Cholesterol and Lipids

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In Australia cardiovascular disease is a common problem causing 16% of the total disease burden, second only to cancer.

The mortality from cardiovascular disease has decreased by at least 80% in the last 50 years, mostly before the introduction of statins (HMG-CoA reductase inhibitors).

Although Australians are living longer, greater rates of physical inactivity, obesity and diabetes all threaten this trend (AIHW,2018).

Dyslipidaemia (usually called hyperlipidaemia),is a major risk factor along with smoking, hypertension and diabetes for developing atherosclerosis. Coronary heart disease is almost entirely due to **atherosclerosis** in the coronary arteries (build-up of fats, cholesterol and other substances in and on artery walls (plaque), which can restrict blood flow).

The leading cause of death in 2018 for ***males was coronary heart disease***, accounting for 10,514 (13%) deaths. ***Dementia was the leading cause of death for female***s, accounting for 8,859 (11%) deaths, followed by coronary heart disease (8,076; 10% of deaths).

Cerebrovascular disease (which includes stroke), lung cancer and chronic obstructive pulmonary disease (COPD) make up the top 5 leading underlying causes of death in Australia in 2018 for males and females of all ages combined.

Lipids: When there is an elevated serum cholesterol it is almost always due to an elevation of the LDL cholesterol. Occasionally an elevated cholesterol is due to a high concentration of HDL cholesterol, but these patients are not at increased risk of cardiovascular disease.

As LDL cholesterol accounts for 60–70% of the total cholesterol and is atherogenic, it is the target of treatment in patients with hypercholesterolaemia.

Cholesterol is a fatty substance that is carried around the body in the blood. The body produces most cholesterol naturally, and it is found in some foods.

Lipoproteins carry cholesterol in the blood.

The two main types that carry cholesterol to and from cells are called *low density lipoproteins (LDL-C)* and *high density lipoproteins (HDL-C).*

Total cholesterol

- is a reading of the HDL-C and LDL-C.
- Triglycerides (TGs) are another form of fat in the blood that can also raise the risk of heart disease.
- Genes will also partly determine blood cholesterol levels are as will diet and lifestyle.
- Cholesterol itself in food has only a very small effect on blood cholesterol.
- However eating too much saturated fat may lead to excess cholesterol in the blood stream
- High triglycerides are often associated with low HDL cholesterol increasing risk, even though total cholesterol levels in the blood appear normal.
- body is made in the liver and the rest may come from the types of fats eaten.

Triglycerides

- are a stored energy source.
- Most of the triglycerides in blood are found in the very large particles, the VLDL (very low density lipoprotein).
- Under some circumstances high blood triglyceride can be a risk factor for heart disease.

Cholesterol at or greater than 6.5mmol/L and above is considered a high cholesterol level, and HDL cholesterol is low (less than 0.9mmol/L) then triglycerides can increase the risk of heart disease if they are greater than 1.7mmol/L .

Triglycerides can be lowered by:

- reducing excess weight
- increasing exercise
- drinking alcohol moderately (as alcohol is very efficient at elevating triglycerides)
- reducing the amount of refined starchy foods and sugary drinks in the diet.

Measurements

Low density lipoprotein cholesterol(LDL)	< 2.0 mmol/L
Total cholesterol (TC)	<4.0 mmol/L
High density lipoprotein cholesterol (HDL-C)	>1.0 mmol/L
Triglycerides (TG)	<.0 mmol/L

Risk factors for cardadiovascular disease: smoking, elevated blood pressure, dyslipidaemia, diabetes, central obesity, poor nutrition, sedentary life-style, excessive alcohol intake.

People with any of the following **risk factors** are already known to be at high risk of a cardiovascular event and do not require risk calculation:

- established cardiovascular disease
- diabetes and age >60 years
- diabetes with microalbuminuria (>20 mcg/min, or urinary albumin:creatinine ratio >2.5 mg/mmol for men or >3.5 mg/mmol for women)
- moderate or severe chronic kidney disease (persistent proteinuria or eGFR < than 45mL/min/ 1.73 m^2
- a previous diagnosis of familial hypercholesterolaemia
- systolic BP ≥ 180 mm Hg, or diastolic BP ≥ 110 mm Hg
- serum total cholesterol >7.5 mmol/L
- Aboriginal and Torres Strait Islander adults aged >74 years.

The absolute risk of developing cardiovascular disease is predictable using the Australian risk calculator, freely available on a number of websites. This is available as a chart or as an interactive calculator which can illustrate reduction of some risk factors and has a great impact when counselling patients. *Dyslipidaemias* can be classified as *primary* or *secondary*. The *primary*, or *genetically* determined hyperlipidaemia forms are classified into six **phenotypes**, depending on the lipoprotein particle elevated. **Phenotypes IIA and IIb carry the highest risk of atherosclerosis**, while phenotypes II and IV have a moderately elevated risk. Factors such as diabetes, obesity, hypothyroidism, nephrotic disease, excessive alcohol consumption and drug treatment (eg, corticosteroids, thiazide diuretics) constitute the **secondary** causes of dyslipidaemia. In these cases, investigation of underlying disease pathology or current drug treatment is necessary before instituting lipid-lowering therapy.

Cholesterol lowering medicines. Pharmacological treatment is used for those at increased risk of cardiovascular events, high LDL and with a calculated cardiovascular risk of more than 15%.

For *cholesterol* lowering HMG-CoA reductase inhibitors (Statins) are most commonly used followed by ezetimibe and resins infrequently.

For *triglyceride* reduction fibrates, fish oil and nicotinic acid are used.

Combination therapy may also be required.

Fish oil (Omacor®) is now available on the Repatriation Benefit Schedule.

Statins are reversible competitive inhibitors of *HMG-CoA reductase*, the rate-limiting enzyme necessary for cholesterol biosynthesis.

They are very effective in lowering cholesterol, LDL-C and triglycerides, and moderately effective in raising HDL-C. They are used by hundreds of millions of people world-wide