



LABORATOIRE SION

BIOLOGICAL ANALYSIS AND MEDICAL IMAGING

Specialized tests – Ultrasound – specimen collection at home or at the office.

Apolipoprotein B



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Abstract

Cardiovascular diseases (CVD) are a major public health problem, characterized above all by their silent progression. Given the role of lipids in the pathogenesis of CVD, measuring certain lipid markers makes it possible to establish a diagnosis. Among these markers, apolipoprotein B (ApoB) is a powerful biomarker for assessing and managing cardiovascular risk, thanks to its direct quantification of atherogenic particles, offering a more precise and more personalized approach to prevention and treatment. Despite a few obstacles to its routine use (the variety of assay methods, some of which have certain shortcomings, and the additional cost of the tests), ApoB measurement is strongly recommended given its greater predictive accuracy in situations where traditional cholesterol markers may not fully reflect cardiovascular risk.

Keywords: Apolipoprotein B; Cardiovascular diseases

Introduction

Cardiovascular diseases (CVD) remain the leading cause of morbidity and mortality worldwide, despite the progress made to date in prevention and treatment. One of the main causes of these conditions is atherosclerosis, a process of narrowing of the arteries due to the accumulation of fat, cholesterol and other debris. This is why quantifying serum lipid levels (lipid panel) is an important tool for establishing the cardiovascular status or risk of patients and for monitoring the effectiveness of the therapeutic program. However, despite all these existing markers, cases of sudden death and stroke still frequently remain the first manifestations of CVD in some patients. This reflects the persistent need for more effective early diagnostic markers. In this regard, apolipoprotein B (ApoB) testing is increasingly recognized as an essential tool in the early diagnosis and management of CVD, providing a more accurate estimate of the number of atherogenic

particles than traditional lipid markers such as LDL cholesterol (LDL-C).

Role of apolipoprotein B in lipid metabolism and the pathogenesis of atherosclerosis

Plasma lipoproteins have many functions, including the transport of lipids to tissues for energy use, lipid deposition, the production of steroid hormones and the formation of bile acids. They are composed of esterified and non-esterified cholesterol, triglycerides, phospholipids and protein components called apolipoproteins, which act as structural components, as ligands for binding to cell receptors, and as enzyme activators or inhibitors. Six main types of lipoprotein have been identified: chylomicrons, VLDL, IDL, LDL, Lp(a) and HDL. With the exception of HDL, these lipoproteins are all atherogenic. A unique feature of these atherogenic lipoproteins is that each particle contains one ApoB molecule, which forms a kind of exoskeleton within which the particle exists. The plasma ApoB level therefore represents the total number of atherogenic lipoproteins, although it is mostly carried by LDL. There are in fact two forms of ApoB: apoB48, carried on intestinal chylomicron particles, and apoB100, carried on hepatic lipoproteins. Moreover, the lipid content transported by atherogenic lipoproteins is highly variable, hence the wide variability in the size of these particles. Thus, in the presence of LDL particles that are enriched in or depleted of cholesterol, any LDL-cholesterol measurement is an incorrect measure of the number of LDL particles. Measuring plasma ApoB, by contrast, not only allows a more accurate assessment of the number of LDL particles, but also reflects the exact number of all atherogenic particles. This may explain why some people can have a low LDL-C level but a high ApoB level.

Reference values

Reference values vary slightly according to the assay technique and the population. However, usual values generally lie around 0.55–1.25 g/L for women and 0.55–1.35 g/L for men.

For people at risk of cardiovascular disease, the European Society of Cardiology (ESC) recommends specific secondary targets for ApoB:

- People at very high risk: ApoB levels must be below 0.65 g/L
- People at high risk: ApoB levels must be below 0.80 g/L

ApoB directly quantifies the concentration of atherogenic lipoproteins. High ApoB levels, even when LDL-C is normal, indicate a significantly higher risk of cardiovascular events. ApoB offers greater predictive accuracy in situations where traditional cholesterol markers may not fully reflect risk.

Challenges related to ApoB measurement:

There are two major obstacles to integrating apolipoprotein testing into the routine markers of the cardiovascular work-up. The first is the additional cost of the tests. However, given the added value of ApoB in the accuracy and the early diagnosis of CVD, this obstacle appears to be fairly negligible. Researchers strongly recommend adding it as an additional parameter of the lipid panel. Although ApoB measurement performs better than LDL measurement, it does not replace the value of the other parameters of the lipid panel, namely total cholesterol, HDL and triglycerides.

The second obstacle lies in the assay techniques. Methodological variability indeed remains greater than that of the other lipid parameters, whose methods are fairly well standardized. Some assay methods still have certain shortcomings. However, given the importance of this marker, advances have been made as regards the standardization of assay methods: a stable and interchangeable IFCC–WHO reference standard has been produced, guaranteeing acceptable standardization of ApoB measurements.

Conclusion

In summary, ApoB is an essential marker for assessing cardiovascular risk, with specific target values recommended for the different risk categories. Its direct quantification of atherogenic particles makes it a more accurate indicator than traditional cholesterol measurements, and efforts are currently under way to further improve its standardization.

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