Nutrition, Food and Fitness
Chapter 6
"Fats: A Concentrated Energy Source"
Page 91

Lipid is a term for a group of compounds that includes fats, oils, lecithin and cholesterol. Lipids can be grouped into three main classes: triglycerides, phospholipids and sterols.

Triglycerides

Triglycerides are the major type of fat found in foods and in the body. They consist of three fatty acids attached to a glycerol molecule.

Fatty acids are organic compounds made up of a chain of **carbon** atoms to which **hydrogen** atoms are attached. The last carbon atom at one end of the chain forms an acid group with two **oxygen** atoms and a **hydrogen** atom.

The fatty acid chains vary in length. The most common fatty acids in food have 16 to 18 carbon atoms.

2. Unsaturated Fatty Acids

Unsaturated fatty acids have at least one double bond in their structure. If a double bond is broken, two hydrogen atoms can be added to the molecule.

The number of double bonds and hydrogen atoms in the fatty acid chain determine the degree of saturation.

A mono-unsaturated fatty acid has only one double bond between carbon atoms.

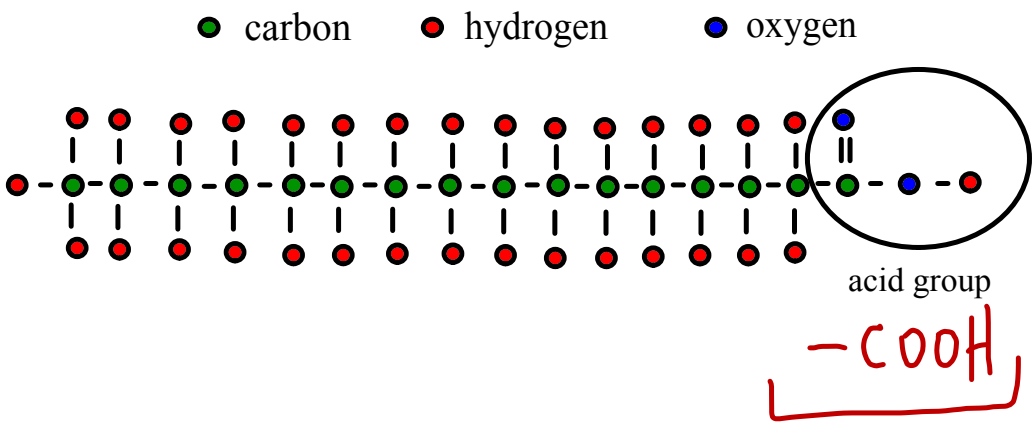
A poly-unsaturated fatty acid has two or more double bonds.

Types of Fatty Acids

1. Saturated Fatty Acids butter, lard, beef fat

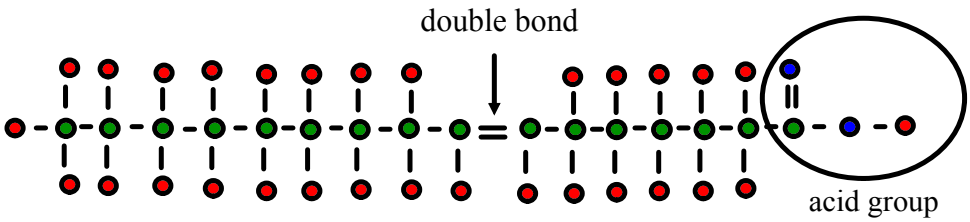
Saturated fatty acids have no double bonds in their structure. They have a full load of hydrogen atoms.

