



## Cholesterol 101

You get to the doctor for your annual physical, spend some time chatting with them about how you feel and your family history, and then review the results of whatever blood work you have. At some point, most of us will end up leaving that yearly appointment with new concerns about our cholesterol levels. While “hyperlipidemia” is a common issue to be addressed when looking at your long-term health, many people don’t really understand what cholesterol is, why you actually need it, and what options you have to improve your numbers if need be.

### What IS Cholesterol?

The definition of cholesterol in itself is problematic. Here is what I got from dictionary.com: *“a sterol, C<sub>27</sub>H<sub>46</sub>O, that occurs in all animal tissues, especially in the brain, spinal cord, and adipose tissue, functioning chiefly as a protective agent in the skin and myelin sheaths of nerve cells, a detoxifier in the bloodstream, and as a precursor of many steroids: deposits of cholesterol form in certain pathological conditions, as gallstones and atherosclerotic plaques.”*

Notice that the highlighted bit all sounds really positive. Then suddenly, that last phrase goes straight to diagnosing disease! So how can something that our bodies need so badly to function and stay healthy be the enemy? The answer: it’s NOT! Without sufficient cholesterol, we can’t think straight, make hormones, or even move well. Our bodies make cholesterol because we *need* cholesterol.

It’s also important to note that when you see your cholesterol numbers in a lab report, they are not actually measuring cholesterol at all; those numbers are estimated counts of the “lipoproteins” that carry cholesterol around the body. LDL (low-density lipoproteins) carry cholesterol to the various tissues that need it), and HDL (high-density lipoproteins) carry cholesterol from the bloodstream and tissues to the liver for detoxification.<sup>1,2</sup> The problems start when we have too many of the wrong kinds of lipoproteins that carry cholesterol throughout our bodies.

### Taking the Kids to School Analogy

My favorite way to simply explain the difference between cholesterol and lipoproteins is to use the analogy of cars on the road taking kids to school:

Each car is cruising through the neighborhood on the way to drop kids off at school. Each car represents a lipoprotein. There are parents and kids inside each car (cholesterol) that need to get to school. By looking from the outside, we can’t tell how many kids are in the car (how much cholesterol) or how safe the car is (quality of the lipoprotein). All we can do is count the cars (total cholesterol).

Not only do your lab results not represent actual cholesterol in each lipoprotein, but they are an estimated count. Because of cost and time, most labs calculate your LDL using the Friedewald equation<sup>3</sup>: *total cholesterol minus HDL cholesterol minus triglycerides divided by five.*<sup>4</sup> This formula is



not only inaccurate but also can underestimate LDL levels in those with a high risk of cardiovascular disease.

### **Why Your Cholesterol Numbers Matter- ish**

Now you understand the difference between the types of cholesterol readings in your lab results, but let's parse through a few details:

- **HDL:** We want a robust amount of HDL (high-density lipoproteins) floating around relative to LDL. This helps you clear cholesterol from being used throughout the body by taking it to the liver for detoxification. Ideally, this is 60 mg/dL or higher.<sup>5</sup>
- **LDL:** Modern dogma says we want this very low- so low, in fact, that you might not have the cholesterol needed for things like good cognition and making hormones! While the doctor's office may tell you that anything under 100 mg/dL is good, I'd argue you want to be careful not to let it dip too low. (More on this below).
- **Triglycerides:** These are fatty acids floating in the bloodstream to be used for energy or stored as fat. We do not want a lot floating around, causing inflammation. Labs usually have ideal ranges of around 150 mg/dL or less.<sup>6</sup> I like to see it on balance with HDL numbers. This ratio: TG/HDL, will give you a good indication of your metabolic health and if you're eating the right level of carbohydrates for your activity level. Ideally, the ratio is close to 1.<sup>7</sup>
- **Total Cholesterol:** I believe that the only reason this is even quantified is to help with figuring out what calculated LDL is. Otherwise, it has very little meaning in itself. Why would we want one component to be high and the other to be low? Think of it this way: You ask a friend: "What was the score of the baseball game last night?" And they respond: "20." What the heck does that mean? Which team won? Who had what points? Well, that's what total cholesterol means to me- zippo.

