Learner Objectives
Upon completion, attendees should be able to:
• List the medical, social, and economic ways in which diabetes impacts the Latino population;
• Describe strategies to overcome barriers to improving diabetes outcomes in the Latino population;
• Utilize current standards of care for the detection of diabetes and the monitoring of complications of diabetes in the Latino patient;
• Assess current treatment options to maximize glycemic control in order to minimize the complications of diabetes in the Latino population;
• Access appropriate national and local resources available to assist in caring for the Latino patient with diabetes.

Why are We Concerned about Diabetes?
Every 24 hours...
• 3,600 new cases of diabetes are diagnosed
• 580 people die of diabetes-related complications
• 225 people have a diabetes-related amputation
• 120 people with diabetes progress to end-stage renal disease
• 55 people with diabetes become blind

Why Are We Concerned about Diabetes Among Latinos?
• Prevalence of type 2 diabetes is 1.5 times higher than in non-Hispanic whites.
• 2 million Latinos 20 years or older have diabetes.
• Latinos have a greater number of risk factors for diabetes.
• Increased prevalence of retinopathy, nephropathy, and peripheral vascular disease in Mexican Americans.

National Diabetes Information Clearinghouse, NIDDK 2002

A Constellation of Complications
Diabetes Care in the U.S. Improvements Needed
Projected Increase in the US Population with Diagnosed Diabetes by 2020 by Ethnicity

Clinical Discussion
• Prevalence of diabetes
• Prevalence of complications
• Pathophysiology
  - obesity
  - insulin resistance
  - metabolic syndrome
Complications of type 2 diabetes in Minorities
- Disparate and Disproportionate prevalence of longterm complications of type 2 diabetes in minorities vs Whites
  - lower leg amputations 2-4x
  - retinopathy and blindness 2-4x
  - stroke 2x
  - ESRD 4-6x

• Latinos- more insulin resistance/diabetes but no higher rates for CAD when compared to Whites
• A true Hispanic paradox?
• Data are not conclusive - some studies may be influenced by changes in the population due to migration factors

Diabetes: Dual Impairment
Insulin Resistance and Impaired β-Cell Function

Insulin Resistance
- Genetic
- Acquired
  - Central obesity
  - Medications
- In 80-90% of type 2 patients
- Clusters with metabolic disease syndrome
- Associated with increased macrovascular disease

Insulin Sensitivity in Healthy Subjects in Various Ethnic Groups
Prevalence of the Insulin Resistance Syndrome in the US Population
Progressive Nature of Type 2 Diabetes
UKPDS: Glucose Control Study Results
Effect of Each 1% Rise in A1C on Risk of Developing Complications

Why Aren’t Patients Achieving Blood Glucose Goals?
- Physicians not setting appropriate glycemic targets
- Type 2 diabetes is progressive - what works now may not work in the future
- Type of medications used and/or doses not appropriate
- Insulin therapy only used as a “threat”

American Diabetes Association
Standards of Care

Diagnosing Diabetes

Goals for Blood Pressure, Lipids and Microalbumin
Blood Pressure  <130/80mmHg  66% achieve goal

Lipids (mg/dl)
  LDL-C  <100(<70)  11% achieve goal
  HDL C  <40 (male)
  HDL-C  >50 (female)
  Triglycerides  <150

Microalbumin  <30 (mg/g creatinine)

Monitoring Parameters for Control of Complications
Every visit  Blood Pressure
            Foot Exam (55% achieve goal)

3-6 months  A1C
            - Every 3 months if treatment changes or not meeting goals
            - Every 6 months if stable

Annual  Dilated Eye Examination (63% achieve goal)
        Lipid Levels*
        Microalbumin

*Every 2 years if levels fall in lower risk categories

Goals of Medical Nutrition Therapy

• Achieve blood glucose goals
• Achieve optimal lipid levels
• Provide appropriate calories for:
  - Reasonable weight
  - Normal growth and development
  - Pregnancy and lactation
• Prevent, delay or treat nutrition-related complications
• Improve health through optimal nutrition

Non-pharmacological Medical Therapy for Type 2 Diabetes

ADA Nutrition Recommendations
Total Daily Energy Intake

• Carbohydrate – 60-70%
Protein – 15-20%

Fat
- 10% from polyunsaturated fats
- < 10% from saturated fats

Preventing or Delaying Type 2 Diabetes
- Exercise can lower risk, delay or prevent type 2 diabetes
- Important for individuals with risk factors
  - Obesity
  - Sedentary lifestyle
  - Family history of type 2 diabetes
  - Native American, Hispanic, African American, Asian American, Pacific Islander

