Diabetes Management for College Athletes

College Athletic Trainers Society 2021

PREPARING CHAMPIONS FOR LIFE

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Disclosure of Financial Relationships

Neither I nor any member of my family has a financial relationship or interest in any commercial entity that may have a direct interest in the subject matter of this presentation.

This includes serving on a speaker's bureau or advisory board, as well as receiving Honoria from a medical education company for CME presentations.

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Today's Presentation

- Basics of Diabetes
- Applying Diabetes Management in a College Athletic Setting
- Discussion with an Elite Type 1 Diabetic Athlete

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Goals of Today's Presentation

At the conclusion of today's presentation, the participant should be able to:

1. Identify how Insulin impacts the body's ability to access glucose from the blood stream.
2. Differentiate between the types of insulin delivery methods for diabetic patients.
3. Develop a plan using technology to help balance blood sugar and insulin levels.
4. Develop effective treatment and planning strategies for practices, games and non-competitive parts of the diabetic college athlete's day.

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Basics

- What is Diabetes?
- Diabetes is a condition in the body where BLOOD SUGAR LEVELS are HIGHER THAN NORMAL.
- This can happen when the body doesn't make any insulin (TYPE 1 DIABETES) or doesn't make enough insulin the body needs (TYPE 2 DIABETES).

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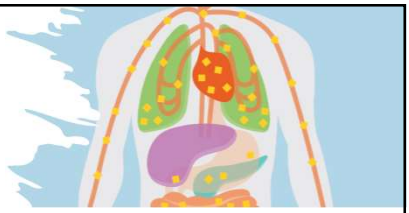
Glucose: The Body's Fuel



- The body is made up of cells and every cell needs ENERGY.
- Your body uses GLUCOSE, or SUGAR, as it's energy source.
- Your body needs some GLUCOSE in your body at all times, even while sleeping.
- Just like cars need fuel to run, the BODY NEEDS GLUCOSE to work.

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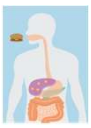
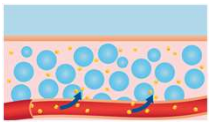
Where Do We Get Glucose?

When you eat, food travels through the digestive system and into the stomach. Food is broken down into nutrients, one of which is GLUCOSE.

Glucose gets absorbed from the small intestines into the bloodstream, then moves into the interstitial fluid surrounding the tissues and cells of the body.





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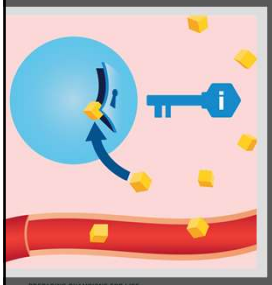

This is the Key

- The only way GLUCOSE can move into the cells is with the help of a hormone called INSULIN.
- INSULIN is the "KEY" that unlocks the cell and allows GLUCOSE to enter.
- Now the cells have the ENERGY the need to perform.

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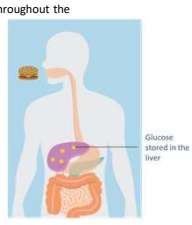
Extra Glucose

Extra Glucose that is not used for energy right away is stored in the LIVER.

The Liver releases GLUCOSE back into the bloodstream for energy throughout the day and night.

Think of the LIVER as the body's GAS TANK for extra FUEL.



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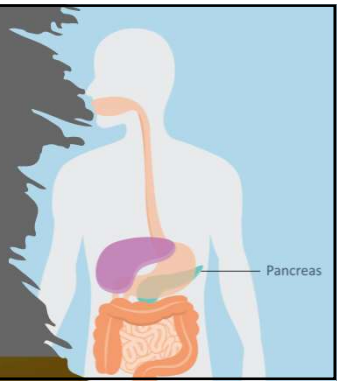
What is Insulin?

- Insulin is a hormone the Pancreas that LOWERS GLUCOSE LEVELS.
- Insulin is released 24 hours a day in two ways:
- BASAL – small amount released in between meals and during sleep.
- BOLUS – larger amount released when eating.
- With DIABETES, the Pancreas may not make any or enough INSULIN.



