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Surprising Factors that Impact Glucose Levels & How to Manage Them



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Surprising Factors that Impact Glucose Levels & How to Manage Them

Presented by Erin Palinski-Wade, RD, CDCES



Objectives

DEMONSTRATE A COMPREHENSIVE UNDERSTANDING OF GLUCOSE CONTROL, INCLUDING THE TRADITIONAL FACTORS INFLUENCING GLUCOSE LEVELS.

EXPLAIN SURPRISING FACTORS THAT CAN IMPACT GLUCOSE LEVELS, SUCH AS STRESS, SLEEP, AND THE ENVIRONMENT.

UNDERSTAND ACTIONABLE STRATEGIES TO HELP PATIENTS MANAGE THEIR GLUCOSE LEVELS THROUGH LIFESTYLE CHANGES AND ADVANCES IN TECHNOLOGY.

Understanding Glucose Regulation



GLUCOSE REGULATION OVERVIEW

Glucose regulation in the body involves a complex interplay between the pancreas, liver, and various hormones such as insulin and glucagon, which work together to maintain blood sugar levels.



IMPORTANCE OF UNDERSTANDING FACTORS

While insulin and glucagon are well-known regulators, other hormones such as cortisol, epinephrine, and growth hormone also significantly impact blood glucose levels.



COMPLEXITY OF GLUCOSE REGULATION

Understanding the intricate interplay of these lesser-known factors is crucial for comprehending glucose metabolism disorders and developing more effective treatments for diabetes.

Blood Glucose Ranges for Different Groups

Metric	People Without Diabetes	People with Prediabetes	People with Diabetes
Fasting blood glucose	Less than 100 mg/dL (5.6 mmol/L)	100-125 mg/dL (5.6-6.9 mmol/L)	80-130 mg/dL (4.4-7.2 mmol/L)
After eating (2 hours)	Less than 140 mg/dL (7.8 mmol/L)	140-199 mg/dL (7.8-11.0 mmol/L)	Less than 180 mg/dL (10.0 mmol/L)
HbA1c	Less than 5.7%	5.7% to 6.4%	Less than 7% (target may vary)

Recommended Targets for CGM Usage

Metric	Target Range
Time in Range (TIR)	70-180 mg/dL (3.9-10.0 mmol/L)
Time Above Range (TAR)	>180 mg/dL (>10.0 mmol/L)
Time Below Range (TBR)	<70 mg/dL (<3.9 mmol/L)

Blood Glucose Recovery



BLOOD GLUCOSE PEAKS AFTER MEALS

Blood glucose typically peaks about 90 minutes after eating a meal.



WHEN SHOULD GLUCOSE DECREASE?

For people without diabetes or those successfully managing it, blood sugar should start decreasing a few hours after eating and return to pre-meal levels within 2-3 hours.



TIME IN RANGE (TIR) GOALS

Aim to keep glucose levels between 70-180 mg/dL for at least 70% of the day, with less than 25% above 180 mg/dL and less than 4% below 70 mg/dL.



POST-MEAL GLUCOSE TARGETS

Try to keep post-meal blood sugar elevation under 30 mg/dL above your pre-meal level.

The Impact of Diet on Glucose



CARBOHYDRATE INTAKE

The amount and type of carbohydrates consumed can significantly impact glucose levels. Higher intake of simple, refined carbs can spike blood sugar, while complex, fiber-rich carbs are absorbed more slowly.



PORTION CONTROL

Eating appropriate portion sizes, especially of carbohydrate-rich foods, can help manage glucose levels and prevent spikes.



FIBER CONSUMPTION

Increasing fiber intake can slow the absorption of glucose, leading to more stable blood sugar levels and better glycemic control.

