

Cholesterol and Coronary Heart Disease Revisited

The association of nutrition and coronary heart disease was a hobbyhorse of mine for 25 years of my working life. It began in the early 1950s when, returning to Australia from the UK, I decided that the rising tide of heart disease, the mystery associated with it, and the hope, and perhaps the possibility, of doing something useful about it was a worthwhile field for research. Lots of other clinicians and researchers all around the world thought likewise and bandwagons flying these flags became increasingly common. I was simply an also-ran, a rather lone figure to start with in this down-under continent, but over the years I and my colleagues managed to contribute little bits-‘n-pieces, some useful, some useless, for the thousands-of—pieces needed for the jigsaw puzzle, having fun in the process; first from a base in Sydney then in Canberra; finally demounting from that hobbyhorse to get on to a different one in 1977. Now, into my twilight years, I have been wondering what progress has been made since my day. So, I have looked back over the field and here I’ll summarise the results of my exploration.

The timing of this revisitation in 2011 was fifty years after the publication of a little book titled “*The Fats of Life*” which sold in such great numbers here in Australia, and less popularly in the UK and the USA, that I was given a medal for it! It was a fellow commuter by rail into the Sydney CBD who nagged me to write such a book saying that the message would get across to the masses much better that way than by putting dry little articles into the medical literature. So, the book came into being and was published in 1961 as a contribution to the launching of Operation Heart Beat, the initial fund-raising appeal for the National Heart Foundation to whom all the royalties were directed. I think my prompter was right and I, undoubtedly a lone figure, am celebrating the 50th anniversary of the launching of the book which I, again alone, claim marked a tipping point in Australia’s recognition of the part played by cholesterol, polyunsaturated fats and obesity in the causation of heart disease and initiated dietary changes which subsequently have led to fewer heart attacks and strokes.

First let’s look back at the development of the story up to the time of the publication of this book. Then we’ll look at the significant developments since the book appeared, up to the present time.

Pre-book

The main steps in the build-up of the story of coronary heart disease and its possible association with cholesterol and diet are as follows.

- Hardening of arteries, that is atherosclerosis, had been known since away back in ancient times
- Clinical accounts of what later became known as Angina Pectoris and coronary heart attacks go back hundreds of years
- Cholesterol was first discovered in the late 1700s in bile—hence its name, chole-sterol—and then in the blood in 1833
- Cholesterol was found to be abundant in atherosclerosis, hardening of the arteries, in the early 1900s.

That’s when the two historical pathways of cardiovascular disease and cholesterol came together.

Experimentation followed with the feeding of cholesterol-rich egg yolks and other nutritional elements to animals and it was found that hardening of arteries, and reversal of these lesions, could be produced in rabbits and guinea pigs, though not in rats. In the same period human clinical studies progressed apace till Coronary Artery Disease, with its associated atherosclerotic plaques and thrombosis, was given official recognition by inclusion in the International Causes of Diseases in 1930. A significant milestone. Only 80 years ago.

Understandably the tempo of investigation into the relationship between cholesterol, nutrition and heart disease then increased, especially from the late 1940s through to the 1960s. Important findings included:

- Some families were found to have abnormally high levels of blood cholesterol and of heart disease
- Population studies began to show big variations between different communities in the prevalence of heart disease and average cholesterol levels
- In general, however, there was a significant correlation between the two; communities with higher average cholesterol levels also had a higher incidence of heart disease
- Other correlates also emerged and the term “Risk Factors” hit the headlines – cholesterol level, blood pressure, smoking, glucose intolerance and obesity all being associated with increased risk of heart disease
- Dietary studies revealed that the total cholesterol level, and particularly that part of it carried in β or low density lipoproteins, LDL, were increased by the consumption of saturated fats (as in fatty meats, dairy products, butter, coconut oil), lowered by unsaturated fats (eg corn oil, nuts, sardines) and influenced to a lesser extent by cholesterol itself (as in eggs, offal and prawns)
- Clinical trials got under way to test whether changing the diet could significantly lower cholesterol levels and heart attacks.