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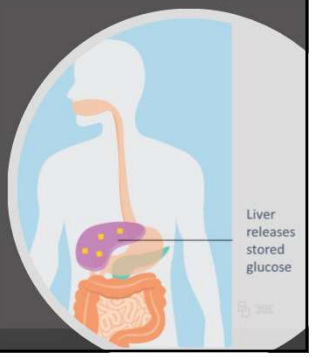
What is Glucagon

- Glucagon is a hormone that acts in the opposite way from Insulin.
- Glucagon RAISES GLUCOSE LEVELS.
- Glucagon signals the Liver to release stored Glucose back into the bloodstream.



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The Pancreas Makes Insulin and Glucagon

- Insulin LOWERS blood Glucose levels, while Glucagon RAISES blood glucose levels.

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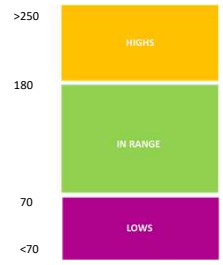
Target Glucose Levels

Time in Range

The percentage of time glucose levels are in the range of 70mg/dL to 180mg/dL



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Target Glucose Levels

Time in range is strongly associated with a reduced risk of complications in the long run.

Less damage to eyes

Less damage to the heart

Less nerve damage

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Managing Glucose Levels in Range

The goal in managing diabetes is to take the right amount of insulin at the right time to balance the amount of glucose in the body.

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High Glucose Levels

When you eat, glucose levels start to rise. If there is not enough insulin, glucose can't move into the cells, so it stays in the interstitial fluid. In turn, more insulin is needed to lower glucose levels.

Too much glucose, not enough insulin

High blood glucose

More insulin needed

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Managing High Glucose Levels

Symptoms of High Glucose
Frequent urination, Thirst, Blurred vision, Fatigue, Headache among others

Causes of High Glucose
Too little insulin, illness or infection among other stresses

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Low Glucose Levels

When there is more insulin in the body than is needed, glucose levels will drop.

It is important to eat or drink sugar to help blood glucose levels recover and go back to the target range of 70-180 mg/dL.

Too much insulin, not enough glucose

Low blood glucose

Must eat or drink sugar

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Managing Low Glucose Levels

Symptoms of LOW glucose between 55-70 mg/dL
Sweating, shakiness, dizziness, nausea, hunger, headache among others.

Symptoms of LOW glucose less than 54 mg/dL
Difficulty concentrating, blurry vision, weakness, confusion and mood changes.

Causes: Too much insulin, a decrease or delay in food intake, and changes in exercise (more on this later).

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Treating Low Glucose The 15/15 rule

Take 15 grams of fast-acting carbohydrate if Blood Glucose is below 70

Wait 15 minutes then re-check Blood Glucose levels

Repeat treatment if the Blood Glucose is still below 70 mg/dL.

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Glucagon Injection

For emergency situations: Severe Hypoglycemia
When someone cannot intake carbohydrates to raise the Blood Glucose Levels a Glucagon Injection may be administered.

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Baqsimi

- Baqsimi is a nasal powder used for Severe Hypoglycemia emergencies.

For both Baqsimi and Glucagon, be sure family, friends and others know how to administer the products.

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Glucose Monitoring

- Glucometer
- This requires a finger prick amount of blood placed onto a strip
- The strip is inserted into the Glucometer to have a Blood Glucose reading.

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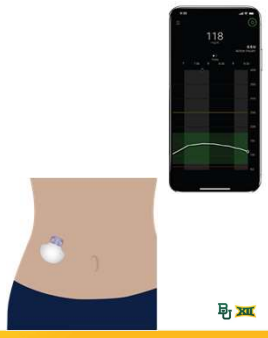
Continuous Glucose Monitor (CGM

A sensor that lets a person continuously know their interstitial glucose (aka SENSOR GLUCOSE) levels every 5 minutes.

Gives a more complete picture of your glucose control than Blood Glucose Monitoring alone by showing trends instead of snapshots.

Takes the place of multiple finger pricks throughout the day.

Usually is worn for a week at a time.



