Digestion of Fats

- Ingested fat is combined with cholesterol, phospholipids, and protein to form a **chylomicron**.
- Chylomicrons then enter the body’s circulatory system.
  - This is also a reason why you don’t want to eat a high cholesterol diet, as it will promote the uptake of fats by your intestine!
- The process of fat digestion is so efficient that your body absorbs ~97% of the fat you eat!
Chylomicrons
The Cholesterol Cycle begins with Fat From Food, which is absorbed by Muscle/Adipose Tissue. The resulting Chylomicrons are then absorbed by Muscle/Adipose Tissue, and Chylomicron Remnants are excreted from the body.

VLDL, produced by the Liver, is absorbed by Muscle/Adipose Tissue and creates IDL, which is absorbed by HDL. LDL, absorbed by HDL, gives to Cells and is used to digest.

Liver creates Bile, which is absorbed by the body and used to excrete from the body.
Coronary Artery Disease

• What occurs is that smoking, high cholesterol, high blood pressure, etc. cause injury to the arteries.
• As a result, a plaque forms as a result of the inflammatory response.
Biochemistry of Heart Disease

Step #1:
- As stated previously, an injury develops inside the inner lining of the coronary artery, known as the tunica intima.
- This injury can be caused by mechanical stress, high blood pressure, carbon monoxide (smoking), inflammation and infection, etc.
Biochemistry of Heart Disease

Step #2:
- Due to the injury, monocytes (white blood cells) are converted to macrophages.
- In an attempt to help repair the injury, macrophages scavenge LDL and turn into foam cells.
Biochemistry of Heart Disease

Step #3:
- Smooth muscle cells then migrate into the blood vessel and divide.
- This causes your body to stimulate platelet growth factors, which causes the formation of connective tissue proteins.
- Ultimately all of these combine to form a “plaque”, or a combination of foam cells, proteins, smooth muscle cells, and cholesterol.
Biochemistry of Heart Disease

Step #4:
- Over time, plaque will accumulate inside the artery, slowly causing it to narrow.
Coronary Artery Disease

- Plaque formation is a very slow process, one that takes many years.
- Meaning that the entire process usually starts in our youth.
Biochemistry of Heart Disease

Step #5:
Eventually a piece will break off from the plaque, which will cause the inflammatory response to rush platelets to the area.

- When this occurs, a blood clot forms...which unfortunately also ends up clogging the artery.
- When this occurs, blood cannot flow past the clot, and tissue “downstream” of the artery dies.
Coronary Artery Disease - Treatments

- Angioplasty involves sticking a long tube with an inflatable “balloon” all the way from an artery in your leg to your coronary artery.
- Once there, the balloon “inflates” and “compresses” the plaque.
- Stents do something similar, except they are attached to your arteries.
Coronary Artery Disease - Treatments

- Bypass surgery involves surgically grafting a vein to bypass the blocked artery.
- By doing so, oxygenated blood can continue to flow past the blocked portion.
- But this procedure does require removal of part of a vein (usually in the leg) and it does require open heart surgery, which can be risky.
Regarding a stroke, this is nearly the same thing as a myocardial infarction.

An artery delivering blood to your brain becomes clogged with plaque, upon which when a piece breaks off and becomes “stuck”, blood does not enter the brain.
Emphysema

- A disease of the lung tissue that results in the destruction of structures feeding the alveoli
- As a result, the ability of the individual suffering from emphysema has a reduced ability to breathe
Emphysema

Healthy

Emphysema
Smoking

- The leading cause of emphysema is smoking.
- Think of the impact this has on your alveoli, where all the “smoke” ends up at.
- This triggers an inflammatory response, similar to that of heart disease.
Emphysema

• Bear in mind, you (typically) are born with a lung capacity exceeding what you normally need.
• However, smoking slowly degrades this capacity.
• For example, you may go from 120% to 115%, then to 110%, and so forth.
Smoking

Healthy lungs

Healthy alveoli

Smoking and Emphysema

Large air cavity lined with carbon deposits formed

Harmful particles trapped in alveoli

Inflammatory response triggered

Inflammatory chemicals dissolve alveolar septum