

Diabetes Lecture Series

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What is Diabetes?

- Most of the food we eat is broken down by the body into glucose and released into the bloodstream
- Glucose is the body's primary source of fuel
- In response to glucose levels, the pancreas releases the hormone insulin
- Insulin attaches to insulin receptors and allows glucose to move from the bloodstream into cells for energy


Type I Diabetes

- Type 1 diabetes is an autoimmune disorder in which the immune system attacks the insulin producing cells of the pancreas
- The pancreas is unable to produce enough insulin, and glucose remains in the bloodstream leading to high blood sugar levels
- Symptoms often occur suddenly and may include increased thirst, increased hunger, and frequent urination, weight loss, blurred vision, and fatigue
- Type 1 diabetes is not preventable, and individuals must inject themselves with insulin daily

Type II Diabetes

- In individuals with type 2 diabetes, the pancreas produces insulin but cell receptors become insulin resistant, and glucose remains in the bloodstream
- The pancreas works overtime producing more insulin to try to get the cells to respond. Eventually the pancreas becomes exhausted and is unable to make as much insulin.

- Nearly 24 million Americans have diabetes (8% of population), an increase of 3 million in last 2 years. 85-90% of diabetes cases are Type 2.




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What do we know


- 2007 data also show that 57 million people have pre-diabetes
- Pre-diabetes puts people at increased risk for diabetes
- 25% of people with diabetes do not know they have it
- 25% of population 60 years and older have diabetes
- 7th leading cause of death in the U.S.

How Do You Get Type II Diabetes?

- **Lifestyle factors increase your odds of getting type 2 diabetes.**
- **Weight**
 - Fat cells have fewer insulin receptors than muscle cells, and being overweight or obese can lead to insulin resistance.
- **Diet**
 - Diets containing high amounts of refined carbohydrates and processed foods are more likely to raise blood sugar levels. This creates more work for the pancreas and promotes weight gain.




- **Activity**
 - Being inactive elevates blood sugar levels and may lead to weight gain. Regular exercise helps lower blood sugar levels.
- **Stress**
 - Prolonged periods of stress increase levels of cortisol in the body, which antagonizes insulin.
- **Genetics**
 - Certain ethnic groups have a higher incidence of diabetes including African American, Native American, Pacific Islander, Latino, and Asian.



How is Diabetes Diagnosed?

- There are some symptoms associated with diabetes, but often people may not experience any symptoms. Routine blood and urine tests can confirm a diagnosis of diabetes.
- **Symptoms-**
 - Increased thirst
 - Unusually Frequent Hunger
 - Frequent Urination
 - Fatigue
 - Infections
 - Blurred vision
 - Cramps or burning sensation in the feet and/or legs
 - Unexplained weight loss
 - Nausea or vomiting
 - Sores that do not heal



Diagnosis

- The most common diagnostic tests include the **Fasting Plasma Glucose Test, Random Plasma Glucose Test, and the Oral Glucose Tolerance Test.**
- Tests should be repeated every 3 years, or more often for individuals with a family history of diabetes, certain ethnic groups, history of gestational diabetes, low HDL cholesterol, high levels of triglycerides, high blood pressure, or pre-diabetes.


- **Fasting Plasma Glucose Test (FPGT)**
 - measures the amount of glucose remaining in the blood after fasting for at least 8 hours. Blood sugar levels of 126 mg/dL or higher indicate diabetes.
- **Random Plasma Glucose Test (RPGT)**
 - does not require fasting.
- **Oral Glucose Tolerance Test (OGTT)**
 - assesses blood sugar levels a few hours after drinking a solution of glucose and water. Blood sugar levels of 200 mg/dL in either the RPGT or OGTT indicate diabetes.

