

What is cholesterol?

Cholesterol is a waxy, fat-like substance that's found in all the cells in your body.

Your body makes all the cholesterol it needs. Cholesterol is also found in foods from animal sources, such as egg yolks, meat, and cheese.

Cholesterol is not just important, it is vital

Your body needs some cholesterol to make hormones, vitamin D, and **Bile** (substances that help you digest foods).

Normal cholesterol levels

In adult **males'** cholesterol levels should be kept in the following range:

- **Total cholesterol** should be kept from 125 to 200 mg\dl
- **LDL** should be less than 100 mg\ dl
- **HDL** should be more than 40 mg\dl

In adult **females'** cholesterol levels should be kept in the following range:

- **Total cholesterol** should be kept from 125 mg\dl to 200 mg\dl
- **LDL** should be less than 100 mg\dl
- **HDL** should be more than 50 mg\dl

What is Triglycerides?

- Triglycerides are a type of fat (lipid) found in your blood.
- When you eat, your body converts any calories it doesn't need to use right away into triglycerides. The triglycerides are stored in your fat cells. Later, hormones release triglycerides for energy between meals.
- **If you regularly eat more calories than you burn, you may have high triglycerides (hypertriglyceridemia).**
- **What's considered normal?**
- A simple blood test can reveal whether your triglycerides fall into a healthy range:
- **Normal — Less than 150 milligrams per deciliter**
- **Borderline high — 150 to 199 mg/dL**
- **High — 200 to 499 mg/dL**
- **Very high — 500 mg/dL or above**

What's the difference between triglycerides and cholesterol?

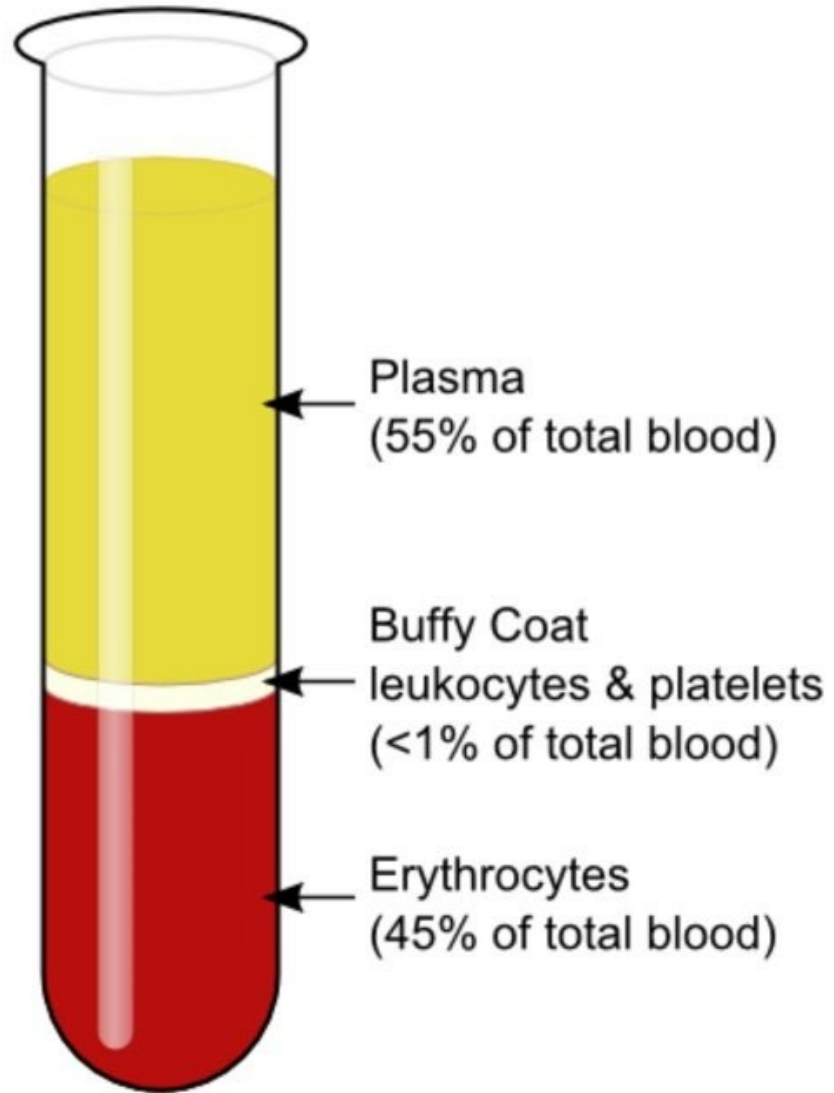
Triglycerides and cholesterol are different types of lipids that circulate in your blood:

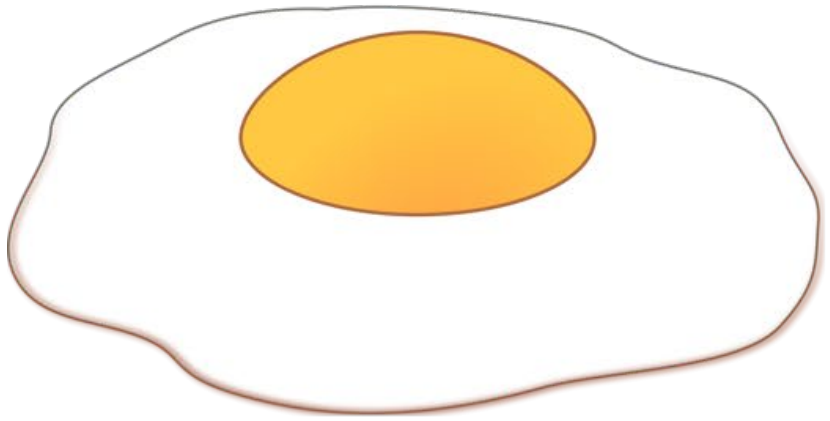
Triglycerides store unused calories and provide your body with energy.

