Sugar Surprise

Nutrition: A Functional Approach

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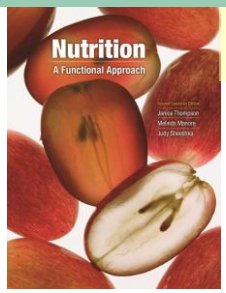


Lipids: Essential Energy-Supplying Nutrients

What Are Lipids?

Lipids: diverse class of molecules that are insoluble in water.

Fats are one type of lipid.

Lipids (fats) do not dissolve in water.

What Are Lipids?

Three types of lipids are found in foods:

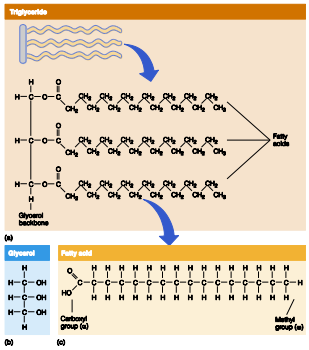
- Triglycerides
- Phospholipids
- Sterols

Triglycerides

Triglycerides are composed of

- Three fatty acid molecules
  - Fatty acids are long chains of carbon atoms surrounded by hydrogen atoms
- One glycerol molecule
  - Glycerol is a 3-carbon alcohol that is the backbone of a triglyceride

Triglycerides



Triglycerides

Fatty acids can differ in

- Length of their carbon chain
  - Short-, medium-, or long-chain
- Level of saturation
  - Saturation refers to how many hydrogen atoms surround each carbon
- Shape

Triglycerides

Saturated fatty acids have hydrogen atoms surrounding every carbon in the chain.

Examples: coconut oil, palm kernel oil, butter, cream, whole milk, beef fat

Triglycerides

Monounsaturated fatty acids lack hydrogen atoms at one carbon; they have one double bond.

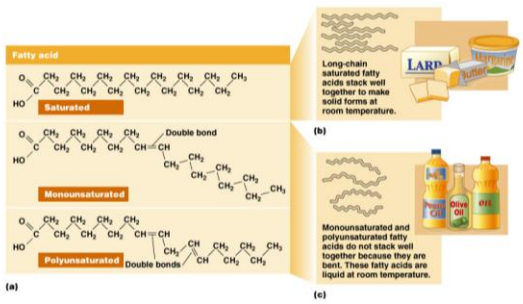
Examples: olive oil, canola oil, cashew nuts

Triglycerides

Polyunsaturated fatty acids lack hydrogen atoms at multiple carbons; they have > 1 double bonds.

Examples: soybean, safflower, corn oils

Triglycerides



Triglycerides

The shape of a triglyceride is determined by the saturation of the carbon chains and by the type of double bond.

Saturated fatty acids can pack tightly together and are solid at room temperature.

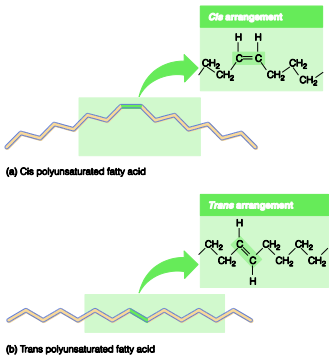
- For example animal fats, butter, and lard are high in saturated fatty acids.

Triglycerides

The hydrogen atoms at the unsaturated region can be arranged in different positions:

- Cis – same side of the carbon chain
- Trans – opposite sides of the chain

Triglycerides



Triglycerides

Unsaturated fatty acids do not stack together well and are liquid at room temperature.

- Plant oils have cis unsaturated fatty acids.

Triglycerides

Hydrogenation: The addition of hydrogen atoms to unsaturated fatty acids.

- Converts liquid fats (oils) into a more solid form
- Used to create margarine from plant oil
- Often creates trans fatty acids
- Helps foods resist spoilage from O_2

Triglycerides

Cutting Out Trans Fats To Combat High Cholesterol

August 28, 2012 By Brigid Mara-Sedlak

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A new study in *The Journal of American Medical Association* (JAMA) has shown a 28 percent drop in total cholesterol levels among US children between 1988 and 2010. Receiving a large portion of the credit for this development is the FDA 2006 requirement that food labels start listing trans fat amounts, prompting big names in the food industry, like McDonald's and Frito-Lay, to start cutting out the harmful substance wherever possible.

