

**Lifespan Cardiovascular Institute**

Rhode Island Hospital • The Miriam Hospital  
Newport Hospital

*Delivering health with care.®*

# Diabetes Mellitus

# STATISTIC

- According to the ADA there are 26 million people living with diabetes.
- Recent numbers by the CDC indicate that every 17 seconds someone is diagnosed with diabetes
- Diabetes is the 7<sup>th</sup> leading cause of death in the US

# What is Diabetes?

- Diabetes consists of a group of metabolic diseases characterized by inappropriate hyperglycemia resulting from defects in insulin secretion, insulin action, or both

# What is Diabetes

- Diabetes can lead to serious complications and premature death, but you can take measures to reduce the chance of such occurrences.
- Diabetes can lead to blindness, heart attack, stroke, and kidney failure



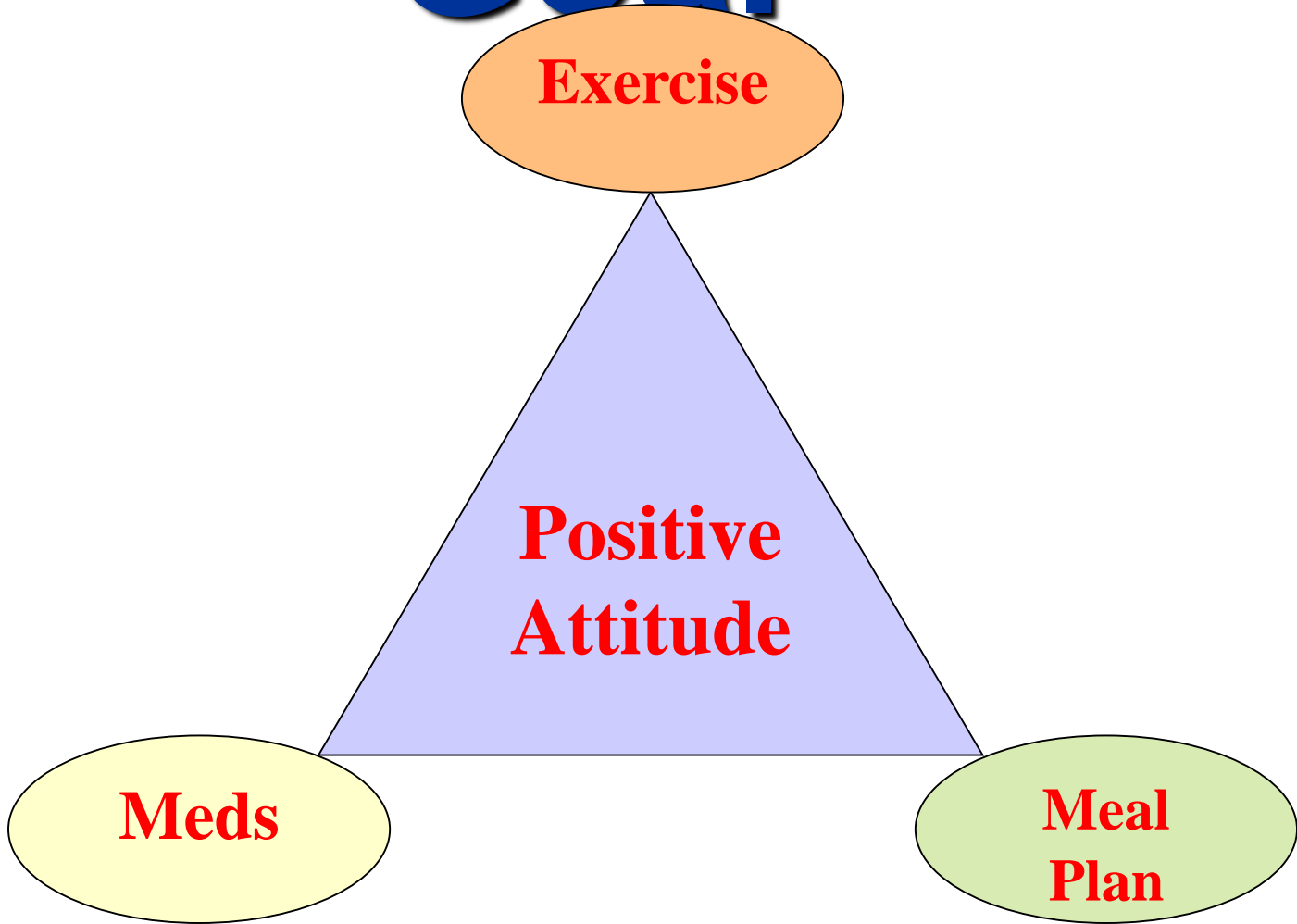
# Goal

**Exercise**

**Positive  
Attitude**

**Meds**

**Meal  
Plan**



# GOAL

- Become active participant in your care.
- Gain knowledge about nutrition and medications.
- Self monitoring of your blood glucose.
- Prevention and treatment of short and long term complications, foot care, travel tips, managing stress, exercise, and care on sick days.

# Understanding Diabetes

- Foods we eat are made up of carbohydrates, protein, fats.
- These nutrients are essential in a healthy diet
- After we have eaten, the glucose (sugar) is absorbed from the small intestine into the blood stream and carried throughout the body to be used by the cells for energy.

# **Understanding Diabetes**

## **Carbohydrates**

**The Body's Prime Source of  
Energy**

# Understanding Diabetes

## Protein

**Necessary for growth and tissue maintenance and is a potential source of energy**

# Understanding Diabetes

## Fats

**Used as an energy source  
Also is an insulator  
and Protects our vital organs**

# Glucose

- All cells in our body need glucose for energy.