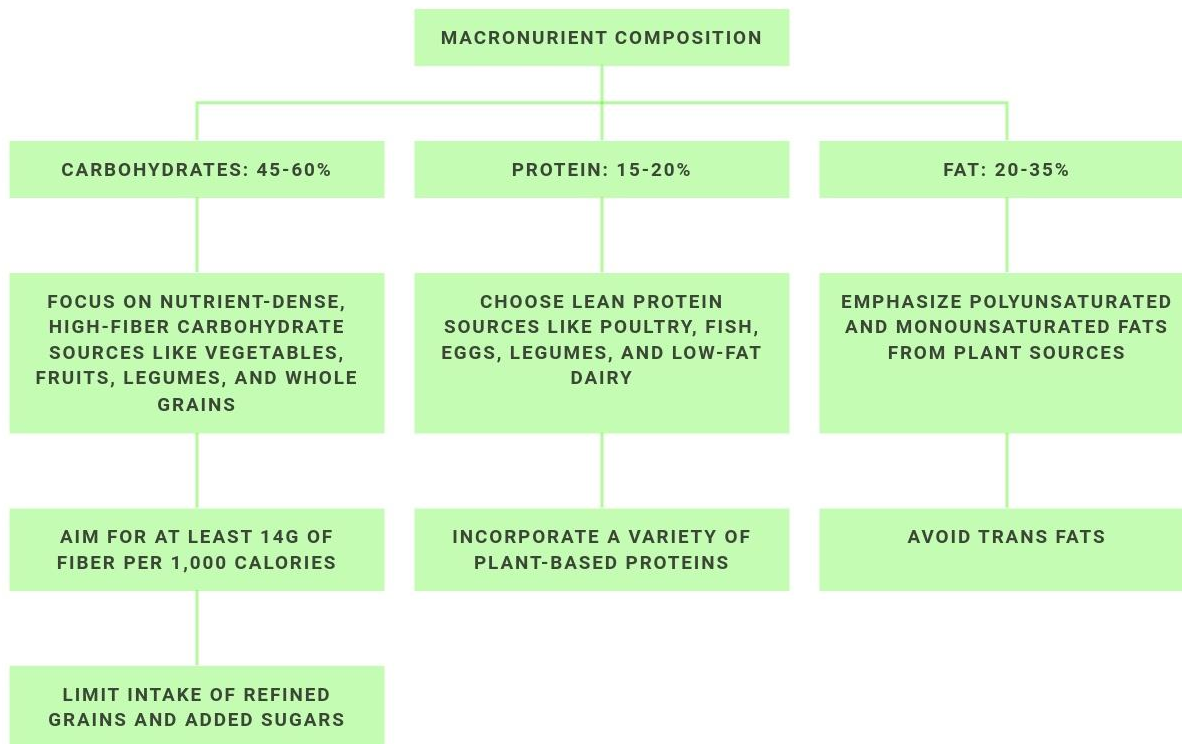


MACRONUTRIENT BALANCE

Maintaining a balanced diet with appropriate amounts of carbs, proteins, and healthy fats can help regulate glucose metabolism and prevent blood sugar fluctuations.

A WELL-PLANNED, NUTRIENT-DENSE DIET IS ESSENTIAL FOR MANAGING GLUCOSE LEVELS AND OVERALL HEALTH IN INDIVIDUALS WITH TYPE 2 DIABETES.

Dietary Recommendations for Diabetes



The Impact of Exercise on Glucose



IMPROVES INSULIN SENSITIVITY

Exercise enhances the body's ability to use insulin effectively, improving glucose uptake and lowering blood sugar levels in those with type 2 diabetes.



POTENTIAL RISK OF HYPOGLYCEMIA

Intense or prolonged exercise can lead to a sudden drop in blood glucose, especially in individuals taking certain diabetes medications, requiring careful monitoring and management.



LOWERS BLOOD GLUCOSE LEVELS

During and after exercise, the muscles use more glucose, reducing the overall blood glucose concentration and helping to maintain healthy levels.



DELAYED GLUCOSE RESPONSE

The effects of exercise on blood glucose can be delayed, with blood sugar levels sometimes continuing to drop for several hours after physical activity, necessitating close monitoring.

