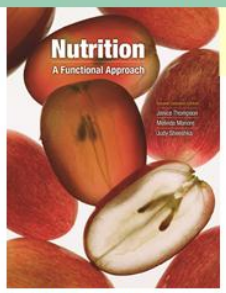
Nutrition: A Functional Approach

Janice Thompson Melinda Manore Judy Sheeshka

3

What Happens to the Food We Eat?



Disorders Related to Digestion

The lining of the stomach is designed to cope with hydrochloric acid but other regions of the GI tract are not.

Heartburn is caused by hydrochloric acid in the lower esophagus.

Remedies: antacids to neutralize HCl, swallowing

Disorders Related to Digestion

GERD, or gastroesophageal reflux disease, is painful, persistent heartburn.

Cause is unknown

Contributing factors: hiatal hernia, cigarette smoking, alcohol use, overweight, pregnancy, spicy, acidic, and fatty foods, large meals, lying down after eating

Disorders Related to Digestion

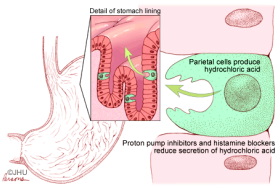
GERD (cont.)

Treatment options:

- Proton pump inhibitors i.e. Nexium
- Antacids i.e. Tums
- H_2 blockers i.e. Pepcid AC, Zantac 75

If left untreated:

- Bleeding
- Ulcers
- Scar tissue
- Cancer



Disorders Related to Digestion

Peptic ulcers are regions of the GI tract that have been eroded by HCL and pepsin.

The bacterium *Helicobacter pylori* and use of non-steroidal anti-inflammatory drugs (NSAIDs) contribute to the production of both gastric and duodenal ulcers.

Disorders Related to Digestion

Peptic ulcers (cont.)

Symptoms: burning pain in abdomen, eroded blood vessels bleed into GI tract causing vomiting of blood, blood in stools, anemia

Treatment: antibiotics, medications to reduce gastric secretions, antacids, proton pump inhibitors, H_2

Fact or Fiction: stress/spicy foods can cause ulcers?

Disorders Related to Digestion

Celiac disease

- Complete intolerance for gluten, a protein found in wheat, rye, triticale, and barley.
- Immune response activated: destroys gluten, erodes cell lining of small intestine
- Can damage the small intestine leading to poor absorption of nutrients.
- Symptoms: fatty stools, frequent stools with an odor, cramping, anemia, pallor, weight loss, fatigue, irritability

Disorders Related to Digestion

Celiac disease (cont.)

- No cure
- Requires a diet lacking wheat, rye, triticale, and barley.
- Corn, rice, tapioca, potatoes, arrowroot, cassava are good gluten-free sources of carbohydrates
- There may be a genetic component to the disease.

Disorders Related to Digestion

Food Allergies

Most common: peanuts, tree nuts, sesame seeds, soy, milk, eggs, fish, wheat, cereal grains that contain gluten and sulphites

An Epipen.

Disorders Related to Digestion

Inflammatory bowel disease (IBD) includes two diseases causing inflammation:

- Crohn's disease affects the small intestine
  - Interferes with absorption
- Ulcerative colitis affects the colon
  - Interferes with normal water reabsorption resulting in bloody diarrhea

In either case, surgery may be needed to remove damaged intestine. No known cause.

Disorders Related to Digestion

Irritable bowel syndrome (IBS) is a disorder that interferes with normal colon function.

Symptoms of IBS include

- Abdominal cramps and bloating
- Diarrhea and/or constipation

IBS is more common in women than in men and those with asthma.

Disorders Related to Digestion

Irritable bowel syndrome (cont.)