- Muscle cells use it to walk.
- Brain cells use it to think.
- Nerve cells use it to feel.
- Glucose can not enter the cells without a hormone called insulin.

# Insulin

- Insulin is a hormone produced in the beta cells of the pancreas.
- Insulin is the “key” that unlocks the door to the cell so glucose can enter.
- Once glucose enters the cell it is changed into energy and used by the body or stored for later use in the form of glycogen or fat.



- In diabetes there is either no insulin produced, or not enough insulin, or the body can not use the insulin efficiently.
- Glucose builds up in the blood stream and this is called Hyperglycemia (High blood sugar)

# What Do The Numbers Mean?

- Normal Fast Blood Sugar 70-110
- Impaired Fasting Blood Sugar 111-125
- Diagnosed with DM=
  - Any Blood Sugar Fasting Over 126
  - Not Fasting Over 200 with symptoms

# DIAGNOSIS

- Acute symptoms of diabetes plus random plasma glucose  $\geq 200\text{mg/dl}$
- Fasting plasma glucose  $\geq 126\text{mg/dl}$
- Two-hour plasma glucose  $\geq 200\text{mg/dl}$  during a 75-g oral glucose tolerance test (OGTT).

# **RISK FACTORS**

- Family History
- WEIGHT
- RACE
- AGE
- PREGNANCY
- STRESS AND TRAUMA

# OTHER RISKS FACTORES

- Overweight/Central obesity
- Inactivity
- High triglycerides
- Pima Indians, Asian, Hispanic, African and Native Americans
- History of large babies (over 9 lbs)
- Gestational diabetes during pregnancy

# Types of Diabetes

- Type 1 Pancreas does not produce any insulin. Absolute insulin deficiency
- Type 2 Something wrong with cell membrane, decreased sensitivity, insulin resistant, decreased production of insulin by the pancreas

# STATISTICS

- Type 1 about 5-10% have it.
- Type 2 about 90% of all diabetics
- Gestational Diabetes occurs during pregnancy at 6-9 months because hormone levels are high, and pancreas can not produce enough insulin.

