So, How Is Your Cholesterol?

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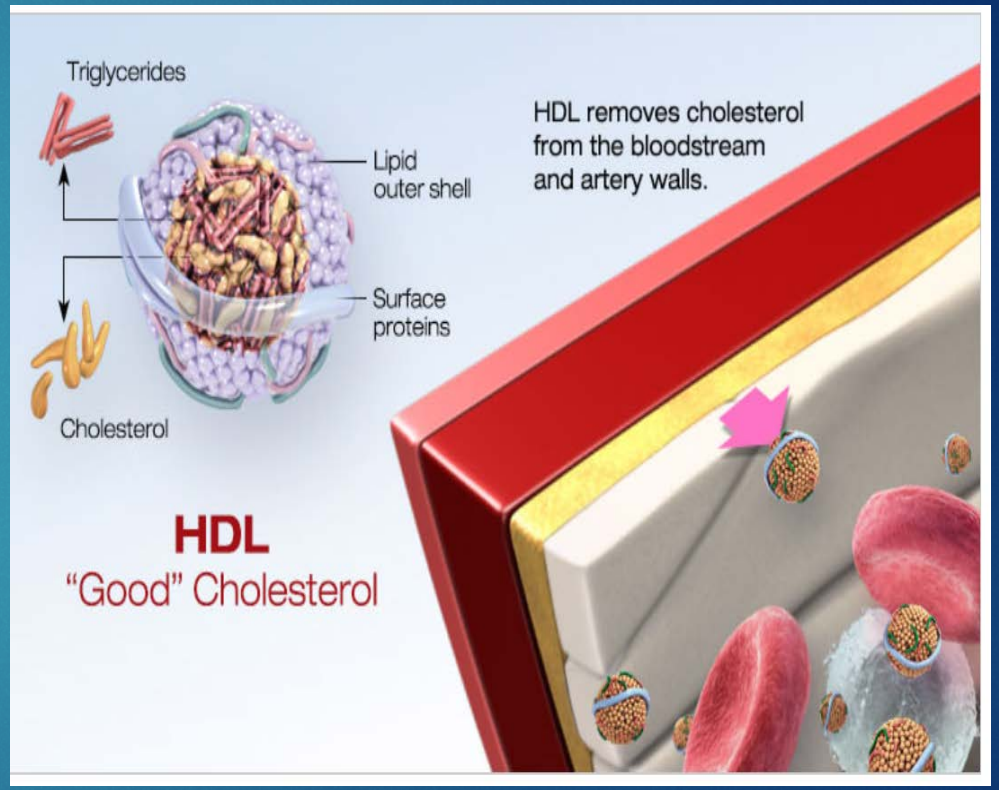
What is Cholesterol?

- Cholesterol is a soft, fat-like substance stored in the bloodstream and carried through the body in fat filled packages covered by a layer of protein called lipoproteins.
- There are several types of lipoproteins, but the two most important ones that are used to calculate cholesterol levels are:
    1. High Density Lipoproteins or HDL
    2. Light Density Proteins or LDL
- Cholesterol is produced by the liver or is taken into the body by eating foods high in fat and cholesterol, i.e. beef, sausage, milk, butter, and cheese.