Cholesterol is used to build cells and certain hormones

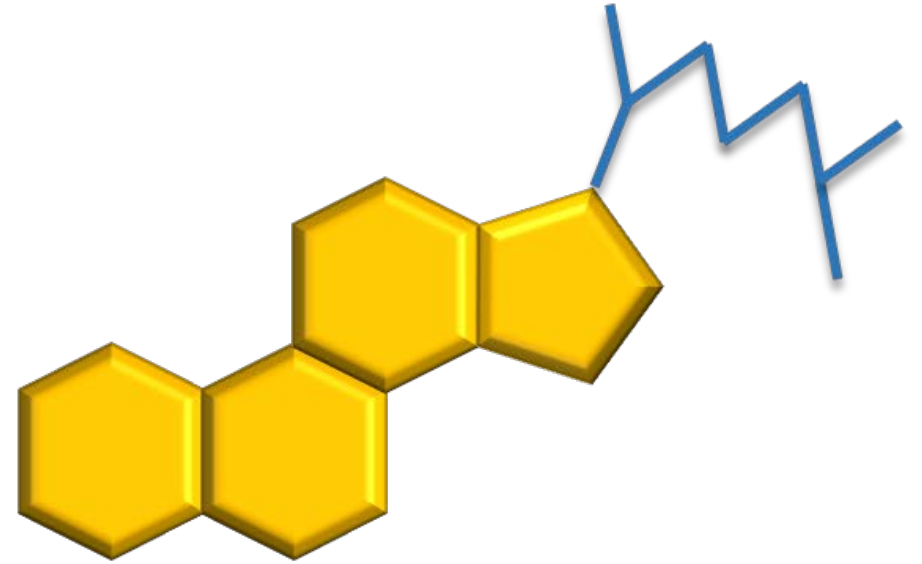


GOOD AND BAD
CHOLESTEROL





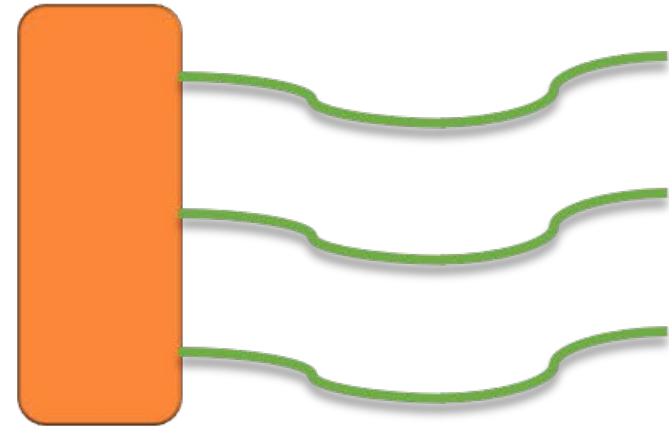
Egg Yolk



Cholesterol

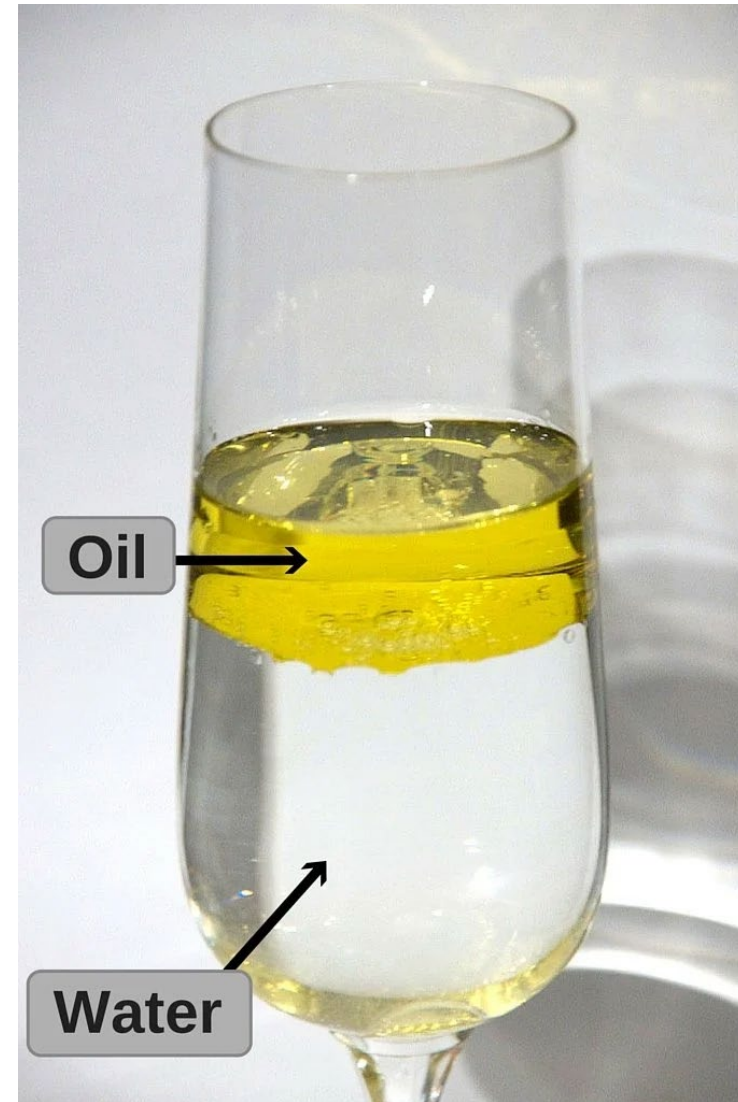


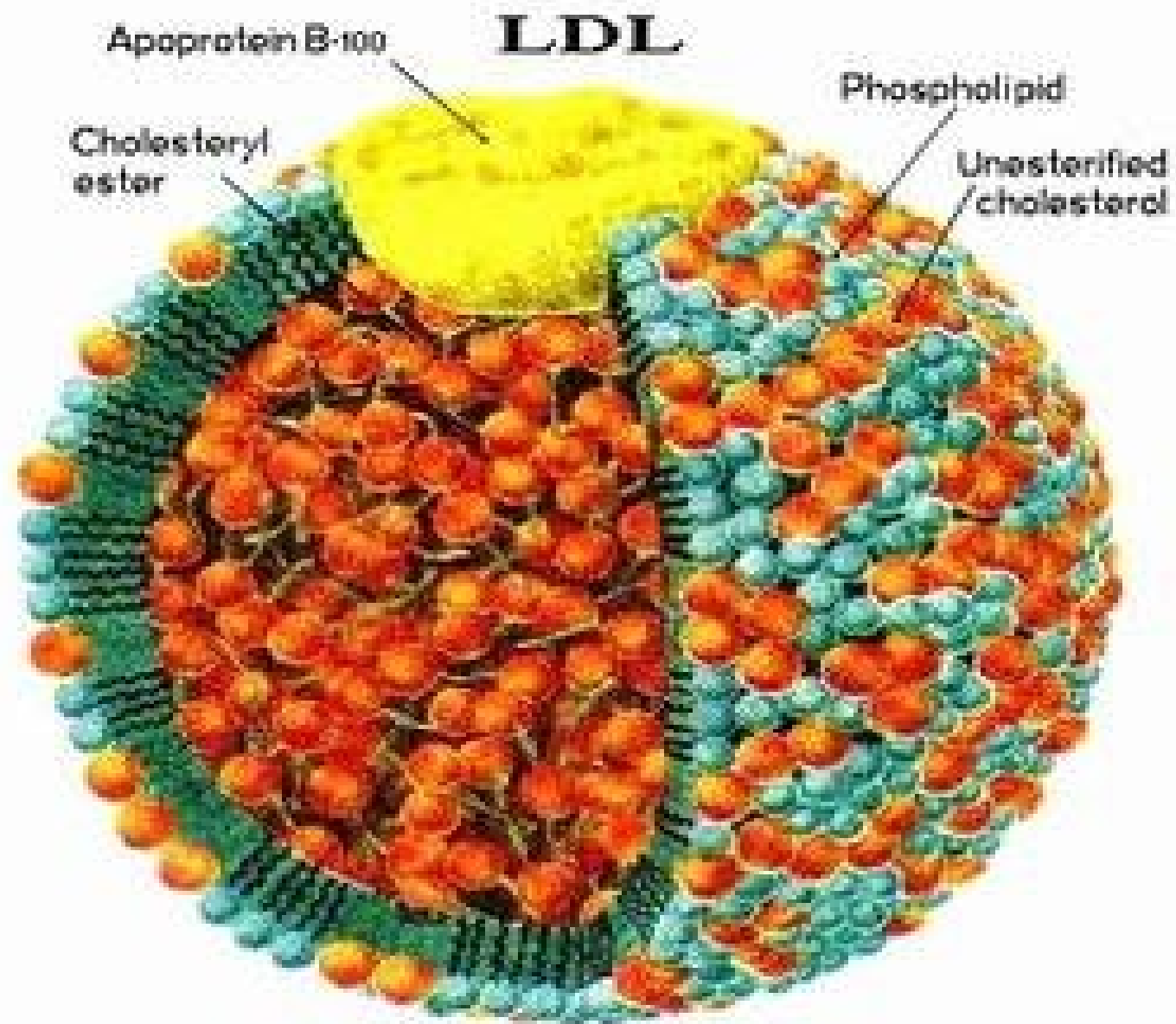
Cooking Oil



Triglycerides

- Triglycerides and cholesterol are different types of lipids that circulate in your blood:



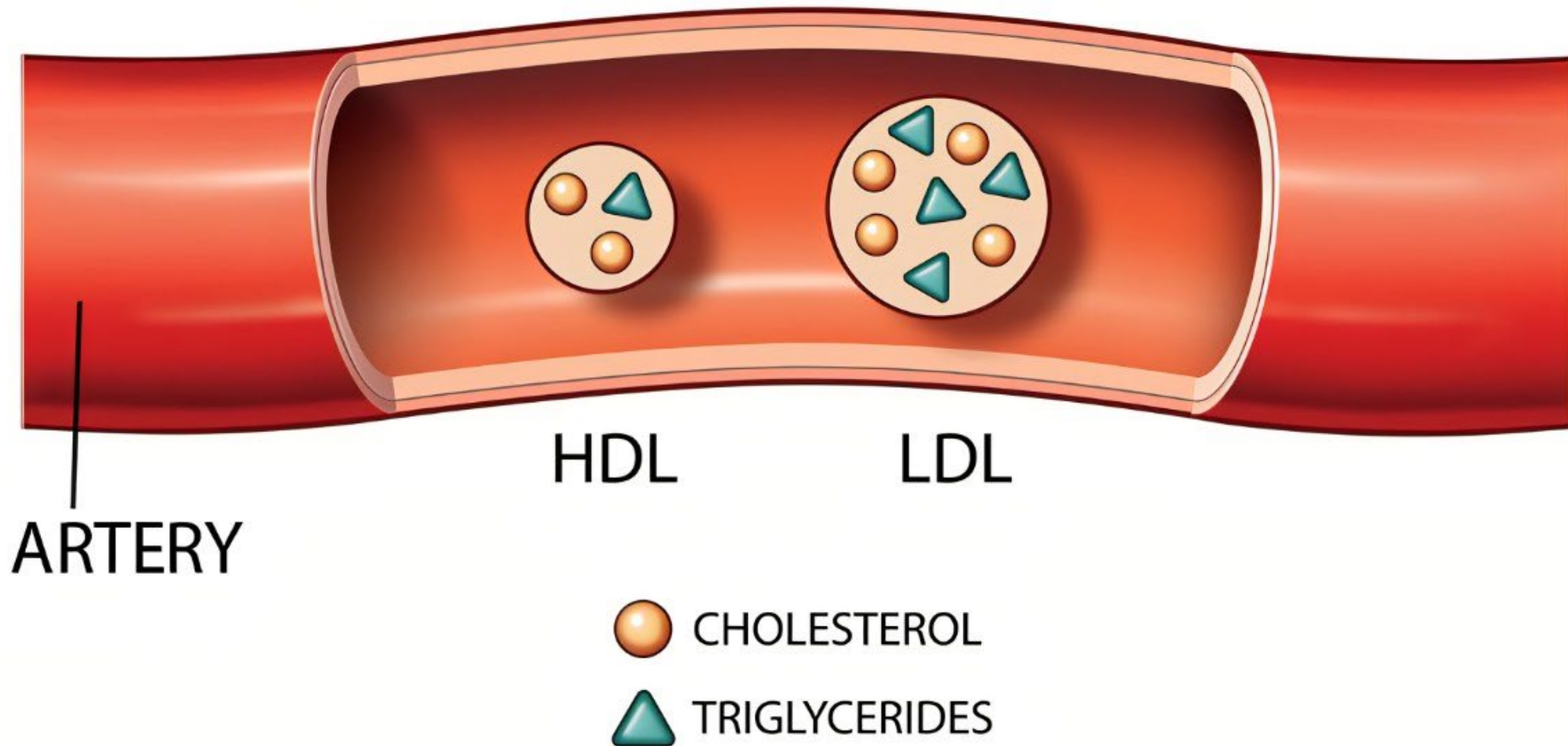


What are LDL, and HDL?

- LDL, and HDL are lipoproteins.
- [LDL](#) stands for low-density lipoprotein. It is sometimes called "bad" cholesterol because a high LDL level leads to the buildup of plaque in your arteries.
- [HDL](#) stands for high-density lipoprotein. It is sometimes called "good" cholesterol because it carries cholesterol from other parts of your body back to your liver. Your liver then removes the cholesterol from your body.



HDL & LDL CHOLESTEROL



HDL



I am the “Good” “Happy” cholesterol, and my job is to help keep your arteries clear and free of plaques!

LDL



I am the “Bad” “Lethal” cholesterol, and I form plaques in your arteries causing them to harden and narrow!

High LDL?

- The reason LDL is called bad cholesterol is because it **can build up in the walls of your arteries** and form plaque, putting you at risk of a serious cardiovascular event, like a heart attack, stroke, stent, or bypass surgery.