The Book – *The Fats of Life*

That’s about the point in time when “*The Fats of Life*” appeared, 1961; 31 years after coronary heart disease was officially recognised. The subtitle of the book was *The theory and practice of eating and cooking to avoid coronary heart disease* and it’s opening burst was: ‘*Let us eat drink and be merry. Yes; and let us see if we can do it without dying tomorrow. Perhaps if we take more care about what we eat, and how much we eat, our merriment need not be cut short by unnecessary suffering, and we need not die prematurely, from coronary heart disease. That is the gist of this book.*’

The last sentence of the book was: *There may be a deeper truth than we have imagined in the saying that the way to a man’s heart is through his stomach.*

The first part of the book dealt with The Theory and included chapters such as: *Why blame food? – The Quantity of Food: and Obesity – The quality of Food: and Fats – The Antidote to Food: Exercise.* The second part dealt with practicalities such as: *Am I Too Fat?* (answered by pinching up a roll of skin and flesh on your tummy) – *How to Reduce* (eat less food, eat different food and exercise more) and – *How to Alter the Fats in Food*, in quantity, and in quality – and a couple of charts of average servings of different foodstuffs and types of exercise were included for guidance.

Part three offered recipes for making these changes. Polyunsaturated margarines had not yet come onto the market.

Post book

An enormous amount of research and practical experience has flowed under bridges since 1961. Fifty years of it. Note-worthy advances, in my opinion, have been as follows:

- Unsaturated fats have been popularised while saturated fats have been somewhat demonised. Mono- and poly-unsaturated margarines and oils came onto the market; and nuts, whose fat content is polyunsaturated, have been upgraded. Incidentally, thousands of copies of *The Fats of Life* were bought by Marrickville Margarine Company and distributed throughout the country to launch their Miracle polyunsaturated margarine, the first of its kind on the Australian market
- Cholesterol in the diet has been found to increase blood cholesterol much less than was originally feared; there is a feedback mechanism whereby it suppresses the manufacture of cholesterol by the body. Hence some reprieve for eggs, brains, liver and oysters on the menu.
- Good and bad cholesterol. Total blood cholesterol was found to be made up of ‘good cholesterol’ plus ‘bad cholesterol’. The bad stuff is carried in the low-density lipoproteins, LDL, as has been

known for some decades. It is bad because it carries cholesterol into the spots where it does damage. The more recently identified good stuff is carried in high density lipoproteins, HDL; it is good because it shuffles cholesterol out of those places

- HDL is higher in women and is increased by a moderate intake of alcohol, by exercise and by a reduction of obesity
- The LDL receptor was discovered in the '70s. It sits on the membrane of cells and plays a vital role in the production and movement of LDL cholesterol and the different effects of saturated and polyunsaturated dietary fats. The discoverers received a Nobel Prize for this, the latest of 13 Nobel awards for work on cholesterol, which makes it, as, has been said, *'the most highly decorated small molecule in biology'*!
- Statins and their effectiveness. This class of chemical was first discovered in a fungus by a Japanese scientist in 1973 and found to put a spanner into the production of cholesterol, first in fungi, then in dogs and then in humans. They block very specifically one of the 30 or so enzymes involved in the production of cholesterol. They are in effect very specific 'antibiotics against cholesterol'. Large scale clinical trials of statins derived from fungi and later of synthetic statins got under way and these showed dramatic lowering of LDL levels, coronary heart disease events and overall mortality
- Side effects of statins. These have been getting some prominence of late – muscle, kidney and liver damage and troublesome interactions with other drugs
- There was some concern as to whether cancer was occurring as a side effect in dietary trials but this scare has been put to rest
- Other dietary suggestions for trying to lower blood cholesterol are to include oatmeal, other fibres and soy products; to exclude trans-fatty acids which occur when fats are hydrogenated by heat to give deep-fried foods like chips a longer shelf-life and a stronger appeal to consumers; and maybe to switch away from Turkish, boiled and espresso coffee, towards filtered, instant and percolated coffee. Tea is in the clear.
- The inclusion of oily fish in the diet, with their polyunsaturated omega 3 fatty acids, has been much-trumpeted of late: the benefit they bestow seems to be attributable more to their preventing dangerous arrhythmia of the heart than to any effect on plasma cholesterol.
- Other advances apart from the cholesterol-related ones have been in the roles played by triglyceride fats and thrombosis in the causation and treatment of heart disease.

Proof of the pudding

The most important advance in the cholesterol story is that the results of the statin trials have been accepted as positive proof of a causal and not simply an associated relationship between cholesterol level and coronary heart disease. As one reviewer has put it: 'The statins provided the final convincing evidence – dietary trials never quite managed to convince everyone – that high LDL-cholesterol is an important CAUSE of CHD'. The reduction in LDL-cholesterol and CHD was of the order of 30%.