Diabetes and Heart Disease


- High levels of blood sugar cause damage to nerves and blood vessels. Blood vessels become thicker, narrower and less elastic which reduces the ability of blood to pass through.
- High blood glucose levels are also associated with higher levels of fat in the blood. These fats, known as lipids, narrow and clog blood vessels.
- Inadequate circulation due to the narrowing or clogging of vessels restricts blood flow to vital organs, like the heart and brain, and throughout the body.

Diabetes and Heart Disease

- Heart disease is the leading cause of death in people with diabetes, and has been coined "the frequent, forgotten, and often fatal complication of diabetes."
- People with diabetes are up to 5 x more likely to develop heart disease or suffer a stroke than those without this condition.



- Not everyone with diabetes will develop all or any complications, but damage to vessels and nerves from uncontrolled blood sugar levels can effect the whole body.



<ul style="list-style-type: none"> Heart Mouth: severe gum disease Lungs: decreased function, increased breathing problems Gastrointestinal Tract: bloating, diarrhea, and constipation. People with diabetes have 3 x the normal risk of developing colorectal cancer Skin: dry and itchy skin, increased risk of fungal and other infections Genitals: decreased blood flow which may impair function and raises the incidence of yeast infections Feet: increased risk for injury and infection due to reduced sensation 	<ul style="list-style-type: none"> Brain: increased risk for Alzheimer's disease and other forms of dementia Eyes: retinopathy and glaucoma Liver: nonalcoholic steatohepatitis (NASH), increased risk of liver cancer Kidneys: impaired function which may lead to kidney failure Bladder: incontinence and increased urinary tract infections Immunity: slower reacting white blood cells, increased risk and severity of infections, flu and pneumonia
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Reducing Risks


- There are several healthcare services that are recommended on a regular basis that can reduce your risk of diabetes-related complications:
 - Annual eye exams
 - Routine medical follow-up appointments
 - Regular dental exams
 - Daily foot checks
 - Stopping smoking
 - Flu vaccinations
 - Daily baby aspirin use (if approved by your doctor)
- This self-care behavior is like the car maintenance schedule of diabetes management. Certain tests need to be done at specific times to prolong the life and efficiency of your car, and likewise, your body.

Why is Good Nutrition Important?

- Eating a healthy diet can:
 - Help you control blood sugar and lipids
 - Help you maintain a healthy weight or lose weight if you are overweight
 - Allow you to take less medication or avoid taking medication for Type 2 diabetes

Why is Good Nutrition Important?

- Prevent complications from high blood sugar:
 - Nerve problems
 - Kidney problems
 - Vision problems
 - Heart disease
 - Circulatory problems



Each person with Diabetes is Different

- Every person with diabetes should receive medical nutrition therapy based on his/her medical needs
- Your dietitian/doctor/nurse/Certified Diabetes Educator may suggest very specific goals for your weight, diet and exercise depending on your health status

Nutrition Guidelines for Type 2 Diabetes


- Lose weight if you are overweight
- Exercise to promote or maintain weight loss and to control blood sugar
- Monitor carbohydrate intake to maintain blood sugar control
- Eat carbohydrates mainly from fruits, vegetables, whole grains, legumes and low-fat or skim milk

Guidelines for a Healthy Diet

- **Estimated Calorie Intake:**
 - On average, women should consume no less than 1,200 calories a day, and men no less than 1,500 calories to ensure adequate nutrition. Calorie needs based on height, weight, age, activity level. www.mypyramid.gov (-500 calories per day to lose wt.)
- **Distribution of Calories from Major Nutrients:**
 - Carbohydrates: ~40%
 - Fat: "healthy fats" ~30%
 - with ≤7% from saturated fat
 - Protein: non-animal/animal ~30%

Nutrition Guidelines for Type 2 Diabetes

- Consume 40% of calories from **carbohydrates** (do not use extremely low carbohydrate diets to treat diabetes) – example: 1500 calories x .40 = 600 calories from carbs, divided by 4 (calories per gram) = 150 grams of carbs per day