Bad vs. Good Cholesterol



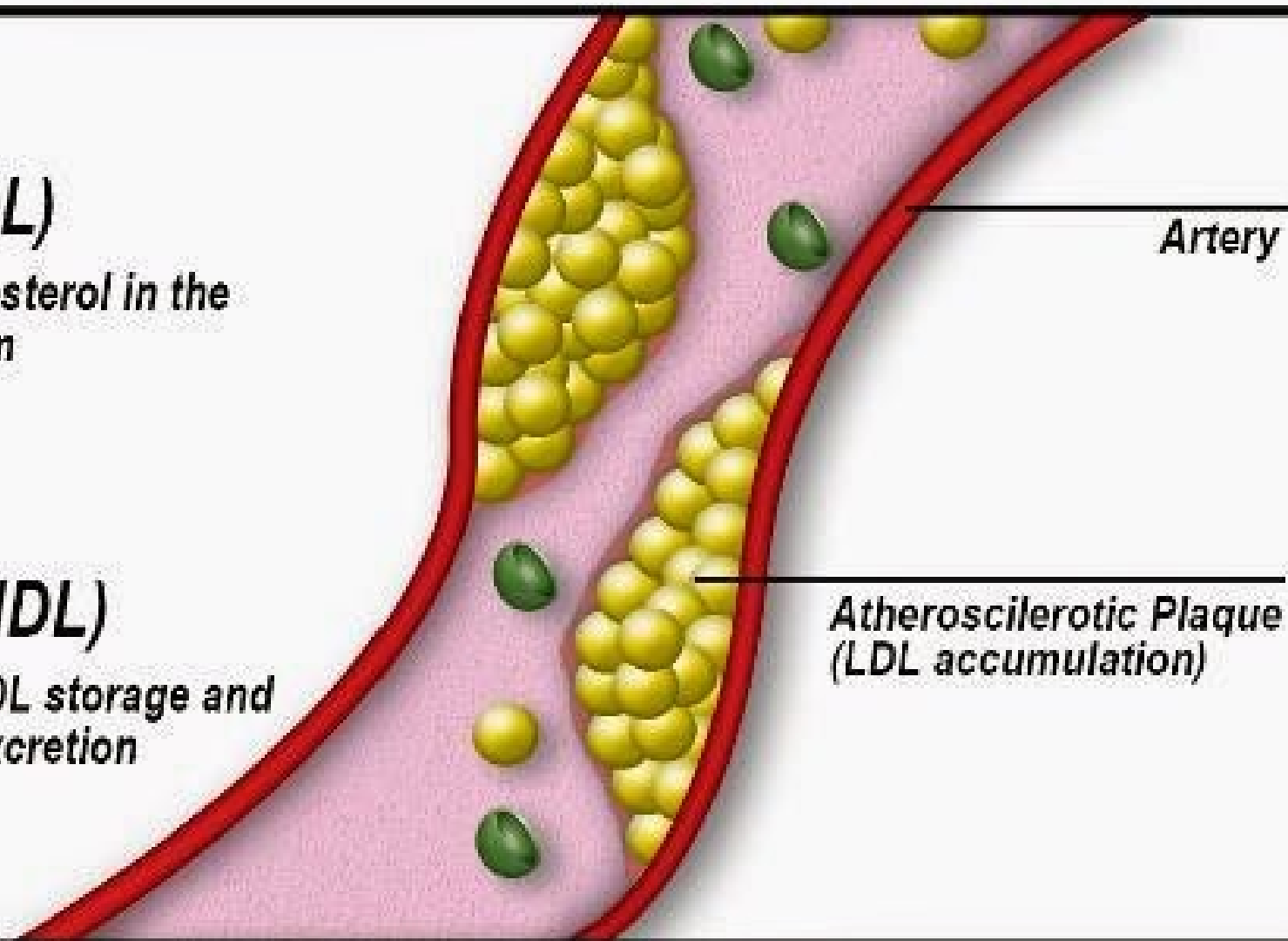
Bad (LDL)

stores cholesterol in the blood stream



Good (HDL)

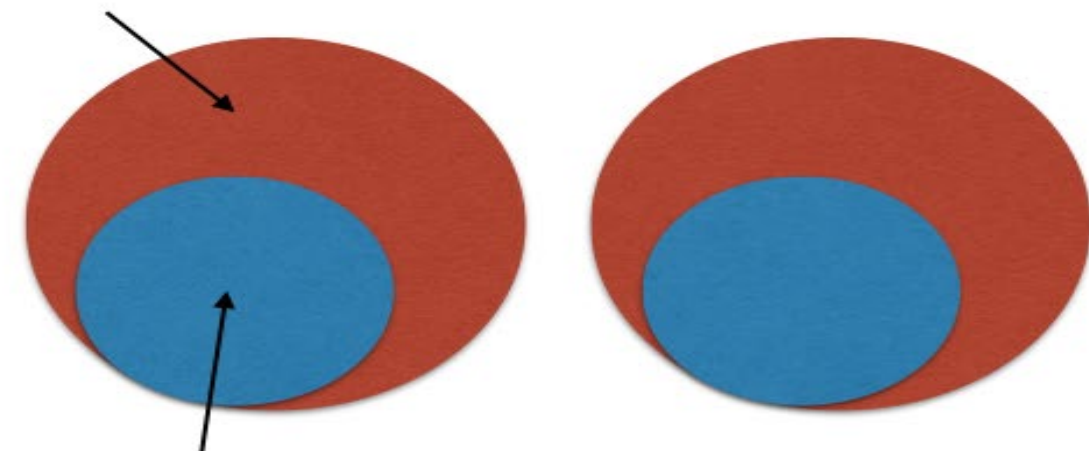
regulates LDL storage and promotes excretion



