

E) Calculating Cholesterol

The two major lipids in the blood are cholesterol and triglyceride. They are both insoluble and have to be transported around the body in lipoprotein structures which are water soluble. There are five major lipoproteins classified according to their separation in the laboratory.

- Chylomicrons
- Very Low Density Lipoproteins (VLDL)
- Intermediate Density Lipoproteins (IDL)
- Low Density Lipoproteins (LDL)
- High Density Lipoproteins (HDL)

All of these lipoproteins contain some cholesterol and some triglycerides but to varying degrees e.g. VLDL contain a lot of triglycerides and a little cholesterol and LDL contain a lot of cholesterol and little triglycerides.

Measured total cholesterol includes cholesterol from all five lipoprotein structures. Chylomicrons contain cholesterol but are found in the blood only after meals so are not present usually in fasting samples. VLDL and IDL behave similarly to LDL but are not included in the figure generated by the calculation of LDL.

LDL Cholesterol is calculated using the Friedewald as follows:

LDL cholesterol = Total cholesterol – HDL cholesterol – Total triglyceride ÷ 2.19

The formula used is reasonably accurate providing total triglyceride levels are below 4.5 mmol/L, but unreliable when triglycerides are high due to the effects of VLDL and IDL.

So just for example a lipid profile may look like this:

Total cholesterol = 3.29 mmol/L

LDL cholesterol = 1.24 mmol/L

HDL cholesterol = 1.81 mmol/L

Triglyceride = 0.48 mmol/L

If you added up the LDL cholesterol and the HDL cholesterol = 3.05 mmol/L it does not equal the total cholesterol of 3.29 mmol/L and that is because there is still a little cholesterol in the IDL and VLDL.

There is an increasing movement particularly in the USA to use the term non-HDL cholesterol to cover the harmful elements of the lipoprotein profile including triglyceride-rich remnant particles derived from VLDL and IDL as well as LDL. Using this term the sum of HDL and non-HDL cholesterol of course add up to total cholesterol.

