MACROMOLECULES AND DIABETES
Why do we eat?
• To take in energy
Is that energy immediately available?
• No!
INSULIN’S ROLE IN THE BODY

• Insulin acts to lower blood sugar levels and provide energy to cells.

• Once in the blood it binds to protein carriers in the plasma.
The story begins in the small intestine.

Large carbs are broken down into glucose (monosaccharide).

Glucose is then absorbed into the blood.
• Insulin stimulates the liver to store excess glucose for later use in the form of glycogen. It is a branched chain of glucose molecules.
Insulin molecules bind to insulin receptors that span the cell membrane of muscle & fat cells.

The bonding activates the GLUT4 proteins which allow glucose to enter the cells by facilitated diffusion.
• Facilitated diffusion uses a protein channel in the cell membrane to move molecules back and forth without expending ENERGY.

• Glucose is then used by the mitochondria to make ATP for the body.
When an event is part of a chain of cause-and-effect that forms a circuit or loop it is said to “feed back” on itself.
Anyone missing insulin?

- In the absence of insulin, many cells will switch to using other fuels such as fatty acids (part of lipids).
- That brings us to…….

Diabetes Type I

Diabetes Type II
Diabetes Type 1

The inability of the body to produce insulin.

It tends to occur in young, lean individuals, usually before 30 years of age, however, older patients do present with this form of diabetes on occasion.

Old Name: Juvenile Diabetes
Cells of the liver and muscle gradually lose the ability to respond to insulin properly.

There is a direct relationship between the degree of obesity and the risk of developing type 2 diabetes,

Old Name: Late Onset Diabetes
Causes of Diabetes

Type 1 diabetes is caused by an autoimmune disease.
Type 2 diabetes is caused by the cells losing their ability to respond to insulin.
Both types of diabetes have the same symptoms.
Diagnosis of Diabetes - 2 tests

• **Fasting blood sugar test.** A blood sample will be taken after an overnight fast.

• **Glycated hemoglobin (A1C) test.** This blood test indicates your average blood sugar level for the past two to three months.
Glucose Tolerance Testing

Time of Blood Collection (min)

Glucose Level in Blood (mg/dL)

- Glucose Tolerance Test Anna Garcia
- Glucose Tolerance Test Patient A
- Glucose Tolerance Test Patient B
Both types are treated with regular exercise and spreading out carbohydrate consumption throughout the day, and medication.

Type 1 treatment involves a life long dependency on insulin injections.
Prevention of Diabetes Type 1

There is no prevention of diabetes type 1 yet.
Prevention of Diabetes Type 2
Both types of diabetes are made worse by smoking.
Why is having too much sugar in blood bad?

High blood sugar can cause damage to cells of the:

- Blood vessels & heart
- Nerves
- Eyes
- Kidneys
Diabetes Affects Blood Vessels & Nerves

Injuries don’t hurt as much when nerves are gone resulting in…
Ouch! It is hard for wounds to heal with poor circulation.
Diabetes Also Affects the Eyes

There are no visual symptoms.
If untreated, there is a 50% mortality rate within Five years of identifying these lesions.
Diabetes Also Affects the Heart

People with diabetes have a greater risk of developing heart diseases caused by hardening of the arteries.
Diabetes Also Affects the Kidneys

People with diabetes may have protein leaking into their urine.