EXERCISE PLAYS A CRUCIAL ROLE IN MANAGING TYPE 2 DIABETES, BUT ITS IMPACT ON BLOOD GLUCOSE LEVELS REQUIRES CAREFUL MONITORING AND ADJUSTMENT OF MEDICATION AND NUTRITION TO ENSURE OPTIMAL GLUCOSE CONTROL.

Common Misconceptions About Glucose Control



GLUCOSE REGULATION GOES BEYOND JUST DIET AND EXERCISE

Glucose levels are influenced by a complex interplay of factors, including sleep, stress, environment, medications, and even the individual's microbiome.



THE BRAIN PLAYS A KEY ROLE IN GLUCOSE REGULATION

Recent research suggests the brain, not just the pancreas, is a central player in managing blood sugar levels and the development of diabetes.



OVERLOOKING LESSER-KNOWN FACTORS CAN LEAD TO SUBOPTIMAL GLUCOSE MANAGEMENT

Dietitians need to be aware of the surprising factors that can impact glucose levels to provide comprehensive and personalized care for their clients.

UNDERSTANDING THE COMPLEXITY OF GLUCOSE REGULATION, BEYOND JUST DIET AND EXERCISE, IS CRUCIAL FOR EFFECTIVE DIABETES MANAGEMENT AND PREVENTION.

Nutrients to Consider



VITAMIN D

May improve insulin sensitivity and beta cell function, however effects are not consistent across all populations



MAGNESIUM

Supplementation may lead to reductions in fasting plasma glucose, HbA1c, and insulin resistance depending on factors such as baseline magnesium levels, body mass index, & duration of diabetes



CHROMIUM

Supplementation may reduce fasting plasma glucose, HbA1c, and insulin resistance, however effects vary and more research is still needed



OMEGA-3 FATTY ACIDS

Mixed research on benefits to insulin sensitivity and beta cell function; consistent benefits in reducing triglyceride levels in individuals with type 2 diabetes, which may indirectly contribute to better overall metabolic health

Sleep and Circadian Rhythms

Sleep duration and quality have a significant impact on glucose metabolism. The dawn phenomenon, a natural increase in blood glucose levels in the early morning hours, is also influenced by circadian rhythms and sleep patterns.



The Impact of Sleep on Glucose



SLEEP DURATION AND GLUCOSE REGULATION

Inadequate sleep has been linked to impaired glucose tolerance and increased risk of insulin resistance, leading to elevated blood glucose levels.



SLEEP QUALITY AND INSULIN SENSITIVITY

Poor sleep quality, including disrupted sleep and frequent awakenings, has been shown to contribute to decreased insulin sensitivity and increased risk of type 2 diabetes.



SLEEP AND APPETITE HORMONES

Lack of sleep can disrupt the balance of appetite-regulating hormones like leptin and ghrelin, leading to increased hunger and cravings, which can contribute to weight gain and metabolic disorders.



SLEEP AND PHYSICAL ACTIVITY

Insufficient sleep can negatively impact physical activity levels, leading to reduced energy expenditure and further exacerbating the impact on glucose metabolism and body weight.

Stress and Hormonal Influences



CORTISOL'S ROLE IN BLOOD SUGAR ELEVATION

Cortisol, a key stress hormone, can stimulate the liver to increase glucose production, leading to higher blood sugar levels.



EFFECTS OF OTHER STRESS HORMONES

Hormones like epinephrine (adrenaline) and glucagon can also contribute to blood sugar rises by promoting glycogenolysis and gluconeogenesis.



INTERACTION BETWEEN STRESS AND GLUCOSE REGULATION

Chronic stress can disrupt the body's normal glucose homeostasis, leading to insulin resistance and impaired glucose tolerance over time.

UNDERSTANDING THE COMPLEX INTERPLAY BETWEEN STRESS HORMONES AND GLUCOSE REGULATION IS CRUCIAL FOR EFFECTIVE DIABETES MANAGEMENT AND PREVENTION OF RELATED COMPLICATIONS.