Page 93



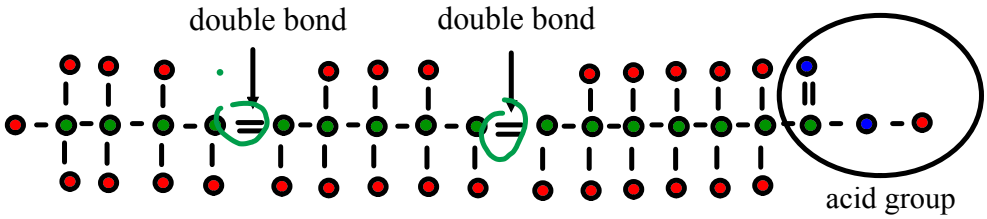
Page 93

Mono-unsaturated Fatty Acid



- COOH

Poly-unsaturated Fatty Acid



- COOH

Standard_Deviants_School_Human_Nutrition__Macronutrients__Fats.wmv

Nearly all fats and oils contain a mixture of the three types of fatty acids.

Example: corn oil

13% saturated fat
25% monounsaturated fat
62% polyunsaturated fat

Fats in meat and dairy products including beef, lard and butterfat tend to be high in saturated fatty acids.

Fats from plants are usually higher in unsaturated fatty acids.
Olive and peanut oils are high in monounsaturated fatty acids.
Corn, safflower and soybean oils are high in polyunsaturated fatty acids.

* The tropical oils (coconut, palm) are an exception to the rule about fats from plants. These oils are high in saturated fatty acids.

The prevalent type of fatty acid determines whether a lipid is liquid or solid at room temperature.

high in saturated fatty acids -> solid at room temperature

high in unsaturated fatty acids -> liquid at room temperature

Unsaturated fatty acids can be hydrogenated. Hydrogenation is the process of breaking the double carbon bonds in unsaturated fatty acids and adding hydrogen. This process converts liquid oils to solid fats.

Besides changing texture, hydrogenation improves the keeping quality of oils. (Increase the shelf life)

Oils can turn rancid if they are exposed to air or stored for a long time. Rancid describes a food oil in which the fatty acid molecules have combined with oxygen. Rancid oils have an unpleasant smell and taste.

Manufacturers often prefer to use hydrogenated fats over unsaturated oils. The longer shelf life of the hydrogenated fats save the manufacturers money and improves customer satisfaction.

When oils are partially hydrogenated, some of the unsaturated fatty acids in the oils change their molecular shapes. These fatty acids are known as trans-fatty acids or trans fats.

Trans fat can often be found in processed foods made with partially hydrogenated vegetable oils such as vegetable shortenings, some margarines, crackers, cookies, candies, snack foods, fried foods and baked goods.

Other Lipids

1. Phospholipids

Phospholipids are lipids that have a phosphorous-containing compound in their chemical structure.

Lecithin is a phospholipid. It is made by the liver so it is not essential to the diet. However, it is found in many foods like egg yolks.
Soya lecithin is added to chocolate candy and commercially baked products.

Lecithin like other phospholipids is an emulsifier. An emulsifier can mix with water and fat.

Lecithin in the body is part of cell membranes.