LDL-C = 100

Low LDL-P

LDL



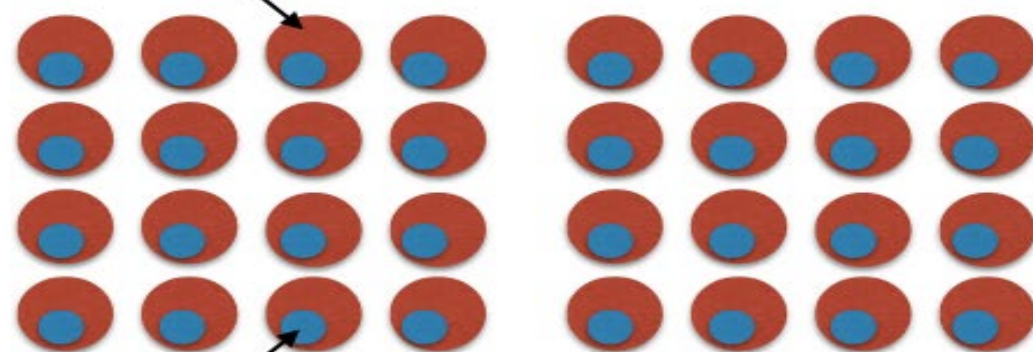
cholesterol

< CVD Risk

LDL-C = 100

High LDL-P

LDL

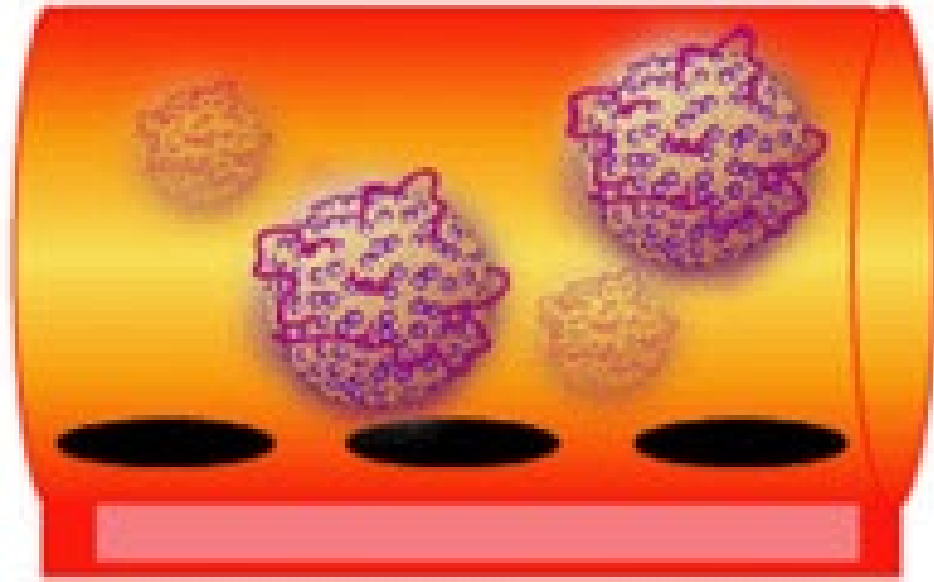


cholesterol

> CVD Risk

Normal Apo B
Normal Cholesterol

artery



Large LDL trait

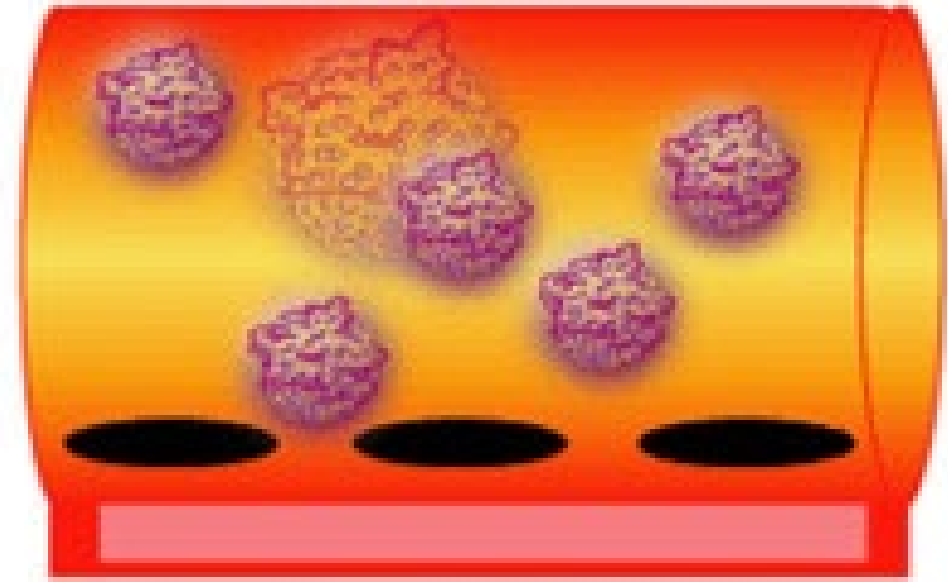
LDL = 80

Normal

Heart Disease Risk

Elevated Apo B
Normal Cholesterol

artery



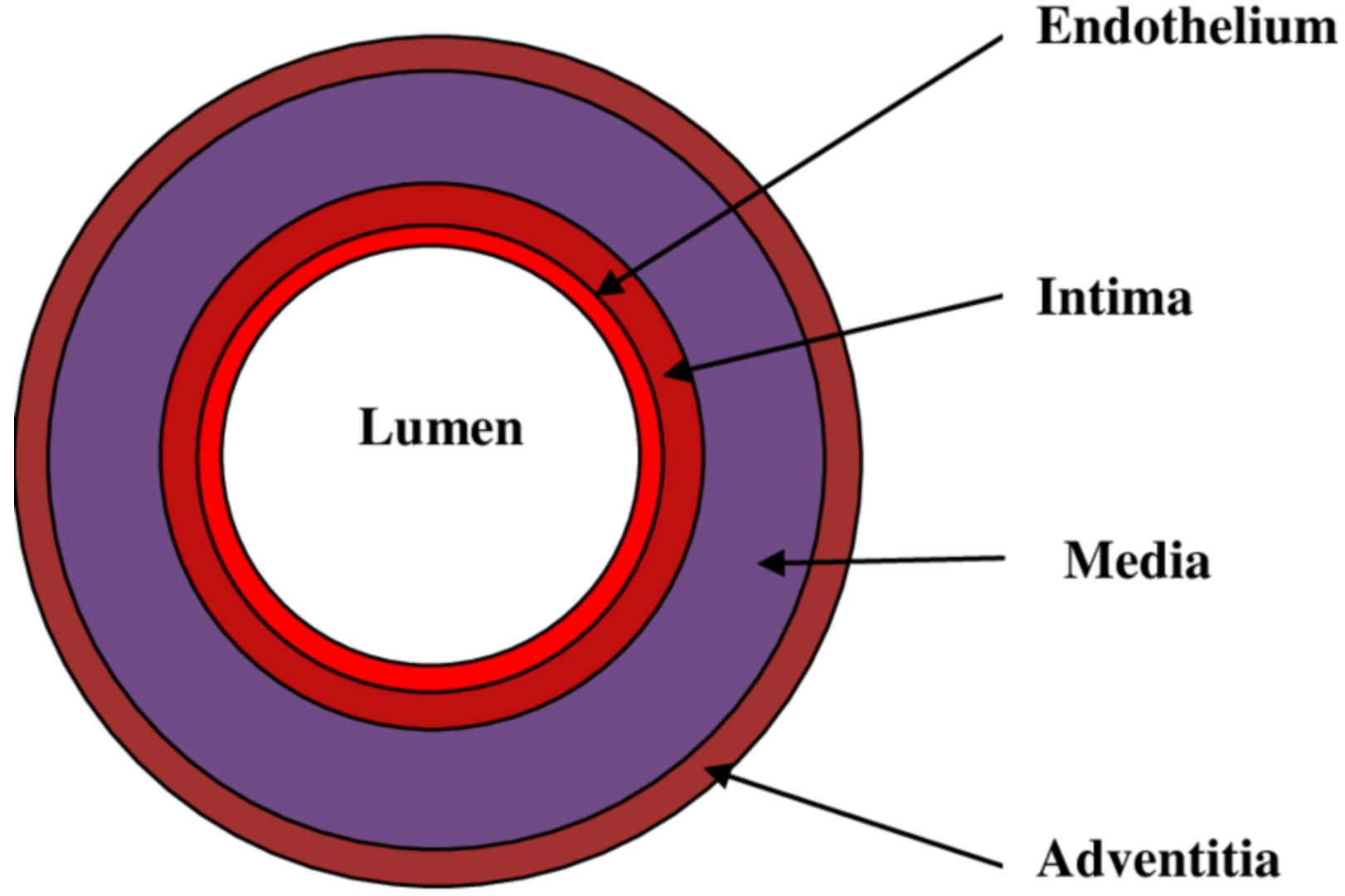
Small LDL trait

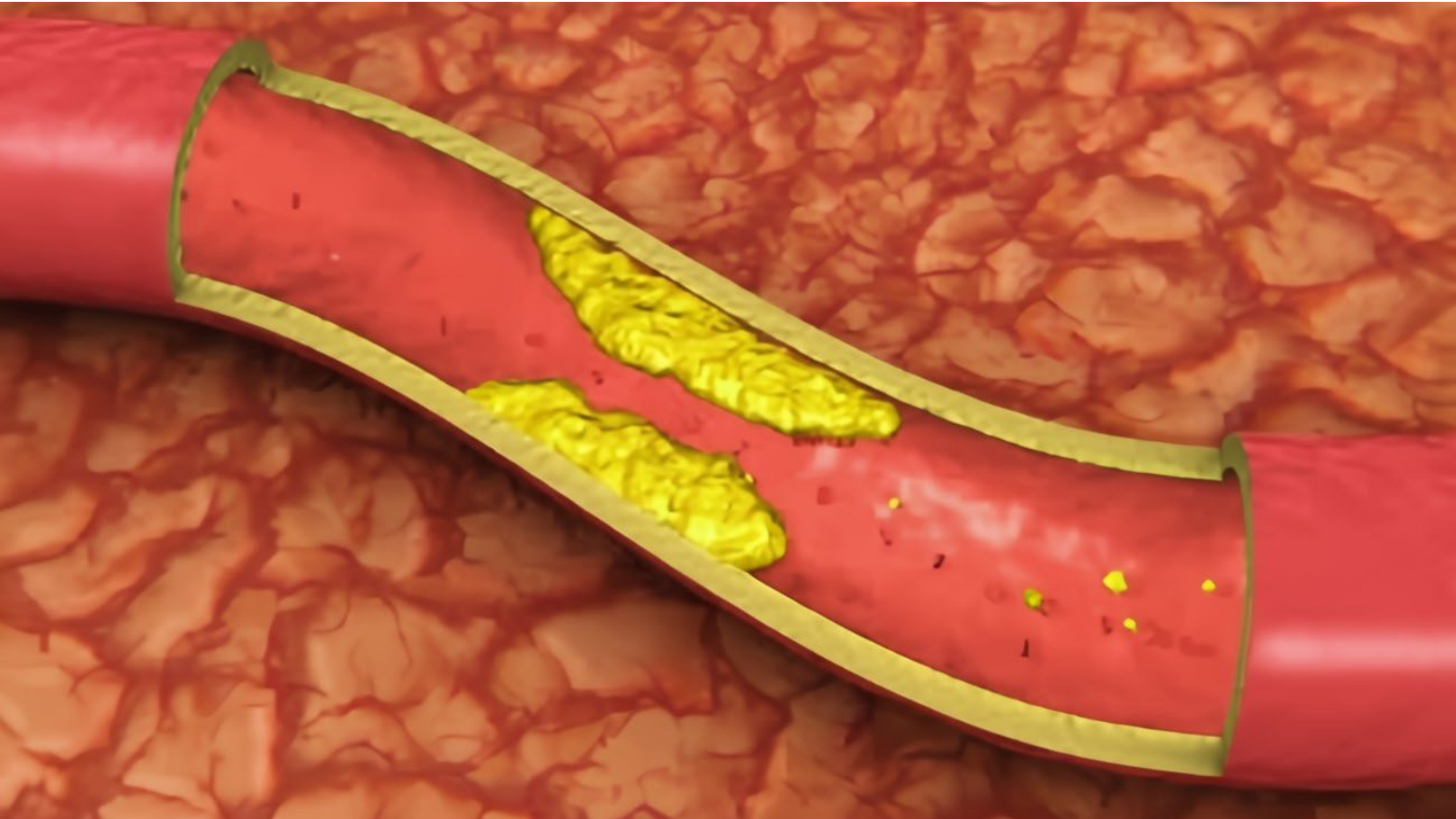
LDL = 80

High

Heart Disease Risk







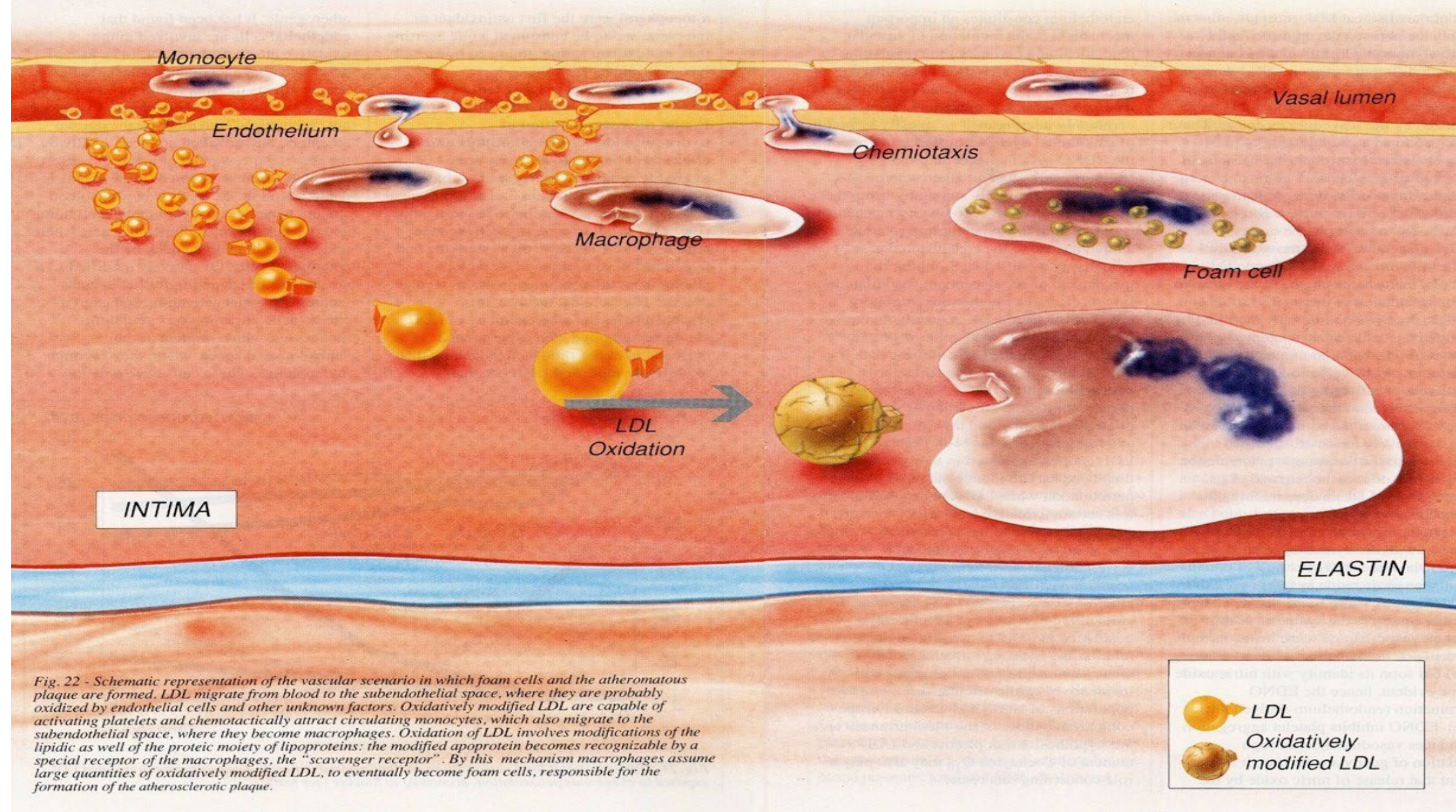
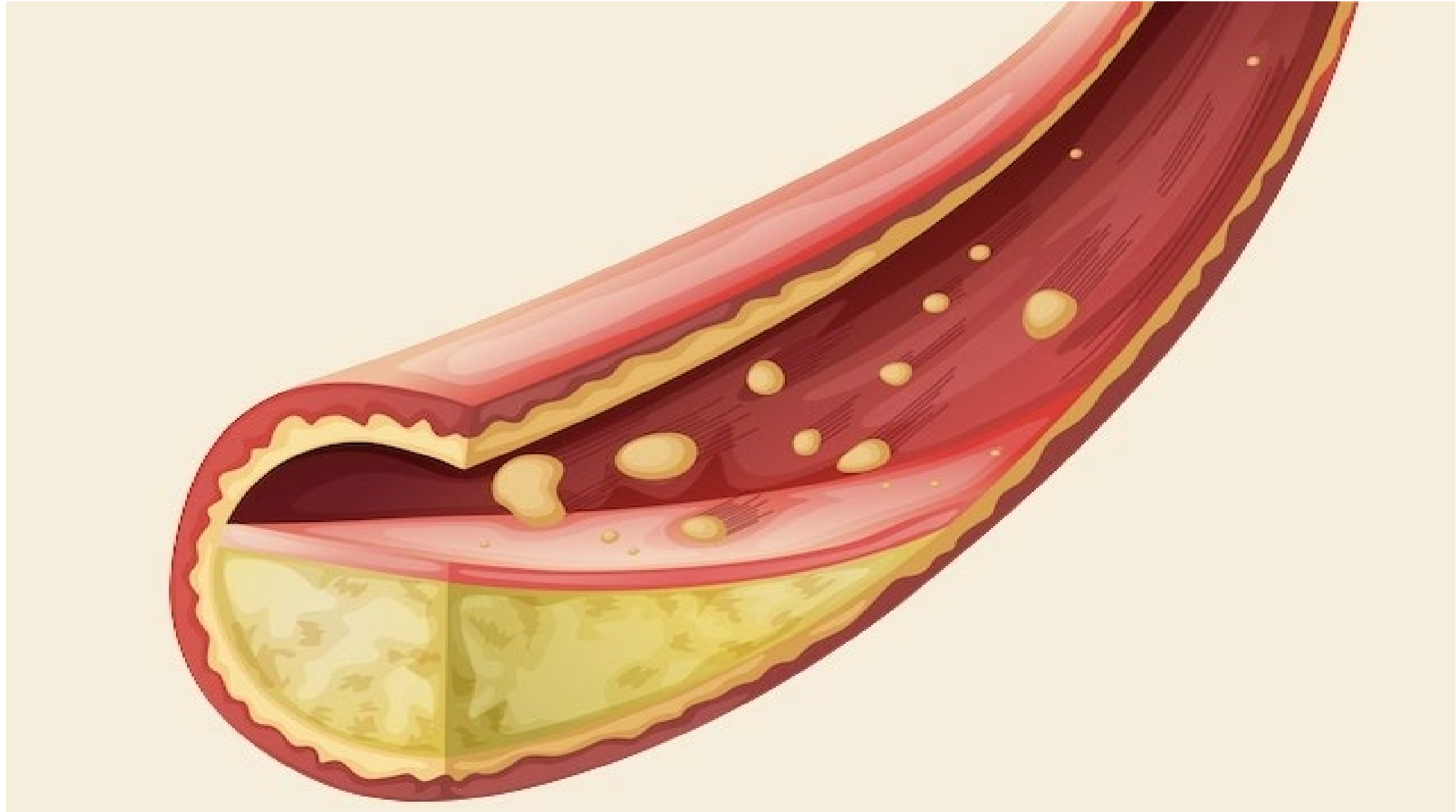
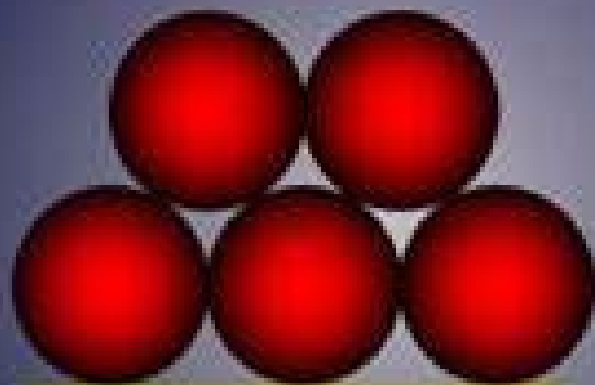