Effects of Exercise
- Increased insulin sensitivity
- Improved lipids
- Lower blood pressure
- Weight control
- Improved blood glucose control in type 2 diabetes

Exercise Precautions for Type 2 Diabetes
- Check with referral source for medical clearance
- Lower VO_{2max} may require a gradual training program
- Autonomic neuropathy or blood pressure meds do not allow for increased heart rate
  - perceived exertion important
- Blood pressure may go higher, avoid exercise if systolic BP >180-200

Exercise Precautions Related to Complications of Diabetes
- Peripheral neuropathy can cause loss of sensation in feet
- Pre-existing CVD can cause arrhythmias, myocardial ischemia, or infarction during exercise
- Proliferative retinopathy does not increase risk for retinal or vitreous hemorrhage with exercise

Treatment of Type 2 Diabetes

Principles of Diabetes Treatment
- Define target goal
- Diabetes education is essential
- Monitoring glycemic control is necessary
- Lifestyle modification
- Stepwise and combination pharmacologic therapy

ADA Recommendations
- Glycemic goals should be individualized
- Certain populations (children, pregnant women, and elderly) require special considerations
- Less intensive glycemic goals may be indicated in patients with severe or frequent hypoglycemia
- More stringent glycemic goals (i.e. a normal A1C, 6%) may further reduce complications at the cost of increased risk of hypoglycemia.
- Postprandial glucose may be targeted if A1C goals are not met despite reaching pre-prandial glucose goals.
Targeted Glucose Control

- Therapy based on glycemic goals
- Monotherapy usually not effective long-term
- Step-wise approach
- Whatever therapy is necessary to achieve glycemic goals

Pharmacologic Therapy

Therapeutic Agents for Type 2 Diabetes

<table>
<thead>
<tr>
<th>Mechanism of Action</th>
<th>Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sensitize the body to insulin</td>
<td>Thiazolidinediones, Biguanides</td>
</tr>
<tr>
<td>2. Control hepatic glucose production</td>
<td>Biguanides, Thiazolidinediones</td>
</tr>
<tr>
<td>3. Stimulate the pancreas to make more insulin</td>
<td>Sulfonyleureas, Meglitinides</td>
</tr>
<tr>
<td>4. Slow the absorption of starches</td>
<td>Alpha-glucosidase inhibitors</td>
</tr>
<tr>
<td>5. Decreases hepatic glucose production and increases peripheral glucose uptake</td>
<td>Insulin</td>
</tr>
</tbody>
</table>

Impact of Therapies on A1C Levels

<table>
<thead>
<tr>
<th>Therapy</th>
<th>A1C Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet and Exercise</td>
<td>0.5 - 2.0%</td>
</tr>
<tr>
<td>Sulfonyleureas and Glinides</td>
<td>1.0 - 2.0%</td>
</tr>
<tr>
<td>Metformin</td>
<td>1.0 - 2.0%</td>
</tr>
<tr>
<td>α-Glycosidase Inhibitors</td>
<td>0.5 - 1.0 %</td>
</tr>
<tr>
<td>Thiazolidinedione</td>
<td>0.5 - 1.0 %</td>
</tr>
<tr>
<td>Insulin</td>
<td>&gt;5.0%</td>
</tr>
</tbody>
</table>


Biguanides

Decrease hepatic glucose production and secondarily may increase insulin-mediated peripheral glucose uptake

- **Efficacy**
  - decrease blood glucose ~ 60 mg/dl
  - reduce HbA1c 1.0 - 2.0%
  - cause small decrease in LDL-C and triglycerides
  - no specific effect on blood pressure
  - no weight gain

- **Other Effects**
  - diarrhea and abdominal discomfort
  - lactic acidosis if inappropriately prescribed
  - contraindicated in patients with impaired renal function

Sulfonylureas

Increase endogenous insulin secretion

- **Efficacy**
- decrease blood glucose ~ 60 mg/dl
- reduce HbA1c 1.0 - 2.0 %
- no specific effect on plasma lipids or blood pressure