2. Sterols

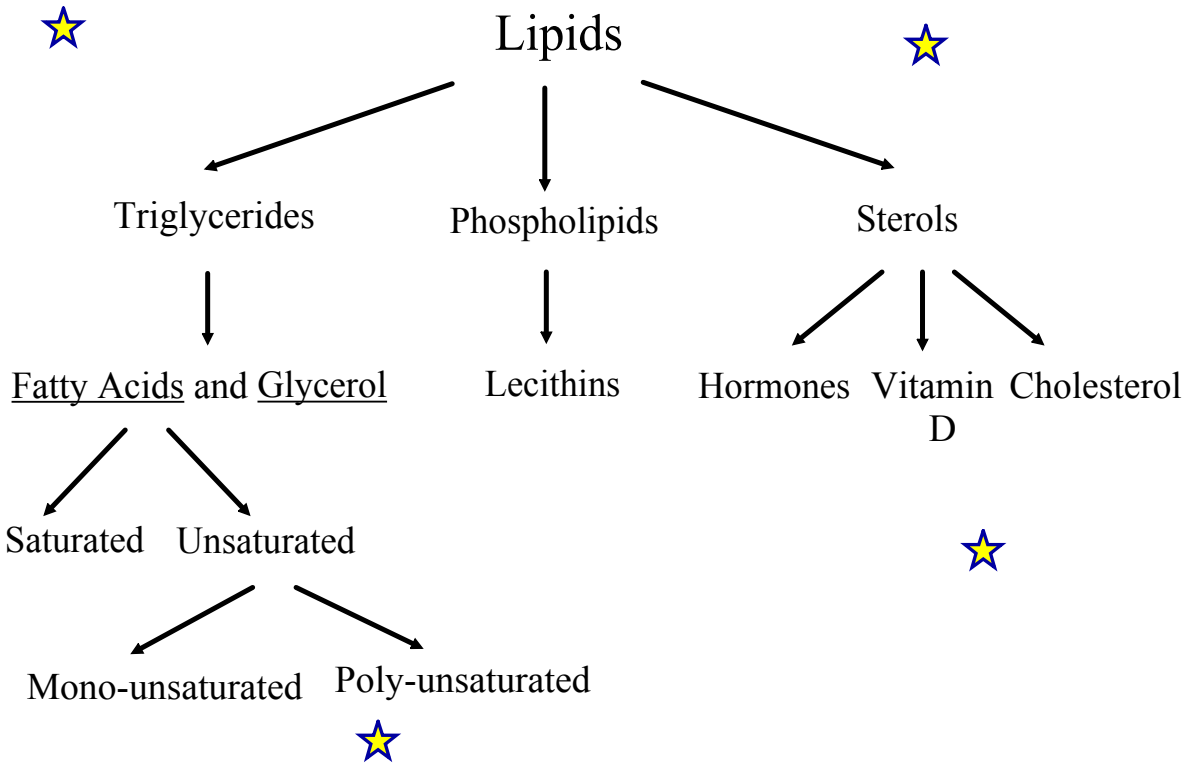
Sterols have a complex molecular structure. They include some hormones, vitamin D and cholesterol.

Cholesterol is a white, waxy lipid made by the body that is part of every cell. Your body uses cholesterol to make sex hormones and bile acids. Cholesterol is found only in animal tissues. It is never present in plants.

All animal foods, including milk, cheese, hamburgers, eggs and butter contain cholesterol. It is abundant in egg yolks, organ meats (liver and kidney), crab and lobster.

Cholesterol is not essential in the diet because the body manufactures it.

Dietary


Lipids
Triglycerides
Phospholipids
Sterols
Fatty Acids and Glycerol
Lecithins
Hormones
Vitamin D
Cholesterol
Saturated
Unsaturated
Mono-unsaturated
Poly-unsaturated