Cause is unknown

Factors linked to IBS: caffeinated drinks, large meals, medications, stress, chocolate, alcohol, dairy, wheat

Treatment options: medications to treat diarrhea or constipation, stress management, regular PA

Disorders Related to Digestion

Diarrhea

- Can be caused by food intolerances, infection of the GI tract, chronic disease, stress, reaction to medications, or bowel disorders
- Can lead to severe dehydration
- Is more dangerous for children and the elderly

Constipation

- Fibre, water and exercise may prevent

Symptoms of Dehydration

Table 3.1 Symptoms of Dehydration in Adults and Children

Symptoms in Adults	Symptoms in Children
Thirst	Dry mouth and tongue
Light-headedness	No tears when crying
Less frequent urination	No wet diapers for 3 hours or more
Dark-coloured urine	High fever
Fatigue	Sunken abdomen, eyes, or cheeks
Dry skin	Irritable or listless
	Skin that does not flatten when pinched and released

Source: National Digestive Diseases Information Clearinghouse (NDDIC), Diarrhea, NIH Publication No. 01–2749, 2001, January, http://digestive.niddk.nih.gov/ddiseases/pubs/diarrhea/index.htm (accessed August 2003).

Signs Occurring with Diarrhea

Table 3.2 Signs Occurring with Diarrhea That Indicate the Need for a Doctor

Danger Signs for Adults	Danger Signs for Children
Diarrhea lasts more than three days.	Diarrhea lasts more than 24 hours.
Severe pain is felt in abdomen or rectum.	Fever is present at a temperature of 38.6°C (101.4°F) or higher.
Fever is present at a temperature of 39°C (102°F) or higher.	There is blood or pus in the stools, or stools are black.
There is blood in the stools, or stools look black and tarry.	There are symptoms of dehydration.
There are symptoms of dehydration.	

Source: National Digestive Diseases Information Clearinghouse (NDDIC), Diarrhea, NIH Publication No. 01–2749, 2001, January, http://digestive.niddk.nih.gov/ddiseases/pubs/diarrhea/index.htm (accessed August 2003).

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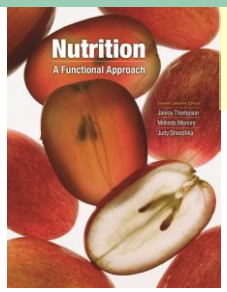
4



Carbohydrates: Bountiful Sources of Energy and Nutrients

What Are Carbohydrates?

Carbohydrates

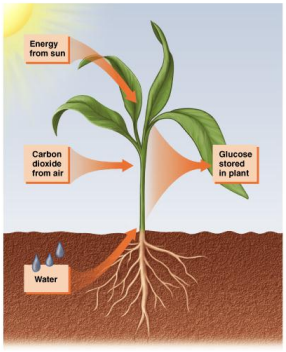
- One of the three macronutrients
- A primary energy source, especially for nerve cells
- Composed of carbon, hydrogen, oxygen
- Good sources include fruits, vegetables and grains

What Are Carbohydrates?

Glucose

- The most abundant carbohydrate
- Used as a building block for other carbohydrate molecules
- Produced by plants through photosynthesis

Photosynthesis

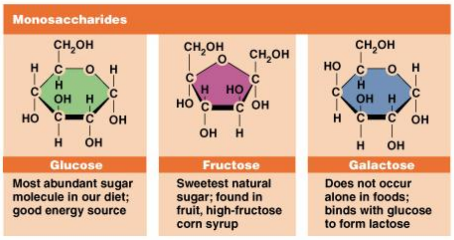


What Are Carbohydrates?

Simple carbohydrates

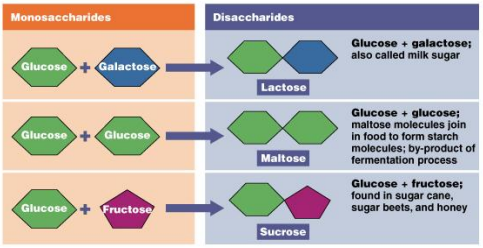
- Contain one or two molecules
- Monosaccharides contain only one molecule
  - Glucose, fructose, galactose
- Disaccharides contain two molecules
  - Lactose, maltose, sucrose

Monosaccharides



Sugar Cane

Disaccharides

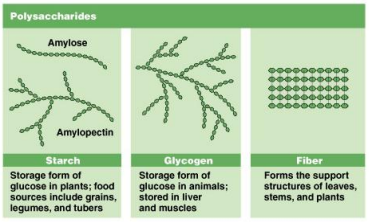


What Are Carbohydrates?

