Nutrition and Health Info Sheet:

Cholesterol

For Health Professionals

Why is it important to be aware of cholesterol?

Having high blood cholesterol, specifically in the form of low-density lipoproteins (LDL; sometimes referred to as "bad" cholesterol) raises cardiovascular disease (CVD)risk. More than 71 million Americans (33.5 percent) have high LDL-cholesterol, defined as at or above 100 mg/dL (milligrams per deciliter). Risk for cardiovascular disease (heart attack and stroke) increases as blood LDL values increase. Additional risk factors for CVD include age, smoking, high blood pressure, diabetes, high triglycerides, taking certain medications, not being physically active and family history of heart disease or stroke.[1,2]

What is cholesterol?

Cholesterol is a fatty substance (lipid) that has a waxy appearance and is found in the cells of humans and animals, particularly the brain, kidneys, and liver. It is important to recognize that human bodies utilize cholesterol in several ways.

How does the body use cholesterol?

The body uses cholesterol to:

- Produce hormones such as estrogen and testosterone
- Maintain cellular structure
- Serve as the substrate for the active form of vitamin D
- Synthesize bile acids which are compounds necessary for fat digestion[2]

What are the two sources of cholesterol?

Cholesterol in the body comes from dietary sources and human synthesis. However, dietary cholesterol does not affect blood levels of LDL-cholesterol as these levels are tightly regulated by the body. Thus, current US Dietary Guidelines for Americans no longer recommend reducing dietary intake of cholesterol. Rather, it is total dietary pattern that has the greatest impact on blood LDL-cholesterol levels and therefore CVD risk.[3]

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Diet

Dietary cholesterol comes only from animal sources, such as dairy products, egg yolks, meats, poultry, and seafood. No vegetables, fruits, or grains contain cholesterol.[4] Baked products may contain some cholesterol if they contain egg yolks, cheese, milk, butter, or lard. In milk products the majority of the cholesterol is in the fat, so low-fat or skim milk contains less cholesterol than whole-milk products.[5]
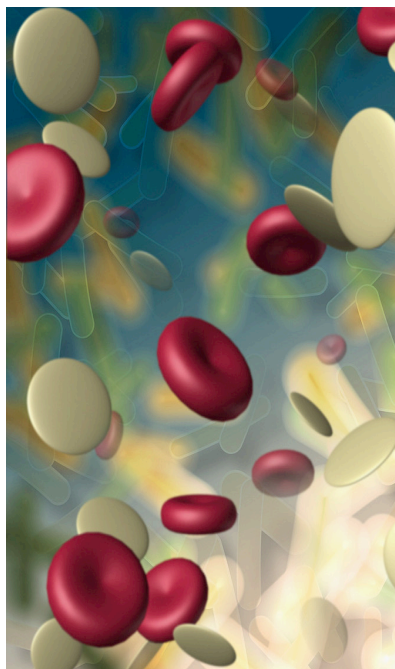
Body

No dietary requirement exists for cholesterol because the body can make enough cholesterol to meet its needs.[4] The body can make cholesterol from compounds produced by the breakdown of protein, carbohydrates, or fats.[6] The liver is the organ responsible for about 10 percent of cholesterol synthesis, and its function has a significant impact on blood cholesterol levels. However, some people lack the ability to control the amount of cholesterol they make and as a result they are prone to high levels of cholesterol in their blood stream.[5]

What are the different types of cholesterol circulating in the body?

Cholesterol, triglycerides (TG), and other fats travel through the bloodstream packaged as large molecules called lipoproteins. These packages differ from one another by the amounts of protein, fat, and related compounds they contain.[7] Cholesterol is mainly carried in the blood by two different types of lipoproteins: high-density lipoprotein (HDL) and low-density lipoprotein (LDL).

Three main lipoproteins exist in our blood:

High-density lipoprotein

HDL-cholesterol is also known as the "good" cholesterol since it is believed to carry cholesterol out of the blood vessels to the liver, where it is removed from the body. Higher levels of HDL have been associated with a lower risk of cardiovascular disease. Emerging research suggests that actual levels of HDL in the blood may not be as important as how well it functions to remove cholesterol from the body.[8]

Low-density lipoprotein

This is the largest portion of circulating cholesterol.[7] Because this form of cholesterol may contribute to the formation of plaque in blood vessels, LDL-cholesterol is often referred to as the "bad" cholesterol.

Very low-density lipoprotein (VLDL)

VLDL is very high in triglycerides and does not carry cholesterol in the blood.

Emerging research suggests that classifying LDL-cholesterol as "bad" and HDL-cholesterol as "good" cholesterol may be an oversimplification in relation to CVD risk. There are different forms of each of the classes of lipoproteins; all of which may have different relationships to CVD risk.

What are the guidelines for cholesterol levels?

For adults, total blood cholesterol below 200 mg/dL is desirable, because these levels are associated with a relatively low risk of cardiovascular disease. Levels in the range of 200–239 mg/dL are considered "borderline," and total cholesterol levels above 240 mg/dL are associated with high risk and the need for treatment. Cardiovascular disease risk is much greater at serum cholesterol levels above 200–239 mg/dL due to elevations in LDL-cholesterol.

What are the current diagnostic values for serum lipids?[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

The American Heart Association has several recommendations for Americans 2 years and older, to reduce CVD risk:[4]

- Eating between 25 and 35 percent of total daily calories as fats from foods like fish, nuts and vegetable oils (not tropical);
- Limiting saturated fat to no more than 7 percent of total calorie intake;
- Consuming less than 1 percent of total calories as trans fats;
- The majority of fats consumed should be monounsaturated and polyunsaturated.