Environmental Factors

Environmental Factor	Effect on Blood Glucose
Extreme Cold (below 50°F/10°C)	Increased the risk of hypoglycemia, as the body uses extra glucose to stay warm
Extreme Heat (above 90°F/32°C)	Decreased insulin sensitivity and higher blood glucose levels due to increased stress hormones and dehydration.
Air pollution	Higher levels of air pollutants are associated with increased risk of type 2 diabetes & pollution can trigger inflammation, insulin resistance, and endothelial dysfunction
Noise pollution	Increased exposure to noise, especially from traffic, is linked to higher diabetes risk. Noise can act as an environmental stressor affecting insulin secretion & sensitivity
Altitude	High altitudes can impact glucose levels, potentially increasing the risk of both hypo- and hyperglycemia

Environmental Factors

Environmental Factor	Effect on Blood Glucose
Sun exposure	Sunburns can affect glucose levels, possibly due to the body's stress response
Light exposure	Exposure to light at night could be associated with type 2 diabetes, potentially due to sleep disruption
Green Space & Walkability	More green space & areas with higher walkability are associated with a reduced risk of type 2 diabetes
Food deserts & accessibility to food	People in food deserts consume food that is 5 to 17 percent higher in fat, cholesterol, and sugars compared to those in non-food desert areas
Food insecurity	Food-insecure individuals living with diabetes are more likely to have poor glycemic control, with higher A1C levels

Medications and Supplements

- **STEROID MEDICATIONS**

Corticosteroids like prednisone can elevate blood glucose levels by increasing insulin resistance and glucose production.

- **PSYCHIATRIC MEDICATIONS**

Antidepressants, antipsychotics, and mood stabilizers can impact insulin sensitivity, glucose metabolism, and appetite

- **CARDIOVASCULAR MEDICATIONS**

Beta-blockers and diuretics may interfere with the body's ability to regulate blood sugar.

- **HERBAL SUPPLEMENTS**

Supplements like ginseng, bitter melon, and alpha-lipoic acid can have hypoglycemic effects and interact with diabetes medications.

- **NIACIN (VITAMIN B3)**

High-dose niacin supplementation can impair glucose tolerance and increase insulin resistance.

The Impact of Hydration on Glucose



HYDRATION AND INSULIN SENSITIVITY

Proper hydration can improve insulin sensitivity, allowing for better glucose regulation in those with type 2 diabetes.



DEHYDRATION AND HYPERGLYCEMIA

Dehydration can lead to elevated glucose levels, as the body attempts to maintain fluid balance, exacerbating the condition.



OPTIMAL FLUID INTAKE

Consuming the recommended amount of water/fluid per day can help maintain healthy glucose levels and prevent complications.

The Impact of Caffeine on Glucose



CAFFEINE RESPONSE CAN VARY

The impact of caffeine on blood sugar can differ significantly among individuals, with some experiencing more pronounced effects than others



ELEVATED POST-MEAL GLUCOSE LEVELS

Individuals with type 2 diabetes who consume caffeine may experience an increase in blood sugar levels, particularly after meals, with intermittent usage



TOLERANCE MAY LESSEN IMPACT

Acute caffeine intake can impair glucose regulation, however long-term coffee drinkers may not experience the same negative effects



UNPREDICTABLE IMPACT

For people with diabetes, the effect of caffeine on blood sugar levels can be unpredictable, potentially resulting in either higher or lower blood sugars

Personal Microbiome



GUT MICROBIOME COMPOSITION

The diversity and balance of gut bacteria can influence how the body processes and regulates glucose.



METABOLIC BYPRODUCTS

Certain gut bacteria produce short-chain fatty acids and other compounds that can affect insulin sensitivity and glucose homeostasis.



INDIVIDUAL VARIABILITY

Each person's unique microbiome profile can contribute to personalized responses to diet and other glucose-regulating factors.

