



LIPIDS - SEPARATING FATS FROM FICTION

Contrary to the widespread belief that lipids are bad for your health, lipids perform essential functions in the body.

Lipids, or fats, are found in the bloodstream in two main forms. The first is triglycerides, a major storage form of energy. Elevated triglyceride levels can, however, increase the risk of developing diabetes, cardiovascular disease, and other life-threatening diseases such as pancreatitis. The second important class of lipids is cholesterol. These molecules have a variety of crucial functions in the body including being predecessors of hormones (including cortisol, oestrogen, and testosterone), maintaining the integrity of cell membranes and aiding in the absorption of fat-soluble vitamins. Most of the cholesterol the body needs is produced internally by the liver, while the rest is obtained from animal-based foods such as poultry, dairy and red meat. Due to their lipid solubility, both triglycerides and cholesterol are transported in the blood in lipoproteins, molecules composed of fat and protein. The most commonly known and measured fractions are very-low-density lipoproteins (VLDL) carrying mainly triglycerides, and low-density lipoproteins (LDL) and high-density lipoproteins (HDL) carrying mainly cholesterol.

LABORATORY MEASUREMENTS AND INTERPRETATION OF THE LIPOGRAM

In addition to measuring total cholesterol (cholesterol-content in all the lipoproteins) and triglycerides, the amount of cholesterol contained in the LDL and HDL particles can be quantified separately. The test for all four components is called a lipogram.

HDL particles collect cholesterol that is not being used by cells and bring it back to the liver to be recycled or destroyed, thereby preventing cholesterol accumulation and obstruction of blood vessels. HDL particles also have anti-inflammatory effects. The amount of cholesterol in HDL particles is regarded as cardio-protective, decreasing the risk of cardiovascular disease, and is therefore called "good" cholesterol. Exercise and

lowering carbohydrate intake are effective methods to increase HDL.

LDL or low-density lipoprotein transports cholesterol produced by the liver and other cells throughout your body. It moves through the bloodstream more slowly than HDL particles and is vulnerable to oxidising agents or free radicals. Oxidised LDL-cholesterol burrows itself into arterial walls, triggering an inflammatory response. Increased levels of LDL or "bad" cholesterol are associated with increased risk of cardiovascular disease (CVD) including disease of blood vessels supplying the heart (coronary artery disease), brain (cerebrovascular disease/stroke), and limbs (peripheral vascular disease). Decreasing blood levels of LDL-cholesterol reduces the risk of CVD.

LDL-cholesterol levels are most widely used for treatment decisions and monitoring of patients following intervention. The target level depends on your risk for CVD (please refer to table 1).

More recently it was recognised that the type of LDL is also important and that smaller LDL particles seem to carry an increased risk of CVD. Measurement of ApoB (the major protein component of LDL) can be used to assess the number of LDL particles.

TABLE 1: LIPOGRAM TARGET LEVELS

Total cholesterol and LDL targets	Total cholesterol	LDL cholesterol
Very high risk:	4.0 mol/l	1.8 mmol/l
1. Established atherosclerosis (coronary artery, cerebrovascular or peripheral vascular disease)		
2. Diabetes type 2/type 1 with microalbuminuria		
3. Genetic dyslipidaemias e.g. Familial Hypercholesterolaemia		
4. Chronic kidney disease		
5. Framingham risk score > 30%		
High risk (15-30%):	4.5 mmol/l	2.5 mmol/l
Moderate/low risk (<15%):	5.0 mmol/l	3.0 mmol/l
Optimal HDL cholesterol	≥ 1.0 mmol/l in men	≥ 1.2 mmol/l in women
Optimal triglyceride	< 2.0 mmol/l	

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IS FASTING REQUIRED FOR LIPOGRAM TESTING?

Although an overnight fast of at least eight hours has previously been required before lipogram testing, recent studies have showed that a non-fasting specimen is acceptable in most patients, especially for first-line

screening and that fasting is only required in patients with triglyceride levels above 8 mmol/l, those recovering from pancreatitis or who are on medication associated with triglyceride increase such as steroid, oestrogen or retinoic acid therapy.

SCREENING

Screening should start at age 35 years for males and at age 45 years for females, unless one of the following risk factors is present (when testing should start at 20 years of age): diabetes, family history of heart disease in a close relative (younger than 50 years if male or 60 years if female), a family history of high cholesterol (incidence of familial hypercholesterolaemia in the South African caucasian population as high as 1:100), or a personal history of multiple coronary disease risk factors (e.g. smoking, high blood pressure).

