

# A Day in the Life . . .

## Diabetes: A personal and professional challenge



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*In a four-part blog series, Dr Huffman discusses a typical work day. Patients in this installment represent composite profiles to protect their personal information. No resemblance to particular patients is implied.*

### Part III: High and low blood glucose, and how to treat hypoglycemia

An older endocrinologist once said, "The human body is designed to do one thing, to provide a constant supply of glucose for the brain. All of its other functions are secondary."

Having had many years of personal and professional experience with the effects of variable blood glucose, I'm inclined to agree with him. Every part of the body plays a role in blood glucose regulation. Even with such a finely tuned, complex system, however, the blood sugar level still varies, even in normal individuals.

That variability of blood glucose plays a role in some of our brains' most interesting abilities. Although some functions, like motor skills and memory, seem to work best with constant blood glucose levels, other so-called "right brain" functions are stimulated by changing blood glucose levels. Imagination, dreaming, and creativity may flourish when glucose levels fluctuate.

Successful diabetes care depends upon one's ability to sense, interpret, and manage blood glucose levels. People who do not have diabetes have little awareness of their blood glucose, because their bodies react continuously to maintain it within a narrow range. But even the normal individual may at times experience physical effects from small changes in blood sugar. The body seeks consistency, or homeostasis. Rapid change produces a response which returns the system to normal. Rapid changes in glucose, or a change to an unfamiliar blood glucose level, cause physical reactions.

For example, imagine Thanksgiving dinner, where family members have feasted upon heavy starchy vegetables covered in gravy, followed by rich desserts. Someone without diabetes might have their highest blood glucose level of the year after such a meal (about 140 mg/dl). The rapid increase in

blood glucose, though small by diabetes standards, yields a warm, sleepy feeling. Vision may become fuzzy. Thinking and reaction time slow. A nap seems like a good idea. Meanwhile, the liver and fat tissues are storing away extra food as fat, to be used if a famine should occur before Christmas.

Take that same normal individual and give him/her nothing for breakfast but coffee with sugar. Four to five hours later, blood glucose levels may fall rapidly to 75 or 80 mg/dl. Though these are low normal blood glucose levels, the rapid change can cause an adrenalin surge with shakiness, cold sweat, hunger, anxiety or unease. This adrenalin reaction signals the liver to push stored glucose into the blood, to support the brain.

Slower changes in blood glucose may not cause this reaction until the levels fall much lower, or in some people with long-term diabetes the adrenalin surge may not occur at all.

Our brain cells require glucose for fuel, and they need a continuous supply of it from the blood. At glucose levels below about 40 mg/dl, the brain begins to malfunction. Numbness and tingling may appear in fingers, toes, lips or tongue. Double vision may occur. Sleepiness, lethargy, and eventual coma may occur, followed by seizures.

People with very low blood glucose may lose consciousness of their actions but continue to function for hours or days with little input from their higher cortex. This can produce embarrassing or destructive consequences. On one occasion in college, before blood glucose monitors became available, I became hypoglycemic in class and drove myself home, made dinner and went to bed ... in the apartment next door to my own. Perhaps most distressing was discovering that back then the police considered such behavior typical for people with diabetes. Fortunately my neighbor was gracious about the episode, and she still tells the story of the strange man she once found in her bed.

People with severe hypoglycemia may appear pale or sweaty, unsteady or shaky, or they may simply appear confused or indecisive. Or they may have none of these symptoms. The most reliable sign of hypoglycemia is a low body temperature. Touch a hypoglycemic person on the neck, and they'll almost always feel cool.

A word of advice: Approach hypoglycemic people, but do so cautiously. As a resident working the emergency room, I once saw a frail elderly woman break the arm of a security guard who tried to restrain her. Subconsciously she knew how to defend herself against attackers, and she already had plenty of adrenalin in her blood from the hypoglycemia.

My wife can sense small changes in my blood glucose (just how remains a mystery) and warns me to check my blood sugar level. If I'm tempted to take offense at her effrontery, I'm (usually) already hypoglycemic. She knows just how to handle this situation: instead of telling me I need to check, she assures me that I WANT to check my blood glucose, that there's nothing I want more.

Even if your thinking is impaired, you'll respond negatively to threats and positively to kindness, caring and empathy.

So how do you treat low blood sugar? Three glucose tablets or a tube of glucose gel work well for conscious persons, but these are not usually available during emergencies.

Four to eight ounces of a sweet soft drink (not diet) or fruit juice will work within 10-15 minutes, but may have to be repeated if hypoglycemia persists after 15 minutes. Once thinking clears, a meal or snack is appropriate, but mealtime insulin should be delayed until after the meal and usually decreased (but not withheld entirely).

Unconscious hypoglycemia is a more serious matter. Glucose gel or cake icing (the kind in the little tubes) can be used if the patient can swallow. Always keep these people upright or on their right side to keep them from inhaling food or vomitus. Glucagon injections usually are kept at home and at work by people on insulin, and if available should be used in people who cannot swallow. Otherwise, call for emergency medical assistance via 911.

If you take insulin or oral hypoglycemic agents, the people closest to you become valuable members of your diabetes team. Have them offer early warning if hypoglycemia should unexpectedly occur, and learn to take their advice even when an adrenalin surge prompts you to break their bones. And never forget the enormity of love, devotion and respect that drives these people to take such risks for you.

*Dr Huffman attended North Carolina State University and received his BS in Chemistry and Biology in 1977 and a MS in Biochemistry in 1979. He received his MD from the University of North Carolina at Chapel Hill in 1982, and completed his Medical Externship in Medical Service at John Umstead Hospital in Butner North Carolina in 1983. His Internal Medicine Internship, Residency, and Fellowship were completed at Baylor Affiliated Hospitals in Houston TX, and in 1989 he moved to Chattanooga TN, with his wife Dr. Terry Melvin. He was diagnosed with Type 1 Diabetes at the age of 12.*