Carbohydrate Supplementation During Prolonged Aerobic Exercise for People Living with Type 1 Diabetes on Insulin Pump Therapy: The ExCarbs Study
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In type 1 diabetes (T1D), the immune system mistakenly attacks the beta cells of the pancreas, causing the need for exogenous insulin to maintain normal blood glucose levels. Even when insulin delivery is temporarily reduced in people with T1D, moderate intensity exercise causes blood glucose levels to drop and increases the risk of hypoglycemia, a serious and potentially life-threatening complication of T1D. Carbohydrate (CHO) feeding has been studied as a preventive measure to hypoglycemia during moderate intensity exercise, but not with an individualized dosage based on body weight with exercise performed in a fasted state with insulin delivery temporarily reduced. In this study, 15 subjects with T1D will be tested in a randomized crossover design. Subjects will perform a 2 hour walk on a treadmill at 50-55% VO$_2$peak for three separate visits; A) CHO dose of 0.3g/kg/hr and usual basal insulin delivery, B) a basal rate reduction of 80% with 0.3g/kg/hr of CHO at exercise onset and C) a basal rate reduction of 80% made ninety minutes prior to exercise and carbohydrate feeding only as needed when whole blood glucose drops to a critical threshold (i.e. <3.9 mmol/L). Capillary glucose will be used to monitor time in target (4.0-11.0 mmol/L) and hypoglycemia incidence (<4.0 mmol/L) during exercise, and continuous glucose monitoring systems will be used to measure recovery and overnight data. Pilot testing (n=2) shows that a dosage of 0.3g/kg/hr of CHO for 2 hours of moderate intensity aerobic exercise is preventative of hypoglycemia if basal insulin delivery is unchanged. Once carried out, this study will allow for a better understanding of blood glucose management in T1D during fasted prolonged exercise.