# Type 1

- Insulin deficient
- Under 20
- Develops suddenly
- Hereditary minor role

# Type 2

- Insulin resistance, not enough
- After 40
- Develops over years
- Hereditary 80%



# Type 1

- Weight not factor
- Virus triggered immune response
- Only RX Insulin
- More common with Caucasian

# Type 2

- 80% overweight at diagnosis
- sedentary lifestyle
- Hispanic, Asian, Native American, African American

# DCCT STUDY

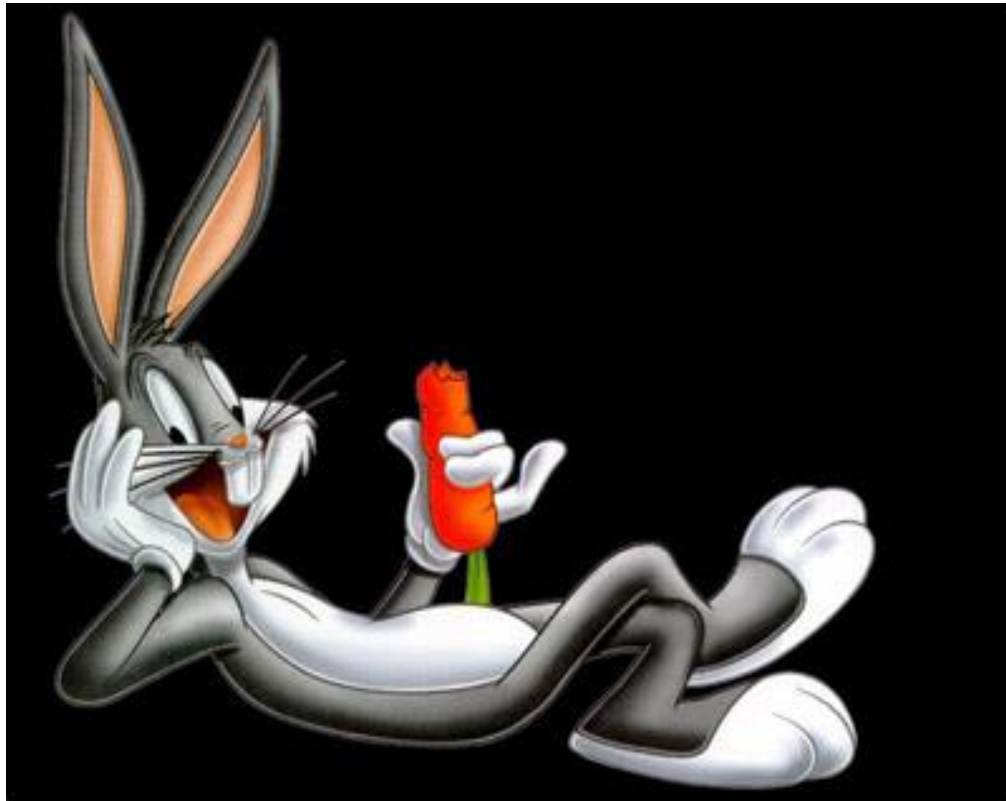
- Diabetes Control and complication Trial
- Lowering Blood Sugar Reduced Risks of Diabetic complications- here are the results:
  - Eye diseases 76%
  - Kidney diseases 50%
  - Nerve diseases 60%

# Feelings

- How did you feel when you were first diagnosed with Diabetes?

- Natural to feel angry, sad, alone, and scared
- Relieved
- Denial
- Important to share your feelings
- Keep a positive attitude

# BREAK



# **SIGNS AND SYMPTOMS HYPERGLYCEMIA**

- Blood sugar over 200
- Extreme thirst, frequent urination, dry skin, hunger, blurred vision, drowsiness, and decreased healing

# Hyperglycemia

- Frequent infections
- Unexplained weight loss
- Fatigue
- Muscle cramps
- Impotence
- Some people have no symptoms

# REASONS

- Not enough insulin and too much food
- Infection, Illness , Fever
- Emotional stress
- Poor food choices
- Not enough or forgot medication
- Change in medication



# Treatment

- Test blood sugar frequently
- Check urine for ketones (type 1)
- Call Doctor (over 300mg/dl)
- Drink extra sugar-free liquids
- Determine cause and prevent in future if possible