• Other Effects
- hypoglycemia
- weight gain

**Thiazolidinediones**
Potentiate insulin action on muscle and adipose tissue

• Efficacy
- decrease FPG ~ 25 - 40 mg/dl
- reduce HbA1c ~ 0.5 - 1%
- combined with sulfonylureas reduce HbA1c ~ 0.8 - 1.0 %
- combined with insulin reduce HbA1C by 0.8 - 1.4%
- Beneficial effect on lipids
- Possible cardiovascular effects

• Other Effects
- contraindicated with abnormal liver function
- weight gain, edema

**Meglitinides**
Non-sulfonylurea insulin releasing agent; taken before each meal
Rapid onset of action with a duration of action of several hours

• Efficacy
- decrease peak postprandial glucose
- decrease blood glucose 60 - 70 mg/dl
- reduce HbA1c 1.0 - 2.0 %

• Other Effects
- hypoglycemia
- weight gain
- safe at higher levels of creatinine than sulfonylureas

**Alpha-Glucosidase Inhibitors**
Competitive inhibitor of alpha glucosidase enzymes in small intestines; taken before meals

• Efficacy
- decrease fasting plasma glucose 20-30 mg/dl
- decrease peak postprandial glucose 40-50 mg/dl
- no specific effect on lipids or blood pressure
- reduce HbA1c 0.5-1.0%

• Other Effects
- abdominal discomfort and flatulence
- contraindicated with inflammatory bowel disease or cirrhosis

**Insulin**
Decreases hepatic glucose production and increases uptake and use of glucose by muscle and adipose tissue

• Efficacy
- can lower plasma glucose to any level
- reduces HbA1c > 5.0%
- limited by hypoglycemia
• Other Effects
  - hypoglycemia
  - weight gain

50 Anticipated Response to Treatment

51 Insulin Therapy in Type 2 Diabetes
• Most patients with type 2 diabetes will eventually need insulin.
• As insulin deficiency progresses, a more physiologic multi-component insulin regimen will be required to adequately replace normal insulin secretion.
  - Basal insulin
  - Meal-Related (prandial, bolus) insulin

52 Indications for Insulin Therapy in Type 2 Diabetes
• Severe hyperglycemia at glucose toxicity
• To meet glycemic goals
• Hyperglycemia despite maximum doses of oral agents
• Most patients with type 2 diabetes will eventually need insulin

53 Insulin Action Comparison

<table>
<thead>
<tr>
<th>Insulins</th>
<th>Onset</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lispro* or Aspart</td>
<td>~15 minutes</td>
<td>1–2 hours</td>
</tr>
<tr>
<td>4–6 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Regular</td>
<td>30–60 minutes</td>
<td>2–4 hours</td>
</tr>
<tr>
<td>6–10 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human NPH or Lente</td>
<td>2–4 hours</td>
<td>6–12 hours</td>
</tr>
<tr>
<td>2–20 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Ultralente</td>
<td>4–6 hours</td>
<td>Unpredictable</td>
</tr>
<tr>
<td>4–24 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glargine*</td>
<td>2–4 hours</td>
<td>Peakless</td>
</tr>
<tr>
<td>26 hours</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Insulin analogs

54 Profiles of Human Insulins and Analogs

55 Pharmacologic Therapy

Possible Treatment Steps

STEP 1
• Add metformin or insulin secretagogue

STEP 2
• If on metformin, add insulin secretagogue
• If on insulin secretagogue, add metformin
Pharmacologic Therapy
Possible Treatment Steps
STEP 3
• Add insulin
• Switch to insulin
• Add a thiazolidinedione
STEP 4
• Add an oral drug to insulin
• Use multiple component insulin therapy

Studies Aimed at Prevention of Type 2 DM
Lifestyle Modification Studies
• DPP (Diabetes Prevention Program)
• DPS (Diabetes Prevention Study, Finnish Study)
• Da Qing (Chinese Study)
• Malmo Study (Males, Sweden)
Drug Intervention Studies
• DPP
• Stop-NIDDM (Acarbose)
  - Prevention Evaluation (Ramipril)
• TRIPOD Study (Troglitazone)
• DREAM Study (Rosiglitazone Ramipril)*
• Navigator Study (Nateglinide, Valsartan)
• Xendos trial (Orlistat)*
• Sibutramine Study*

Summary
• The Latino Population is the largest minority group in the country
• The prevalence of diabetes and its complications is higher in Latinos when compared to the non-Latino White group
• Genetic and environmental factors influence the development of obesity, metabolic syndrome and type 2 diabetes in Latinos

continued