Fig. 22 - Schematic representation of the vascular scenario in which foam cells and the atheromatous plaque are formed. LDL migrate from blood to the subendothelial space, where they are probably oxidized by endothelial cells and other unknown factors. Oxidatively modified LDL are capable of activating platelets and chemotactically attract circulating monocytes, which also migrate to the subendothelial space, where they become macrophages. Oxidation of LDL involves modifications of the lipidic as well of the proteic moiety of lipoproteins: the modified apoprotein becomes recognizable by a special receptor of the macrophages, the "scavenger receptor". By this mechanism macrophages assume large quantities of oxidatively modified LDL, to eventually become foam cells, responsible for the formation of the atherosclerotic plaque.



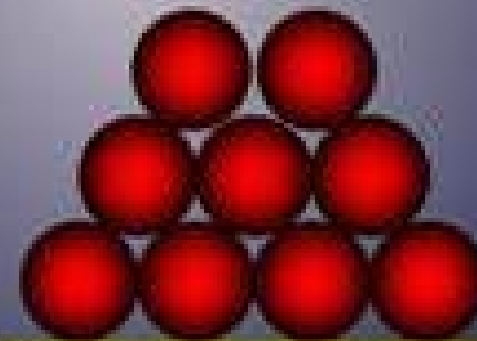
Lower risk



130 mg/dL

Large LDL
(Pattern A)

Higher risk

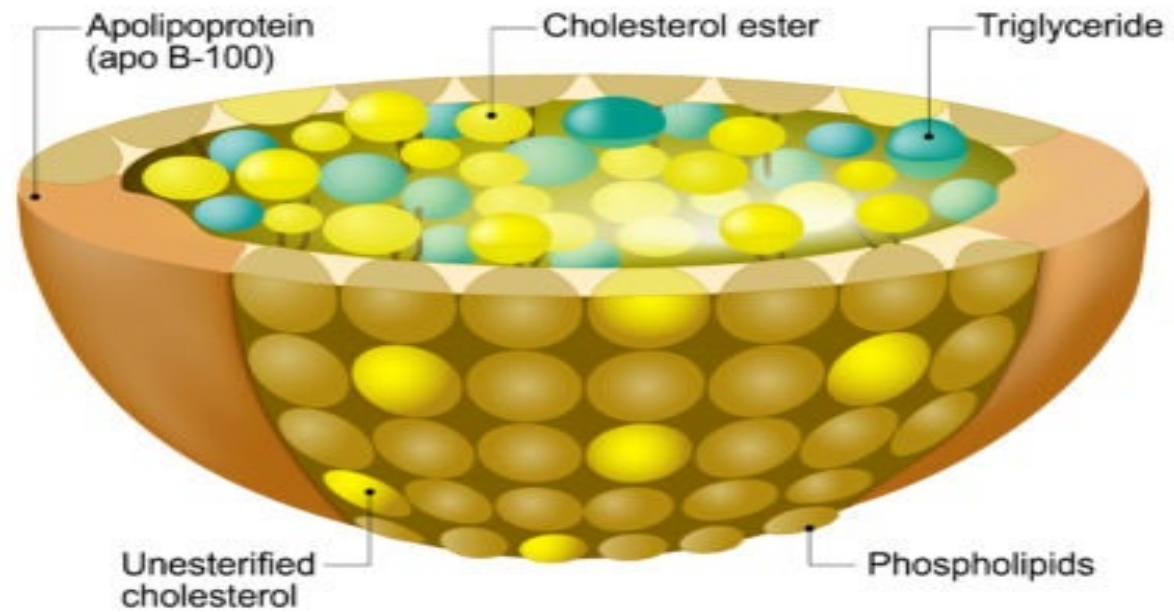


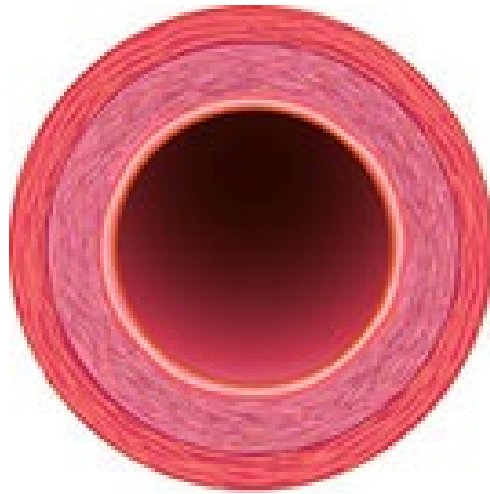
130 mg/dL

Small LDL
(Pattern B)

