# SMALL DENSE LDL CHOLESTEROL (sdLDL-C)

SIZE MATTERS: THE TRUE WEIGHT OF RISK IN LIPID PROFILING

RANDOX

## Clinical Significance of small dense LDL Cholesterol (sdLDL-C)

When measuring LDL cholesterol (LDL-C), it is the cholesterol mass within the LDL particles that is being measured. The LDL particle population within LDL is heterogeneous - meaning that the size, density & composition of each particle will be different. sdLDL-C is a subfraction of low density lipoprotein (LDL) with smaller particle size and higher density than larger more buoyant LDL. They all transport triglycerides and cholesterol to the tissues, but their atherogenesis varies according to their size. sdLDL-C will more readily permeate the inner arterial wall. sdLDL-C is more susceptible to oxidation and has a lower affinity to the hepatic LDL receptor, and as such circulates in the blood longer [1].

## Risk Assessment

As sdLDL-C is particularly atherogenic, a person with elevated sdLDL-C levels has a **3-fold increased risk of myocardial infarction (MI).**[2]

sdLDL-C measurement therefore provides a more comprehensive understanding of cardiovascular disease (CVD) risk compared to traditional LDL-C tests.

## sdLDL-C

- Is a valuable screening tool for CVD risk
- Is more atherogenic than LDL-C
- Can be used as a predictor of future cardiovascular events and in the secondary prevention of subtle coronary artery disease (CAD)

## Management

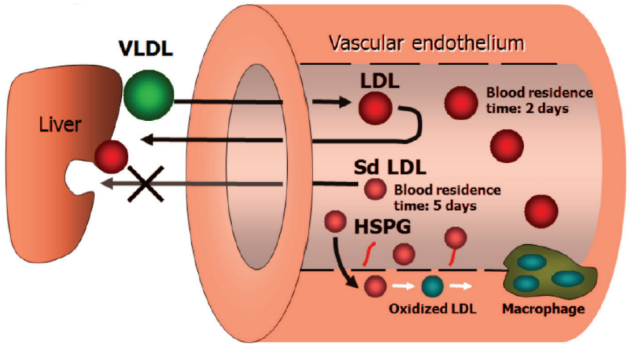
Reducing sdLDL-C levels will aid in reducing the risk of CVD and MI. High dose statin therapy has been proven to aid in reducing the levels of sdLDL-C as a risk factor for cardiovascular events and high risk patients. Elevated levels of sdLDL-C arise from multiple sources. A major factor is a sedentary lifestyle with a diet high in saturated fat. Insulin resistance and pre-diabetes have also been implicated, in addition to genetic predisposition.[3]

The measurement of LDL-C or the review of levels within arteriosclerotic coronary heart disease (ASCHD) treatment are known within different guidelines (including ATP III, AHA/ ACC, ESC/ EAS and NICE). However doubt remains on the impact of targeting LDL-C only. The inclusion of sdLDL-C within the clinical testing panel will assist in removing this doubt.

Figure 1: LDL-CHOLESTEROL = 110mg/dL[4]

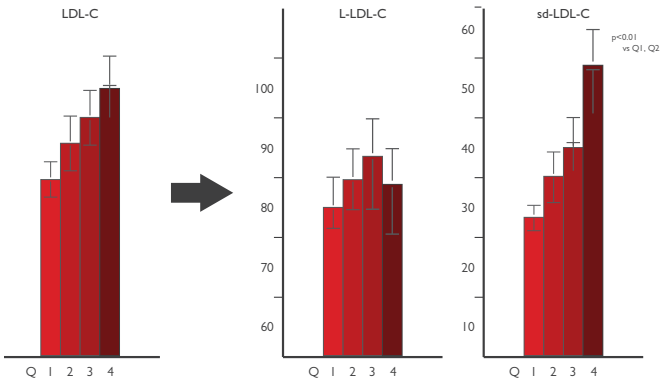

Even though the overall LDL-C mass looks the same for each patient, by measuring sdLDL-C, there are very different treatment considerations needed.

Figure 2: Atherogenic mechanism of sdLDL-C[5]




sdLDL-C has a lower affinity to the hepatic LDL-C receptor, thus circulates in the blood longer than larger LDL-C. sdLDL-C has a stronger affinity to vessel wall heparin sulphate proteoglycans (HSPGs), which means that sdLDL-C can more readily permeate the arterial wall. sdLDL-C is also liable to oxidation from its physicochemical properties which leads to foam cell formation.