Carbohydrate Intake

■ Total Calorie	Carbs (grams)	Each Meal (3)	Snack
1200	120	30 g	30 g
1500	150	30-45 g	15-30g
2000	200	45-60 g	30-45g
2500	250	60 g	60 g

Fat Intake

- Consume 30% of calories from **fat:**
 - Example: 1500 x .30 = 450, divided by 9 (calories per gram) = 50 grams total fat per day
 - Best fat sources: olive oil, nut oils, canola oil, nuts, seeds, salmon, avocado



Protein Intake

- Consume 30% of calories from protein- for those without existing kidney problems- from non-animal as well as animal sources: example: $1500 \times .30 = 450$ divided by 4 (calories per gram) = 112 grams of protein per day
- **Best protein sources:** fish, skinless chicken or turkey, nonfat/low-fat dairy products, beans/peas
- Always follow the advise of your physician/dietitian/nurse/CDE



Saturated Fat Intake

- Saturated (animal) fats: meat, cheese, dairy, etc.
- Limit saturated fat to 7% of calories
- Example: $1500 \times .07 = 105$, divided by 9 (calories per gram) = 11 grams or less of saturated fat per day



Trans Fats

- Found mainly in packaged and processed foods. Look for “partially hydrogenated”
- Ideal intake: 0 grams
- Limit use of packaged crackers and cookies
- Limit use of commercial bakery products like cakes, cookies, etc
- Use soft margarine instead of stick
- Read food labels for trans fat

Use a food log to start

- Once you know how many grams of:
- Carbohydrates
- Fats
- Protein
- Start keeping a food log to see how you are progressing and adjust accordingly

Carbohydrates

- Carbohydrates are broken down and converted to glucose, the body’s primary source of energy.
- Carbohydrates activate a stronger insulin release and response than protein or fats.
- Even distribution of carbohydrates throughout the day are important for good control of blood sugar levels.
- Consuming smaller amounts of food more frequently results in steadier, more even blood glucose levels.


Carbohydrate Quality

- Various forms of carbohydrates affect blood glucose levels in different ways
- Carbohydrates containing soluble fiber can help slow the release of glucose
- **Best sources are:**
- Fruits
- Vegetables
- Oat bran and barley
- Legumes/ beans and peas




Carbohydrate Quality (Cont...)

- The more refined a food substance is, the faster the release of glucose into the blood stream.
Example: whole potato vs fries or chips
- Choose solid forms of foods rather than liquid
 - For example: an orange instead of orange juice
- Raw and whole foods are generally more slowly absorbed than cooked and processed carbohydrates
- Avoid/limit foods high in simple sugars which hasten the release of glucose
 - For example: white bread, white rice, cookies, candies, cake, pie, etc.



Sugar Substitutes

- Use sparingly in place of sugar
- Can promote weight gain




Fiber

- Fiber can significantly reduce risk of heart disease, diabetes, cancer and obesity
- Fiber is one of the best ways to control blood sugar
- Soluble fiber delays movement of food into small intestines
- Slows post-meal surges in blood sugar
- 1 tsp fiber (Metamucil, Fiber Sure) in 1 cup of water before meals can drop blood sugar levels from 210 to 140 mg/dL

Fiber

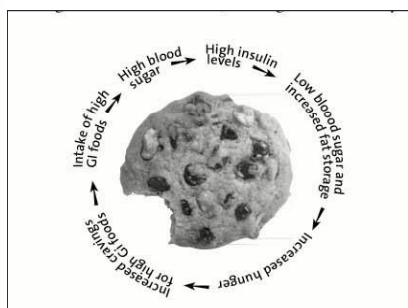
- Aim for 25-40 grams per day or 20 grams per 1,000 calories
- Best sources of soluble fiber: fruits, vegetables, oat bran, barley, beans/legumes and peas
- See Fiber handout