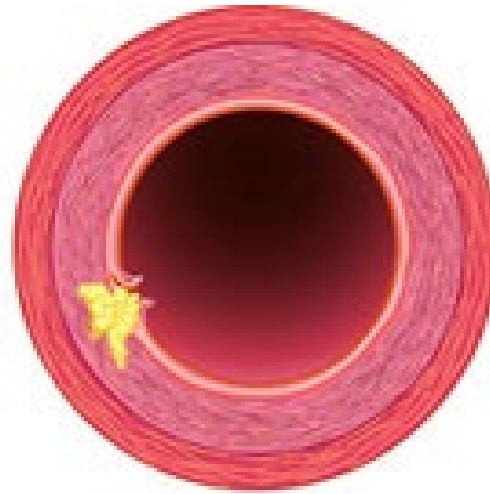
LDL
Cholesterol
Balance

Low-density lipoprotein

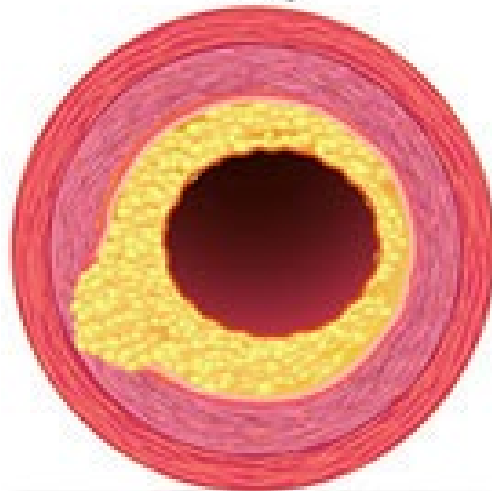




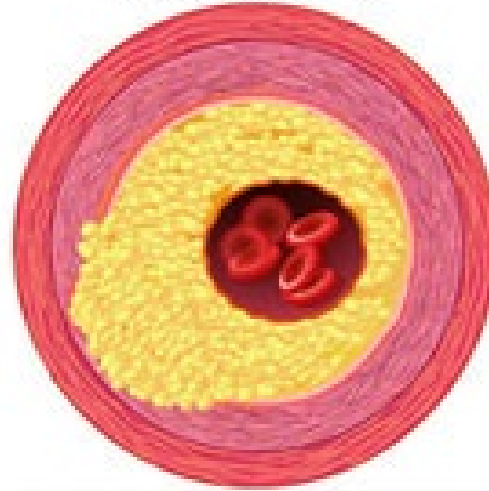
Normal coronary artery



High cholesterol can injure artery wall



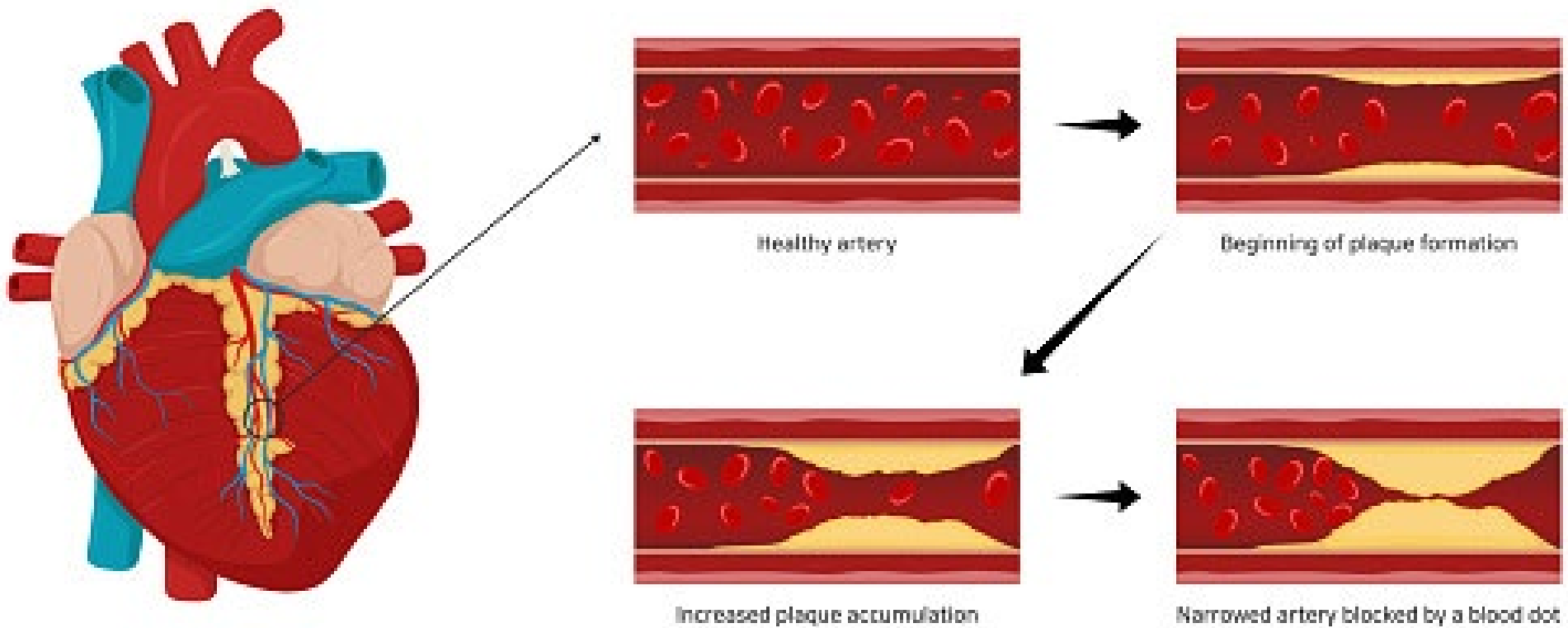
In response, plaque forms



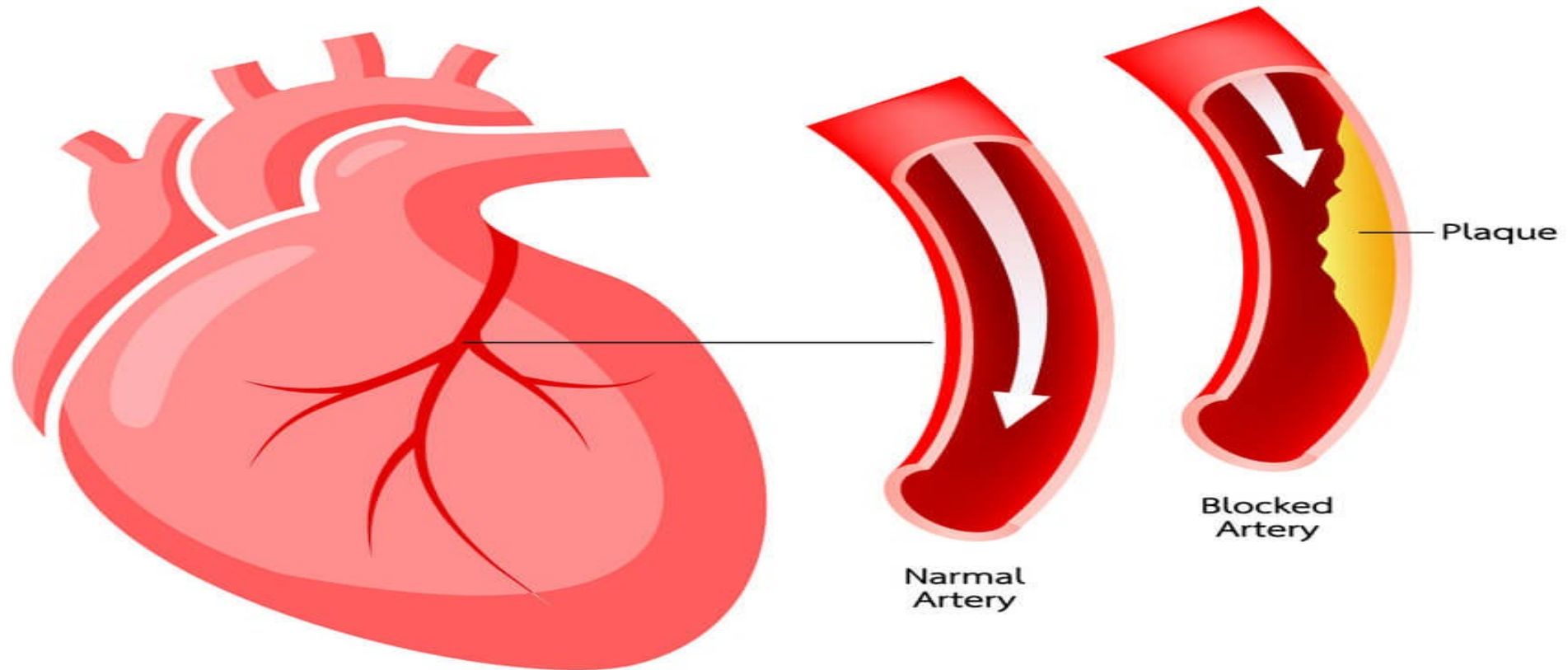
Plaque accumulates, narrowing artery

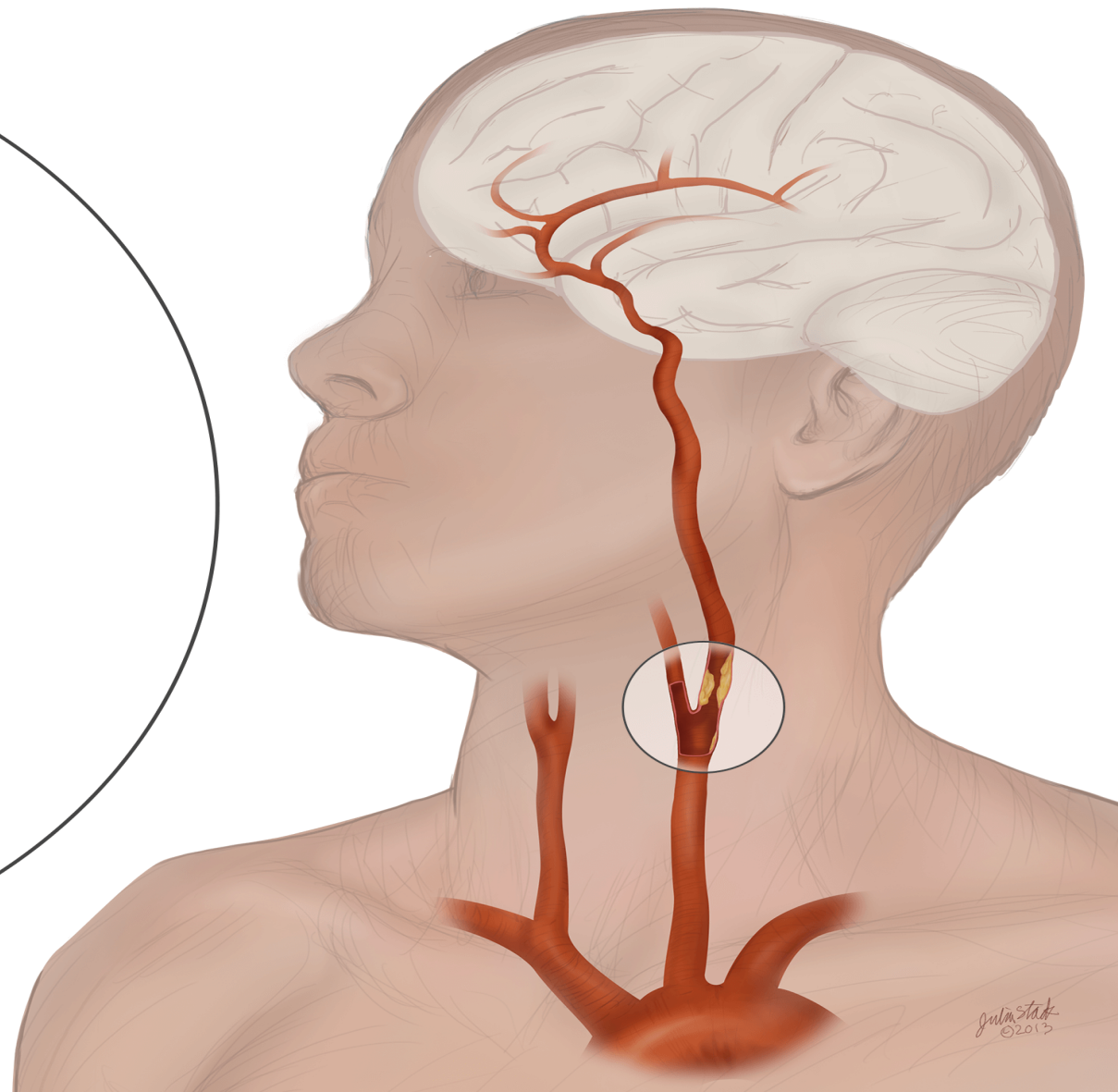
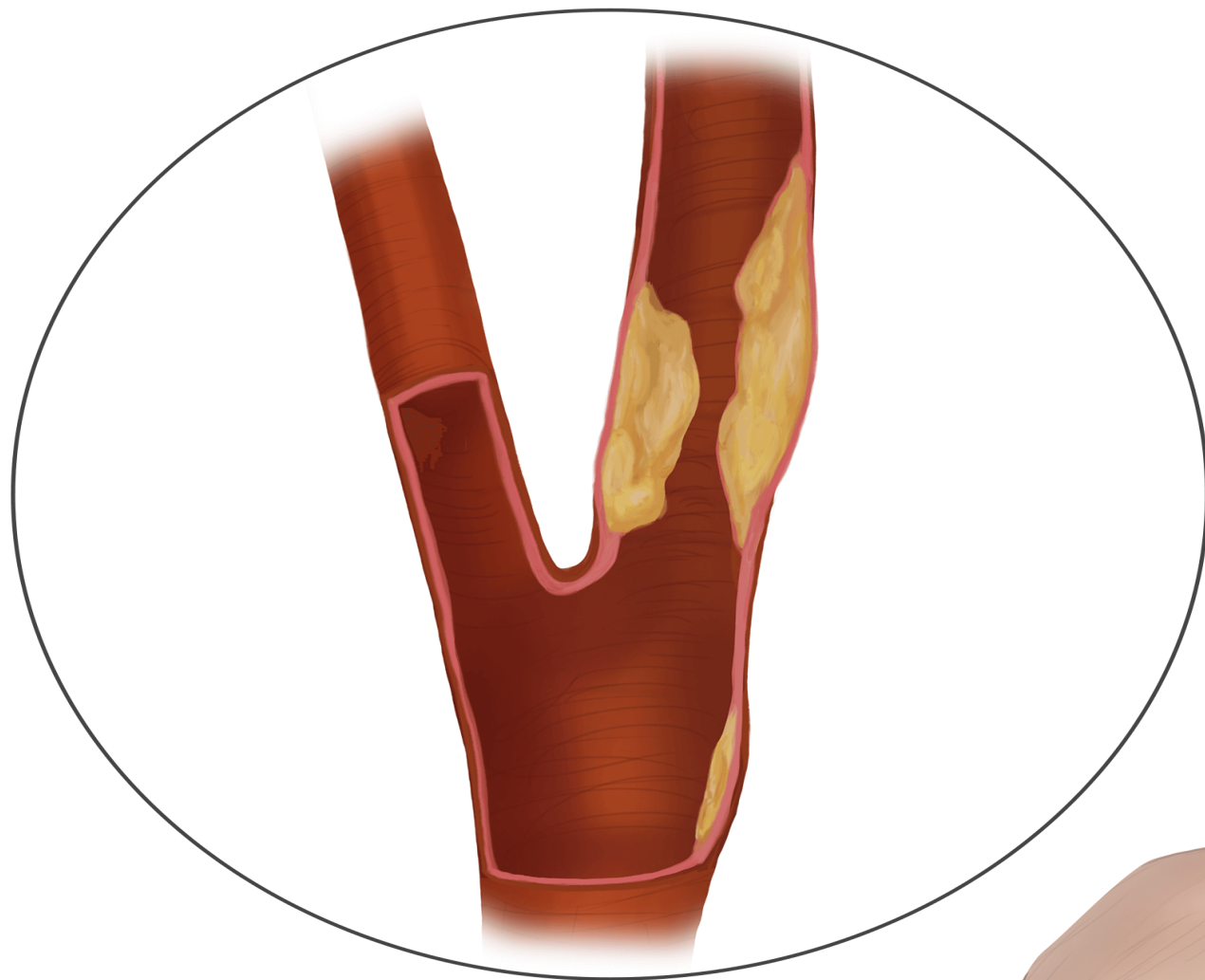
Atherosclerosis Stages

