

Diabetes in Athletes

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- I. What is Diabetes?
 - a. Impaired glucose (regulation of body energy source) homeostasis. The ability to produce or respond to the hormone insulin is impaired, resulting in abnormal metabolism of carbohydrates and elevated levels of glucose.
 - b. Type 1 (loss of insulin production) versus Type 2 (decreased insulin sensitivity)
 - c. Insulin Dependent versus Non-Insulin Dependent Diabetes

- II. Why is Exercise an Issue with Diabetes?
 - a. Mainly an issue with Insulin Dependent Diabetes
 - b. If **too much** insulin then hypoglycemia can occur secondary to:
 - Increased muscle glucose uptake with exercise
 - Decreased counter regulatory response which impairs glucose production by liver
 - c. If **too little** insulin hyperglycemia can occur leading to:
 - Decreased performance
 - Increased risk of dehydration (can lead to acidosis, electrolyte disturbances and severe health risks)
 - d. Post exercise delayed hypoglycemia is also a major concern as body attempts to restore muscle glycogen stores

- III. Variables Affecting Glycemic Control
 - a. Starting blood glucose level
 - b. Circulating insulin levels, determined by:
 - Types of insulin(s) used
 - Timing of prior insulin injection or bolus
 - Insulin dosage given
 - c. Type, intensity, and duration of activity
 - d. Carbohydrate ingestion before and during activity
 - e. Activity status (new or usual)
 - f. Time of day of exercise
 - g. Heat and cold

- IV. Warning signs of Hyperglycemia
 - a. Diaphoresis
 - b. Polydipsia/polyuria
 - c. Athralgias/myalgias
 - d. Muscle weakness/atrophy
 - e. Change in mental status
 - f. Paresthesias
 - g. Edema
 - h. Fatigue

- V. Warning signs of Hypoglycemia

- a. Heart palpitations
- b. Fatigue
- c. Pale skin
- d. Shakiness
- e. Anxiety
- f. Sweating
- g. Hunger
- h. Irritability
- i. Tingling sensation around the mouth
- j. As hypoglycemia worsens, signs and symptoms may include:
 - Confusion, inability to complete routine tasks
 - Visual disturbances, such as blurred vision
 - Seizures
 - Loss of consciousness

VI. Glucose Management During Exercise

- a. Pre-Exercise
 - Ensure adequate CHO stores pre exercise with low GI meal 2-3 hours prior to exercise
 - Consider decreasing pre-exercise insulin dose
- b. Check pre-exercise blood glucose
 - i. Below target (<90 mg/dl)
 - Ingest 10-20 g of glucose before starting exercise
 - Delay exercise until BG >90 mg/dl and monitor
 - Closely for hypoglycemia
 - ii. Near target (90-124 mg/dl)
 - Ingest 10 g of glucose before starting aerobic exercise
 - Anaerobic exercise and high intensity interval training sessions can be started
 - iii. At target level (124-180 mg/dl)
 - Aerobic exercise can be started
 - Anaerobic exercise and high intensity interval training sessions can be started but glucose concentrations could rise
 - iv. Above target (180-270 mg/dl)
 - Aerobic exercise can be started
 - Anaerobic exercise and high intensity interval training sessions can be started but glucose concentrations could rise
 - v. Above target (>270 mg/dl)
 - check blood ketones
 - modestly elevated (0.6-1.4 mmol/L)
 - limit exercise to a light intensity for a brief duration (<30 min)
 - small pre-exercise corrective dose of insulin might be needed
 - ketones >1.5 mmol/L
 - exercise is contraindicated

- glucose management should be initiated rapidly
- c. During Exercise
 - i. BG <70: Consider terminating Exercise if hypoglycemic symptoms, Recheck in 20 min and terminate if BG not increasing with CHO consumption
 - ii. BG 70-249: Consume 30-100g/hr CHO
 - iii. BG 250-299: Monitor Closely, No CHO
 - iv. BG > 300: Consider Terminating Exercise
- VII. Diabetes Action Plan
 - a. Blood glucose targets
 - b. Exclusion thresholds
 - c. Insulin therapy guidelines
 - d. List of other medications
 - e. Guidelines for hypoglycemia
 - f. Guidelines for hyperglycemia
 - g. Emergency contact information
- VIII. Managing Diabetic Complications in Athletes
 - a. Dehydration
 - b. Hypoglycemia
 - c. Hyperglycemia
 - d. Ketosis