All that said, if your LDL comes back high: over 160 mg/dL<sup>8</sup>, consider asking your doctor about advanced lipid testing before thinking about medications like a statin. This is an especially good idea if you have a family history of high cholesterol, high blood pressure, cardiovascular disease, stroke, diabetes, and obesity. These tests would look at LDL particle number, particle size, and the presence of apolipoprotein-B (Apo-B), which can increase the risk for cardiovascular disease.<sup>9</sup>

### **Going back to our "Taking the Kids to School" story**

Let's say you do advanced testing to look at your lipoprotein particles. What they are going to look for is the integrity of those particles and how many are on the road. What you really want are a few (not too many) parents driving their kids to school in their minivans. You also want mom's coming to pick those kids up from school in those same minivans- why? Because they are safe! They don't speed; they don't look at their phones- they don't get in accidents and cause traffic jams. What you DON'T want is a bunch of kids being picked up by maniacs in sports cars! These delinquents are looking at their phones, running stop signs, and causing all



kinds of traffic snarls. In this analogy, the minivans are buoyant, healthy LDL particles, and the sports cars are oxidized unhealthy particles. These are what will clog arteries, cause inflammation, and lead to heart disease. The advanced testing will help you understand what, if anything, is wrong with your lipoprotein particles and will inform your decisions on what interventions to take.

### **Diet and Lifestyle Changes**

Before you dive straight into signing up for prescriptive intervention, there are things you can do with diet, lifestyle, and even some supplementation to support a healthy lipid profile. Dietary cholesterol sources (eggs, shellfish, etc.) actually impact your blood cholesterol levels very little. Most of the cholesterol in our system is produced by our bodies and is tightly regulated. When we get more from our diets, our bodies produce less, and vice versa.<sup>10</sup> That said, for some people with familial hyperlipidemia (family history of high cholesterol), there may always be high cholesterol production regardless of dietary intake. Avoiding sources of dietary cholesterol is not the best way to impact your lab results.

What you CAN do is to help with the *quality* of your lipoproteins (more minivans on the road) and increase your HDL levels while decreasing triglycerides. Here are some simple tips:

- **Get plenty of fiber.** This will help your body detoxify and lower LDL and triglyceride numbers while helping keep HDL numbers high.<sup>11</sup> Replacing simple starches (bread, crackers, juice, etc.) with complex and fibrous carbohydrates (vegetables, legumes, low-sugar fruits) will also lower your blood sugar and help with weight loss.
- **Don't be afraid of "healthy" fats.** Things like avocados, nuts, olives and olive oils, and fatty fish will keep your HDL levels robust while improving the integrity of your LDL particles.<sup>11</sup> Remember, fat doesn't make you fat; excess (and especially empty) calories will! These foods will help you get full and maximize the nutrient density of your diet.
- **Avoid processed and oxidized oils.** I would go on to say to avoid overly processed anything! These will make for very small, dense, and harmful LDL particles.<sup>12</sup> This includes all industrial seed oils, or as Dr. Cate Shanahan refers to them: "The Hateful 8": Canola, corn, cottonseed, soy, sunflower, safflower, grapeseed, and rice bran.<sup>13</sup>
- **Increase aerobic exercise.** This will stimulate enzymes that move LDL and triglycerides from the blood for excretion.<sup>14</sup> Aerobic activity (fast walking, running, cycling, etc.) will not only improve your LDL numbers and triglycerides but increase your HDL.<sup>15</sup>
- **Decrease body fat.** Obesity, especially when body fat is centralized in the abdomen, wreaks havoc on your blood lipids. Losing 20 pounds can decrease your LDL by 15%, triglycerides by 30%, and increase your HDL.<sup>16</sup>

### **Supplements that may help**

In addition to making changes to your diet and exercise, you may consider some natural supplements to improve your overall lipid profile. Note: please discuss any supplements with your doctor first, even if no prescription is required.