Complex carbohydrates

- Long chains of glucose molecules
- Hundreds to thousands of molecules long
- Also called polysaccharides
- Starch, glycogen, most fibres

Complex Carbohydrates



Complex Carbohydrates

Starch

- Plants store carbohydrates such as starch
- We digest (break down) starch to glucose
- Grains, legumes, and tubers are good sources of starch in our diet
- Some starch in plants is not digestible; this so-called *resistant starch* may be beneficial to the colon

Complex Carbohydrates

Glycogen

- Animals store carbohydrate as glycogen
- Stored in the liver and muscles; acts as a quick source of energy
- Not found in food and therefore not a source of dietary carbohydrate

Complex Carbohydrates

Fibre

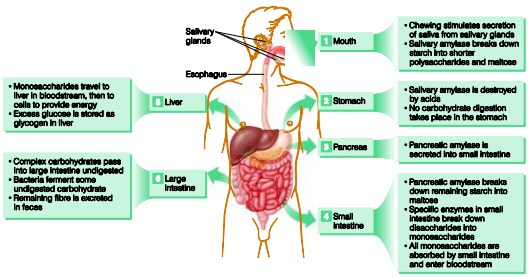
- Dietary fibre is the non-digestible part of plants
  - Grains, rice, seeds, legumes, fruits
- Functional fibre is nondigestible carbohydrate extracted from plants and added to food
  - Cellulose, guar gum, pectin, psyllium
- Total fibre = dietary + functional fibre

Complex Carbohydrates

Different types of fibre have different properties

- Soluble fibres absorb water and form gels; they delay absorption of glucose
  - E.g., fruit pectin, oat bran mucilage
- Insoluble fibres attract water; they speed up passage of food through intestine, helping to prevent constipation
  - E.g., cellulose in wheat, lignin in fibrous vegetables

Digestion of Carbohydrates



Digestion of Carbohydrates

Salivary amylase

- Enzyme that begins carbohydrate digestion in the mouth
- Breaks carbohydrates down to maltose

There is no digestion of carbohydrates in the stomach.

Digestion of Carbohydrates

Most chemical digestion of carbohydrates occurs in the small intestine.

Pancreatic amylase

- Enzyme produced in the pancreas and secreted into the small intestine
- Digests remaining starch to maltose

Digestion of Carbohydrates

Additional enzymes in the small intestine digest disaccharides to monosaccharides.

These enzymes include maltase, sucrase, and lactase.

Monosaccharides are absorbed into the cells lining the small intestine and then enter the bloodstream.

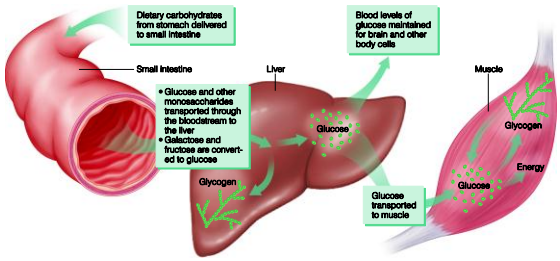
Digestion of Carbohydrates

All monosaccharides are converted to glucose by the liver.

Glucose circulating in the blood is our primary energy source.

Excess glucose is converted to glycogen by the liver.

Storage of Glycogen



Digestion of Carbohydrates

We do not have the enzymes necessary to digest fibre.

Bacteria in the large intestine can break down some fibre.

Most fibre remains undigested and is eliminated with feces.

Regulation of Blood Glucose

The level of glucose in the blood must be closely regulated.

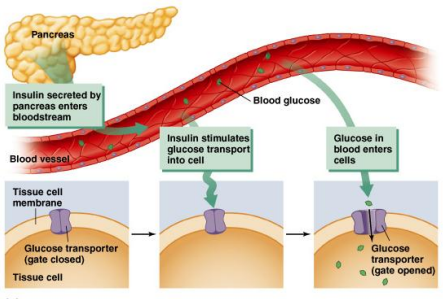
Two hormones, insulin and glucagon, control the level of glucose in the blood.

