

Is Elevated LDL Cholesterol (eg: from a Ketogenic diet) a Health Concern?

That very much depends on the context (which should include HDL Cholesterol and Triglycerides):

The concern with elevated LDL (“bad cholesterol”) is that it may lead to the formation of arterial plaque and then narrowing and hardening of the arteries (Atherosclerosis) which in turn could lead to Cardiovascular Diseases (eg. angina, blood clots, stroke and heart attack).

However, LDL particles come in various densities and sizes. Particles of small dense LDL (sdLDL) have greater atherogenic potential than that of other LDL subfractions and “sdLDL proportion” is a better marker for prediction of cardiovascular disease than that of total LDL. (Particles of sdLDL are actually small enough to penetrate the arterial wall.) Also, published research shows that people on a Ketogenic diet tend to have less sdLDL (Phenotype Pattern A) than those eating a diet rich in carbs (Pattern B) and that starting a Ketogenic diet will reduce a person’s percentage of sdLDL.

If the sdLDL in the arterial walls is oxidised or glycated it attracts macrophages and this contributes to Atherosclerosis. (Small dense LDL cholesterol particles are deficient in vitamin E and are highly susceptible to oxidation.) Consuming seed/vegetable oils, which are high in polyunsaturated fatty acids (Omega 6), can cause LDL oxidation, but I’m careful not to consume any seed/vegetable oils. Also, since a Ketogenic diet is extremely low in carbs (I’m eating <20g per day excl. fibre) very little glucose is present in the blood from diet. (When Keto adapted, the brain derives about 75% of its energy from the ketone β -hydroxybutyrate. The remainder comes from glucose made by the liver (gluconeogenesis) which is roughly the equivalent of eating 40g of carbohydrate. Consequently there is little glucose in the blood to cause sdLDL glycation.)

Also, why is LDL high? If someone is eating a Ketogenic diet, they are burning fat for fuel instead of glucose. Their blood supplies the energy to body cells in the form of triglycerides by packaging them up in a vLDL in the liver. When the triglyceride payload is delivered, an LDL particle results. In this case, the LDL can be considered benign as it is recycled relatively quickly by the liver to transfer more energy, so it isn’t left lingering in the blood to possibly become small and dense.

Of course, there are other possible reasons for elevated LDL, eg: an infection or an injury as the body works hard to repair itself, but LDL levels fall again when the problem has resolved. In these cases, elevated LDL is a sign of a problem, and isn’t the problem itself. Familial Hypercholesterolemia (FH), though, causes elevated LDL and results in high levels of small dense LDL, too. (I gather that Statins can be prescribed to reduce the amount of sdLDL in people with FH). Diabetes causes higher levels of sdLDL because the LDL particles linger twice as long in the blood, and Cardiovascular Diseases are certainly associated with Diabetes.

I gather that cardiologists use the ratios Total Cholesterol/HDL or Triglycerides/HDL as better indicators of Cardiovascular Disease risk than total LDL Cholesterol. Also, the Atherogenic Index of Plasma (AIP), a strong marker to predict the risk of atherosclerosis, is the logarithm (base 10) of Triglycerides/HDL. It has been suggested that AIP values of -0.3 to 0.1 are associated with low, 0.1 to 0.24 with medium and above 0.24 with high CV risk.

(I gleaned most of this information from a talk by Asst Prof. Ken Sikaris called 'Making Sense of LDL', which is viewable on YouTube, but it also agrees with what I have learned from other sources, including episodes of The Low Carb Cardiologist Podcast hosted by cardiologist Dr Bret Scher.)

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