Figure 3: The Gensini score (Non-diabetic Stable CHD)[2]




sdLDL-C level increases along with the development of arteriosclerosis. The impact and difference between the different quartiles of risk of large buoyant LDL and sdLDL-C are very clear. The higher the quartile of sdLDL-C the higher the risk of arteriosclerosis. Whilst, any quartile of large buoyant LDL Cholesterol (lbLDL-C) has minimal impact.

## Methods of Detection

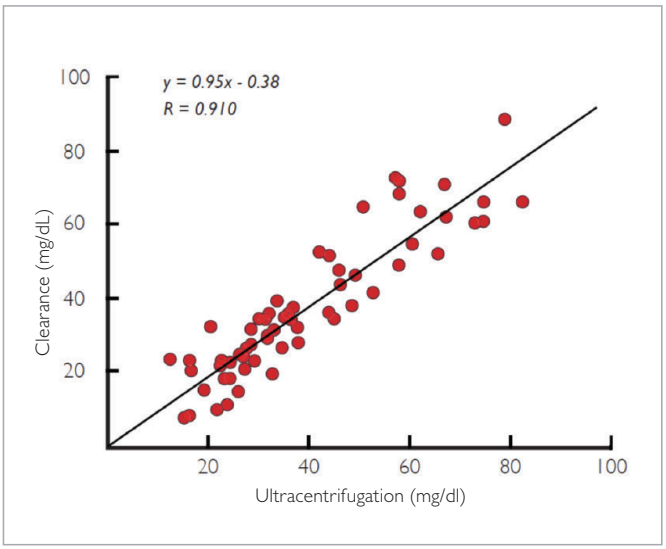
**sdLDL-C can be easily implemented in the routine biochemistry lab using the Randox IT assay.**

The only direct automated sdLDL-C kit on the market, the Randox sdLDL-C test is a direct method for the quantitative determination of sdLDL-C using **automated chemistry analysers** capable of accommodating two-reagent assays. The assay consists of two steps and is based on the use of well-characterised surfactants and enzymes that selectively react with certain groups of lipoproteins.

## Key Features of the Randox sdLDL-C Assay

- **Direct, automated test** for convenience and efficiency
- **Rapid analysis** results can be produced in as little as ten minutes, facilitating faster patient diagnosis and treatment plan implementation
- **Good correlation** to the gold standard ultracentrifugation method (see figure 4)
- **Liquid ready-to-use reagents** for convenience and ease of use
- **Applications available** detailing instrument specific settings for a wide range of clinical chemistry analysers
- **Clearance method**
- **sdLDL-C controls and calibrator available**

Figure 4: Correlation of Ultracentrifugation & Clearance methods[6]




The Randox automated sdLDL-C assay correlates well with the gold standard method.

## Ordering Details

| Description | Cat. No. | Size |
|---|---|---|
| Direct sdLDL-C kit | CH8153 | R1 1 x 16.2ml<br>R2 1 x 8.2ml |
| Direct sdLDL-C kit | 562616 | R1 1 x 19.8ml<br>R2 1 x 8.6ml |

## Controls and Calibrators for Direct sdLDL-C Kit

| Description | Cat. No. | Size |
|---|---|---|
| sdLDL-C Calibrator | CH5050 | 3 x 1ml |
| sdLDL-C Control Level 1 | LE5013 | 3 x 1ml |
| sdLDL-C Control Level 2 | LE5014 | 3 x 1ml |
| sdLDL-C Control Level 3 | LE5015 | 3 x 1ml |

## References

1. Hirano. T, et al, 2005, "Measurement of small dense low-density lipoprotein particles". J Atheroscler Thromb, 12, 67
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3. Najmafshar, A.wt al, 2012. "The Correlation between Overweight and Obesity with Plasma Levels of leptin, Insulin and sdLDL in People over 20 Years Old". Journal of Obesity & Weight Loss Therapy. 2 (8), 1-3
4. Mora. S, 2006. "LDL Particle Size: Does It Matter?". Harvard Medical School. Boston, MA
5. Liu, ML, 2002. "LDL Oxidation and LDL Particle Size in the Development of Atherosclerosis". Department of Medicine, University of Helsinki, Finland.
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