# Hyperglycemia

- Call your physician if your blood sugar is persistently over 200
- Take medication as prescribed by your physician
- Treat any infection or illness

# Hypoglycemia

- Blood sugar below 70
- Sweaty
- Fast heart beat
- Shaky
- Anxious
- Hunger
- weakness
- Fatigue
- Headache

- Irritability, unusual angry, crying, and nervousness hungry
- Cold sweat
- “wet” symptoms/signs
- Lower blood sugars- loss of consciousness, confusion

# REASONS

- Too much insulin/medication
- Not enough food
- Unusual amount exercise
- Delayed or skipped meals

# Treatment

Fast acting sugar  
1cup skim milk  
4oz orange juice  
4oz regular soda  
3tsp sugar or  
honey  
6 lifesavers

3 glucose tablets  
re-test after 15 min

Blood sugar low or  
symptoms, repeat  
fast acting sugar

Wait 15 min retest  
If, have snack



# Blood sugar testing (HBGM)

- WHY TEST- guidelines for treatment and plan, gives you feedback
- WHO TEST- Type 1 3-4xday. Type 2 reach optimal goals.
- WHEN- fasting, 2 hour after meals, bedtime, 2 or 4 am
- WHERE- Finger and alternate sites (forearm, palm of hand)
- HOW- Proper technique, side of finger



# GUIDELINES FOR TESTING

- Store strips and solution according to manufactures guidelines
- Avoid exposure to heat, cold, and humidity
- Check expiration dates and calibrate meter (control solution)
- Keep cap on the strips
- Match code numbers
- 10-15% difference serum vs. whole blood
- Monitoring has revolutionized management of diabetes

# Types of Meters

- light reflectance meters.
- Electrophoresis technology meters.
- All kinds to suit individual needs.
- Find out from insurance where to purchase meters.
- Companies that will come to house and demonstrate meters.

# OBTAINING BLOOD

- Warm fingers , Hang hand lower than heart
- Dry finger, Locate site, Use proper lancing device, Press end-cap against finger when puncturing
- Relax hand, gentle squeeze
- Let drop collect, touch drop to strip or cover strip completely

# COMMON ERRORS

- Not enough blood (some meters require more blood than others)
- Uncovered bottle/storing strips in bathroom (moisture)
- Code strips do not match
- Outdated supplies

# HbA1c

- The HbA1c test measures the amount of glucose in your blood over 3 month period
- Glucose binds to your hemoglobin molecule
- Test is done upon diagnosis then usually every 3 months

**HbA1c**

**Blood sugar**

# Target Glucose levels

**TIME**

**ADULT**

**ELDERLY**

**Fasting**

**80 – 100 mg/dL**

**100-150 mg/dL**

**1 Hour after**

**140 – 160 mg/dL**

**150 – 200 mg/dL**

**2 Hour after**

**120 – 140 mg/dL**

**100 – 160 mg/dL**

**Bedtime**

**100 – 140 mg/dL**

**100 – 160 mg/dL**

**2 – 4 a.m.**

**80 – 120 mg/dL**

**100 – 160 mg/dL**

# ACTION NEEDED

- Pre-meal-  $< 70$  or  $> 130$  mg/dl
- 1 Hour after meal - Over 180mg/dl
- 2 Hours after meal - Over 150mg/dl
- Bedtime -  $< 80$  or  $> 160$ mg/dl



# Pattern Management

- Review several days of glucose records.
- Look for a pattern (sugars out of range)
- Food, exercise, stress, illness
- Timing is variable depending on goals and meds.



