

- » Understanding the basics of cholesterol and the new science of cholesterol and health
- » Recognizing the importance of risk
- » Exploring the benefits of lifestyle and culinary medicine

Chapter 1

Why Cholesterol Matters for Health

Odds are, you hear a lot about cholesterol. It's one of the most common blood tests recommended by doctors and requested by patients — about two-thirds of U.S. adults say they've had their cholesterol checked within the last five years. According to the World Health Organization (WHO), approximately 40 percent of adults worldwide have high cholesterol. In 2024, the U.S. Centers for Disease Control and Prevention (CDC) estimated that 86 million adults in the United States have cholesterol levels that are considered borderline or high. In 2024, the value of cholesterol-lowering medications produced by the pharmaceutical industry was \$34 billion and it's predicted to rise to \$50 billion by 2033.

But what does this mean for you? To answer that question, you need to know the role of cholesterol in the body, the risks associated with high cholesterol, the latest research that's changing our understanding of the link between cholesterol and disease, and the role of lifestyle and medications in keeping our cholesterol levels and blood vessels healthy.

In this chapter, you begin to appreciate the importance of cholesterol and why it's appropriate to ask questions and perhaps challenge some of the previous assumptions about how best to manage your results. Many people feel disempowered by

a lack of understanding of the risks of high cholesterol and the pros and cons of taking medication. With the help of the different approach of this book, you can take back that control!

What Cholesterol Means for You

If you've had your cholesterol measured, it was probably done in the form of a *full lipid panel* or *full lipid profile*, which is a test of circulating fats that include different types of cholesterol. (We describe the elements that make up this complete result and their significance in Chapter 2.)

You may have requested a blood test because you heard it's important to know your cholesterol level, or your doctor may have ordered the blood test as part of an annual checkup or possibly because you have symptoms of an illness, whether associated with cholesterol or not.

The importance of knowing your cholesterol level stems from the association of high levels of some types of circulating cholesterol with *vascular pathology* (a disease of the blood vessels that can lead to many different illnesses, including the most common causes of death and sickness in most countries — heart disease and stroke).

But there is much more to the story of cholesterol and the risk of heart disease and stroke than first meets the eye. There is certainly more than is known to many physicians and much more than can be explained in a brief consultation, which may result in a patient committing to lifelong medication. Many aspects of cholesterol remain poorly understood. Not everyone with high cholesterol will end up getting sick. Given that cholesterol levels can vary along a spectrum, the definition of a high cholesterol is inevitably somewhat arbitrary. Plus, there is debate about what causes high cholesterol for many people, as well as controversy about the extent to which highly effective cholesterol medications may cause significant side effects.



REMEMBER

During 35 years of clinical practice as a physician in primary care, Simon has had countless consultations with patients about cholesterol — discussing blood tests, risk assessment, and possible treatment for high cholesterol. The challenge for all doctors is to provide enough accurate and up-to-date information within the constraints of the time available, so every patient is in a position to make a fully informed and individual decision about what's best for them and how to consider if those judgments may change over time.

What Causes Heart Disease

All parts of the body — whether it's the heart, brain, muscles, lungs, kidneys, or any other organ — depend on a healthy blood supply to fulfill their various functions. The blood vessels that supply oxygen, nutrients, immune support, and hormones to effectively sustain the cells that perform the tasks for life are called *arteries*. Together with *veins*, which take the blood back to the heart, they're collectively described as the *vascular system*.



TECHNICAL
STUFF

Larger blood vessels, which carry blood over longer distances, are part of the *macrovascular system*. Branches of blood vessels get smaller as they approach the cells they support; here, the arteries become *arterioles* and *capillaries* and are described as the *microvascular system*.

Arteriosclerosis is a condition in which the arteries are hardened and thickened, with fatty or calcified deposits known as *plaques*. A similar term, *atherosclerosis*, is more specifically used when describing plaques in larger arteries. (See the nearby sidebar for more on the coining of this term and the study of heart disease over the past couple hundred years.) The changes visible in blood vessels affected by atherosclerosis are shown in Figure 1-1.