Many millions of people around the globe are now taking statins and it has been estimated that many more millions, especially older people, fit the accepted criteria for taking them and could benefit from a lowering of their cholesterol levels by suffering fewer heart attacks and strokes. A casual suggestion has even been made that statins should be included in the water supply for the general public! On the other hand it has also been estimated that millions are taking the drug unnecessarily and recognition of side effects is now leading to greater caution in prescribing statins and an increased interest in natural alternatives which include, most importantly, diet, especially for young people.

What has been happening to coronary heart disease overall in Australia over the time under review? When I became interested in the subject in the early 1950s the death rate for men had risen to about 450 deaths per 100,000 population. When the book was published in 1961 the rate had climbed to about 550. It continued to climb but then it peaked at about 600 deaths per 100,000 in 1965 after when it gradually declined. Twenty-five years later it was down to 300 and now, 50 years after the time of the book, it is a way down to 100. Why this decline? As you might suspect my answer is – the book! Well, perhaps not entirely. No one else has suggested that. But Australia was among the 7 countries

that showed this reduction of mortality in the 1970s, in 6 of which analysis showed that a ‘trend towards better dietary habits’ was evident. A later analysis reported that ‘In almost all of the countries with major falls or rises in CHD mortality, there are, respectively, corresponding decreases or increases in animal fat consumption, with reciprocal changes in the consumption of vegetable fats’. It is now generally accepted that a change in dietary habits has been a real contributor to this decline in mortality but other contributors include the better use of anti-hypertensive drugs, reduction of smoking, advances in the treatment of heart attacks and, more recently, the increasing use of statins. This dramatic decline has occurred despite the counter influence of the increasing prevalence of obesity.

All in all it is now well accepted that cholesterol—more specifically the LDL cholesterol level—is a culprit in the causation of CHD (and stroke), that diet—especially its fatty components and excessive caloric intake—influence the LDL level, and that lowering of that level can contribute very significantly to a lower mortality rate from cardiovascular disease.

That was the gist of the book, now 50 years out of date. If a revised edition were to be produced now what changes would be made?

An imaginary revision of the book

Surprisingly, perhaps even disappointingly, very little change would be needed, by my assessment, to bring the book up to date. Very extensive detailed, advances have been made in the understanding of cholesterol and lipid metabolism and of coronary artery disease but little of it needs to be known by the general public. It is the practical ‘so what?’ outcome that is their main interest. Drugs are for those at high risk whereas a prudent diet is for everyone, especially for the young before they develop less than optimal nutritional habits that increase their risk via an elevated ‘bad cholesterol’, low ‘good cholesterol’ and increasing obesity. But it is never too late to follow the suggestions for healthy eating.

The dietary recommendations advocated these days by the National Heart Foundation and other such bodies vary little from what *The Fats of Life* was promoting 50 years ago. Here are some quotations from their publications: choose ‘*healthier unsaturated fats instead of saturated and trans fats*’ they say; ‘*use margarines made from canola, sunflower or olive oil instead of butter*’; ‘*select lean meat and poultry*’; eat ‘*more bread, cereals, vegetables, fruit and legumes*’; ‘*choose reduced, low or no fat milk, yoghurt, custard and desserts*’; eat ‘*two or three serves of oily fish per week*’; ‘*snack wisely*’; ‘*go easy on high salt foods*’; ‘*limit alcohol intake*’; and ‘*achieve and maintain a healthy body weight*’.

So, the main changes appearing in this brand new, virtual booklet would refer in the explanatory or theoretical section to ‘good’ and ‘bad’ cholesterol, trans fats, statins, the results of dietary and statin trials, the amazing decline in coronary heart disease mortality and that a desirable level of blood cholesterol is below 5 millimoles per litre. In the practical sections, there would be reference to the large range of more appropriate foodstuffs now available, friendliness towards alcohol, more emphasis on fish, and less emphasis on cholesterol in the diet in the form of eggs, offal and seafood.

Oh well, not really enough to justify the toil of resurrecting and revising *The Fats of Life*. Besides, it would have to compete with lots of other books now in the market on the same subject and, what’s more, the message has already become widely known in the community. As for putting the message into practice throughout the population, especially among young folk, there is still a long way to go.

Perhaps *The Fats of Life* played a part in initiating and encouraging the changes in eating habits which have led to fewer heart attacks and strokes in this country but, if I am honest and not bragging as I was at the beginning of this talk, I must say it was but a small part and the time has come for any remaining copies of that tired, old, forgotten, dead, little book to be cremated or buried, together with its medal. Thank you for being present with me for the memorial, funereal celebration.