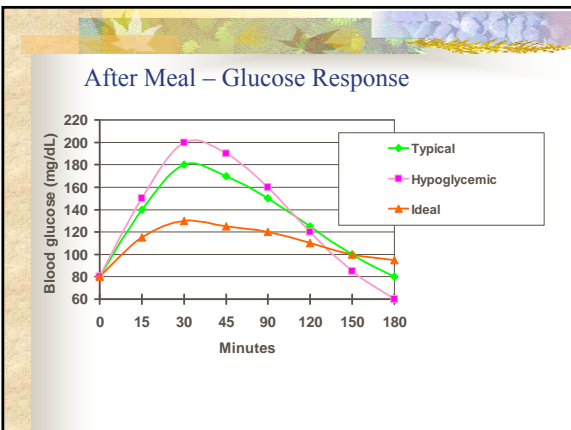
Insulin Response & Overweight

- **Insulin is a 'storage hormone'** – it signals the body to store sugar, fat, and protein.
- As long as your insulin level is high you are in storage mode and you cannot lose weight!
- High intake of sugar/refined carbs over time produces 'insulin resistant' cells.

Vicious Cookie Cycle



The diagram illustrates a cycle starting with 'Intake of high GI foods' leading to 'High blood sugar', which causes 'High insulin levels'. This leads to 'Low blood sugar and increased storage', which results in 'increased hunger' and 'increased craving for high GI foods', completing the cycle.




Glycemic Index and Glycemic Load

- The Glycemic Index (GI) and Glycemic Load (GL) can be used to predict how different types of food will affect blood glucose levels.
- GI and GL rank carbohydrates on a scale from 0 to 100 based on a food's glycemic response: how fast the carbohydrate is digested and how much your blood sugar increases after you eat.
- Being aware of the effects of different foods may assist in regulating blood sugar levels.
- www.glycemicindex.com
- <http://www.mendosa.com/gilists.htm>

Glycemic Index and Glycemic Load

- Diets composed mainly of high glycemic index and high glycemic load foods have been associated with a greater risk of type 2 diabetes in men and women
- Low GI and GL diets release glucose into the blood stream more slowly and steadily than high GI and GL foods, making blood sugar levels easier to regulate
- GI and GL indexes are simple tools for controlling blood sugar levels and measuring the carbohydrate content of foods, but do not account for calories, fats, or sodium content, or other nutrients and portion sizes

- It is important to consider overall intake for effective control of blood sugar and weight management
- Consider which foods will give you the most nutritional value
- Remember **portion size**- low GI foods can still be high in calories
- Try to combine some moderate to high GI foods with low GI foods to reduce the overall GI rating of a meal
- Use GI ratings to exchange  foods

Bottom Line




- Eat Less: refined starches like white bread, white rice, white pasta, white potatoes
- Eat Less: sugary foods like cookies, cake, pastry, sugary beverages
- Eat More: vegetables, fruit, whole grains and legumes
- Add lean protein and good fats to slow release of glucose

Combine Carbohydrate with Protein/Fat

- Foods comprised of protein and fat take longer to digest than carbohydrates
- Proteins and fat slow down digestion
- Foods break down to glucose much slower and raise blood sugar more slowly than carbohydrates alone
- Example: Apple with 10 almonds
Whole grain crackers with low-fat cheese


The Diabetic Diet: Debunking the Myths

- **Myth I**
- **Simple vs. Complex Carbs: Table Sugar**
 - For many years people believed that diabetics have to avoid simple carbohydrates like table sugar and opt for complex carbs such as potatoes instead.
 - Healthy eating still focuses on minimizing highly processed foods, which are often full of refined flour and sugar, but 15 grams of carbohydrates is the same **whether it comes from fruit or fudge**

Myth II

- **The Diabetic Diet**
 - Eating with diabetes is not a life sentence to a rigid, deprived meal plan.
 - All foods can fit into the diabetic diet, and will have different responses for each individual.
 - The best diet is the same kind of healthy eating that is best for everyone.