Plaque formation and growth.



CORONARY ARTERY DISEASE





How to lower cholesterol and Triglycerides

Multiple factors contribute to your cholesterol levels, some of these factors are modifiable such as:

Diet: Keeping a significant calorie surplus puts you at risk of higher levels of cholesterol and blood sugar, which may increase your risk of chronic disease.

Manage your weight: Being overweight may increase your risk of hypercholesteremia and thus increase your cardiovascular disease risk. When you lose even 10% of weight, this will decrease your total cholesterol, triglyceride, and LDL instantly.

Sedentary lifestyle: Physical inactivity is a risk factor for cardiac disease and atherosclerosis. But you can change that immediately, start by walking at least 30 minutes per day and build more on that. Being active may help in decreasing LDL- p.

The most important way to lower
cholesterol

How to Rid the Body of Excess Cholesterol Through Bile Production

- Bile is the digestive juice made in the liver and assists in breaking down fat (we eat).
- Bile is made of Cholesterol
- Bile can be recycled
- If we can force our body to make new bile instead of recycling the old Bile, we can help rid our body of the excess cholesterol to make this new bile.

Lowering Cholesterol Through Fiber

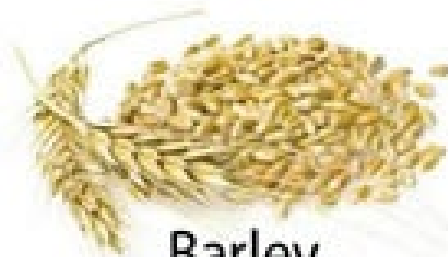
- Fiber is indigestible and as it moves down the digestive tract it catches and eliminates all sorts of things.
- Bile can get trapped in the mesh of fiber
- As fiber leaves the body, it takes bile with it
- The Body now needs to make new bile and needs cholesterol to do so.
- Lowering cholesterol and risk of heart disease

Types of Fiber

(Soluble and Insoluble Fiber)

-
- **Soluble fiber** dissolves into water and turns into a gel like substance within the digestive track. It mixes with the food and slows down the digestive process, hence making one stay full for longer. Soluble fiber also lowers total and LDL cholesterol, which may reduce the risk of cardiovascular disease.

Soluble Fiber



Barley



Oats



Beans



Figs



Prunes



Sweet potatoes

- **Insoluble fiber**, on the other hand, not does dissolve in water, and neither does is get absorbed within the body. It literally just passes through the digestive track. However, in doing so, it add bulk to the stool hence making defecation easier. It also helps alleviate constipation.

Insoluble Fiber



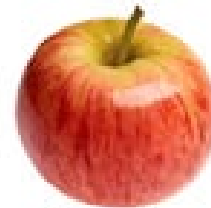
Cereals



Whole-wheat bread



Lentils



Apple



Avocado



Strawberries



SOLUBLE

dissolves in water

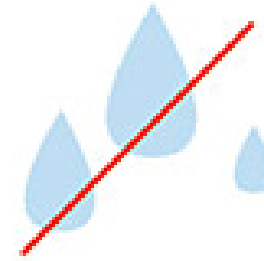
WHAT IT DOES

reduces cholesterol
levels and keeps blood
sugar stable

EXAMPLES

beans, fruits, and oats

<http://askDrTanu.com>



INSOLUBLE

does NOT dissolve in water

WHAT IT DOES

increases bulk and
prevents constipation

EXAMPLES

broccoli, cabbage, dark
leafy greens, root
veggie skins, wheat
bran, brown rice

Breaking Down Fiber: Soluble vs. Insoluble

Soluble	Insoluble
Oatmeal/oat bran	Whole-wheat breads
Nuts and seeds	Barley
Dried peas	Couscous
Beans	Brown rice
Lentils	Wheat bran
Apples	Carrots
Pears	Zucchini
Strawberries	Celery
Blueberries	Whole-grain cereals



- 
- **Apples:** One apple can contain 3-7 grams of dietary fiber, depending on its size. In addition, apples contain compounds called polyphenols, which may also have a positive impact on cholesterol levels.
 - **Avocados** are rich in heart-healthy nutrients
 - **Oats** research confirms that the soluble fiber in oats lowers LDL cholesterol levels and can improve cardiovascular risk as part of a heart-healthy diet..
 - **Nuts** are a great source of unsaturated fats, which can help lower LDL cholesterol levels, especially when they replace saturated fats in the diet.
Nuts are also rich in fiber, which helps keep the body from absorbing cholesterol and promotes its excretion.

- **Dark chocolate**

- Cocoa, which can be found in dark chocolate contains flavonoids, a group of compounds in many fruits and vegetables. Their antioxidant and anti-inflammatory properties can benefit health in various ways.

- **Extra virgin olive oil** features regularly in the heart-healthy Mediterranean diet. One of its many uses is as a cooking oil.

- Substituting saturated fat, found in butter, with monounsaturated fat, found in extra virgin olive oil, might reduce LDL levels. Moreover, extra virgin olive oil has antioxidant and anti-inflammatory properties that can be very beneficial to cardiovascular and overall health.

- Antioxidants called catechins in certain teas, such as **Green Tea**, can be very beneficial to health.

The importance of omega 3 fatty acids

The importance of Omega 3 fatty acids

- Research has suggested that omega-3 fatty acids, found in fish, nuts, and supplements such as fish oil, might be able to help you lower your cholesterol and triglyceride levels. As "healthy fats," omega-3 fatty acids may also provide other heart-healthy benefits and even prevent cardiovascular disease.
- What Are Omega-3 Fatty Acids?
- Omega-3 fatty acids are types of [polyunsaturated fats](#) found in supplements, fatty fish, plant-based sources, including:

- **Fatty fish** (anchovies, salmon, tuna, halibut, herring, and sardines)
- **Nuts** (walnuts and almonds)
- **Supplements** (fish oil, cod liver oil, and krill oil)



- 
- **Omega-3 fats have a notable effect on triglyceride levels:**
 - The effectiveness of omega-3 fatty acids on triglycerides appears to be dose-dependent. This means that the more omega-3 fatty acids ingested, the lower your triglyceride levels will fall.
 - Omega-3 fatty acids seem to affect recently ingested triglycerides and work best when following a healthy diet.
 - Individuals with extremely high triglyceride levels (greater than 500 mg/dL) appear to get the most benefit from omega-3 fatty acid supplementation.





Cholesterol and Your Weight



- **Cholesterol and Your Weight**

- Carrying extra weight raises your chances of having too much low-density lipoprotein (LDL), or “bad cholesterol,” in your blood. That raises your chances of heart problems and other serious issues. Every 10 pounds your overweight causes your body to produce as much as 10 milligrams of additional cholesterol every day.
- Losing weight can help lower cholesterol, and your chances of heart disease and diabetes.
- How Obesity Raises Your Risk of High Cholesterol
- Your body needs some cholesterol. Your liver makes the waxy substance to help build cells and store fat. Your body also uses it to make vitamin D, which is important for a healthy immune system.
- The problem starts when there’s too much LDL in your bloodstream, a condition called hypercholesterolemia. That can create fatty deposits that build up (atherosclerosis), block your arteries, and eventually restrict blood flow. That could lead to a heart attack or stroke.

