

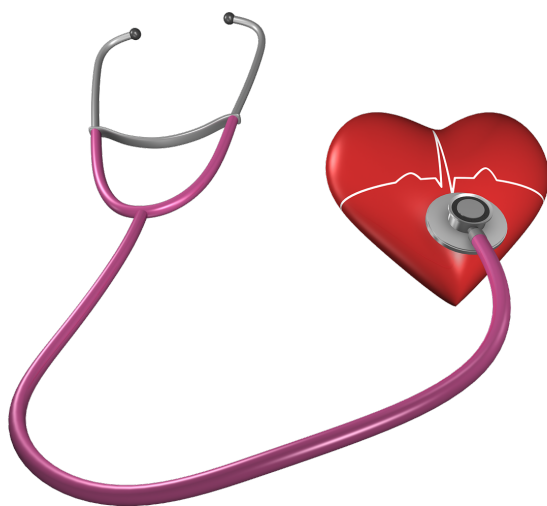
Nutrition & Health Info Sheet:

CHOLESTEROL

Produced by:
Hanee (Hyun Hee) Park, BS
Rachel E. Scherr, PhD
Sheri Zidenberg-Cherr, PhD
Center for Nutrition in Schools
Department of Nutrition
University of California, Davis
2017

What is CHOLESTEROL?

Cholesterol is a fat-like substance with waxy appearance that is found in many parts of the body, particularly in the blood, brain, kidneys, and liver. The body needs cholesterol to make vitamin D, essential hormones such as estrogen and testosterone, maintain healthy cellular structure, and synthesize bile acids to digest food.^{1,2}



Why do we care about cholesterol?

It is important to be aware of blood cholesterol values because having high blood cholesterol, specifically the low-density lipoprotein (LDL) or “bad” cholesterol, raises the risk for heart attack and stroke. The risk for heart attack and stroke increases as blood LDL values increase.

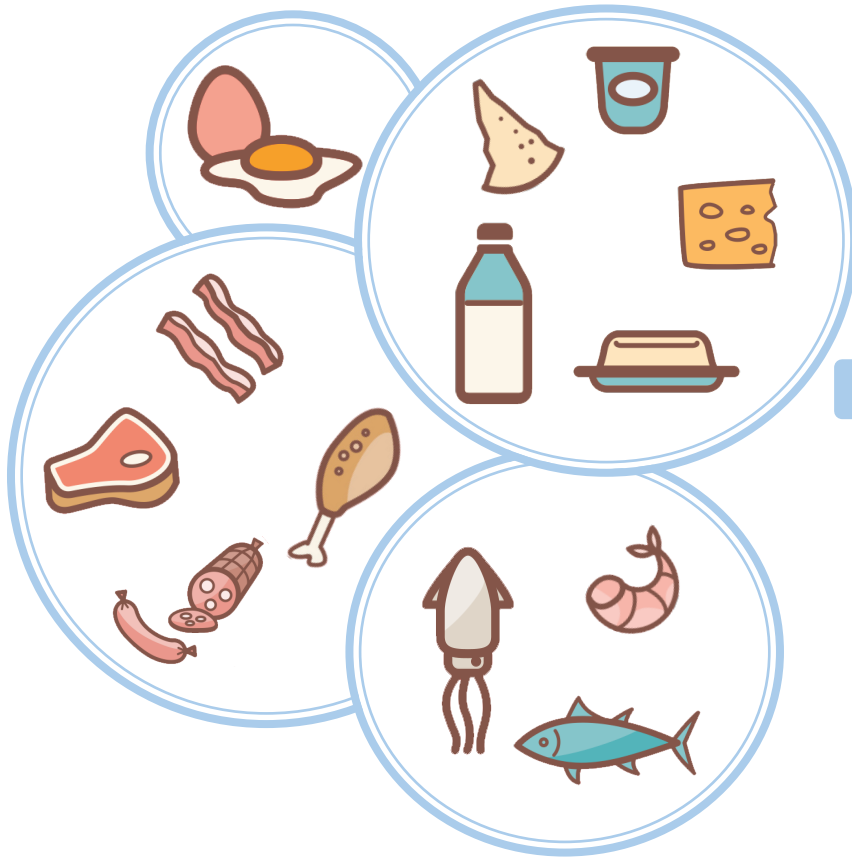
Where do we find cholesterol?

Cholesterol is produced in the body and is found in our diet. However, it is important to note that cholesterol from food does not affect LDL-cholesterol blood levels. For this reason, the current US Dietary Guidelines for Americans 2015-2020 no longer recommend reducing dietary cholesterol intake.³



Cholesterol in Diet

Dietary cholesterol only comes from animal sources. Vegetables, fruits, or grains do not contain cholesterol.