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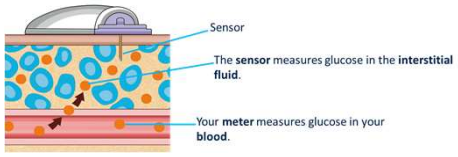
Sensor Glucose versus Blood Glucose



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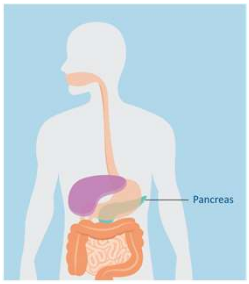
Insulin Delivery

A Pancreas in a person without Diabetes releases small amounts of Insulin frequently

Insulin is released 24 hours a day in two ways:

Basal – small amounts released in between meals and during sleep

Bolus – lager amounts released when eating



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Types of Delivery Methods

- Single dose of Long-Acting Insulin. Usually taken once a day.
- It works slowly, releasing a steady supply of insulin to help control BG levels.
- This is called BASAL insulin.
- It is administered via an insulin pen that looks much like an epi-pen.
- Positive: It's one shot per day

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Types of Delivery Methods

- Old-fashioned syringe injections.
- Requires the patient to self-inject small amounts of insulin throughout the day, usually around meal-times.

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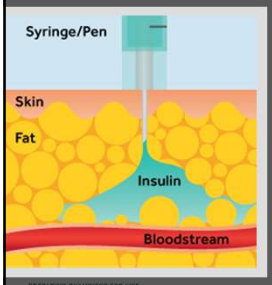

Negatives to Insulin Pens and Syringe Injections

- Long-acting insulin injections can "pool" under the skin leading to inconsistent absorption.

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Insulin Pumps

An insulin pump acts like a Pancreas by delivering insulin in two ways: BASAL and BOLUS.

Insulin Pumps hold several days' worth of insulin.

No long-acting insulin is needed when you use an insulin pump.

Amounts of insulin released can be customized for each patient.

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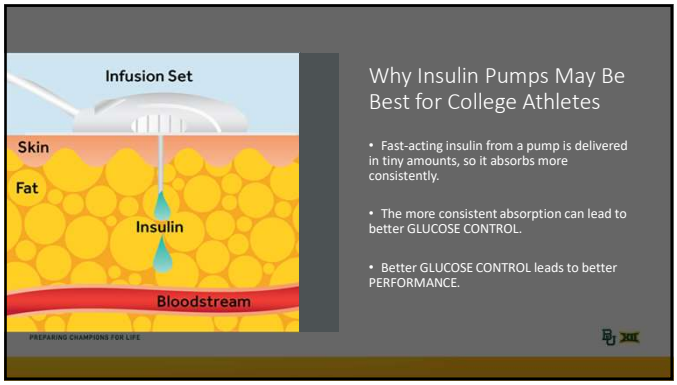

Why Insulin Pumps May Be Best for College Athletes

- Fast-acting insulin from a pump is delivered in tiny amounts, so it absorbs more consistently.
- The more consistent absorption can lead to better GLUCOSE CONTROL.
- Better GLUCOSE CONTROL leads to better PERFORMANCE.

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Injections vs. Pumps

Injections:

You cannot stop insulin from working once it's injected in the body.

This can lead to "LOWS", like during or after exercise.

Insulin Pump:

Allows you to adjust the amount of insulin you receive more often.

Can stop delivery if needed.

Some Pumps can adjust insulin in response to glucose levels (this is the best option)

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Injections vs. Pumps

Injections:

You must remember to carry the syringes with you.

Missing a dose of insulin almost certainly leads to high glucose levels

Insulin Pumps:

You always have your insulin pump with you.

Helps to avoid highs better and manage glucose levels.

