

# Is There a Recommended Target Range for Blood Glucose for the Type 1 Diabetic Endurance Athlete?

**PHYSICAL ACTIVITIES** ALONG with diet are key elements in the management and prevention of diabetes. For individuals with type 2 diabetes and those with pre-diabetes, regular physical activity can improve blood glucose control and may alleviate symptoms of the disease. According to the American Diabetes Association, all levels of physical activity including leisure activities, recreational sports, and competitive professional performance can be performed by individuals with type 1 diabetes.<sup>1</sup> However, for individuals with type 1 diabetes, exercise does not have the same tendency to improve glycemic control. Rather, it has the potential to contribute to substantial blood glucose variability and considerable management challenges.<sup>2</sup>

Athletes with type 1 diabetes must overcome numerous obstacles during exercise because, for them, metabolic adjustments to maintain fuel homeostasis are lacking.<sup>2</sup> The normal interplay of insulin, glucagon, catecholamines (epinephrine and norepinephrine), and cortisol to stabilize the blood glucose does not function normally and can lead to hyper- or hypoglycemia. The most common problem for the person with type 1 diabetes is hypoglycemia during endurance exercise.

Variables that influence the glycemic response to exercise include<sup>2</sup>:

- level of training and fitness;
- intensity and duration of exercise;
- type and time of exercise;
- metabolic control;

- nutritional status and glycogen stores; and
- circulating insulin levels.

In athletes with type 1 diabetes, glucose production by the liver, regardless of prior carbohydrate intake, does not match the elevated rates of glucose disposal into the muscle both during exercise and in recovery.<sup>3</sup> This results in the increased fluctuation of blood glucose levels. In addition, the symptoms of hypoglycemia are often masked by physical activity and the stress of competition. Athletes may be at increased risk for severe hypoglycemia, acute injury, and permanent organ/tissue damage if they continue to exercise.<sup>3</sup>

Exercise must be carefully integrated into the diabetes management regimen so that optimal blood glucose levels are maintained and training and performance goals are achieved. Insulin adjustments and carbohydrate supplementation can be used independently or together to maintain optimal blood glucose levels during and after exercise. The risk of hypoglycemia can extend up to 31 hours after exercise due to increased insulin sensitivity and continued extraction of glucose from circulation for the replenishment of muscle and liver glycogen stores.<sup>4</sup>

Although the goal for blood glucose during activity must be individualized, 120 mg/dL to 180 mg/dL is the general guideline.<sup>5</sup> Monitoring blood sugar using a glucometer or a continuous glucose monitoring system (CGMS) frequently during activity is essential. It is imperative the individual keep detailed records and must understand glycemic response to exercise, learn to make appropriate exercise-related management decisions, and evaluate the effectiveness of these decision. In addition to the need for carbohydrates as an exercise fuel, additional rapid-acting carbohydrates must be available at all times to treat impending or actual low blood sugar levels prior to and during activities.

The complexity of these patients makes it extremely important for the registered dietitian to recognize and exercise professional judgment within the limits of his or her qualifications and collaborate with others, seek counsel, or make referrals as appropriate.<sup>6</sup>

## Reference

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5. Academy of Nutrition and Dietetics. Sports Nutrition Care Manual. Preventing Hypoglycemia during Exercise. [http://www.nutritioncaremanual.org/content.cfm?ncm\\_content\\_id=110622](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=110622). Accessed September 12, 2012.
6. Academy of Nutrition and Dietetics. Code of Ethics for the Profession of Dietetics and Process for Consideration of Ethics Issues (Principle number 8). <http://www.eatright.org/Members/content.aspx?id=6442452672>. Accessed September 14, 2012.

## Additional Academy Resources

1. Shop Academy; Diabetes Nutrition Resources <https://www.eatright.org/shop/categories.aspx?id=252>
2. Evidence Analysis Library (EAL): Diabetes Mellitus Type 1 & 2 Evidence-Based Nutrition Practice Guideline <http://andevidencelibrary.com/topic.cfm?cat=3251>

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