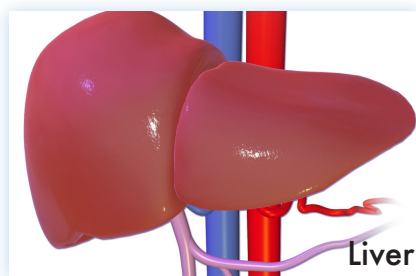
Some sources of cholesterol include:^{4,5}

- Dairy products such as milk, butter, and cheese
- Egg yolks
- Meat, poultry, and seafood
- Lard

Cholesterol in Body

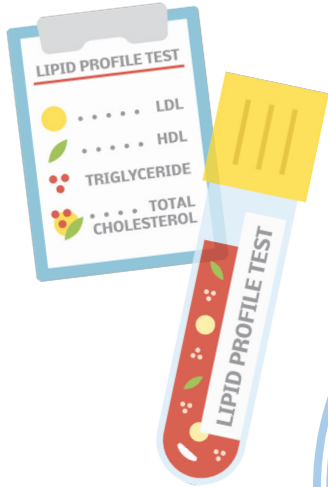
Our livers can make adequate cholesterol on their own.^{4,6}

However, some people are not able to control the amount of cholesterol produced in the body and are prone to having high blood cholesterol levels.⁵



3 Main Lipoproteins in our Blood

High Density Lipoprotein, Low Density Lipoprotein, and Very-Low Density Lipoprotein



LOW DENSITY LIPOPROTEIN (LDL)

Known as the “bad” cholesterol because it may lead to a build up of cholesterol or plaques in blood vessels, which can interfere with blood circulation. *LDL cholesterol is found in the highest amounts in the blood-stream⁸*

**21-27 nm in diameter*⁹*

HIGH DENSITY LIPOPROTEIN (HDL)

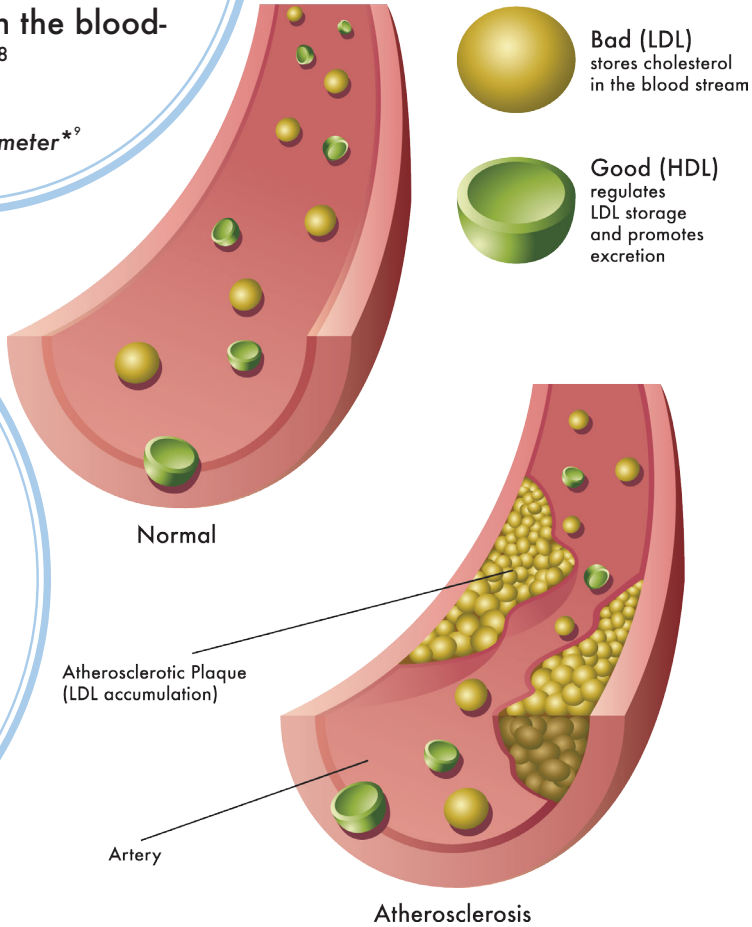
Known as the “good” cholesterol, *HDL-cholesterol is believed to carry cholesterol from other parts of the body to the liver, where it removes cholesterol from the body.⁷*

**7-13 nm in diameter*⁹*

VERY-LOW DENSITY LIPOPROTEIN (VLDL)

Unlike HDL and LDL cholesterol, *VLDL does not carry cholesterol in blood and contains mostly triglycerides (fat).*

**30-90 nm in diameter*⁹*
VLDL is the largest in size among 3 main lipoproteins!



build up of cholesterol or plaques in arteries may lead to *atherosclerosis*

What is atherosclerosis?¹⁰

Atherosclerosis refers to build up of cholesterol or plaques in arteries. As plaques build up, arterial walls get thicker, reducing blood and oxygen flow. Eventually, clogged arteries may block blood flow and lead to coronary heart disease (CHD) and heart attack.

Where do your cholesterol numbers fall?¹

| | Desirable (mg/dL) | Borderline (mg/dL) | High Risk (mg/dL) |
|--------------------------|-----------------------------|------------------------------|-------------------|
| Total cholesterol | <200 | 200-239 | >240 |
| LDL-cholesterol | <130, but <100 optimal | 130-159 | >160 |
| HDL-cholesterol | >60, but 40-59 normal range | <40 for men <50 for women | <35 |
| TG | <150 | 150-199 | >200 |

What are the guidelines for cholesterol levels?