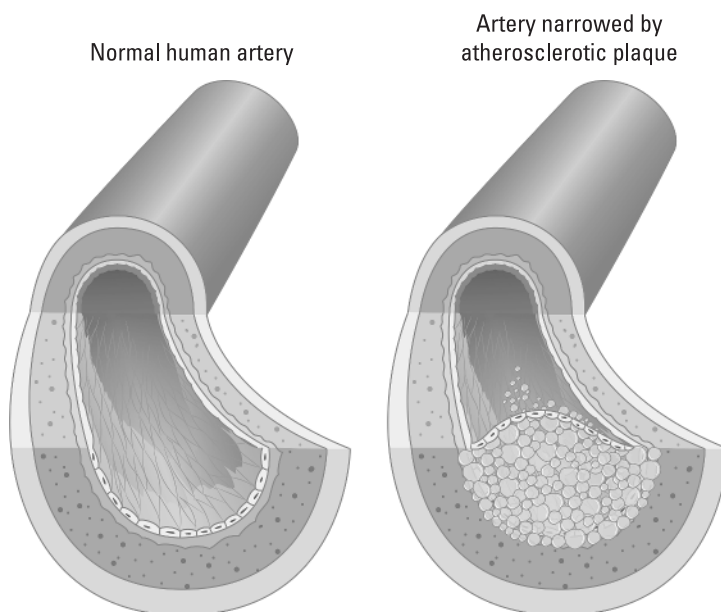


FIGURE 1-1:
A blood vessel
showing signs
of developing
changes of
atherosclerosis.

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So, what does cholesterol have to do with it? Years ago, doctors believed that cholesterol (and saturated fat, which leads to cholesterol production) in the diet caused excess circulating fats, or *lipids*, and those excess lipids were deposited in blood vessel walls as plaques. The result was damage to and narrowing of the blood vessels, and ultimately blockage of blood supply to vital organs like the heart and brain. But today we know that the process by which cholesterol may be associated with heart disease, stroke, or other organ damage is complex. And the consequences of this understanding are significant.

The path to heart disease or any other vascular disease must be dependent on other factors. After all, not everyone with high cholesterol will develop problems. Plus, because of the complexity of the multiple risk factors for atherosclerosis and how they interact, people with identical cholesterol profiles may well have very different likelihoods of developing disease. It's obvious that there must be something else (or many other things) going on.

But the story is even more complicated: Cholesterol in the diet doesn't actually contribute most to blood cholesterol levels, and different fats can have adverse or beneficial effects. Other factors — including carbohydrate metabolism, diabetes, obesity, physical inactivity, some medications, and smoking — can affect cholesterol levels as well.



TIP

There have been numerous recent advances in research into the formation, structure and chemistry of blood vessel plaques and it is now possible to explain much more about their relationship with circulating cholesterol. We offer an up-to-date description of how plaques in blood vessels develop, become unstable, and lead to disease in more detail in Chapters 5, 9, and 10. When you understand this subject, you have the opportunity to make actionable changes in the management of your cholesterol.

Perhaps the greatest change in approach has come from the appreciation that plaque progression occurs as a result of chronic inflammation, and that a process called *cholesterol oxidation* contributes to this process — a phenomenon that has its own underlying causes and can vary significantly between individuals and over time.



REMEMBER

Bottom line: The development of atherosclerosis is not just a matter of cholesterol. It relates to oxidation of cholesterol and inflammation of plaques, which can occur where there are excessive reactive oxygen atoms, described as *oxidative stress* and *chronic inflammation*. We explore this subject more extensively in Chapter 3. In addition, Chapters 4 and 10 focus on how you may be able to reduce that oxidation and inflammation with relatively easy changes to diet and lifestyle.

THE HISTORY OF THE STUDY OF HEART DISEASE: A CHANGING STORY

In the 17th and 18th centuries, anatomists began to explore the relationship between postmortem changes and diseases. In 1829, Jean Lobstein, a French pathologist, coined the term *arteriosclerosis*. Lobstein linked this condition to aging and disease, but the mechanism was unclear.

A few decades later, Rudolf Virchow, a German physician and scientist, proposed that plaques resulted from lipid accumulation and inflammation. He described how cholesterol deposits and cellular debris contributed to arterial blockage, forming the foundation for the modern understanding of atherosclerosis.

Early 20th-century researchers, including Nikolai Anichkov, demonstrated experimentally that dietary cholesterol could lead to arterial plaques in animals. This understanding solidified the connection between lipids, plaques, and vascular disease. By the mid-20th century, epidemiological studies, such as the Framingham Heart Study, connected high cholesterol levels and plaque buildup to cardiovascular events like heart attacks and strokes.

From the University of Washington, Seattle, Professor Russell Ross's 1999 article "Atherosclerosis — An Inflammatory Disease" in the *New England Journal of Medicine* was a landmark publication that redefined atherosclerosis as a chronic inflammatory condition. It emphasized the role of blood vessel wall injury from smoking and pollution toxins, chemical changes of high glucose or cholesterol levels, and the physical stress from high blood pressure as the initiating event, triggering an immune response, which promotes inflammation, leading to plaque buildup and arterial narrowing. Cholesterol trapped in the arterial wall can undergo a process called *oxidation* (damage from circulating reactive oxygen atoms), which triggers an immune response and makes this a central player in plaque formation and inflammation.

