Equivalent Low-density Lipoprotein (LDL-C EQ) Calculation from Apolipoprotein B (ApoB) Measurement

Background

Low-density lipoprotein cholesterol (LDL-C), the most commonly measured atherogenic lipid particle, has been associated with diagnostic, prognostic and therapeutic goal attainment criteria for several decades. The LDL molecule is comprised of various lipids, primarily cholesterol as cholesterol esters and free cholesterol, as well as some triglyceride and a single apolipoprotein B100 (ApoB), which is a key structural component of all atherogenic lipoproteins.[1] It is well established that the measurement of LDL-C lacks correlation to the actual number of LDL particles in circulation due to the changing cholesterol content of the LDL particle; thus, monitoring LDL-C levels may not provide adequate assurance that therapeutic treatment to LDL-C goals is achieved.[1] However, as each atherogenic lipoprotein particle contains exactly one molecule of ApoB, its measurement is a powerful tool for assessment of atherogenic lipid status, providing a direct correlation to circulating atherogenic LDL particles.[2] While recent literature provides evidence that the measurement of ApoB assures a more accurate assessment of atherogenic risk as well as therapeutic goal attainment, LDL-C remains the most commonly measured parameter. In addition, ApoB levels do not vary among ethnicities or sex, and fasting is not required.[1-3]

The 2019 ESC/EAS Guidelines for the Management of Dyslipidemia recommend ApoB for risk assessment and state "It can be used as an alternative to LDL-C, if available, as the primary measurement for screening, diagnosis, and management, and may be preferred over non-HDL-C in people with high triglyceride (TG), Diabetes mellitus (DM), obesity, or very low LDL-C."[4] The 2018 American Heart Association and the American College of Cardiology Task Force guidelines consider ApoB as a risk enhancer and recommend a relative indication for testing when triglycerides are ≥200 mg/dL.[5] The 2022 ACC Expert Consensus Decision Pathway on the Role of Nonstatin Therapies for LDL-Cholesterol Lowering in the Management of Atherosclerotic Cardiovascular Disease Risk endorses the same guidance.[6] The 2020 AACE/ACE consensus statement recommends assessment of ApoB and provides treatment goals for ApoB based upon risk category.[7]

The following is a brief summary from the preponderance of data using ApoB in CVD risk reduction, which demonstrates the clinical benefits of ApoB measurement:

- Lower ApoB levels lowered risk of major adverse cardiovascular events despite therapeutic secondary LDL-C goal achievement[8]
- ApoB assessed residual risk and more accurately reflected atherogenic lipoprotein burden than LDL-C[8]
- Achievement of the most stringent current LDL goals may not ensure lipoprotein residual risk has been minimized[8]

Key highlights

- The measurement of LDL-C lacks correlation to the actual number of LDL particles in circulation due to the changing cholesterol content of the LDL particle, so monitoring LDL-C levels may not provide adequate assurance that therapeutic treatment to LDL-C goals is achieved[1]
- Recent literature provides evidence that the measurement of ApoB assures a more accurate assessment of atherogenic risk as well as therapeutic goal attainment, and LDL-C remains the most commonly measured parameter
- By converting an ApoB measurement to an LDL-C value, Labcorp's new panel aims to allow the clinician the ability to quickly assess residual risk and the necessity for more stringent intervention to reach therapeutic goals

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- The measurement of ApoB should be the focus of therapeutic strategies[9]
- Clinical utility of ApoB far exceeds that of LDL-C as well as non-HDL cholesterol[10]
- CVD risk reduction strategies using lipid-lowering therapy over the past 30 years do not exceed 30%, leaving a high residual risk when using LDL-C as the primary target[1]

Clinicians are familiar with LDL targets and thresholds but may be less familiar with those for ApoB. A publication from the National Institutes of Health demonstrates that ApoB measurements may be translated to population-equivalent LDL-C values, allowing clinicians to utilize conventional risk assessment and therapeutic targets.[11]

Extended Lipid Panel with ApoB and Equivalent LDL-C Calculation

Labcorp has developed a standard lipid panel that includes the current LDL (NIH) calculation, ApoB and the new LDL-C Equivalent (LDL-C EQ) calculation from ApoB as well as traditional triglycerides, total cholesterol and high density lipoprotein cholesterol (HDL-C). The side-by-side LDL-C (NIH) and LDL-C EQ from ApoB will allow the clinician to quickly assess residual risk and the necessity for more stringent intervention to reach therapeutic goals.

The patient report below illustrates the discordance between the two LDL calculations, whereby the higher LDL (from ApoB) result could indicate that the patient may require more assertive treatment to achieve a therapeutic goal.

Individual tests	Result	Flag	Reference Interval (mg/dL)	Lab
Cholesterol, Total	142		100–199	01
Triglycerides	149		0–149	01
HDL cholesterol	45		>39	01
VLDL Cholesterol	23		5–40	
Apolipoprotein B (ApoB)	**105**	**High**	0–89	01
LDL Cholesterol Calculation (NIH)	74		0–99	
LDL Cholesterol Equivalent (from ApoB)	**116**	**High**	0–99	

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Test Name	Test No.
Extended Lipid Panel With LDL-C Equivalent Calculation from Apolipoprotein B (ApoB)	167651

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