Millions of Europeans still at heart disease risk from trans fat

By Caroline Scott-Thomas, 18-Sep-2012 Post a comment

Related topics: Sugar, salt and fat reduction, Science & Nutrition, Fats & oils

Millions of Europeans are still at increased risk of heart disease due to consumption of artificial trans fatty acids, according to a new pan-European review published in *BMJ Open*.

Trans and saturated fatty acids increase blood cholesterol levels and our risk of heart disease.

Back to Facts

Who am I?

Nutrition Facts
Per 125 mL (87 g)

Amount		% Daily Value
Calories 80		
Fat 0.5 g		1 %
Saturated 0 g + Trans 0 g		0 %
Cholesterol 0 mg		
Sodium 0 mg		0 %
Carbohydrate 18 g		6 %
Fibre 2 g		8 %
Sugars 2 g		
Protein 3 g		
Vitamin A	2 %	Vitamin C 10 %
Calcium	0 %	Iron 2 %

Nutrition Facts
Per 1 jar (128 mL)

	Amount
Calories	110
Fat	0 g
Sodium	10 mg
Carbohydrate	27 g
Fibre	4 g
Sugars	18 g
Protein	0 g
% Daily Value	
Vitamin A 6 %	Vitamin C 45 %
Calcium 2 %	Iron 2 %

Triglycerides

For a label to indicate that a product is low in trans-fat, the product must also be low in saturated fat

Fast-food outlets and family restaurants are not required to provide nutrition facts on their foods


Triglycerides

Products with 0.2 g of trans fatty acids or less per reference amount AND low in saturated fatty acids (2 g or less per reference amount) can be labelled "free of trans fatty acids."

Triglycerides

McCain Foods was the first Canadian manufacturer to make retail French fries using non-hydrogenated oil to reduce the amount of saturated and trans fats.

A serving (100 grams) of McCain Super fries Straight Cut provides 158 Calories and 5 grams of fat:

Saturated – 0.8 g

Trans – 0.2 g

Polyunsaturated – 2.6 g

Monounsaturated – 1.2 g

Triglycerides

CANADA: Voortman Cookies to remove trans fats from products

By: just-food.com | 26 November 2003

Canadian cookie maker Voortman Cookies Ltd has announced that it is to remove trans fats from its entire range of cookies.

"We're No. 1 at making this switch and it's only a matter of time before everyone else follows our example," Harry Voortman, the firm's president, told the Globe and Mail.

The company expects the change in ingredients to boost sales, as consumers become increasingly aware of the health risks associated with trans fats.

"Most consumers are not aware of this issue but when they become aware, they don't want to eat products with trans fats," Voortman was quoted as saying.

The company expects to make all its 120 types of cookies trans fat free by March 2004.

Triglycerides

In the U.S., Kraft, Kellogg Company, PepsiCo and other large food companies have begun to reformulate their products to lower the trans fat content.

Triglycerides

How to reduce your intake of trans fat?

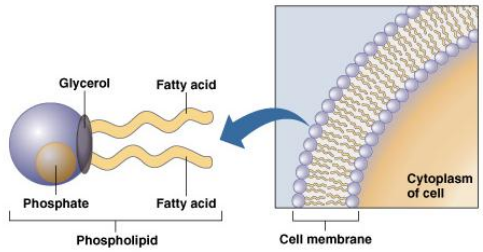
- Limit foods that contain "vegetable shortening" or "hydrogenated" oil
- Avoid deep-fried foods
- Use olive or canola oil instead of margarine or shortening
- Eat fewer high-fat animal products

Phospholipids

Phospholipids

- Are composed of
  - Glycerol backbone
  - 2 fatty acids
  - Phosphate
- Are soluble in water
- Are manufactured in our bodies so they are not required in our diet

Phospholipids

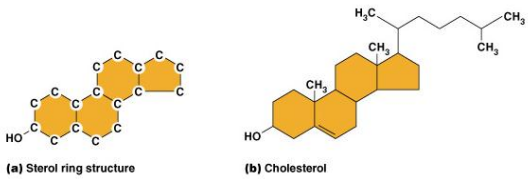


Sterols

Sterols: Lipids containing multiple rings of carbon atoms.