# Exercise

- Helps control blood glucose
- Improves insulin sensitivity
- Improves glucose tolerance

# EXERCISE BENEFITS

- Feel better physically and mentally
- Improve cardiac function and circulatory function
- Improves self esteem and self image
- Manage stress
- Provides social interaction
- Controls weight

# **SAFTEY TIPS- EXERCISE**

- Start out gradually
- Carry short acting sugar source
- Test blood sugar before and after
- Do not inject in muscle arm or leg
- Wear proper identification
- Carry ID bracelet

# SAFTEY TIPS- EXERCISE

- Find exercise you enjoy 10-30 minute a day, 3 times a week
- Bring a friend
- Wear supportive shoes and sneakers
- Do not exercise in extreme weather (too hot or cold)

# SAFTEY TIPS

- Exercise 1 hour after meal and not while insulin peaking
- Stop if you develop any chest pain, SOB, lightheadedness, or low blood sugar symptoms
- Include warm up and cool down
- Drink enough fluids and maintain hydration while exercising

# Carbohydrate replacement during exercise

- Intensity Duration Replacement frequency
- Mild to moderate  $<30$  may not be needed =0
- Moderate  $30-60=15$  Grams each hour
- High  $60=30-50$  Grams each hour



# CAUTION

- Neuropathy- water aerobics, swimming, biking. No impact exercises
- Retinopathy-no holding breath, resistance training, or high impact aerobics
- Unable to walk- Do chair exercises
- Do not exercise if blood sugar over 300mg/dl – or below 100mg/dl
- Avoid if having blood sugar problems
- Be aware if on beta blockers hypoglycemia can be masked

# CAUTION

- Use caution walking outdoors
- Avoid lower head position
- Avoid weight training
- Blood sugar levels can be affected for up to 24 hours, and peak effect after 4 hours

# THINGS TO DO

- Exercise with a partner
- Use proper footwear and protective equipment
- Inspect feet daily
- Monitor blood glucose before and after exercise
- Stay in your safe target heart rate zone

# TARGET HEART RATE

- Measurement obtained from a stress test
- Stress test preformed on everyone over 35 with diabetes
- Different formulas used for safe target heart rates
- Percentage of max heart rates

# TYPES OF EXERCISE

- **AEROBIC**- greatest benefit
- Exercise includes repetitive sub maximal contraction of muscle groups and requires oxygen to sustain muscle effort.
- **ANAEROBIC**
- Exercise that does not require sustained oxygen to meet energy demands

# EXERCISE

## AEROBIC

- Swimming, cycling, jogging, walking
- Greatest benefit for people with diabetes in terms of blood glucose control and cardiovascular status

## ANAEROBIC

- Strength training
- Improves strength and body composition
- Improves cardiovascular function and glucose tolerance

# EXERCISE PROGRESSION

- **USE TARGET HEART RATE AND RPE SCALE**
- **DURATION**- Amount of time on equipment
- **INTENSITY**- Work load set on equipment
- **FREQUENCY**- How often exercise in a week

# GOALS

- Pick something fun that you will continue
- Plan exercise time appropriately
- Stick to your plan
- Reward yourself (BUT NOT WITH FOOD)



# BREAK

# COMPLICATIONS

- Studies show that complications are not inevitable. (DCCT, UKPDS)
- Reduction of modifiable risk factors essential in diabetes self management
- It is never too late to improve control and halt progression of illness

# COMPLICATIONS

- DCCT studies lowering blood sugar reduce
- Eye diseases 76%
- Kidney diseases 50%
- Nerve diseases 60%

# RISK FACTORS

## Modifiable

- Hyperglycemia
- Smoking
- High blood pressure
- High lipid levels
- Increase platelet adherence
- Stress
- Eating habits
- Obesity
- Lack of exercise
- Type A personality

# RISK FACTORS

## Non-Modifiable

- Age
- Genetics
- Race
- Gender
- Length of time have diabetes

# Large Vessel Disease

- Coronary artery disease- Heart circulation
- Myocardial infarction- death of heart tissue
- Peripheral vascular disease- circulation of arms and legs
- Cerebral vascular disease- Circulation of the brain

# Complications

- 40% decrease in large vessel damaged with good control
- High glucose speeds up process of arteriosclerosis (hardening of artery) high risks of heart disease
- Large vessels in the legs can be affected by arteriosclerosis
- Circulations impaired ends to ulcers, infection, and gangrene