Nutrition for Healthy Living 120

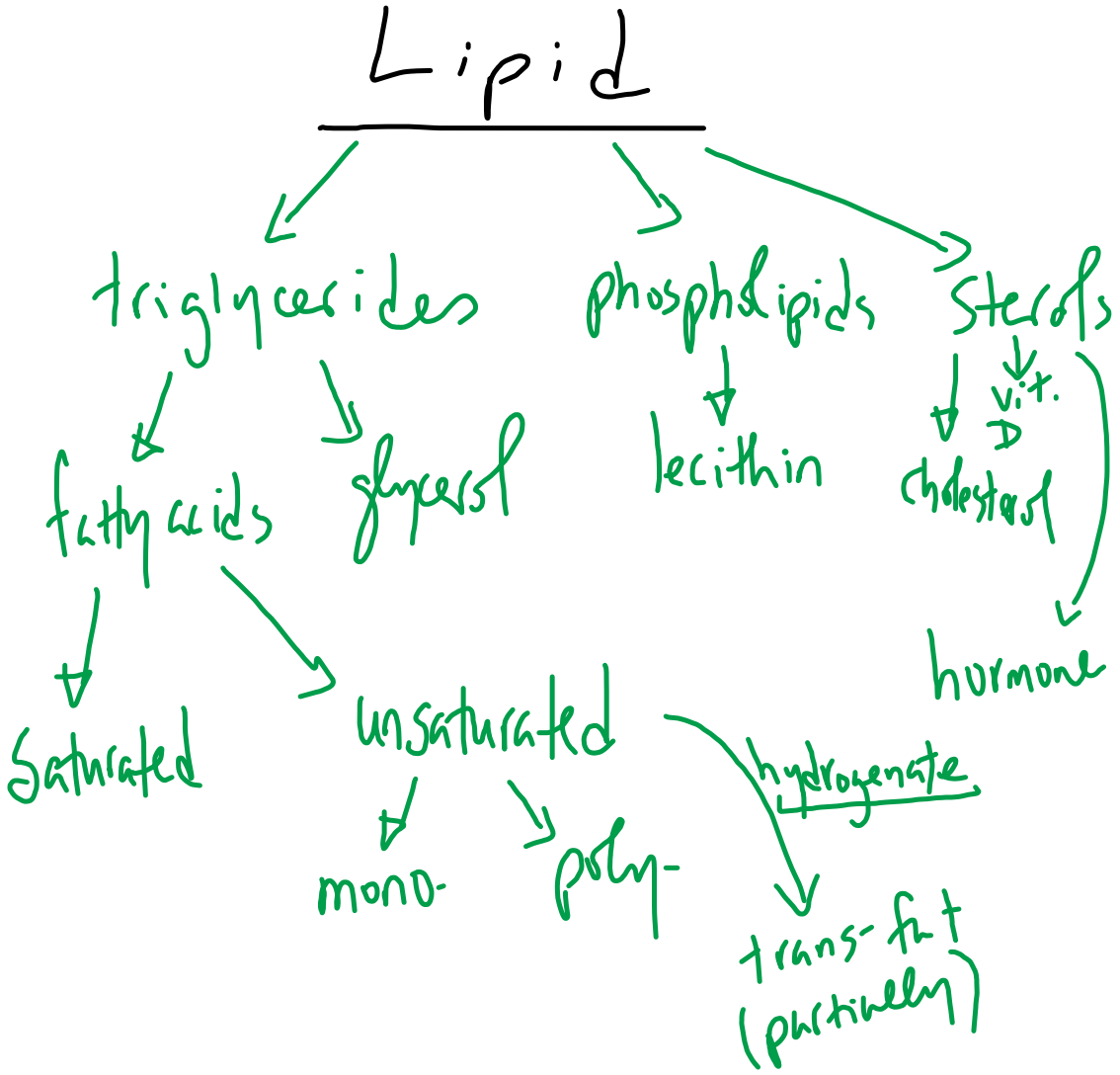
Assignment - Functions of Lipids in the Body

Design a poster illustrating the seven major functions of lipids in the body.

1. Identification of the Seven Major Functions of Lipids in the Body 21
2. Organization (4)
3. Creativity (4)
4. Content (4)
5. Time on Task (5)

See rubric handout.

p. 94



emulsifer
rancid

double bond
Single bond

hydrogenation
↓
shelf-life

Saturated – Solid
unsaturated – liquid
] room temp.

Functions of Lipids (Page 94)

1. Normal Growth and Development
   - Your body can make most of the fatty acids needed for this function.
   - Your body cannot make two essential fatty acids that must come from your diet: **linoleic acid** and **linolenic acid.**
   - Without these two essential fatty acids, the skin, reproductive system, liver and kidneys may all be affected.

2. A Concentrated Source of Energy
   - All lipids provide 9 cal/g of energy.
   - Your body can store fat calories for future energy needs.

3. Serves as an Internal Blanket
   - The body stores a large share of lipids in adipose tissue.
   - Half of this tissue is just under your skin.
   - Fat cells in adipose tissue can expand to hold almost an unlimited amount of fat.