Dietary Exchanges and Carb Counting

- Other approaches to meal planning with diabetes include using dietary exchanges or carbohydrate counting.
- **Dietary Exchanges:**
 - The dietary exchange system includes a series of exchange lists that group foods with similar nutrition profiles.
 - The system is based on 3 major categories of food: the carbohydrate group, the meat and meat substitutes group, and the fat group.

Dietary Exchanges

- Each food selection on a given exchange list has a similar nutrient profile
- Any food choice on the list may be exchanged for another  = 
- The system is easy to learn and can help build a meal plan that outlines a certain number of exchanges from each list based on caloric and other nutritional requirements.

Dietary Exchanges

- **Carbohydrate Group: One Exchange equals:**
 - Starch: 15 g carb; 3 g protein, 0-1 g fat; 80 calories
 - Fruit: 15 g carb; 0 g protein and fat 60 calories
 - Milk: 12 g carb; 8 g protein; 0-8 g fat 90-150 calories
 - Vegetable list (non-starchy): 5 g carb; 2 g protein, 0 g fat; 25 calories
 - Other carbs (e.g. sweets) 15 g carb; other nutrients vary
 - See Booklet

Meat and meat substitute group

One exchange equals:

- **Very lean** list; 0 g carb; 7 g protein; 0-1 g fat; 35 calories (1 oz poultry/fish)
- **Lean** list; 0 g carb; 7 g protein; 3 g fat; 55 calories (1 oz lean pork/dark turkey)
- **Medium-fat** list; 0 g carb; 7 g protein; 5 g fat; 75 calories (1 oz beef/1 egg)
- **High-fat** list; 0 g carb; 7 g protein; 8 g fat; 100 calories (1 oz cheese/salami)

Fat Group – One exchange equals

- 0 g carbs, 0 g protein, 5 grams fat; 45 calories
- 2 Tbs avocado
- ½ Tbsp peanut butter
- 1 tsp margarine or mayonnaise
- 1 Tbsp regular salad dressing

Dietary Exchange vs Carb Counting

- When using the **dietary exchange** system, recipes that combine multiple foods may be difficult to calculate exchanges for.
- **Carbohydrate counting** provides another approach to meeting dietary goals with greater freedom of food choice.
- Carb counting involves calculating the number of carbohydrate grams in a given meal or snack. The total amount of carbs are added up to ensure that the total does not exceed a predetermined goal for the meal and/or day.

Carb Counting (Cont...)

- Every 15 grams of carbs are counted as 1 carbohydrate choice.
- Carb counting allows diabetics who use fast-acting insulin to calculate the right amount of insulin to counteract the corresponding blood glucose rise from their meals.

Diabetes and Alcohol



- The enjoyment of social drinking makes eliminating alcohol from the diabetic diet difficult. Using proper precautions, diabetics can still take pleasure in drinking in moderation.
- When alcohol is consumed, the liver decreases its ability to release glucose. Instead the liver is busy trying to clean alcohol from the blood. Because glucose production is halted, diabetics are at risk for hypoglycemia, especially if you drink on an empty stomach or after taking insulin or glucose-lowering oral medications.
- It takes 2 hours for 1 ounce of alcohol to be broken down and leave the body's system, so the risk continues long after you finish a drink.

Alcohol

- For individuals with well-controlled diabetes, alcohol intake should follow the same guidelines established for the general population by the United States Department of Agriculture (USDA):
 - A maximum of two drinks per day for men and one drink for women (women have a lower body water content and metabolize alcohol more slowly than men)
 - A maximum of one drink for anyone over the age of 65.
- One drink is defined as:
 - 12 ounces of regular beer (150 calories)
 - 5 ounces of wine (100 calories)
 - 1.5 ounces of 80-proof distilled spirits (100 calories)
 - One drink = 2 fat exchanges; regular beer is an additional starch exchange



Alcohol

- Alcohol is a unique substance. The body processes alcohol before it metabolizes fat, protein, or carbs.
- A 5-ounce glass of wine typically contains 110 calories, 5 grams of carbs, and about 13 grams of alcohol (which accounts for 91 of the calories).
- These numbers are roughly the same as you will find in a 12-ounce light beer or 1.5 ounces of 80-proof liquor.
- Most people experience a dip in their blood sugar after consuming alcohol; the glycemic index of beer, wine, and hard liquor is zero.

