



## Cholesterol Information

### Total Blood Cholesterol

If your cholesterol level is less than 5.2 mmol/L, that is reassuring. Unless you have other risk factors, such as a family history of heart disease, low HDL cholesterol, high blood pressure, cigarette smoking or diabetes mellitus, your risk of heart attack is relatively low. Even with a low risk cholesterol level, it is still a good ideal to follow a heart-healthy diet, since keeping your cholesterol level well **below 5 mmol/L** reduces your heart disease risk even further.

If your total cholesterol is in the 5 to 6 mmol/L range, you have twice the risk of heart attack as compared to your risk if your level was well below 5 mmol/L. But don't feel alone: 45% of Canadian adults are in this group. Cholesterol readings in this range mean you should watch out for other risk factors, have your cholesterol re-checked, and modify your diet and activity to attempt to reduce your level to **below 5 mmol/L**.

### LDL-Cholesterol

Your LDL-cholesterol level greatly affects your risk of heart attack. In fact, LDL-cholesterol is a better predictor of heart attack risk than total blood cholesterol. When your LDL-cholesterol is over 4.5 mmol/L you are at high risk; when it's between 3.5 and 4.5 mmol/L, you are at borderline-high risk. Ideally your LDL-cholesterol should be below 3.5 mmol/L. However, as with total cholesterol, the lower the level, the less the risk. If you have a history of heart disease, stroke, vascular disease, aneurysm or type 2 diabetes, the ideal LDL-cholesterol is **between 1.5 and 2.5 mmol/L**, and probably **between 1.5 and 2.0 mmol/L**. Medications will likely be required to achieve and maintain these levels.

### HDL-Cholesterol

In the average man, HDL-cholesterol levels are usually in the range of 1.1-1.4 mmol/L; in women from 1.3-1.6 mmol/L. HDL-cholesterol levels less than 1.0 mmol/L are considered abnormally low. Increasing HDL-cholesterol levels can significantly reduce the risk of heart disease. Weight loss, quitting smoking and most importantly, increasing aerobic exercise, are the best ways to raise the level of HDL-cholesterol. Having high triglycerides also reduces HDL-cholesterol and thus, increased the risk of heart attack. Female sex hormones (estrogens) and moderate alcohol intake are two other factors which can increase HDL levels.

### Triglycerides

To obtain an accurate measurement of your triglyceride level, it is necessary to have a blood sample taken after an overnight fast. Triglyceride levels above 2.0 mmol/L are considered elevated. Excess body fat, poorly controlled diabetes and excessive alcohol intake are common causes of elevated blood triglycerides. The clustering or risk factors including high triglycerides, low HDL, obesity, hypertension and impaired fasting blood sugar are called the **Metabolic Syndrome**. Weight loss, reduction in alcohol intake, increased activity and better control of diabetes often normalize triglyceride levels.

### LP(A)

Lipoprotein (a) is a newly recognized risk factor of heart disease. Lp (a) is a type of LDL which is particularly atherogenic (causes cholesterol deposits in arteries) and also appear to increase the risk of blood clot formation in already narrowed arteries leading to heart attacks or strokes. Lp (a) is dependent on genetic factors and hence levels are often found to be elevated in families with a history of early heart disease. A normal Lp (a) level is about 15 mg/dl. Heart disease risk increases with levels above 30 mg/dl. The only effective medication for Lp (a) is Niacin, but the risk associated with Lp (a) decreases if LDL cholesterol is lowered by diet or other medications. Lp (a) is measured in specialized laboratories.



It is advisable for people with coronary artery disease to be measured for levels of cholesterol and for the subgroups of LDL and HDL cholesterol. You can speak to your physician about the need for this. These values are best measured shortly after admission or after a period of recovery from myocardial infarction. If cholesterol levels are high, then it may be necessary to change your diet or take medications to lower the cholesterol. You and your doctor can discuss the need for this.

\* Adapted from COPING WITH CHOLESTEROL Booklet-University of Ottawa Heart Institute/Ottawa Civic Hospital

## Homocyst(e)ine

Homocysteine is an amino acid in the blood. Amino acids are the building blocks of proteins. Build-up of homocysteine in the blood may be due to vitamin deficiencies or hereditary deficiencies of enzymes that normally break down homocysteine. An excess of homocysteine in the blood has been linked to premature vascular disease (hardening of the arteries) and early development of stroke, heart attack or peripheral vascular disease. There is as yet, no proof that treating homocysteine excess with vitamins known to work with certain enzymes to increase the breakdown of homocysteine, has any effect on clinical outcome. Nevertheless, in patients with premature atherosclerosis or in patients with no obvious risk factors who develop CAD, it is reasonable to test for homocysteine and to treat with appropriate doses of Vitamins B6, B12 and folic acid (see Cardiovascular Risk Reduction Rx Checklist).

## CRP (C-reactive protein)

Atherosclerosis is an inflammatory disease. Inflammatory cells are active within the cholesterol plaque ingesting cholesterol to aid in its removal. CrP or C-reactive protein, is a marker of vascular inflammation. CrP has been shown to be a strong predictor of future cardiovascular events. An increased CrP at admission has been shown to be a marker for worse short and long term prognosis in patients with unstable angina. In one recent trial CrP was superior to an elevated LdL as a predictor of primary cardiovascular events. CrP and LdL are independent, thus the use of both markers has been shown to be superior to the use of either marker alone. Almost 50% of cardiovascular events occur in patients with normal LdL levels. The measurement of CrP in these patients helps to identify those patients at greater risk. Low risk is defined as hs-CrP (high sensitivity- CrP) <1 mg/ml; average risk 1.0 - 3.0 mg/L and high risk as 3.0-10 mg/L. If hs-CrP is 10 mg/L, the test should be repeated and patient examined for sources of infection or inflammation. Risk estimates based on CrP levels are not affected by the use of hrT (hormone replacement therapy).

Unfortunately high sensitivity CRP (hs-CRP) assays are not yet widely available. When they are, CRP will become a useful test to predict cardiovascular risk, particularly in those patients with low LDL levels and the absence of other traditional cardiac risk factors.

**For treatment guidelines, the Lipid Optimization Tool:**

[http://www.cvtoolbox.com/downloads/ch/Lipid\\_Optimization\\_Tool.pdf](http://www.cvtoolbox.com/downloads/ch/Lipid_Optimization_Tool.pdf)

**AS A CARDIAC PATIENT, YOU SHOULD KNOW YOUR CHOLESTEROL AND LDL LEVELS. TARGET VALUES ARE:**

Test	Current Date	Previous Date	Ideal: No Risk factors	Ideal: With Risk factors	Ideal: With CAD* DMŞ (Optional)
Total Cholesterol mmol/l			< 5.2	< 5.0	< 4.5
Triglycerides mmol/l			< 2.0	< 1.7	< 1.5
HDL-Cholesterol mmol/l			> 1.0	> 1.1	> 1.2
LDL Cholesterol mmol/l			< 5.0	< 3.5	< 2.0 (1.8)
TC/HDL Ratio			6/1	5/1	4/1 (3/1)
Lp(a) mg/dl			< 30	< 30	< 30
Apolipoprotein B g/L			< 1.2	< 1.05	< 0.85
hs-CRP (high sensitivity-CRP) mg/ml			< 3	1-3	< 1
Homocysteine µmol/L			< 10	< 10	< 10