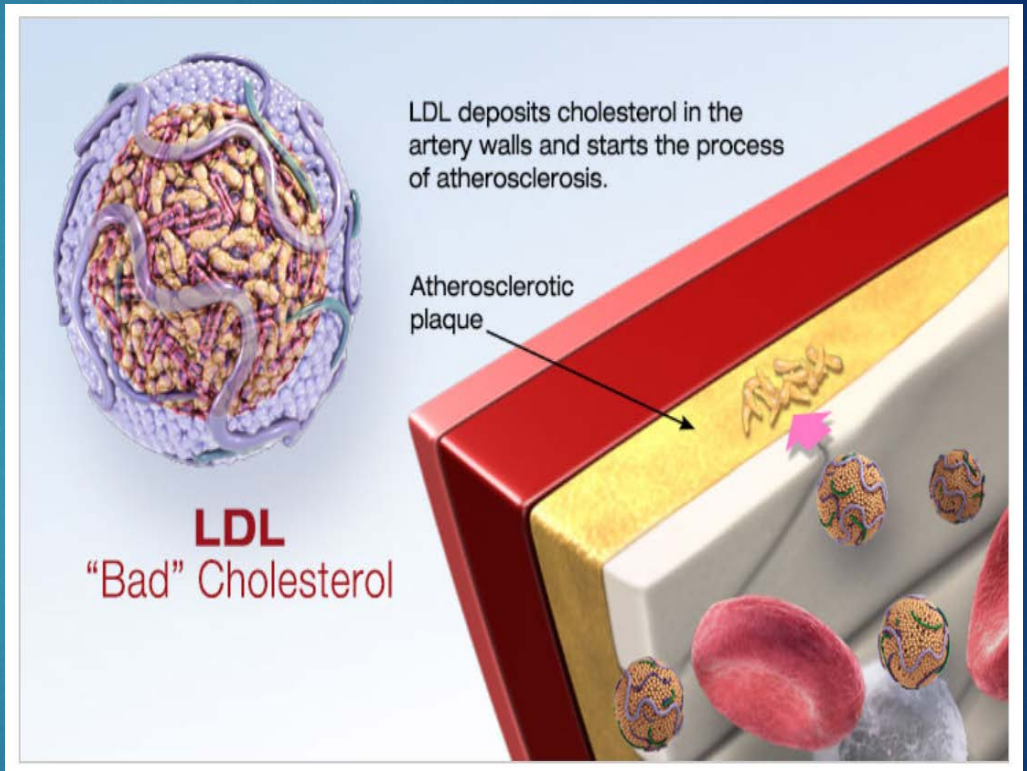
HDL Cholesterol

- High density lipoproteins (HDL) are called "good" cholesterol
- HDL remove cholesterol from the bloodstream and the artery walls and transport the cholesterol to the liver where the cholesterol is eliminated from the body
- A higher HDL score is desirable and is associated with a lower risk of coronary artery disease



