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Opinion

Type II Diabetics Require More Carbohydrate During Exercise Than Euglycemic Individuals

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Abstract

Glucose uptake into skeletal muscle is greater as are insulin concentrations while lipolysis is lower in Type II Diabetics during exercise. This reduces blood glucose to a greater extent in Type II Diabetics than euglycemic individuals. Therefore, the carbohydrate requirements of exercise are greater and risk of hypoglycemia greater in Type II Diabetics. As a result, a low carbohydrate diet appears contraindicated in exercising Type II Diabetics.

Carbohydrate Metabolism, Exercise, Insulin Resistance

Blood glucose is a finite commodity at rest and during exercise. At a blood glucose of 80 mg/dl there are only 4 grams of glucose in the blood. At a blood glucose of 200 mg/dl there are only 10 grams of glucose in the blood. From the classic work from John Wahren's lab *(Martin, Katz, and Wahren 1995)* [1] the glucose uptake into the leg musculature was about 43% greater in Type II diabetics than individuals with normal glucose. An additional finding was that lipolysis as measured by the arterial blood glycerol concentration was 50.4% greater in normal than in Type II diabetics. This was accompanied by a 55% higher insulin concentration in the Type II diabetics. This clearly sets up a scenario where much more carbohydrate is oxidized in Type II diabetics than normal. These individuals were untrained and were exercising between 60-64% of VO2max. Based on carbohydrate oxidation rates and the maintenance of blood glucose during exercise, the American College of Sports Medicine suggests (ACSM 2007) [2] taking in 40-60 g of easily digestible carbohydrate per hour for normal individuals. Because of the 43% greater glucose uptake in Type II diabetics than controls during low intensity exercise and because of the possibility of hypoglycemic associated autonomic failure *(HAAF; Cryer PE; 2013)* [3] I suggest that type II diabetics should take in between 60-90 grams of carbohydrate during low-moderate intensity exercise and even higher amounts during higher intensity exercise as carbohydrate oxidation is exponential relative to exercise intensity. An alternative strategy would be to take in 150 grams of carbohydrate greater than one hour prior to exercise *(Costill, et al. 1977)* [4] to fill up even a very large liver (range 75-150 g capacity) and to take in 40-60 g of carbohydrate during exercise. In essence, the liver (mainly glycogenolysis) and exogenous carbohydrate intake are the only way to buffer blood glucose concentrations. The low capacity of the human liver for gluconeogenesis (about 0.2 grams per minute in the exercise trained or untrained state; *Emhoff, et al.* 2013) [5] would suggest this is not a viable source for adequate amounts of blood glucose during exercise. Additionally, prior to exercise a low carbohydrate diet would appear ludicrous for the Type II diabetic who could undergo HAAF *(Cryer 2013)* [3]. Rather than a low carbohydrate diet, I suggest type II diabetics ingest about 50% of daily energy needs (calories) as carbohydrate and exercise approximately 5-6 days per week *(Arciero, et al. 1999)* [6] to normalize their blood glucose concentrations.

References

1. I K Martin, A Katz, J Wahren (1995) Splanchnic and muscle metabolism during exercise in NIDDM patients. Am J Physiol 269: 583-590.
2. (2007) ACSM Position Stand: Exercise and Fluid Replacement. Medicine and Science in Sports and Exercise 39: 377-390.
3. Philip E Cryer (2013) Mechanisms of hypoglycemia-associated autonomic failure in diabetes. N Engl J Medicine 369: 362-372.
4. D L Costill, E Coyle, G Dalsky, W Evans, W Fink, D Hoopes (1977) Effects of elevated plasma FFA and insulin on muscle glycogen usage during exercise. J Appl Physiol 43(4): 695-699.
5. Chi An W Emhoff, Laurent A Messonnier, Michael A Horning, Jill A Fattor, Thomas J Carlson, et al. (2013) Gluconeogenesis and hepatic glycogenolysis during exercise at the lactate threshold. J Appl Physiol 114: 297-306.
6. P J Arciero, M D Vukovich, J O Holloszy, S B Racette, W M Kohrt (1999) Comparison of short-term diet and exercise on insulin action in individuals with abnormal glucose tolerance. J Appl Physiol 86:1930-1935.