Blood Sugar Management: Hypo- and Hyperglycemia

- **Hypoglycemia: Low blood sugar**
 - Sometimes referred to as an “insulin reaction”, hypoglycemia occurs more frequently in people with diabetes who take insulin
 - Typical hypoglycemic threshold: 70 mg/dl (3.9 mmol/l)
 - Commonly caused by certain oral medications, missed meals, and exercise without proper precautions

Hypoglycemia (Cont...)

- Symptoms may include erratic heartbeat, sweating, dizziness, confusion, unexplained fatigue, shakiness, hunger, and potential loss of consciousness
- Once recognized, treat immediately with a fast-acting carbohydrate, such as glucose tablets or juice



Hyperglycemia

- **Hyperglycemia: High blood sugar**
 - May lead to 1 of 2 conditions:
 - **Diabetic ketoacidosis (DKA)**
 - More common in Type 1 diabetes
 - **Hyperglycemic hyperosmolar nonketotic syndrom** (HHNS or hyperglycemic hyperosmolar nonketotic coma)
 - Known as a **Diabetic coma**
 - More common in Type 2 diabetes

Diabetic ketoacidosis (DKA)

- When not enough insulin is available the body is unable to use glucose for energy, and it remains in the blood
- In order to sustain function, the body switches into starvation mode and releases fat to use for energy
- The fat that is released is converted into ketones, which are used more slowly than they are made

DKA

- Excess ketones and high glucose in the blood leak into the urine and pull water out of the body causing dehydration
- This condition develops slowly over several hours if hyperglycemia is not promptly treated

DKA

- Symptoms include:
 - Dehydration and excess thirst
 - Excess urination
 - Vomiting
 - Abdominal Pain
 - Drowsiness
 - Difficulty breathing
 - Fruity smell on the breath
 - Ketones in the urine
- Treatment requires insulin and fluids. Levels of sugar and urine ketones need to be measured frequently. If untreated, DKA may lead to coma or possible fatality.



Diabetic Coma (HHNS)

- Occurs when blood sugar levels become too high and the body becomes severely dehydrated
 - (no ketones are formed with diabetic coma)
- Occurs more often among people older than 60, whom have a decreased thirst sensation and are more likely to become dehydrated
- In most cases, people experience excess thirst and urination for weeks prior to diagnosis

Diabetic Coma (HHNS)

- High blood sugar levels and excess urination lead to dehydration throughout the cells of the body
- The severe loss of body water can lead to shock, coma, and death
- The chronically ill or disabled are especially at risk


Diabetic Coma (HHNS)

- Causes include:
 - Infection
 - Heart attack
 - Kidney failure
 - Medications (diuretics, heart medication, or steroids)
 - Illness
 - Bleeding ulcer
 - Blood clot
 - Uncontrolled blood sugar

Early Symptoms


- Increased thirst
- Increased urination
- Weakness
- Drowsiness
- Altered mental state
- Headache
- Restlessness
- Inability to speak
- Paralysis

■ Once early symptoms are noticed, treatment usually requires intravenous fluids and possibly insulin



Prevention of Hyperglycemic Conditions

- Check blood glucose levels regularly
- Eat regular meals at consistent times
- Take extra care of yourself particularly when you are sick, and check blood glucose levels every 4 hours



Blood Sugar Management

- Maintaining blood glucose levels through proper dietary changes, exercise and/or medication and insulin therapy is essential for effective diabetes control.
- Avoiding fluctuations of high and low blood sugar levels will reduce the risk of diabetes complications and improve the way you feel.
- It is important to test blood glucose levels frequently each day and get regular A1c tests from your health care provider to make sure that your blood glucose levels are in target range.

