Appendix 2 (as supplied by the authors): Algorithm and Meal Description.

Algorithm Description

The dosing algorithm was based on a fuzzy-supervised model-based predictive technique combined with extended Kalman filtering and a set of heuristic rules (Guylaine, McGill University, Canada). The algorithm was initialized using body weight, daily insulin requirements and insulin-to-carbohydrate ratios. The dosing algorithm utilized a physiologically-motivated compartmental parametric model that consists of six submodels: insulin absorption kinetics (2 compartments), insulin action (1 compartment), glucagon absorption kinetics (2 compartments), meal absorption kinetics (2 compartments), plasma glucose kinetics (2 compartments) and interstitial glucose kinetics (1 compartment). The supervisory layer (based on fuzzy-logic) determined in real-time the reference glucose trajectory (parametric time-varying function), the aggressiveness of the controller and the prediction and control horizons (2 to 4.5 hours) based on the estimated glucose levels, mismatch between the model and real data, the time elapsed since last meal and the recent history of glucagon delivery. The supervisory layer recommended glucagon delivery based on heuristic logical rules that employed estimates of plasma glucose concentrations and their trends as provided by the Kalman filter. Glucagon delivery was accompanied by suspension of insulin delivery, and reduced aggressiveness of insulin dosing. Prandial boluses were determined by fuzzy-logic. Prandial boluses were always 70-100% of the carbohydrate content multiplied by the individualized insulin-to-carbohydrate (g CHO per insulin unit) ratio. Estimates of pre-meal glucose level and its trend determined the exact amount of prandial bolus.

Appendix to: Haidar A, Legault L, Dallaire M, et al. Glucose-responsive insulin and glucagon delivery (dual-hormone artificial pancreas) in adults with type 1 diabetes: a randomized crossover controlled trial. *CMAJ* 2013; DOI:10.1503/cmaj.121265.

Meal and Snack Description

The meal was composed of lasagna with meat sauce, biscuits, a piece of cheese and a vegetable juice. Male participants had an extra peach parfait dessert. The meal contained 673 Kcal; 80g carbohydrate (48%); 33.1g protein (20%), 21.4g fat (29%) for males and 573 Kcal; 60g carbohydrate (42%); 32.8g protein (23%), 19.9g fat (31%) for females. The bedtime snack was composed of yogurt that contained 100 Kcal; 15g carbohydrate; 4g protein, 3g fat.

Appendix to: Haidar A, Legault L, Dallaire M, et al. Glucose-responsive insulin and glucagon delivery (dual-hormone artificial pancreas) in adults with type 1 diabetes: a randomized crossover controlled trial. *CMAJ* 2013; DOI:10.1503/cmaj.121265.