For adults, keeping total blood cholesterol below 200 mg/dL is desirable for healthy blood vessels. Total cholesterol levels above 240 mg/dL is at high risk for heart attack and stroke and need treatment.

The American Heart Association's recommendations for Americans 2 years and older include:⁴



- Eating healthy sources of fat such as fish, nuts, and non-tropical vegetable oils
- Limiting intake of saturated fat to less than 7 percent of total daily calories
- Limiting trans fats to less than 1 percent of total daily calories
- Substituting saturated fats in diet with monounsaturated and polyunsaturated fats



What can we do to reduce cholesterol levels?

The American Heart Association Diet and Lifestyle Recommendations include:⁴


Make a variety of healthier food choices

- Include more fruits, vegetables, and legumes
- Go for fiber-rich whole grains when choosing grains
- Buy skinless poultry and fish 
- Include a variety of fish at least two times a week, especially fish containing omega-3 fatty acids such as salmon, trout,  and herring.
- Consider snacking on some mixed nuts as healthy snack
- Use non-tropical vegetable oils when cooking
- Select fat-free and low-fat dairy product
- Limit foods and beverages with add-sugars



Make healthier lifestyle changes



- Be active! Aim for at least 150 minutes of moderate physical activity or 75 minutes of vigorous activity each week
- Do not smoke tobacco and avoid second-hand smoke 



References

1. Cholesterol Levels: What You Need to Know. NIH Medline Plus. <https://medlineplus.gov/magazine/issues/summer12/articles/summer12pg6-7.html>. Summer 2012 Issue: Volume 7 Number 2 Page 6-7. Accessed Feb 4, 2017.
2. Cholesterol Fact Sheet. Centers for Disease Control and Prevention. http://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_cholesterol.htm. Updated Apr 30, 2015. Accessed Feb 4, 2017.
3. U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015-2020 Dietary Guidelines for Americans. 8th Edition. Dec 2015. Available at <http://health.gov/dietaryguidelines/2015/guidelines/>.
4. American Heart Association. http://www.heart.org/HEARTORG/HealthyLiving/HealthyEating/Nutrition/The-American-Heart-Associations-Diet-and-Lifestyle-Recommendations_UCM_305855_Article.jsp#.WRNfOFMrLdR. Updated March 27, 2017. Accessed May 3, 2017.
5. Wardlaw GM, et.al. Contemporary nutrition: issues and insights. 2nd Edition. McGraw-Hill Higher Education, USA.
6. Shils ME, Shike, M, et. al. Modern nutrition in health and disease. 10th Edition. Philadelphia (Pa): Lippincott Williams and Wilkins; 1999.
7. When HDL cholesterol doesn't protect against heart disease. NIH. <https://www.nih.gov/news-events/nih-research-matters/when-hdl-cholesterol-doesnt-protect-against-heart-disease>. Updated March 22, 2016. Accessed Feb 8, 2017
8. Mahan, KL, Escott-Stump, S. Krause's food, nutrition, and diet therapy. 10th Edition. Philadelphia (Pa): W.B. Saunders; 2000.
9. German JB, Smilowitz JT, Zivkovic AM. Lipoproteins: When size really matters. *Current Opinion in Colloid & Interface Science*. 2006; 11(2-3): 171-183.
10. American Heart Association. http://www.heart.org/HEARTORG/Conditions/Cholesterol/WhyCholesterolMatters/Atherosclerosis_UCM_305564_Article.jsp#.WRNfHIMrLdQ. Updated April 26, 2017. Accessed May 3, 2017.

The University of California prohibits discrimination or harassment of any person on the basis of race, color, national origin, religion, sex, gender identity, pregnancy (including childbirth, and medical conditions related to pregnancy or childbirth), physical or mental disability, medical condition (cancer-related or genetic characteristics), ancestry, marital status, age, sexual orientation, citizenship, or service in the uniformed services (as defined by the Uniformed Services Employment and Reemployment Rights Act of 1994: service in the uniformed services includes membership, application for membership, performance of service, application for service, or obligation for service in the uniformed services) in any of its programs or activities.

University policy also prohibits reprisal or retaliation against any person in any of its programs or activities for making a complaint of discrimination or sexual harassment or for using or participating in the investigation or resolution process of any such complaint.

University policy is intended to be consistent with the provisions of applicable State and Federal laws.

Inquiries regarding the University's nondiscrimination policies may be directed to the Affirmative Action/Equal Opportunity Director, University of California, Agriculture and Natural Resources, 1111 Franklin Street, 6th Floor, Oakland, CA 94607, (510) 987-0096.

Copyright © The Regents of the University of California, Davis campus, 2017. All rights reserved. Inquiries regarding this publication may be directed to cns@ucdavis.edu. The information provided in this publication is intended for general consumer understanding, and is not intended to be used for medical diagnosis or treatment, or to substitute for professional medical advice.