4. Act as Shock Absorbers
   - Body fat surrounds organs like the heart and liver.
   - It helps protect the organs from the bumps and bruises of body movements.

5. Move Vitamins
   - Vitamins A, D, E and K dissolve in fat.
   - Lipids move the vitamins around inside your body.

6. Formation of Healthy Cell Membranes
   - Lipids are part of the structure of every cell.

7. Used to Make Some Hormones, Vitamins, and Other Secretions

Fats and Heart Health

http://www.rd.com/health/diet-weight-loss/weight-loss-story-a-day-in-the-life-of-a-fat-cell/

Write an accurate description of a day in the life of a fat cell in your body based on what you eat on a certain day.

Lipids in the Body

1. Lipid Digestion and Absorption

fats (triglycerides) in foods

↓

chewed and swallowed

↓

fat separates from the watery contents of the stomach and floats in a layer on top

↓

fats reach the small intestine and are mixed with bile which breaks the fats into tiny droplets and keeps them suspended in watery digestive fluid

↓

pancreatic enzymes break triglycerides down into fatty acids, glycerol and monoglycerides (one fatty acid attached to a glycerol molecule)

↓

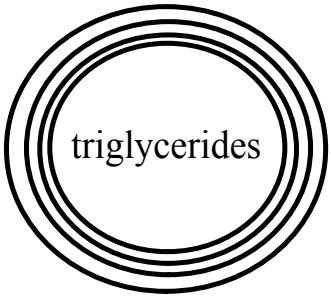
fat is absorbed by the cells lining the intestine

http://www.youtube.com/watch?v=-H5W5VTYVWk

2. Lipid Transport in the Body

Glycerol and short-chain fatty acids pass through the intestinal lining directly into the bloodstream.

Monoglycerides and long-chain fatty acids are converted back into triglycerides. Balls of these triglycerides are thinly coated with cholesterol, phospholipids and proteins forming chylomicrons.



Chylomicrons carry absorbed dietary fat to body cells. They are absorbed into the lymphatic system and then move into the bloodstream.

http://en.wikipedia.org/wiki/Lymphatic_system

Blood is made up mostly of water and does not mix well with fats. The protein and phospholipid coat on chylomicrons allows fats to remain dispersed in water-based blood. This helps fats move efficiently through your blood vessels to the tissues where they are needed.

3. Lipid Use for Energy

Body cells can take up fatty acids from the bloodstream. Cells can break fatty acids down further to release energy for immediate needs. If the cells do not have immediate energy needs, they can rebuild the fatty acids into triglycerides. The cells store these triglycerides for future energy needs.

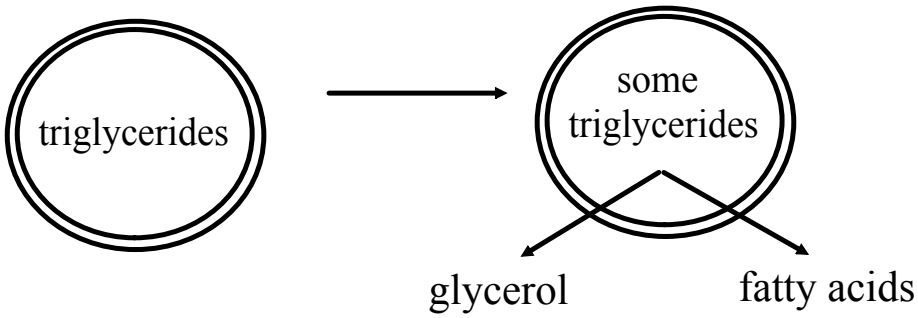
Most cells can only store only a limited amount of triglycerides. Fat cells, however, can hold an almost limitless supply.

Lipoproteins

Lipoproteins are a combination of fats and proteins that help to transport fats in the body.

Chylomicrons are one type of lipoproteins.