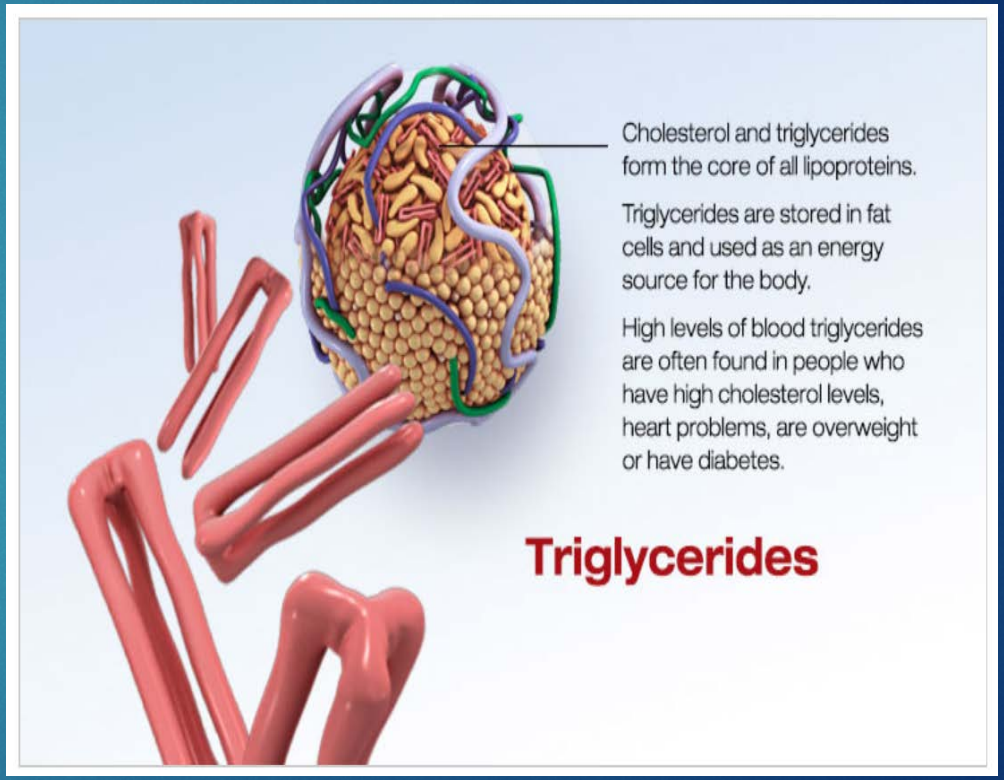
LDL Cholesterol

- Low density lipoproteins (LDL) are considered "bad" cholesterol
- LDL carry needed cholesterol to all parts of the body
- Too much LDL in the system (higher LDL score) can lead to coronary artery disease due to the buildup of LDL deposits in artery walls



Where Do Triglycerides Fit?

- Triglycerides are the most common type of fat and is stored all over the body
- A higher triglyceride level may mean you have a higher chance of developing coronary artery disease
- Extremely high triglyceride levels may lead to pancreatitis



What Does Cholesterol Do?
"The Good"

- Cholesterol is essential for normal body function. It is used to:
  - Form cell membranes
  - Produce hormones (estrogen, testosterone, etc.)
  - Produce Vitamin D (in the skin)
  - Produce substances that aid in digestion (bile)

What Does Cholesterol Do?
"The Bad"

- High blood cholesterol levels, especially LDL cholesterol, leads to the development of heart disease and stroke
- High blood cholesterol itself does not cause any signs or symptoms, so many people are unaware that their cholesterol level is too high
- High cholesterol is considered one of the major risk factors for heart disease that is treatable

What Does Cholesterol Do?
"The Ugly"

- Heart diseases (which includes heart disease, stroke and other cardiovascular diseases) is the leading cause of death for both men and women.
- Cardiovascular diseases claim more lives than all forms of cancer combined.
- Coronary heart disease is the most common type of heart disease, killing over 370,000 people annually.
- In the United States, someone has a heart attack every 34 seconds. Every 60 seconds, someone in the United States dies from a heart disease-related event.

High Cholesterol, Atherosclerosis and CAD

- High cholesterol levels lead to the deposition of cholesterol in artery walls, over time, forming plaques that narrow the lumen of the artery
- Coronary artery disease (CAD) occurs when the inside (the lumen) of one or more coronary arteries narrows, limiting the flow of oxygen-rich blood to surrounding heart muscle tissue
- Atherosclerosis is the process that causes the artery wall to get thick and stiff
- CAD may lead to a complete blockage of the artery, which leads to a heart attack