How Cardiovascular Diseases Harm the Body

The supply of blood through blood vessels to the organs is essential for the organs' proper functioning and the maintenance of health. It's what keeps you alive. Disruption and compromise of the efficient passage of oxygen and nutrients carried by blood cells through those vessels is responsible for the illnesses that cause the most sickness and death in the majority of populations — *cardiovascular diseases* (CVDs), which include *coronary heart disease* and *cerebrovascular disease*, more familiarly referred to as heart disease and stroke, respectively.

When large blood vessels are affected, it may result in sudden events of critical loss of blood supply to a large area of an organ, such as a *myocardial infarction* (heart attack) or a *cerebrovascular accident* (stroke) affecting the brain. When the smaller blood vessels are more involved, more gradual and smaller incremental damage may occur and result in slower deterioration in functioning, such as in heart failure or vascular dementia.

CVDs are the leading cause of death globally. In 2019, an estimated 17.9 million people died from CVDs, representing 32 percent of all global deaths. Of these deaths, 85 percent were due to heart attack and stroke. CVDs are the leading cause of death and disability in the WHO European Region. An estimated 4.2 million people in Europe died from CVDs in 2019, representing 42.5 percent of all deaths. This is the highest proportion of all the WHO regions. According to the WHO, the majority of these deaths are preventable.

The CDC describes heart disease as the leading cause of death for men, women, and people of most racial and ethnic groups in the United States, with one person dying every 33 seconds from CVD. In 2022, 702,880 people died from heart disease. The cost of CVD was estimated to be about \$252.2 billion from 2019 to 2020.



REMEMBER

The heart and brain are the organs that are most vulnerable to vascular diseases, but deficiencies in blood supply to other parts of the body can result in damage to the following:

- » **Kidneys:** Vascular diseases can impair blood flow to the kidneys, leading to kidney damage and chronic kidney disease.
- » **Lungs:** Vascular diseases can affect the blood vessels in the lungs, leading to conditions like *pulmonary embolism* (blood clot in the lungs) and *pulmonary hypertension* (high blood pressure in the lungs).
- » **Liver:** Vascular diseases can reduce blood flow to the liver, leading to liver damage and dysfunction.
- » **Limbs:** Vascular diseases, particularly *peripheral artery disease*, can affect the blood vessels in the legs and arms, causing pain and numbness, and potentially leading to tissue damage and amputation.
- » **Eyes:** Vascular diseases can affect the blood vessels in the eyes, leading to conditions like *diabetic retinopathy* (damage to the retina of the eye from diabetes) and *age-related macular degeneration* (age-related damage to central vision).



TIP

Optimum management of cholesterol is not just a numbers game. A low cholesterol number shouldn't in itself be the target — the desired outcome is a healthy and fulfilled life, free from the burden of illness.



WARNING

An article in the journal *Life* in 2016 that considered how physicians can influence lifestyle changes in patients at risk of heart disease noted a phenomenon referred to as *statin complacency* or *risk compensation*. This idea is based on the notion that people taking medications such as statins to lower cholesterol may feel a false sense of security, believing the medication is sufficient to manage their cardiovascular risk and, therefore, maintain a poor diet, feel no need to exercise, or even continue to smoke! Fortunately, there are also research papers that contradict this concern, showing that most people who receive adequate explanations about cholesterol, medication, and lifestyle tend to adopt more healthy behaviors. We look at medical treatments for high cholesterol in Chapter 11.

With any level of cholesterol, oxidation and inflammation, which are now known to be crucial to the development of CVD, are also critical factors. Measuring oxidation and inflammation isn't as straightforward, though, and because doctors generally rely on simple numbers that only provide the proportions of lipids, virtually no attention is given to levels of oxidation and inflammation. As Albert Einstein said, "Not everything that counts can be counted, and not everything that can be counted counts." Despite being a less measurable and tangible aspect of cholesterol, what is happening to the cholesterol circulating in the body must be central to any discussion about its management.

Why an Integrated Approach Counts

CVD and other vascular diseases are linked not just to high cholesterol, but to a number of other aspects of life: smoking, high blood pressure, poor diet, obesity, diabetes, and physical inactivity. Being male increases the risk, though following menopause the risk is similar if not higher in females, as well as having a family history of CVD. Risk further rises with age. Conditions of chronic inflammation and oxidative stress also increase rates of CVD. Having high cholesterol is just one of many factors, and it shouldn't be looked at in isolation. That's why it's important to consider an integrated approach to managing cholesterol and reducing the risk of CVD.