- **Berberine:** I've recommended this to clients who are dealing with abdominal obesity, elevated blood sugars, and even gut bugs. It has also been shown to have a cholesterol-lowering effect in some people.<sup>17</sup>
- **Fish Oil:** We've all heard that fish oil can be good for gut health, immunity, joints, etc., but Omega 3 fatty acids can also significantly decrease triglycerides and raise HDL.<sup>18</sup> Please make sure to get the highest quality to avoid ingesting oxidized fish oil, which will only cause further inflammation. Omega 3 supplements may interfere with other medications, so please consult with your doctor first.<sup>23</sup>
- **Flaxseed:** Consuming around two tablespoons of freshly ground flaxseeds per day may help you naturally lower LDL.<sup>19</sup> The lignans, fiber, and omega-3 fatty acids in flax are healthy for most of us anyhow and can add some good flavor to yogurt and smoothies. Again, to avoid oxidized flax, keep whole seeds in the fridge, and grind as needed.
- **Niacin:** This B-vitamin (B3) prevents the liver from making LDL and VLDL cholesterol, which could help lower triglycerides and improve HDL.<sup>20,23</sup> This one isn't for everyone, though, as it may cause liver damage, so proceed carefully and consult with your doctor first.
- **Phytosterols (plant sterols and stanol esters):** These are similar in structure to the body's cholesterol and compete with it for absorption in the digestive system. Phytosterols are so effective that they can lower total cholesterol by up to 10% and LDL by 14%.<sup>21</sup> I'd recommend trying to get as much as possible from your food first by greatly increasing your produce intake to several cups per day. If you decide to supplement, you'll want to take it with meals.
- **Red Yeast Rice:** This has been used in China as a natural treatment for increasing circulation and digestion for centuries. It has also been shown to be beneficial for lowering cholesterol, similar to a prescription statin. The monacolin K in red yeast rice is what mimics the effects of statins. It is so potent, in fact, that many supplements of red yeast rice no longer contain the critical ingredient. Please advise with your doctor if this is a good choice, and if so, which supplement to choose.<sup>22</sup>

### When Medication is Necessary

If you have a family history of heart disease, have already tried all the diet and lifestyle changes, and your doctor says it is time for medication, here are a few things to consider:

- **Statins:** These work by blocking your body's ability to produce (or overproduce) cholesterol.<sup>24</sup> For those whose cholesterol levels are likely due to family history or genetic predisposition to elevated cholesterol, statins may be helpful. However, since having sufficient cholesterol is critical to cognition, hormone production, and as part of cell membranes, decreasing cholesterol too much or too fast can have negative consequences. I recommend that anyone on a statin also take the supplement Coenzyme Q-10 (which is depleted with statins). Without this enzyme, the mitochondria of the cells (all your cells) may not function at their highest. This is especially important in the elderly as well as the athletic population.<sup>25</sup>



- **Cholesterol Absorption Inhibitors:** While statins block your endogenous production of cholesterol, these function by blocking the absorption of cholesterol. These are often prescribed when one cannot tolerate statins or in combination with a statin.<sup>26,27</sup>
- **Bempedoic Acid:** This works similarly to a statin in that it blocks the production of cholesterol but is less likely to cause muscle pain and weakness.<sup>23,28</sup> It is considered a “prodrug” which becomes metabolically active once absorbed.<sup>29</sup> Bempedoic acid is often used in conjunction with a statin to maximize the cholesterol-lowering effects.<sup>30</sup>
- **Bile Acid Sequestrants:** Your liver uses cholesterol to make bile for digestion. These bile-acid-binding agents do just that: bind to bile acids which indirectly lowers cholesterol by prompting your liver to use cholesterol to make more bile acids.<sup>23</sup> Basically, there is a negative feedback loop where the body is always thinking it needs more bile acids and keeps using the cholesterol for that purpose. This leads to a lowering of circulating blood cholesterol, although the effect on cholesterol is less than that of statins. Since the extra bile is being excreted in the stool, this could cause abdominal pain and digestive issues.<sup>31</sup>
- **PCSK9 Inhibitors:** These help the liver absorb more cholesterol, thereby lowering circulating cholesterol. These injectables are often used in patients with both familial high cholesterol and a personal history of stroke or heart disease.<sup>23</sup> This drug treatment for cholesterol can lower LDL-C by as much as 40-50% above what statins can. For this reason, only high-risk patients and those with very high levels should consider this treatment.<sup>32,33</sup>
- **Fibrates:** When triglycerides are quite high, in addition to VLDL (which is mostly triglycerides), fibrates may be prescribed. These reduce the liver’s production of VLDL and have been shown to increase HDL production.<sup>23,34</sup> What’s most interesting about this class of drugs is their ability to help the LDL particle quality, making them less small and dense and more large and buoyant. Fibrates are often a good choice when diabetes and metabolic syndrome are the primary concerns in relation to cardiovascular health.<sup>35</sup>

### **Cholesterol: The Big Picture**

First of all, please know that cholesterol in itself is not an enemy of wellness. As stated above, we need cholesterol for almost all processes of metabolism. Without it, we could not thrive. However, it’s important to know what your cholesterol numbers mean and when to take steps to improve them. Start with diet and lifestyle changes to have nice safe minivans on your road! Then, if necessary, talk to your doctor about supplements and even prescriptive options to keep those wreckless sports cars under control.

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available. Please consult your physician before making any changes to your diet, exercise, supplements, or prescriptions.

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