Very low-density lipoproteins (VLDL) are a second type. They carry triglycerides and cholesterol made by the liver to body cells.



VLDL become more dense and contain larger percentage of cholesterol. At this point VLDL becomes low-density lipoproteins (LDL). "bad"

Another type of lipoproteins are high-density lipoproteins (HDL). They pick up cholesterol from around the body and transfer it to other lipoproteins for transport back to the liver. The liver processes this returned cholesterol as a waste product for removal from the body.

HDL "Good"

Recommended Limits

Nutrition experts recommend no more than 35% of the total calories in your diet come from fats. No more than 10% of your total daily calories should come from saturated fats.

The National Cholesterol Education Program recommends a maximum intake of 300 mg of cholesterol per day. Studies show that too much dietary cholesterol raises serum cholesterol for some people, increasing their risk of CHD (coronary heart disease).

People who have high serum cholesterol may want to increase their intake of plant foods. They provide fiber and other heart-protective substances that can help to lower blood cholesterol.

200 mg - Canadian

How Many Calories in Sainsburys Angel Hair Spaghetti

View calories and nutrition info per 1 Serving/100g of Sainsburys Angel Hair Spaghetti and see how many calories are in 100g of Sainsburys Angel Hair Spaghetti and its nutrition information.

Sainsburys Angel Hair Spaghetti Calories and Nutrition per Serving (1 Serving=1 Serving/100g)

Calories	357
Protein	12.3
Carbohydrate	73.1
Fat	1.7
Fibre	2.5
Alcohol	0

Spaghetti squash

Amount Per 100 grams

Calories 31

	% Daily Value*
Total Fat 0.6 g	0%
Saturated fat 0.1 g	0%
Polyunsaturated fat 0.2 g	
Monounsaturated fat 0 g	
Cholesterol 0 mg	0%
Sodium 17 mg	0%
Potassium 108 mg	3%
Total Carbohydrate 7 g	2%
Dietary fiber 1.5 g	6%
Sugar 2.8 g	
Protein 0.6 g	1%

Vitamin A	2%	Vitamin C	3%
Calcium	2%	Iron	1%
Vitamin D	0%	Vitamin B-6	5%
Vitamin...	0%	Magnesium	3%

http://www.everydayhealth.com/specialists/cardio/mosca/fish-for-heart/index.aspx?pos=4&xid=nl_EverydayHealthWomensHealth_20131103

Fish Oils and Heart Health

Fish oils contain a certain type of polyunsaturated fatty acids called omega-3 fatty acids. Researchers have found that omega-3 fatty acids lower the risk of heart disease.

This finding led people to ask if taking fish oil in pill form would improve their health. The American Heart Association has found no conclusive evidence that fish oil pills lessen the risks of heart disease.

Large amounts of fish oil supplements can cause health problems. Large amounts of fish oil have been found to thin the blood and may prevent clotting of the blood. Some fish oils like cod liver oil contain dangerously high amounts of vitamins A and D.

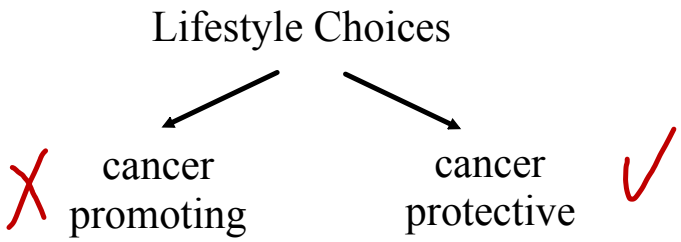
Fish contain high quality protein and a variety of vitamins and minerals as well as omega-3 fatty acids. You can't get this range of nutrients from fish oil pills alone. Including fish in your diet at least once a week offers more benefits than taking fish oil supplements.

http://www.youtube.com/watch?v=4MtcndcFfWg

Fats and Cancer

Cancer is a general term that refers to a number of diseases in which abnormal cells grow out of control.