Preventing or treating disease by managing risk

When you manage cholesterol, you're managing a risk factor for vascular disease. The fact that CVD and other disorders of blood vessels are so common makes it an important consideration, but as a single risk factor, a high cholesterol level should not be thought of in isolation. Any gains in reducing cholesterol should be seen in the context of all other risk factors. On its own, raised cholesterol is a poor

predictor of whether someone is likely to develop CVD, but where it exists among other risks, it becomes much more significant. (We explore the concept of risk in detail in Chapters 7 and 8.)



TIP

There is a big difference in the effects of reducing cholesterol levels depending on whether a person is known to have already established vascular disease. *Primary prevention* targets people without CVD to prevent its development, while *secondary prevention* focuses on individuals with CVD or risk factors to reduce the risk of future events.

The 4S Study was a landmark clinical trial published in the prestigious *Lancet* journal in November 1994 looking at people who had CVD. It demonstrated a 30 percent reduction in overall mortality and a 28 percent reduction in the risk of coronary heart disease events in patients with coronary heart disease who were treated with simvastatin, a cholesterol-lowering and oxidation-reducing medication in a class of drugs called statins. This study demonstrated the importance of cholesterol management in secondary prevention. Statins have become the cornerstone of medical prevention of further strokes, heart attacks, or other complications in people who have been diagnosed with vascular diseases or who are at high risk.



TIP

The reduction in risk of further events in the secondary prevention of CVD with statin treatment is very impressive. However, comparable risk reductions can be seen when people adopt a Mediterranean diet, exercise regularly, and stop smoking, showing that lifestyle changes in conjunction with medical treatments can be very effective and that one should not be a substitute for the other.

Primary prevention of CVD may also involve medications like statins; however, the reduced risks and lower potential gains mean that different considerations apply. The significance of modestly elevated cholesterol in a young person with no other risk factors is much less important than the implications of the same level in someone who is older or who has other risks of vascular disease.

Whether a person has their cholesterol checked at all may depend on where they live and what attitudes they and their doctor have about cholesterol and risk. In some countries, the approach to screening is much more proactive and there is a lower threshold for active management, surveillance, and treatment. In regions where this more anticipatory attitude is common, public health bodies issue guidelines encouraging doctors to screen. Sometimes there are financial incentives for health practitioners to identify and treat patients with high cholesterol. For example, in some countries pharmaceutical companies are allowed to advertise or even sell medications directly to the public; in other countries, legislation prohibits or limits this activity. How often you have your cholesterol checked, if at all, at what age, and whether this results in medication depends to some degree on where you live.

This reality makes understanding the implications of cholesterol even more important. It empowers you to know when to request a test, how to respond to an invitation for screening, and how to decide, in discussion with your doctor, on the best treatment for you.

Modifying lifestyle and drawing on culinary medicine

The majority of healthcare professionals receive most of their training applying the *medical model of care* (the traditional approach to healthcare focused on diagnosing and treating diseases primarily through clinical interventions such as medications, surgeries, and other acute care measures). Under the medical model of care, there is a tendency to emphasize identifying and addressing specific diseases or conditions and treating symptoms or managing crises rather than preventing illnesses. Although this model is often effective for acute illnesses and emergencies, it sometimes overlooks broader lifestyle and social determinants of health, such as diet, exercise, and mental well-being.

Increasingly, there is a drive to take a more holistic approach with the practice of complementary and aligned principles of *lifestyle medicine*, which takes a proactive, prevention-oriented approach to health by addressing the root causes of chronic diseases through lifestyle changes. Lifestyle medicine is built on principles of maintaining health and considering the whole person, engaging individuals as active participants in their health journey (including their physical, mental, and emotional well-being), and encouraging sustainable modifications in areas such as the following:

- » Nutrition
- » Physical activity
- » Sleep
- » Stress management
- » Substance avoidance
- » Social connectedness
- » Relaxation

Various components of lifestyle medicine — such as exercising, eating a healthful diet, losing weight if necessary, using healthful cooking methods, and reducing stress through yoga, tai chi, and meditation — may also help you to keep your cholesterol levels under control. Chapter 12 discusses various alternative therapies to consider as well.

Culinary medicine is a new field of medicine that combines the art of cooking with evidence-based nutritional science to help people achieve better health through food. It focuses on the role of dietary habits in preventing, managing, and even reversing chronic diseases while emphasizing the enjoyment and cultural significance of eating. Culinary medicine bridges the gap between knowing what to eat (nutrition) and making it practical and enjoyable (culinary skills), empowering individuals to take control of their health through food. This field recognizes that food is not only medicine but also a source of joy, culture, and connection.



TIP

The best way to optimize taking care of your cholesterol is through lifestyle and culinary medicine, with effective medical management explored if you and your healthcare professional agree that it's necessary and appropriate.