THE HUMAN GUT MICROBIOME PLAYS A SIGNIFICANT, YET COMPLEX, ROLE IN GLUCOSE METABOLISM AND REGULATION. RECOGNIZING ITS INFLUENCE IS CRUCIAL FOR DEVELOPING PERSONALIZED NUTRITION AND LIFESTYLE STRATEGIES TO OPTIMIZE BLOOD SUGAR CONTROL.

Patient Education

EXPLAIN COMPLEX FACTORS IN SIMPLE TERMS

Break down the science behind unexpected glucose influences, such as sleep, stress, and environmental factors, using easy-to-understand analogies and examples that resonate with patients.

CUSTOMIZE EDUCATION PLANS

Develop personalized education plans that address each patient's unique circumstances, goals, and learning preferences, ensuring the information is relevant and actionable.

UTILIZE VISUAL AIDS

Incorporate visual tools, such as charts, graphs, and interactive demonstrations, to help patients better understand the complex relationships between various factors and their glucose levels.

ENCOURAGE SELF-MONITORING

Empower patients to track their own glucose levels, sleep patterns, stress levels, and other relevant factors using apps, wearable devices, and self-reflection, enabling them to identify personal trends.

FOSTER COLLABORATIVE DISCUSSIONS

Encourage open dialogues with patients, soliciting their feedback and allowing them to share their experiences, concerns, and questions, creating a partnership in the management of their glucose levels.

PROVIDE ONGOING SUPPORT

Establish regular check-ins and follow-up appointments to monitor progress, address challenges, and make adjustments to the personalized education plan as needed, ensuring long-term success.