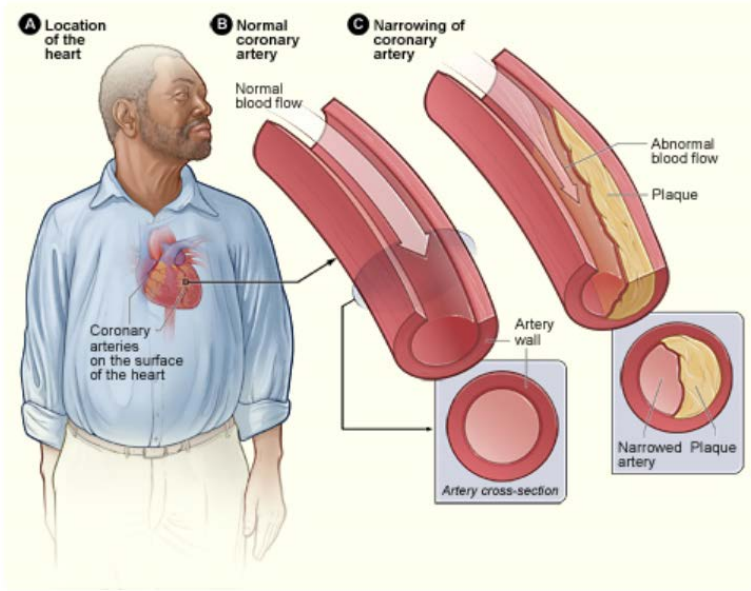


Figure A shows the location of the heart in the body. Figure B shows a normal coronary artery with normal blood flow. The inset image shows a cross-section of a normal coronary artery. Figure C shows a coronary artery narrowed by plaque. The buildup of plaque limits the flow of

What Are Cholesterol Goals?

- Total cholesterol (TC) goal values:
  - 75-169 mg/dL for those age 20 and younger
  - 100-199 mg/dL for those over age 21
- Low density lipoprotein (LDL cholesterol) goal values:
  - Less than 70 mg/dL for those with heart or blood vessel disease and for other patients at very high risk of heart disease (those with metabolic syndrome)
  - Less than 100 mg/dL for high risk patients (for example: some patients who have diabetes or multiple heart disease risk factors)
  - Less than 130 mg/dL otherwise
- High density lipoprotein (HDL) goal value:
  - Greater than 45 mg/dl (the higher the better)
- Triglyceride (TG) goal value:
  - Less than 150 mg/dl

What Affects Cholesterol Levels?

- Factors that are under your control:
  - Diet: Saturated fat and cholesterol in the food you eat make your blood cholesterol level rise. Saturated fat is the main problem, but cholesterol in foods also matters. Reducing the amount of saturated fat and cholesterol in your diet helps lower your blood cholesterol level.
  - Weight: Being overweight is a risk factor for heart disease. It also tends to increase your cholesterol. Losing weight can help lower your LDL and total cholesterol levels, as well as raise your HDL and lower your triglyceride levels.
  - Physical Activity: Not being physically active is a risk factor for heart disease. Regular physical activity can help lower LDL (bad) cholesterol and raise HDL (good) cholesterol levels. It also helps you lose weight. You should aim to be physically active for 30 minutes on most, if not all, days.
  - Smoking: Using any tobacco products is an increase risk factor for elevation of cholesterol levels and heart disease
- Factors not under your control:
  - Age and Gender: As women and men get older, their cholesterol levels rise. Before the age of menopause, women have lower total cholesterol levels than men of the same age. After the age of menopause, women's LDL levels tend to rise.
  - Heredity: Your genes partly determine how much cholesterol your body makes. High blood cholesterol can run in families.

Therapeutic Lifestyle Changes

- The new guidelines from the American College of Cardiology and American Heart Association emphasize preventing heart disease in the short- and long-term, and recommend "therapeutic lifestyle changes (TLC)" to lower LDL. These involve:
  - Reducing saturated fat and cholesterol intake
  - Increasing intake of soluble fiber
  - Reducing weight if you are overweight - especially if you have metabolic syndrome
  - Increasing physical activity - regular physical activity is recommended for everyone.
  - Controlling high blood pressure
  - Quitting smoking

New Treatment Guidelines for Cholesterol

- New guidelines from the American College of Cardiology and American Heart Association focus on four main groups of people who may be helped by statins:
  - People who already have cardiovascular disease. This group includes people who have had heart attacks, strokes caused by blockages in a blood vessel, mini-strokes (transient ischemic attacks), peripheral artery disease, or prior surgery to open or replace coronary arteries.
  - People who have very high LDL (bad) cholesterol. This group includes adults who have LDL cholesterol levels of 190 mg/dL or higher.
  - People who have diabetes. This group includes adults who have diabetes and an LDL between 70 and 189 mg/dL, especially if they have evidence of vascular disease.
  - People who have a higher 10-year risk of heart attack. This group includes people who have an LDL above 100 mg/dL and whose 10-year risk of a heart attack is 7.5 percent or higher.

