), Department of Mathematics, University of Louisville, Louisville, KY 40292. *Modeling impulsive subcutaneous insulin delivery with time delay and a frame work for artificial pancreas.*

An artificial pancreas is an integrated system consisting of an insulin pump (IP), a glucose monitoring system (GMS), and CLC algorithms, which mimics the physiological dynamical behaviors among glucose and insulin in an automated fashion. Although substantial progress in developing model-based CLC algorithms has been made over the past decade, effective approach is still lacking in handling the delayed effects in the insulin delivery mechanisms, GMS and the hepatic glucose production (HGP). We model the delayed effects explicitly in the metabolic feedback loop by delay differential equations with impulsive inputs. Analytically we show the existence of a periodic solution. Numerically we demonstrate the effectiveness of the control using our models. We expect that ideal tight control of blood sugar can be achieved by applying algorithms based on our models and integrated with IP and GMS. (Received February 03, 2015)