

Chapter 9: Complex Carbohydrates Outline

Functions of Complex Carbohydrates

- Provide structure
- Bind products together

CC Categories

- Divided into 2 categories: STARCH & INDIGESTIBLE FIBER
 - Should be ½ of your calorie intake daily

Complex Carbs & Your Health

- Excess carbs stored as glycogen in **liver** and **muscles**
- Body usually uses up glycogen stores *within less than 2 hours of vigorous exercise*
- Important to eat carbs every 4-6 hours
- Skip Breakfast?
 - Body will slow brain and organ functions to conserve glycogen
 - More difficulty concentrating
 - May remember only ½ of what you hear
 - Lowers metabolism rate
- Body does not need fat to properly use starch
- Carbs must be present to convert fat to energy
 - **KETOSIS:**
 - Process of burning fat without carbs
 - **KETONE BODIES:**
 - By-product of ketosis
 - High levels of ketones
 - Damage to kidneys
 - During pregnancy: brain damage & cognitive disabilities in babies

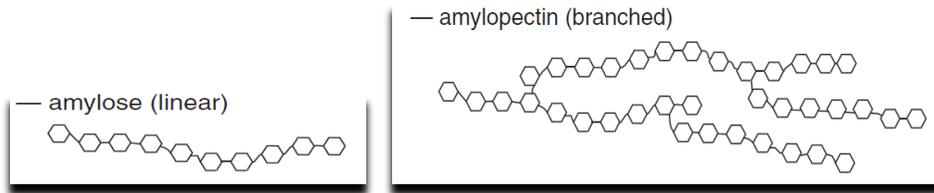
Nutritional Functions of Complex Carbohydrates

1. Provide bulk for the digestive process
2. Tie up bile acids, decreasing reabsorption
3. Lower cholesterol
4. Promote utilization of fat

Starch

- Storage form of carbohydrate
- Common sources
 - Seeds, roots, tubers
 - Most common- wheat flour
 - Cereal grains – corn, wheat, rice, oats
 - Legumes
 - Roots and tubers – potato, tapioca, arrowroot
 - Other starches less commonly used in US:
 - rye, sorghum, soy, tapioca
- Starch is a polysaccharide (polymer of sugar)
- Polymer: Large molecule that consists of large numbers of small molecular units linked together
- Polysaccharide is made up of hundreds or thousands of glucose molecules.
 - Polysaccharide – a complex carbohydrate.
 - Glucose – a monosaccharide or simple sugar.
- Polysaccharide made from large amounts of glucose

- Molecular Composition of Starch:



Fiber

- Forms rigid structure of plants
- Examples: Celery strings, corn kernel membranes
- Humans lack the digestive enzymes needed to break the bonds in cellulose molecules
- CELLULOSE IN OUR DIET= FIBER
 - Note: Although plants contain cellulose, that doesn't always mean the plant is high in fiber

Cooking with Complex Carbohydrates Terminology

- Slurries: Uncooked mixtures of water and starch
- Sols: Thickened liquids (pourable)
 - Ex. Muffin or pancake batter
- Pastes: Thickened mixtures of starch & liquid with little flow
- Gels: Starch mixtures that are rigid
- Retrogradation: Firming of a gel during cooling and standing
 - Good form of retrogradation- need gel to form; Bad-Cracks in gravy
- Syneresis: Water leaking from a gel
- Viscosity: Resistance of a mixture to flow
 - Larger molecules more difficult to move
 - Measures a starch's thickening ability
 - Lower the viscosity readings, higher the viscosity
- Stability: Ability of a thickened mixture to remain constant over time
 - Stable sauce can be frozen and/or reheated
- Opacity: How much an object blocks light
- Translucency: How much light passes through an object

Starch & Fat Combinations in Cooking

- BEURRE MANIE
 - Mixture of equal amounts by weight of flour and butter
 - Added to hot soups to thicken broth
 - Disperses starch granules with little risk of clumping
 - ROUX
 - Mixture of equal amounts by weight of flour and fat cooked to a varying degree of doneness
 - Needs low heat and constant stirring
- Extended heating will reduce starch's thickening ability**

Gums and Pectins

- Used as gelling agents, thickeners, stabilizers
 - Both polysaccharides
 - Not readily available as an ingredient at home

 - Gums
 - Soluble in water and extracted from plants
 - Thicken and stabilize mixtures
 - Trap color
 - Trap flavor
 - Maintain smooth texture of products like ice cream
 - Examples:
 - Guar gum, gum arabic, carob bean gum, carageenan, agar, xanthan gum

 - Pectins
 - Found in plant cells and made of chemical derivatives of sugar called sugar acids
 - Part of primary cell wall
 - Found naturally in fruit
 - Hold cells together (hold skin on fruit)
 - Produces strong gels that remain stable to near 100°C (212°F)
 - Presence of sugar:
 - Pectin molecules dehydrate
 - Acid will cause bonding to occur
 - Creates thickened structure
- KEY COMPONENT IN JAMS AND JELLIES