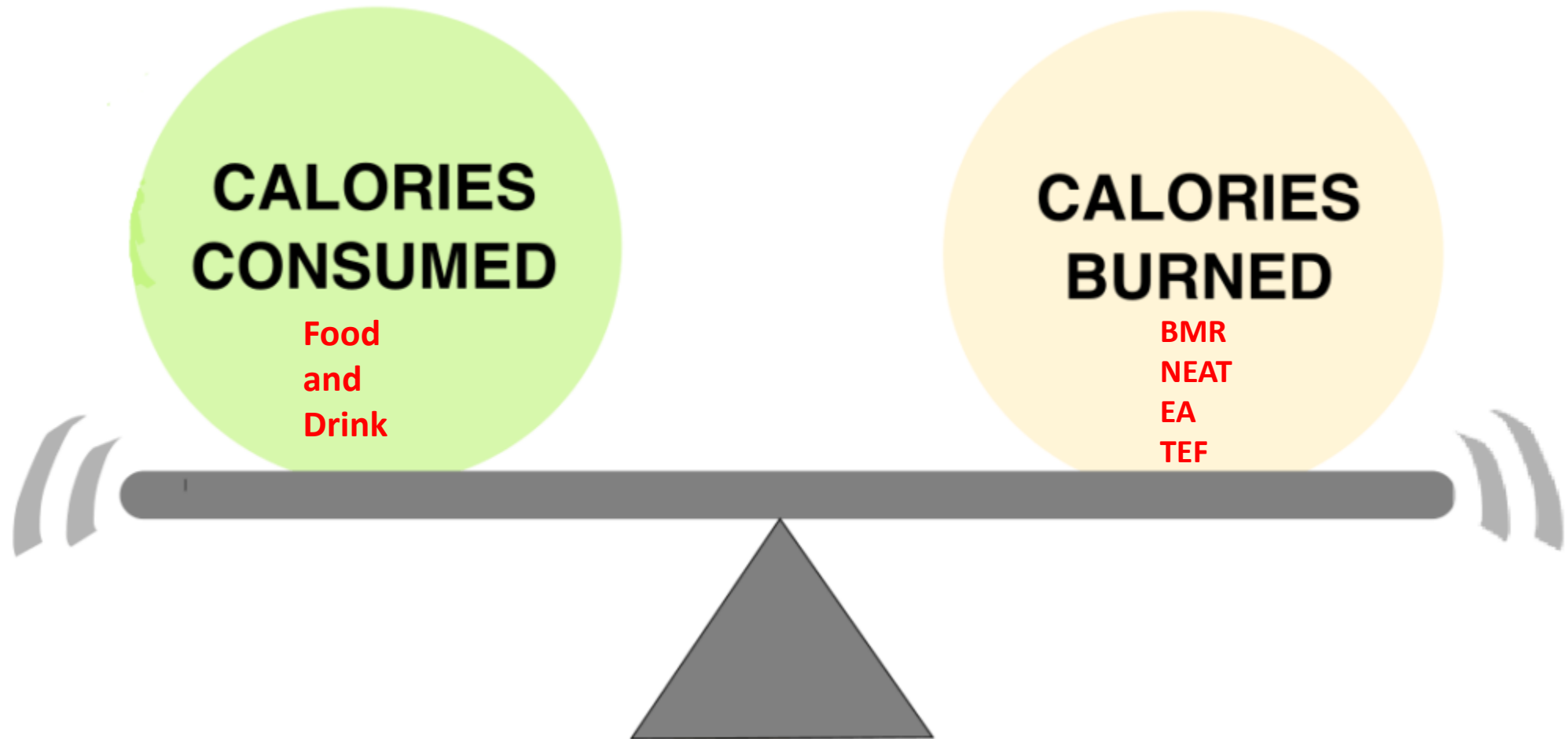


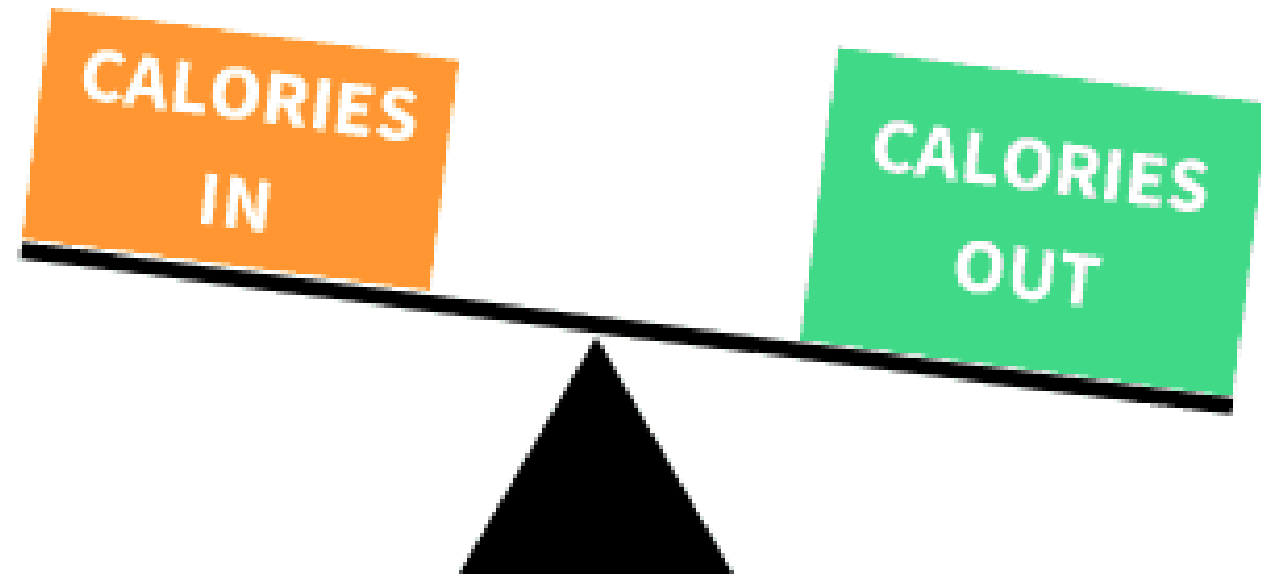
How to Lose Weight



What is a Calorie Deficit?

- A calorie deficit is simply **consuming fewer calories than you burn each day**. Calories come from food and drink. Those calories provide our bodies with energy in order to function properly.
- Then, our bodies expend those calories in the form of heat. To **achieve a reduction in calorie intake, a person needs to consume fewer per day than it expends**.

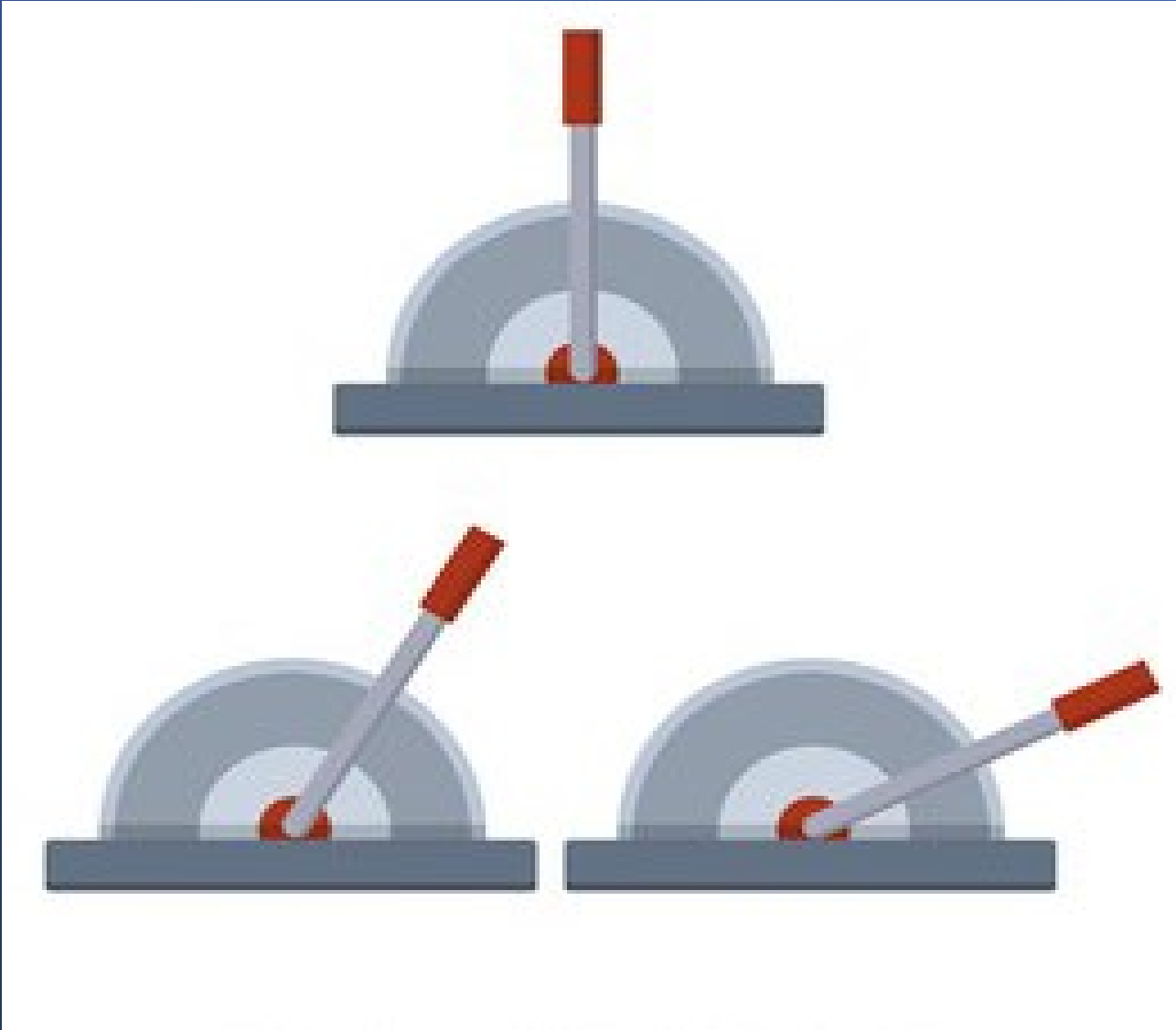




WEIGHT LOSS
(calorie deficit)

CALORIES IN < CALORIES OUT

Diet  vs. disease



Caloric Restriction

Dietary Restriction

Time Restriction

No Restriction



References

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- J. Boren, K.J. Williams The central role of arterial retention of cholesterol-rich apolipoprotein-B-containing lipoproteins in the pathogenesis of atherosclerosis: a triumph of simplicity
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QUESTIONS