Screening should be by means of a full lipogram or at least a total and LDL cholesterol and repeated every five years if normal or at more frequent intervals in the presence of risk factors, and continued until the age of 65 years. Patients on life-style intervention should be followed up at six-monthly intervals, and after two months of initiating or changing medication.

TREATMENT CONSIDERATIONS

The decision to start lipid-lowering therapy is made on an individual basis, and is usually based on the LDL cholesterol level in combination with the presence of specific risk factors and/or the result of risk calculations.

Patients suffering from the following conditions are classified as high risk and do not need formal risk scoring:

- Established atherosclerosis (coronary artery, cerebrovascular or peripheral vascular disease)
- Diabetes type 2 (> 40 years of age or 10 years duration) or type 1 with microalbuminuria
- Genetic lipid disorder e.g. familial hypercholesterolaemia
- Chronic kidney disease

For all other patients, the 10-year risk to develop CVD should be calculated using a risk calculator established on a broad population (in SA the updated Framingham risk scores are used) utilising total cholesterol and HDL cholesterol in combination with other factors known to increase CVD risk such as high blood pressure, increasing age, male gender, and smoking status. Risk calculators are widely available (such as <https://www.cvdriskchecksecure.com/FraminghamRiskScoreResults.aspx>).

TREATMENT OPTIONS

Lipid levels can be lowered with lifestyle changes, medication, or a combination of these approaches. A trial of lifestyle changes is usually advised before medication. The approach will depend on your lipid levels, health condition, risk factors, other medications and lifestyle. Lifestyle changes may include reducing total and saturated fat in the diet, losing weight (if overweight or obese), performing aerobic exercise, and

eating a diet rich in fruits and vegetables. The benefits of such lifestyle modifications usually become evident within 6 - 12 months.

Statins are among the most powerful drugs for lowering LDL cholesterol and are the most effective for prevention of coronary heart disease, heart attack, stroke, and death. Statins include lovastatin, pravastatin, simvastatin, fluvastatin, atorvastatin and rosuvastatin. They act by decreasing internal cholesterol production and can reduce LDL levels by 20 to 60%. In addition, statins lower triglycerides and slightly raise HDL cholesterol levels, and also prevent plaque rupture in blood vessels.

Fibrate medications (gemfibrozil, fenofibrate and fenofibric acid) can lower triglyceride levels and raise HDL cholesterol levels, and are used in patients where triglyceride levels are elevated, often in combination with statins.

Secondary causes

Before prescribing cholesterol-lowering medication, secondary causes of cholesterol increase should be excluded and treated. Possible causes to consider for LDL cholesterol increase include obesity, insulin resistance, diabetes mellitus type 2, an underactive thyroid, renal and liver disease, as well as medication such as androgens, corticosteroids, diuretics, anti-retroviral treatment, retinoids and unopposed progestogens.

Secondary causes for increased triglyceride levels are similar but the following causes should additionally be considered: alcohol abuse, HIV infection and treatment, as well as oral contraceptives and unopposed oestrogens.

Can foods lower cholesterol?

The type of fat seems to be more important than the amount of total fat. Yes, cholesterol can be lowered by avoiding red meat, butter, cheese and other foods containing high amounts of saturated fats, replacing these with monounsaturated fats (found in plant oils such as olive oil or avocados). Saturated fats should be distinguished from trans fats ("partially hydrogenated oils") which are regarded as "bad fats" and should be avoided. These are found in some margarines, commercial baked goods and in oils kept at high temperatures for a long period such as frying vats in fast food restaurants. Eggs are a good source of protein and do not raise cholesterol that much.

The following foods containing "good fats" and fibre may further lower your cholesterol level and decrease your risk of CVD:

- Foods containing high amounts of omega-3 fatty acids (essential polyunsaturated fats), such as oily fish (e.g. salmon, herring or tuna), olive and canola oil.
- Nuts, such as walnuts and pistachios, can lower CVD risk but be aware of extra calories.
- Foods rich in fibre such as fruits, vegetables, beans and oats.

It is best to focus on improving your health in general, and not focus only on lowering cholesterol. No single diet is right for everyone but, in general, a healthy diet includes – in addition to the above - some milk and milk products, and a limited amount of sweets and refined grains (e.g. white bread, white rice, most forms of pasta), as these are most often the cause of obesity and diseases such as insulin resistance and diabetes.