What Numbers Should You Be Looking For?

- The American Association of Clinical Endocrinologists (AAACE) recommends the following general blood glucose testing goals for adults with type 1 and type 2 diabetes:
 - Preprandial (fasting, or before a meal): <110 mg/dl (6.1 mmol/l)
 - Two hours postprandial (after the start of a meal): <140 mg/dl (7.8 mmol/l)
 - A1c (three month blood glucose average): 6.5% or lower
- The American Diabetes Association (ADA) suggests:
 - Preprandial: 70-130 mg/dl (3.9-7.2 mmol/l)
 - Postprandial (1-2 hours): <180 mg/dl (<10.0 mmol/l)
 - A1c (three month blood glucose average): 7.0% or lower
- Self-testing blood glucose levels will be determined by your physician according to your individual medical history and lifestyle requirements

Weight Management

- Excess weight is an issue for many people living with type 2 diabetes.
- Being overweight or obese promotes insulin resistance and fat makes it harder for the body to use insulin to process blood glucose.
- Excess glucose is stored by the body as fat, making weight problems worse for people with uncontrolled diabetes.

Body Mass Index (BMI)

- BMI measures weight in relationship to height as an indicator of body fat.
- Adult BMI Range:
 - Normal: ≤ 24.9
 - Overweight: 25-29.9
 - Obese: 30-39.9
 - Extreme: ≥ 40
(or morbid) Obesity

BMI – Body Mass Index

- Location of pounds also make a difference.
- People who have an apple-shaped body, that carry extra weight around the waist, are at a higher risk for developing type 2 diabetes and heart disease.
- http://www.nhlbi.nih.gov/guidelines/obesity/bmi_tbl.htm



Effective Weight Management

- The same things that are good for controlling diabetes are also key to weight control: healthy dietary habits and regular exercise.



Diabetes and Exercise

- Regular physical activity helps control blood sugar levels, reduces the risk of complications, increases energy, improves heart health, and promotes emotional well-being.
- Many diabetic complications occur as a result of poor circulation. Damage to blood vessels caused by high blood glucose levels decreases circulation throughout the body.
- Regular exercise promotes circulation, decreasing the risk of developing complications, and may help reduce the amount of medications needed.

Exercise



- Exercise also reduces stress, enhances your mood, improves body image, and promotes a sense of well-being.
- Diabetics can benefit from participating in at least 30 to 60 minutes of physical activity on most days of the week.
- Always consult your health care practitioner before starting a new exercise or fitness routine to determine which activities are safe and compatible with your individual health profile.

Rules to Ensure a Safe Exercise Session

- ✓ **Check your levels**
 - ✓ Self-test blood glucose levels before and after a workout. The ADA recommends using caution with exercise if fasting glucose levels are >300 mg/dl (16.67 mmol/l) and no ketosis is present, and avoid exercise if ketosis is present and fasting glucose levels are >250 mg/dl (13.89 mmol/l). If levels are below 100 mg/dl (5.56 mmol/l) before exercise, have a snack and retest in 15 minutes.
- ✓ **Keep a Log**
 - ✓ Track your blood sugar response to different activities and environments (e.g., hot versus cold) and your food intake to be able to recognize patterns and make treatment adjustments.
- ✓ **Sweets for Safety**
 - ✓ Keep a source of fast acting carbohydrates (e.g., glucose gel or tablets; juice) available for hypoglycemic emergencies.