- Are essential components of cell membranes and many hormones
- Are manufactured in our bodies and therefore are not essential components of our diet
- Found in plant and animal foods

Sterols



Sterols

Plant Sterols

- Have been shown to block the absorption of cholesterol in the small intestine
- Sterols in the form of esters have been added to high-fat foods i.e. margarine
- Canada does not permit the sale of products with added plant sterols

Sterols

Cholesterol

- Most common sterol, found in animals
- Vital to health: part of cell membranes, used to synthesize hormones and vitamin D
- Vegetable oils and peanut butter derived from plants are sometimes labeled "cholesterol free" – WHY MISLEADING?
- Sources:

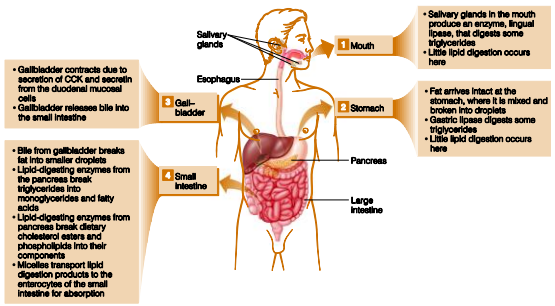
Digestion of Lipids

Lipids are not digested and absorbed easily because they are insoluble in water.

Little digestion of lipids occurs in the watery environments of the mouth or stomach.

Digestion of lipids begins in the small intestine.

Digestion of Lipids

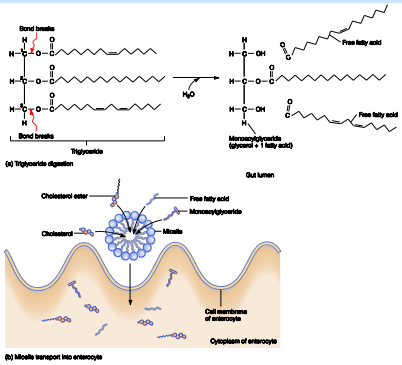


Digestion of Lipids

As fat enters the small intestine:

- Bile is secreted from the gall bladder into the small intestine
- Bile is produced by the liver and stored in the gall bladder
- Bile disperses fat into smaller fat droplets
- Pancreatic lipases break fat into 2 separate fatty acids and a monoglyceride

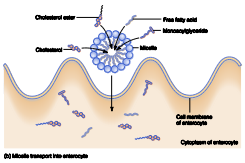
Digestion of Lipids



Digestion of Lipids

Micelle

- Water-soluble, spherical compounds made of bile and phospholipids
- Traps free fatty acids and monoglycerides
- Transports lipids to the mucosal cells for absorption



Digestion of Lipids

How do lipids get into the bloodstream?

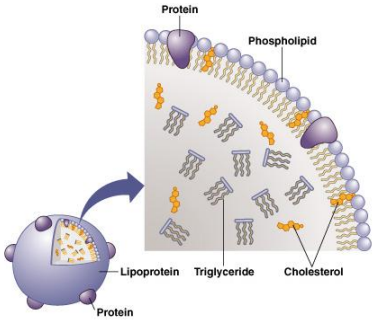
Once inside mucosal cells, longer-chain fatty acids and monoglycerides are re-formed into triglycerides

Triglycerides are arranged with protein and phospholipids as lipoproteins for absorption and transport.

Chylomicron: A lipoprotein produced by cells lining the small intestine.

- Composed of fatty acids surrounded by phospholipids and proteins
- Soluble in water

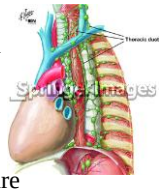
Structure of a Lipoprotein



Digestion of Lipids

Chylomicrons are absorbed by cells of the small intestine, then they

- travel through the lymphatic system
- are transferred to the bloodstream



Short- and medium-chain fatty acids are absorbed more quickly since they are not arranged into chylomicrons.

Digestion of Lipids

Triglycerides in the chylomicrons must be disassembled by lipoprotein lipase before they can enter body cells.

LPL found on the outside surface of adipose cells

After entering body cells, triglycerides can be:

- Used immediately for energy
- Used to make lipid-containing compounds
- Stored in liver and muscle cells

Digestion of Lipids