A physician should be consulted in order to treat each individual in regard to cholesterol levels. It is recommended that blood cholesterol levels be tested every 5 years after the age of 20. If blood cholesterol is found to be high, dietary measures can be taken to try to reduce the levels. If after several months dietary modifications have minimal impact on the serum cholesterol levels, a physician may prescribe a cholesterol-lowering drug, particularly if there are other risk factors or symptoms of CVD.[1]

How can HDL-cholesterol be increased?

Excess body weight and cigarette smoking are associated with low HDL-cholesterol levels. Exercise can help raise HDL-cholesterol.[9] The exercise doesn't have to be strenuous; just walking a mile or two or even gardening several times a week can help.[4]

What is the total fat, saturated fat, polyunsaturated and monounsaturated content of some common foods?[10]

Since the dietary intake of fat, saturated fat, polyunsaturated and monounsaturated can influence the risk of cardiovascular disease, Table 2 includes values for each of these categories.[4,10]

How can cholesterol levels be reduced?

The American Heart Association Diet and Lifestyle Recommendations include:[4]

- Aim for at least 150 minutes of moderate physical activity each week
- Eat a variety of fresh, frozen and canned vegetables and fruits without high calorie sauces or added salt or sugars
- Replace high calorie foods with fruits and vegetables
- Choose fiber-rich whole grains for most grain servings
- Choose poultry and fish without skin and prepare without adding saturated or transfats
- If you choose to eat red meat, look for the leanest cuts available
- Eat a variety of fish twice a week, especially fish containing omega three fatty acids
- Select fat-free and low-fat dairy products
- Avoid foods containing partially hydrogenated vegetable oils
- Cut back on beverages and other foods with added sugars
- Choose foods with less sodium and prepare foods with little or no salt
- If you drink alcohol, drink in moderation
- Do not smoke tobacco and avoid second-hand smoke

	Cholesterol (mg)	Total fat (g)	Saturated fat (g)	Poly-unsaturated fat (g)	Mono-unsaturated fat (g)
Meat, poultry, fish, and eggs					
Prime rib, 3 oz	72.0	27.5	11.4	0.95	12.0
Beef liver, braised, 3.5 oz	396.0	5.3	2.9	1.1	1.1
Lean cut (eye of round), 3 oz					
Lean and fat	65	3.8	1.4	0.3	1.6
Lean only	65	3.3	1.2	0.25	1.4
Ground beef, cooked, 3 oz patty					
Regular (75 percent lean & 25 percent fat)	75.0	16.0	6.2	0.44	7.3
Extra lean (95 percent lean & 5 percent fat)	75.0	5.8	2.5	0.28	2.3
Chicken, light and dark meat, thigh, roasted					
With skin (130g)	166	17.9	5.4	4.3	8.3
Without skin (112g)	143	15.5	4.6	3.7	7.2
Tuna, canned, 3 oz					
In oil	15.0	6.9	1.3	2.5	2.5
In water	31.0	0.8	0.18	0.24	0.09
Shrimp, cooked, 4 large	46.0	0.4	0.1	0.13	0.08
Eggs, large, cooked	186	5.3	1.6	0.7	2.0

	Cholesterol (mg)	Total fat (g)	Saturated fat (g)	Poly-unsaturated fat (g)	Mono-unsaturated fat (g)
Dairy products					
Milk, 1 cup					
3.25 percent fat (whole)	24.0	7.9	4.5	0.48	0.12
2 percent fat (reduced fat)	20.0	4.9	3.1	0.18	1.4
1 percent fat (low fat)	12.0	2.4	1.5	0.09	0.68
Skim (nonfat)	5.0	0.2	0.1	0.01	0.05
Yogurt, 1 cup					
Nonfat plain	5.0	0.4	0.3	0.01	0.12
Low-fat, plain	15.0	3.8	2.5	0.12	1.04
Fats, oils, sweets					
Butter, 1 tbsp	15.0	7.7	4.8	0.29	2.2
Margarine, 1 tsp	0.0	11.5	2.2	3.5	5.5
Mayonnaise (regular), 1 tbsp	6.0	10.3	1.6	6.2	2.3
Sour cream, 1 tbsp	7.0	2.3	1.2	0.1	0.55
Cream cheese, 1 tbsp	15.0	5.0	2.9	0.2	1.3
Cheesecake (9 in), no bake1/12 (99g)	29.0	12.6	6.6	0.8	4.5
Nuts and Seeds (1 cup)					
Walnuts, English (chopped)	0.0	76.3	7.2	55.2	10.5
Pecans (chopped)	0.0	78.5	6.7	23.6	44.5
Almonds (whole)	0.0	71.4	5.4	17.6	45.1
Sunflower Seeds	0.0	63.7	6.7	42.1	12.2
Macadamia	0.0	101.5	16.2	2.01	78.9
Pistachios	0.0	55.7	7.3	17.7	28.6
Peanuts	0.0	71.9	9.2	22.7	35.7
Legumes (1 cup)					
Soybeans	0.0	37.1	5.4	4.4	8.2
Lentils	0.0	2.0	0.29	1.01	0.37
Red Kidney Beans	0.0	0.46	0.06	0.25	0.04
Navy Beans	0.0	1.1	0.29	0.49	0.1
Vegetables (1 cup)					
Corn	0.0	1.9	0.47	0.71	0.63
Green Beans	0.0	0.22	0.05	0.11	0.01
Broccoli	0.0	0.34	0.04	0.04	0.01
Spinach	0.0	0.12	0.02	0.05	0.003
Beet	0.0	0.23	0.04	0.08	0.04
Avocado	0.0	22.0	3.2	2.7	14.7

Acknowledgements:

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