✓ No insulin before exercise

- ✓ Exercise has a blood sugar lowering effect and muscles in action metabolize insulin injections faster, increasing the risk for hypoglycemia.
- ✓ **Stay hydrated**
 - ✓ Drink plenty of water. Staying well-hydrated before, during, and after exercise is important for preventing erratic blood sugar levels and heat stroke.
- ✓ **Identify yourself**
 - ✓ When exercising, always wear a medical identification tag or bracelet in a noticeable place on your body, so others will know how to help you if you lose consciousness.

✓ Warm up and cool down

- ✓ The ADA recommends a warm-up of 5-10 minutes of aerobic activity (walking, cycling, etc.) at a low intensity level and an additional 5-10 minutes of gentle stretching. The cool-down should also last 5-10 minutes, until heart rate has returned to pre-exercise levels.
- ✓ **Dress appropriately**
 - ✓ Well-fitting shoes and socks and breathable, weather appropriate clothing are essential for preventing foot problems and heat stroke.



Supplements

- Very important not to replace conventional medical therapy for diabetes without communicating with health care professional
- Diet and exercise are key, but supplements can help.
- Work with a health care professional if you'd like to try supplements
- Start with one supplement at a time and see how blood sugar improves

Recommendations

- **GTF (glucose tolerance factor) chromium:** This trace element plays a role in blood sugar regulation by working with insulin to help transport glucose into cells. Can take 1,000 mcg daily.
- **Alpha-lipoic acid:** An antioxidant that can enhance glucose uptake, inhibit glycosylation (the abnormal attachment of sugar to protein), and helps promote and maintain eye and nerve health. Start with 100 milligrams a day. Higher doses (600 milligrams a day) help treat and prevent diabetic neuropathy (nerve damage from impaired circulation).
- **Magnesium:** To help promote healthy insulin production, take 400 mg daily. (Magnesium glycinate is a good form with less of a laxative effect.) Magnesium citrate is good to help move bowels.

Recommendations

- Vitamin D – at least 1,000 IU daily with food
- Large study showed a strong inverse association between blood levels of Vitamin D and diabetes
- Lower a person's Vitamin D level, higher chance they had diabetes – check your levels!
- Vitamin D in infancy helps prevent type 1 diabetes
- Vitamin D deficiency may also play a role in development of type 2

Supplements

- Coenzyme Q10: A powerful antioxidant that may help maintain a healthy heart. Take 60-100 milligrams of a softgel form with your largest meal.
- Cinnamon: ½ tsp in food or 1,000 mg/day
- Bitter melon (*Momordica charantia*)
- Gurmar (*Gymnema sylvestre*)
- Prickly-pear cactus (*Opuntia spp*)
- Glucomannan - fiber

Summary

- Good nutrition is one of the keys to managing Type 2 Diabetes
- Nutrition guidelines for Type 2 Diabetes focus on controlling carbohydrate and fat intake
- Weight management and exercise are also key
- Seek help to set and reach your nutrition and exercise goals

Summary

- Talk to your doctor, dietitian, diabetes educator about which changes are most important for you
- Start slowly by changing your habits one at a time for a lifestyle program you can live with
- Seek support from your dietitian and/or diabetes support team

Resources

- American Diabetes Association
www.diabetes.org
- Joslin Diabetes Center www.joslin.org
- National Diabetes Information Clearinghouse
www.diabetes.niddk.nih.gov
- Calorieking.com
- Dwlz.com (Restaurants)
- <http://www.changingdiabetes-us.com/>

Resource Books

- *American Diabetes Association Complete Guide to Diabetes*
- *Diabetes for Dummies*
- *The All-Natural Diabetes Cookbook* by Jackie Newgent, RD
- *Magic Menus* – American Diabetes Assoc.
- *The New Glucose Revolution* by Jeannie Brand-Miller, PhD

Remember

- Type 2 Diabetes is mainly a disease of “lifestyle.”
- You can prevent many of the complications of diabetes through diet, exercise and stress reduction
- Take care of yourself – you’re worth it!!!