# Small vessel disease

- Retinopathy- diseases of the eyes
- Nephropathy- diseases of the kidneys
- Neuropathy- diseases of the nerve endings



# Small Vessel Disease

- Retinopathy is diseases of the eyes, such as high blood sugar damage tiny blood vessels of retina causes loss of vision, or blindness, blurred spots, and double visions
- 76% of diabetes eyes treatment with laser Rx
- Neuropathy is pain and loss of feeling in the hands and feet. Also, it can effect nerves in the heart, bladder, digestive system, and sexual organs

# PREVENTION OF COMPLICATIONS

- Control blood sugars
- Eat healthy foods
- Quit smoking
- Control high blood pressure ideal 120/80
- Avoid salty food
- Exercise regularly
- Report infection
- Keep alcohol to a minimum
- Report any sudden or unusual change in vision
- Take your prescribed medications

# PREVENTION OF COMPLICATIONS

- Cholesterol lower than 200
- Triglycerides lower than 150
- HDL high than 45
- LDL 70 or below
- Take cholesterol meds
- Exercise and eat healthy
- Quit smoking-damage vessels

# DIABETES CARE SCHEDULE

- DAILY- foot inspection, HMBG
- EVERY 3 MONTHS- HgbA1c, Check blood pressure
- YEARLY- Dilated eye exam, kidney function tests, Dental check up, Lipid profile, See Podiatrist

# FOOT CARE

- Inspect daily for redness, swelling, cuts, and sores
- Do not soak, but wash daily and use a mild soap
- Clean with dry pat
- Avoid extreme of temperatures
- Wear socks if cold no heating pads or water bottles.
- Never go out without shoes
- See podiatrist never walk on bare feet
- Review care of diabetic foot list
- Measure feet avoid high heels and pointed toes

# **Checklist for preventing complications - How Doctor can help**



# SICK DAYS

- Body breaks down fat for energy
- Ketones result
- Ketones are acids
- Acids lead to acidosis– Ketosis
- Causes– Infection, Injury, Surgery, Fever, Psychological upsets, Vomiting, Diarrhea, Head or Chest cold, Congestion, and flu



# **DKA-Diabetic keto acidosis**

- Type 1
- Ketoacidosis
- Blood sugar  
300-600mg/dl
- Severe GI  
symptoms
- Loss of appetite
- Vomiting
- Dehydrated
- Kussmaul  
respirations
- Fruity breath
- Mentation alert  
to coma

# HHNS- Hyperglycemic Hyperosmolar Non-ketotic Syndrome

- Type 2
  - No Ketoacidosis
  - Blood sugar 600-2000mg/dl
  - Less GI symptoms
  - Severe dehydration
  - No Kussmaul respirations
  - Confusion to coma
- Look like CVA

# HHNS

- If undetected lead to change in mental status or coma

- Preventions

- Test blood sugar regularly
- Drink 8 oz/fl. of fluid first rapid diagnosis of flu or UTI
- Educate yourself about diabetic symptoms

# PREVENT DEHYDRATION

- Minimum amount of fluid
- Drink every half hour
- Monitor ketones
- Monitor for fever Call if fever is  
=>101.5

# UNABLE TO EAT

- *If Able to eat regular meal*, drink ½ cup calorie free fluid every hour while awake. Broth, caffeine free tea, sugar free soda, water.
- *If Unable to eat regular meal*, try to drink fluid containing 15 grams of Carbohydrate every hour

# WHEN TO GET HELP

- Unable to stop vomiting after 6 hours
- More than 5 diarrhea stools in day
- Unable to get minimum amount fluid in 6 hours
- If you have taken extra insulin and blood sugar still elevated
- Moderate to large ketones in urine
- Blood sugar over 250
- Fever above 101°F

# WHEN TO GET HELP

- Dehydrated and getting worst
- Breathing rapid and deep
- Have infection in the legs
- Miss more than 1 day of work
- Pain upon urination or bladder infection
- Change in mental status

