By the end of this lecture, student can:

► Define what is carbohydrate
► Explain the structure, roles and metabolism of carbohydrate
► Understand the deficiency and excess intake of carbohydrate
Chemist’s View of Carbohydrates

- Carbohydrates (saccharides) - Molecules consist of carbon, hydrogen and oxygen atoms. A major food source and a key form of energy for most organisms.

- The simple carbohydrate
  - Monosaccharide (single sugars)
  - Disaccharides (a pair of monosaccharide)

- The Complex carbohydrate
  - Polysaccharides (chains of monosaccharide)
Simple Carbohydrates

- Monosaccharide:
- Simple sugar with six atoms of carbon and the formula C6H12O6

- Three types:
  - Glucose
  - Fructose
  - Galactose
Simple Carbohydrates

- Disaccharides:
  - Maltose (Glucose + Glucose)
  - Sucrose (Glucose + Fructose)
  - Lactose (Glucose + Galactose)

- Are pairs of monosaccharide, each containing a glucose paired with one of the three monosaccharides.
The Complex Carbohydrates

• Contain many glucose units: Poly
• Three main types of polysaccharides:
  – Glycogen
  – Animal (meat) and not at all in plants
  – Composed of glucose

• Manufactured and stored in the liver and muscles
• As a storage form of glucose
Starches

• Long, branched or unbranched chains of hundreds or thousands of glucose molecules linked together

• Foods high in starch include:
  – Starchy vegetables like peas, corn, lima beans and potatoes
  – Dried beans, lentils and peas such as pinto beans, kidney beans, black eyed peas and split peas
  – Grains like oats, barley and rice.
• The grain group can be broken down even further into whole grain or refined grain.

• A grain contains three parts:
  – Bran
  – Germ
  – Endosperm

• The bran is the outer hard shell of the grain. It is the part of the grain that provides the most fiber and most of the B vitamins and minerals.

• The germ is the next layer and is packed with nutrients including essential fatty acids and vitamin E.

• The endosperm is the soft part in the center of the grain. It contains the starch. Whole grain means that the entire grain kernel is in the food.
Fiber

- Fiber comes from plant foods so there is no fiber in animal products such as milk, eggs, meat, poultry, and fish.

- Fiber is the indigestible part of plant foods, including fruits, vegetables, whole grains, nuts and legumes.

- For good health, adults need to try to eat 25 to 30 grams of fiber each day.

- Contributes to digestive health, helps to keep regular, and helps to make you feel full and satisfied after eating.

- Additional health benefits, such as a reduction in cholesterol levels — have been suggested by some so may be an additional benefit.
• Good sources of dietary fiber include:

• Beans and legumes: black beans, kidney beans, pintos, chick peas (garbanzos), white beans, and lentils.

• Fruits and vegetables, especially those with edible skin (for example, apples, corn and beans) and those with edible seeds (for example, berries).

• Whole grains such as:
  • Whole wheat pasta
  • Whole grain cereals
  • Whole grain breads

• Nuts — try different kinds. Peanuts, walnuts and almonds are a good source of fiber and healthy fat, but watch portion sizes, because they also contain a lot of calories in a small amount.
Functions of Carbohydrates

- Supplying Energy
- Brain cell and red blood cell
- Sparing protein
- Aid in synthesis of other substances
- Non essential amino acid
- Glycoprotein
- Glycolipid
- Promotes complete lipid metabolism
- Provide bulk (fiber in the diet)
- As sweetener
- Food concentrated agent
Digestion and Absorption of Carbohydrates

Glucose polymers
- Starch, glycogen

Digest to

Disaccharides
- Maltose
- Sucrose
- Lactose

Maltase
- 2 glucose

Sucrase
- 1 glucose + 1 fructose

Lactase
- 1 glucose + 1 galactose
• Large Intestine
  – One to four hours after a meal – all the sugars have been digested

  – INDIGESTABLE FIBER / STARCHES
    • Legumes, raw potatoes, banana
    • Promote bowel movement
    • Fiber – lower blood cholesterol
Health Problem Related Carbohydrates

- Lactose Intolerance
- Inability to digest the milk sugar
- Bloating, gas, abdominal discomfort, diarrhea.
- Acidophilus milk – a cultured milk created by adding Lactobacillus acidophilus
- Breaks down lactose to glucose and galactose.
- Dental Caries
- Sugar and starch breaking down in the mouth – contribute to tooth decay.
- Obesity
- Chronic diseases i.e. coronary heart disease, diabetes
Thank You.......