Regulation of Blood Glucose: Insulin

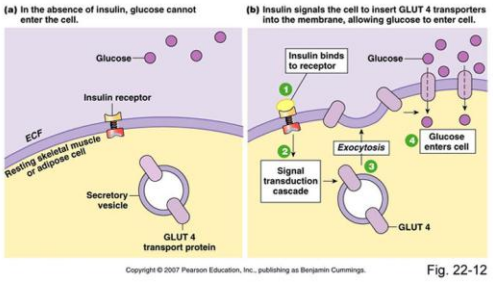
Insulin

- Produced by beta cells of the pancreas
- Helps cells take in glucose from the blood
- Stimulates the liver to take up glucose and convert it to glycogen
- Overall effect of lowing blood glucose

Regulation of Blood Glucose: Insulin



Regulation of Blood Glucose



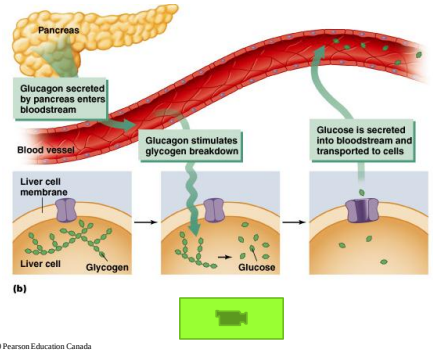
What happens during exercise?

Regulation of Blood Glucose: Glucagon

Glucagon

- Produced by alpha cells of the pancreas
- Stimulates the breakdown of glycogen to glucose
- More glucose is available to cells of the body
- Stimulates gluconeogenesis – the production of glucose from amino acids
- Overall effect of raising blood glucose

Regulation of Blood Glucose: Glucagon



Regulation of Blood Glucose

Glycemic index (GI)

- A food's ability to raise blood glucose levels
- Foods with a low GI:
  - Are better for people with diabetes
  - Are generally higher in fibre
  - May reduce the risk of heart disease and colon cancer

Glycemic Index

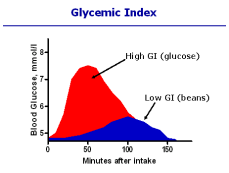


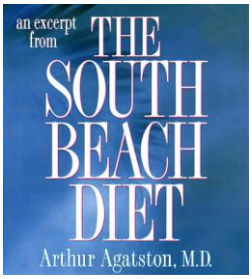
Table 4.2 Selected High, Medium, and Low Glycemic Index (GI) Foods, Using Glucose as the Reference

Low GI (55 or less)*† Choose most often ✔✔✔	Medium GI (56–69)*† Choose more often ✔✔	High GI (70 or more)*† Choose less often ✔
Breads 100% stone-ground whole wheat Heavy mixed grain Pumpernickel	**Breads** Whole wheat Rye Pita	**Breads** White bread Kaiser roll Bagel, white
Cereal All Bran™ Bran Buds with Psyllium™ Oat Bran™	**Cereal** Grapenuts™ Puffed wheat Oatmeal Oats Raisin Bran™ (Kellogg's)	**Cereal** Bran flakes Corn flakes Rice Krispies™
Grains Barley Bulgur Pasta/noodles Parboiled or converted rice	**Grains** Basmati rice Brown rice Couscous	**Grains** Short-grain rice
Other Sweet potato Yam Legumes: lentils, chickpeas, kidney beans, split peas, soy beans, baked beans Fruit and juices: apples, apple juice, bananas, oranges, pears Plain yoghurt Skim milk	**Other** Potato, new/white Sweet corn Pineapple Raisins Popcorn Shredded Wheat Thins™ Ryvita™ (rye crisps) Black bean soup Green pea or split pea soup	**Other** Potato, baking (Russet) Potatoes, boiled and mashed French fries Carrots, boiled Parsnip, Rutabaga Watermelon Pretzels Rice cakes Soda crackers Doughnuts

*expressed as a percentage of the value for glucose
†Canadian values where available

Source: Adapted from The Glycemic Index, Canadian Diabetes Association, www.diabetes.ca/files/GlycemicIndex_08.pdf, accessed Nov. 2008; Foster-Powell K, Holt SHA, Brand-Miller JC. International table of glycemic index and glycemic load values 4th. J Clin Nutr 2002;76:5-76 and The Glycemic Index, The University of Sydney, Dec. 2005, www.glycemicindex.com, accessed Nov. 2008.

South Beach Diet



Good vs. Bad