# Sick Day Box

- regular soda
- Canned soup, or Instant soup
- Regular pudding or jello made quickly, or snack pack
- Canned fruits or small bottle of juice
- Ensure-nutritional liquid supplementary



# Additional items in sick box

- Diary to record blood sugars
- Doctors name and telephone number
- List of medications
- Ketone strips that are individually wrapped
- List of foods that give you 15gm. Of easily digested carbohydrates
- Menus that spell out what to eat when sick
- Extra testing supplies, such thermometer, Tylenol OTC meds

# Doctor visits

- Think about why are you going
- What questions do you have
- Talk it over with someone else
- Write questions down
- Bring written questions
- Log book
- List of medications and dosages
- Paper and pencil

# Break

# Travel Tips

- Diabetes medication and supplies.  
Enough to last the duration of the trip and 1 extra week supplies.
- Written prescription from a physician
- Extra batteries for meter.
- If you take insulin use insulated carrying case for your supplies.
- Pack meds and supplies in your carry on bag.
- Do not store in glove compartment or

# Travel Tips

- Keep quick-sugar source with you
- Glucagon emergency kit if you inject insulin
- Snacks that fit your meal plan
- Medical identification- card, necklace, or bracelet
- Diary or logbook with pen and paper
- Letter from doctor states diabetes, management plan, emergency instructions

# Travel Tips

- Prescriptions for all medicines with generic names included that you take
- Medical insurance card and phone number
- Nonprescription meds such as pain relievers, sugar free cold medicine
- First aid supplies for minor cuts and blisters
- Doctors phone number and medical assistance numbers

# Travel Tips

- Packets of sugar substitute
- Sunscreen with 15SPF sunglasses with 90%UVA and UVB protection
- Extra pair of eyeglasses or contacts
- Sturdy comfortable broken in shoes
- Lots of good socks
- Extra cash (for taxis, vending machines)
- Telephone calling cards for emergencies

# TRAVEL

- Car travel- Do not store insulin or meds in the dash board, trunk
- Travel with someone
- Carry extra food
- Plane- plan appropriate snacks (flight delays, etc.) do not leave insulin in baggage keep in your carry-on with your glucose meter/supplies, medications
- Tell hostess your health problem



# TRAVEL

- Drink plenty water
- Sugar free liquid
- Adjust meals, snacks for time zone
- If injecting insulin during flight, inject  $\frac{1}{2}$  air into syringe
- Keep supplies in carry on

# WORLD TRAVELER

- Avoid drinking tap water in the following countries:
- Cuba, Mexico, South America, Asia, and Africa contain bacteria in the water that cause diarrhea and vomiting
- Bring sugar substitute packages
- Sunny place- use sunscreen with SPF-15, wear sandals, and hat on the beach
- Keep insulin in the small cooler where it can be protected
- Emergency kit with first aid supplies

# STRESS

- A physical and emotional reaction to a situation that is perceived both as a threat to one's well being and as unmanageable.
- Stressor is a condition or situation that causes stress
- Name some stressors both good and bad
- Fight or flight reaction

# THE BODY'S RESPONSE TO STRESS

- Endocrine system- thyroid releases thyroxin
- Adrenal glands- Cortex releases glucocorticoid (cortisol)
- Medulla releases epinephrine and norepinephrine
- Autonomic nervous system/ Sympathetic nervous system
- Gastrointestinal system-symptoms
- Blood serum cholesterol

# ATTITUDE

- **Positive attitude**
- Personalities- Type A vs. Type B
- Coping style- Problem solving attitude
- Talk themselves into accepting situation
- Change mindset Persevere

# Handling Stress

- Relaxation
- Exercise
- Support
- Humor
- Reality check
- Lifestyle

# TREATMENT FOR STRESS

- GUIDED IMAGERY- Relax and use the power of your mind and mental energy on positive physical change
- PROGRESSIVE RELAXATION- This method contracts and relaxes muscle groups

# EVALUATION



**THANK YOU  
FOR  
ATTENDING**