The American Insitute for Cancer Research reports that lifestyle choices have a great impact on cancer development.



Eating a low-fat diet may prevent the development of colon, prostate, breast and some other types of cancer.

Choosing a diet that includes a variety of vegetables, fruits and grains is a cancer-protective lifestyle choice. These foods contain fiber and certain chemicals that have anticancer effects.

Maintaining a healthy weight is a cancer protective factor too - having a high percentage of body fat increases the risks of some types of cancer.

Guidelines for Food Choices
(Page 106)

1. Switch your food choices to reduce your consumption of total fats, especially saturated fats, trans fat and cholesterol.

2. Eat more fruits, vegetables, whole grain products and fat free dairy products.

3. Eat no more than 6 ounces of cooked fish, skinless poultry or lean meat each day.

4. Go easy on fried foods such as potato chips and fried chicken.

5. Limit visible fats, such as butter, cream and salad dressing.

6. Drink fat-free milk.

Check Your Understanding
Page 108

1, 3-4, 6-9, 11, 13

worksheet
Heart of the Matter

Important

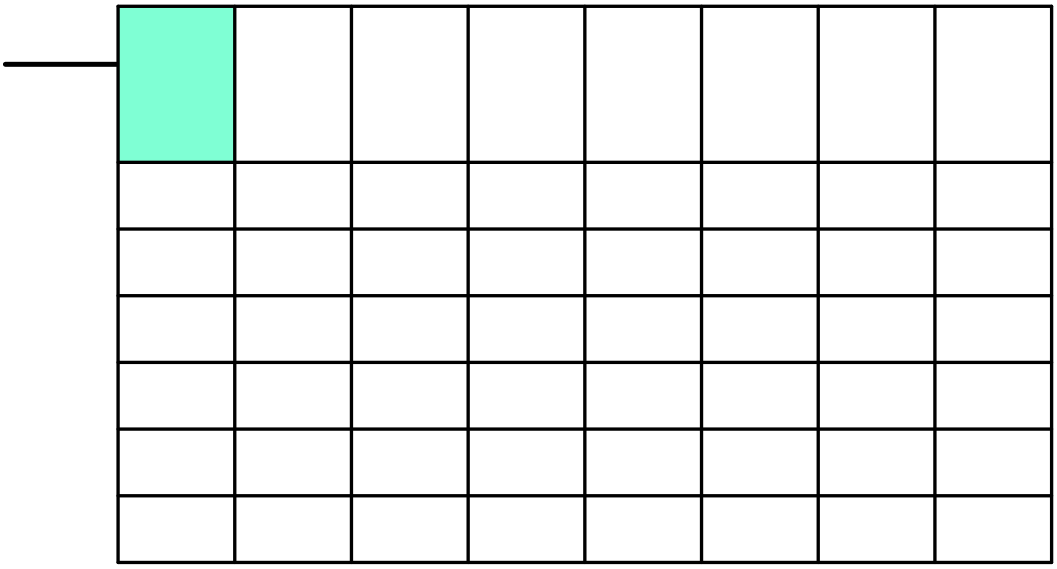
- 9 cal/ gram of fat
- no more than 35% of the total calories in your diet come from fats.
- No more than 10% of your total daily calories should come from **saturate fats.**
- **Tree diagram**
- **c**holesterol - white, waxy lipid, not in plants, naturally produced by body
- Good cholesterol (HDL) vs bad cholesterol (LDL)
- good fats (unsaturated) vs bad fats (saturated,hydrogenation -trans fats))
- Answers to questions on Fats & Heart Health
- Causes of heart attacks & strokes
- blood pressure readings, good numbers
- 120/80
- systolic/diastolic
- when heart beats/when heart at rest

Blood Pressure

(2 numbers)

120/80

- systolic
- diastolic



Attachments

Nutrition 120 - C6 Fats and Heart Health.doc

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