Medical Treatments

- Statins (HMG-CoA Reductase Inhibitors)- Block the production of cholesterol in the liver
- Statins lower cholesterol and stabilize cholesterol plaques by decreasing the inflammatory process in the artery wall
- Statin meds include:
  - Lovastatin- Mevacor, Altoprev (20-80 mg)
  - Pravastatin- Pravachol (20-40 mg)
  - Simvastatin- Zocor (20-80 mg)
  - Fluvastatin- Lescol (20-80 mg)
  - Atorvastatin- Lipitor (10-80 mg)
  - Rosuvaststin- Crestor (5-40 mg)
  - Pitavastatin- Livalo (1- 4 mg)

Medical Treatments

- **Bile Acid Sequestrants-** Work inside the intestine to decrease the amount of fat absorbed from food
  - Cholestyramine- Questran/ Questran Light
  - Colesevelam- Welchol
  - Colestipol- Colestid
- **Cholesterol Absorption Inhibitor-** Decrease the amount of cholesterol absorbed from food (and also lower triglycerides)
  - Ezetimibe- Zetia
- **Fibric Acids-** Are primarily used to decrease triglycerides, but can also increase HDL cholesterol (minimally decrease LDL)
  - Fenofibrate- Tricor, Antara, Fenoglide, Fibricor, Lipidil, Lipofen, Lofibra, Triglide, Trilipix
  - Gemfibrozil- Lopid

Vitamins and Supplements

- **Niacin (Nicotinic Acid)-** is a B-complex vitamin, which blocks the liver from removing HDL and lowers triglycerides
  - Niacin- Niaspan, Niacor, Slo - Niacin
- **Omega 3 Fatty Acids (Fish Oils)-** increase the level of HDL and lowers triglycerides
  - Icosapent Ethyl- Vescepa
  - Omega-3-Acid Ethyl Esters- Lovaza

Hot Topics!

- **Do statins cause muscle pain or injury?**

  Muscle aches and inflammation is a potential side effect listed on statins. The symptoms generally resolve after discontinuation of the medication. There have been rare causes of more severe muscle issues for which treatment is needed.

- **Do statins cause dementia?**

  There is some data available that supports the theory that statins may increase patient's susceptibility to dementia, but interestingly, some studies suggest that statins might improve memory in certain people by lowering the risk of dementia.

- **Do statins cause diabetes?**

  Careful review of findings from many trials combined does show that statins can modestly raise blood sugars(through increasing insulin resistance and production in the pancreas) , and more patients who are on statin therapy are diagnosed with diabetes mellitus compared with those not on statins. Although patients on statins do have a higher risk of developing diabetes mellitus during the studies, they also experience a significant drop in cardiovascular events. (review of 13 studies showed development of 1 case of DM, but 5.4 CV events were prevented)

Questions?

Risk Factors for Heart Disease

- Age (>50 for men, >55 for women)
- High blood pressure
- High blood cholesterol
- Diabetes and pre-diabetes
- Smoking
- Being overweight or obese
- Being physically inactive
- Having a family history of early heart disease (<55 for men, < 65 for women)
- Having a history of preeclampsia during pregnancy
- Unhealthy diet

Cholesterol Scores

Total Cholesterol Level	Category
Less than 200mg/dL	Desirable
200-239 mg/dL	Borderline high
240mg/dL and above	High
LDL (Bad) Cholesterol Level	LDL Cholesterol Category
Less than 100mg/dL	Optimal
100-129mg/dL	Near optimal/above optimal
130-159 mg/dL	Borderline high
160-189 mg/dL	High
190 mg/dL and above	Very High
HDL (Good) Cholesterol Level	HDL Cholesterol Category
Less than 40 mg/dL	A major risk factor for heart disease
40—59 mg/dL	The higher, the better
60 mg/dL and higher	Considered protective against heart disease