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How This Applies to College Athletics: A Case Study

- Female College Basketball Player
- No. 1 ranked Post Player in the country
- Was the WBCA High School Player of the Year her senior year of high school
- McDonald's All-American
- USA Basketball Developmental Team Member
- Was diagnosed with Type 1 Diabetes at age 7

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It's a Team Approach

- Athletic Trainer – Daily contact with patient
- Endocrinologist – Specialist that cares for patients with Diabetes
- Team Physician – Works closely with AT in caring for all aspects of patient's health
- Registered Dietician – Understanding nutrition (especially counting carbohydrates)
- Psychologist – Mental health and coping mechanisms
- Strength and Conditioning Coach
- Academic Advisor

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Set Up Boundaries

- Set up what to do with "LOWS" and "HIGHS"
- What levels of Blood Glucose are the boundaries
- What steps will be taken
- Tough Scenario Questions

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Educate Your Program

Coaches – What will happen when the player goes "out of bounds" with BG

Players – Educated them on symptoms and what to do when by themselves

The Patient – Teach them how to best care for themselves (Carb Counting for example)

The Care Team – Everyone communicating and working together

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Notice Trends in Blood Glucose Levels

Over time, notice when patients begin to trend towards high or lows:

- With intensity of workouts
- With Adrenaline
- With Meals

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BG Trends with Workouts

Research and Books can provide an overall trend with variables, but customize insulin based on individual patient trends.

Short, high intensity workouts typically cause an increase in BG. Sprints, maxing in Weight Room

Typical practices lasting multiple hours typically see a general trend down in BG

Adjusting pump insulin delivery to 50% prior to the start of practice.

Have snacks and carbohydrate drinks available throughout practices.

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BG Trends During Workouts

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Snacks/Drinks to Increase Blood Glucose

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Snacks/Drinks

- Try to have a set amount of carbohydrates for each snack or drink.
- Helps to incrementally dose carbohydrates per 15 minute period.
- Can prevent swings between lows and highs.
- Remember the 15/15 Rule

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BG Trends with Games

- 99.9% of the time BG levels increase at the start of games.
- Don't underestimate the power of Adrenaline.

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Develop a Routine

It will be easier for the Endocrinologist to adjust BASAL amounts when a routine is established.

Sleep Times

Meal Times

Exercise Times

It will be easier for the Endocrinologist to "dial in" the best BASAL insulin amounts.

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Not All Technology is the Same

- For College Athletes we know that using a pump is better than injections.
- Using a Continuous Glucose Monitor (CGM) is better than multiple finger pricks.
- Combining the Pump with the CGM is better than using each independently.

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Pump Options

Find the Pump that fits your patient's needs best.

There are several options, each with its strengths and weaknesses.

Animas (no longer available)

Dexcom

Medtronic

Omnipod

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Advantages of Using a Pump with a CGM

- The Continuous Glucose Monitor (CGM) reads Blood Glucose levels every 5 minutes.
- The Pump has scheduled BASAL insulin delivery times throughout the day.
- The Pump can manually be adjusted prior to workouts and games.
- The Pump records highs and lows so the Endocrinologist can adjust to the patient's trends to help keep the BG in a target range.

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Beware of Triggers

- Illnesses
- Injuries
- Social Stressors

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Pitfalls

- Strep Throat
- Dexcom misplaced
- Focus on Illness and not on Blood Glucose
- Result = Diabetic Ketoacidosis
- Hospitalization for multiple

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Pitfalls

- Patient Compliance
- Patient Discipline

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The Game Changer

- Medtronic 670G (now the 770G)
- Closed Loop System between the CGM and the Insulin Pump
- Auto Mode – Keeps BG levels at a target range by adjusting BASAL insulin levels 24 hours a day.
- Works like the A/C Thermostat in your home
- "Artificial Pancreas"

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Time In Target Range

The Insulin Pump records the amount of time spent in the glucose target range.

Lauren Cox's Freshman Year		Lauren Cox This Year	
September 2016 – Glucose Range		February 2021 – Glucose Range	
High	61.5%	High	17%
In Range	33.9%	In Range	82%
Low	4.6%	Low	1%

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A1C Blood Test

- Provides a "snap-shot" picture of the average blood sugar level over the past several months.
- The higher the levels, the greater the risk of developing diabetes complications.

Normal | Pre-Diabetes | Diabetes

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A1C Comparisons

March 2016	May 2021
8.2	6.8

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Attaching the Sensor

- Apply Benzoin Tincture in a 4"x4" square.
- Cut a 4"x4" square of Cover Roll Stretch.
- Place the Sensor into skin.
- Cover with the Cover Roll Stretch.

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Q&A: A Discussion with Lauren Cox

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Thank You!

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