Lifestyle Modifications

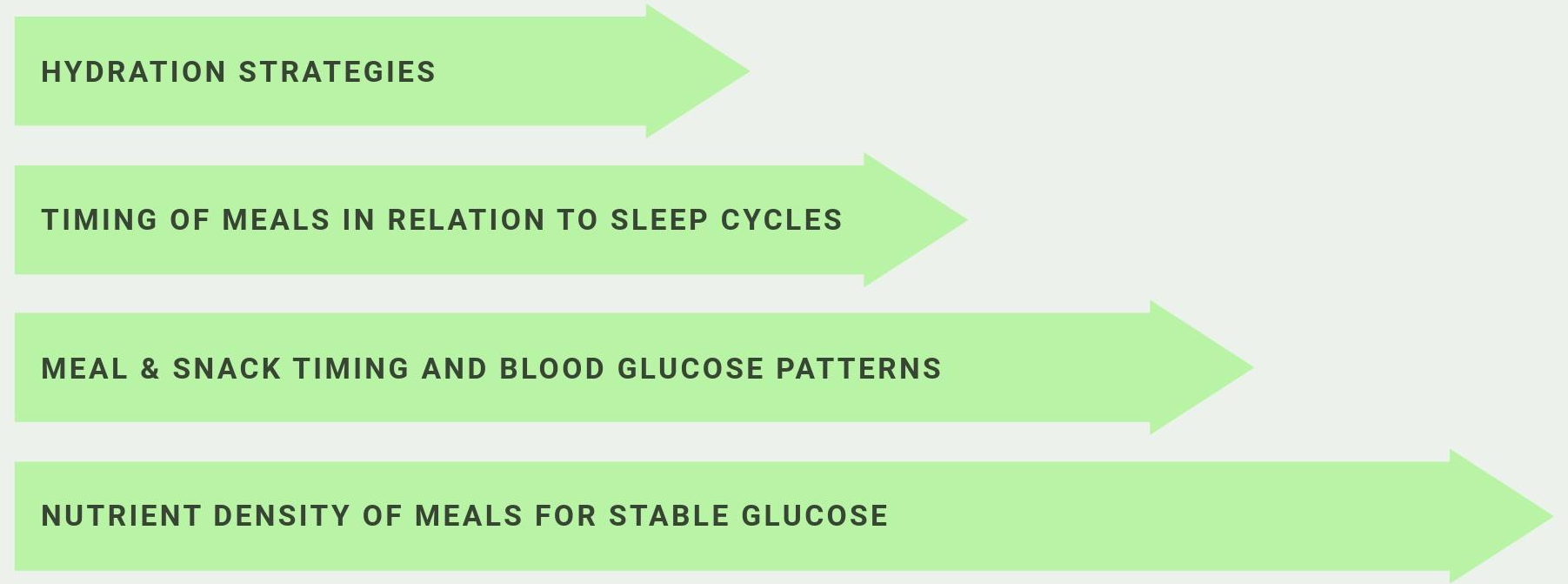
IMPROVE SLEEP HYGIENE

Establish a consistent sleep schedule, avoid screen time before bed, create a relaxing bedtime routine, ensure the bedroom is dark, cool, and comfortable, and limit caffeine and alcohol intake.

STRESS MANAGEMENT TECHNIQUES

Incorporate mindfulness practices like meditation, deep breathing exercises, or yoga into daily routine, engage in regular physical activity, maintain a balanced diet, and seek social support from family and friends.

Nutritional Interventions



HYDRATION STRATEGIES

TIMING OF MEALS IN RELATION TO SLEEP CYCLES

MEAL & SNACK TIMING AND BLOOD GLUCOSE PATTERNS

NUTRIENT DENSITY OF MEALS FOR STABLE GLUCOSE

Monitoring and Technology in Diabetes Management



UTILIZING CONTINUOUS GLUCOSE MONITORING (CGM)

CGM devices provide real-time, continuous data on blood glucose levels, allowing users to identify patterns and trends in their glucose levels.



APPS AND TOOLS FOR TRACKING MULTIPLE INFLUENCING FACTORS

Various apps and tools are available to help users track and analyze factors that influence their glucose levels, such as diet, physical activity, stress, and sleep.



USING DATA TO BE YOUR OWN 'DETECTIVE'

The more personalized data available, the more you can track and adjust the various factors that impact glucose response

UTILIZING CONTINUOUS GLUCOSE MONITORING AND RELATED TECHNOLOGIES CAN HELP INDIVIDUALS WITH DIABETES OR PREDIABETES BETTER UNDERSTAND AND MANAGE THEIR CONDITION, LEADING TO IMPROVED HEALTH OUTCOMES.

Collaborative Care



WORKING WITH THE HEALTHCARE TEAM

Collaborating with the diabetes care team can foster comprehensive care.



INTEGRATING FACTOR AWARENESS

Incorporating awareness of relevant factors, such as medical history and patient needs, into comprehensive care plans.

EFFECTIVE COLLABORATIVE CARE INVOLVES INTERDISCIPLINARY TEAMS WORKING TOGETHER TO PROVIDE PATIENT-CENTERED, COMPREHENSIVE TREATMENT PLANS THAT ADDRESS ALL RELEVANT FACTORS.

Real-world Scenarios: Analyzing Glucose Fluctuations and Developing Management Strategies



ANALYZING UNEXPECTED GLUCOSE FLUCTUATIONS

Identify and understand the various factors that can lead to unexpected changes in blood glucose levels, such as medication interactions, physical activity, stress, and dietary intake.



DEVELOPING MANAGEMENT STRATEGIES FOR COMPLEX CASES

Explore effective strategies for managing patients with intricate glucose regulation challenges, including personalized treatment plans and close monitoring.



PROGRESS NOT PERFECTION

Empower individuals to learn what does and does not impact their individual blood glucose levels so they can continue to make lasting improvements

A top-down view of a breakfast table. In the center is a large white platter filled with various fruits: kiwi slices, dragon fruit, orange segments, and blueberries. To the left, a hand holds a fork over a plate with a crepe topped with blueberries and kiwi. Another plate with a crepe and fruit is at the bottom. A small cup of coffee is on the left, and a white teapot is on the right. The word "Questions?" is written in green over a grey rectangle in the center.

Questions?

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