Maintaining Normal Glucose Metabolism
**Why do we need Sugar?**

- **Glucose** is a simple sugar, meaning one glucose molecule.

- Our Body’s primary source of fuel for energy.

- All carbohydrates we eat are eventually broken down into glucose.
Carbohydrates

- **Simple sugars**
  - Highly processed
  - Quickly released into blood

- **Complex carbohydrates**
  - Unprocessed whole foods
  - Slowly enter bloodstream
Blood sugar regulation:

- ENDOCRINE SYSTEM

- Hormones that regulate blood sugar levels
  - Insulin
    - secreted from pancreas when blood sugar rises
    - Needed for glucose to pass into cells to be used for energy
  - Glucagon
    - Secreted by pancreas when blood sugar falls too low
    - Causes liver to convert stored glycogen into glucose and release it into the bloodstream
  - Epinephrine
    - Released by the adrenal glands when blood glucose is too low
What happens to our blood sugar after we eat a meal?

- Blood sugar rises
- Pancreas Releases Insulin
- Insulin binds to glucose receptors on cells
- Glucose is allowed to enter cells
- Blood sugar returns to normal

Blood sugar returns to normal when insulin binds to glucose receptors on cells, allowing glucose to enter cells.
Factors influencing Glucose regulation

- **Diet:**
  - Macronutrients: Carbohydrates, fat, and protein balance
  - Types of carbohydrates consumed
  - Portions
  - Frequency of meals/snacks
- **Lack of physical Activity**
- **Stress**
- **Other medical conditions**
How can we control blood glucose?

Diet:
- Minimize sweets and refined carbohydrates (i.e.: white bread, candy).
  - Reduces insulin response and stress on pancreas
- Consume carbohydrates with proteins and fats to slow breakdown.
  - Increases satiety, feel full longer, reducing frequency of eating
- Reduce portion sizes to control calorie intake.
  - What we don’t need for energy keeps blood sugar elevated, increases insulin response, and increases fat stores

Exercise:
- Physical activity increases cellular glucose needs
- Reduces or eliminates insulin resistance

Stress Reduction:
- Reduces stress hormone (cortisol) response, reducing blood sugar.
Health Issues related Chronically elevated blood Glucose:

Abnormal Lipid profile:
- Liver converts excess glucose to triglycerides.
- Some triglycerides convert to cholesterol.

Obesity:
- Triglycerides stored in fat cells.

Inflammation:
- Excess glucose binds to fats or proteins in blood (Glycation).
- Inhibits normal nutrient metabolism (tissue maintenance and repair).
- Free radicals (inflammatory factors) start to build up.

Insulin resistance:
- Cells are saturated with glucose, insulin no longer effective.
- Pancreas is overworked and eventually wears out.

DIABETES!
The incubation period for this disease can be up to 10 to 20 years.

Metabolic disruptions are present long before physical symptoms.

Reduces overall quality of life feelings of wellbeing.

Accelerates development of other health issues: hypertension, heart disease, dementia.
Complications of Diabetes

- Complications develop mainly because of high blood sugar levels over the years

- Diabetes increases the risk of getting:
  - heart problems
  - stroke
  - eye sight problems
  - kidney problems
  - foot problems
  - skin problems

Image: R. Kousar & M. Mayhew, Australian Community Centre for Diabetes, 2011