LDL-C Select FS*

Diagnostic reagent for quantitative in vitro determination of low density lipoprotein cholesterol (LDL-C) in serum or plasma on photometric systems

Order Information

Cat.-No.	Kit size						
1 4121 99 10 021	R1	5 x	20 mL	+	R2	1 x	25 mL
1 4121 99 10 026	R1	5 x	80 mL	+	R2	1 x	100 mL
1 4121 99 10 717	R1	5 x	80 mL		R2	5 x	20 mL
1 4121 99 10 917	R1	8 x	60 mL	+	R2	8 x	15 mL
1 4121 99 10 930	R1	4 x	20 mL	+	R2	2 x	10 mL

Summary [1,2]

Cholesterol is a component of cell membranes and a precursor for steroid hormones and bile acids synthesized by body cells and absorbed with food. Cholesterol is transported in plasma via lipoproteins, namely complexes between lipids and apolipoproteins. There are four classes of lipoproteins: high density lipoproteins (HDL), low density lipoproteins (LDL), very low density lipoproteins (VLDL) and chylomicrons. While LDL is involved in the cholesterol transport to the peripheral cells, HDL is responsible for the cholesterol uptake from the cells. The four different lipoprotein classes show distinct relationship to coronary atherosclerosis. LDL cholesterol contributes to atherosclerotic plaque formation within the arterial intima and is strongly associated with coronary heart disease (CHD) and related mortality. Even with total cholesterol within the normal range an increased concentration of LDL cholesterol indicates high risk. HDL cholesterol has a protective effect impeding plaque formation and shows an inverse relationship to CHD prevalence. In fact, low HDL cholesterol values constitute an independent risk factor. The determination of the individual total cholesterol (TC) level is used for screening purposes while for a better risk assessment it is necessary to measure additionally HDL cholesterol and LDL cholesterol.
In the last few years several controlled clinical trials using diet, life style changes and/or different drugs (especially HMG CoA reductase inhibitors [statins]) have demonstrated that lowering total cholesterol and LDL cholesterol levels reduce drastically CHD risk.

Method

Previous LDL-cholesterol determinations were performed indirectly by calculation from the combined results of total cholesterol, HDL cholesterol and triglycerides using the Friedewald equation [3]. LDL-C Select FS is a homogeneous method without centrifugation steps for the direct measurement of LDL-cholesterol. In a first step, LDL is selectively protected while non-LDL-lipoproteins are processed enzymatically. In a second step, LDL is released and LDL-cholesterol selectively determined in a color producing enzymatic reaction.

Principle

1) LDL + reagent 1 $\longrightarrow$ Protected LDL

HDL, VLDL, Chylomicrons $\xrightarrow{\text{CHE \& CHO}}$ Cholestenone + H_2O_2

H_2O_2 $\xrightarrow{\text{Catalase}}$ H_2O

2) Protected LDL + reagent 2 $\longrightarrow$ LDL

LDL-C $\xrightarrow{\text{CHE \& CHO}}$ Cholestenone + H_2O_2

H_2O_2 + 4-Aminoantipyrine + H-DAOS $\xrightarrow{\text{POD}}$ Color

Reagents

Components and Concentrations

R1:	Good's buffer	pH 6.8		20 mmol/L
	Cholesterol esterase		(CHE)	≥ 2.5 kU/L
	Cholesterol oxidase		(CHO)	≥ 2.5 kU/L
	N-(2-hydroxy-3-sulfopropyl)-3,5-dimethoxyaniline		(H-DAOS)	0.5 mmol/L
	Catalase			≥ 500 kU/L
R2:	Good's buffer	pH 7.0		25 mmol/L
	4-Aminoantipyrine			3.4 mmol/L
	Peroxidase		(POD)	≥ 15 kU/L

Storage Instructions and Reagent Stability

The reagents are stable up to the end of the indicated month of expiry, if stored at 2 – 8°C, protected from light and contamination is avoided. Do not freeze the reagents!
On board stability: 4 weeks at 2 – 8°C

Warnings and Precautions

1. Reagent 2 contains sodium azide (0.95 g/L). Do not swallow! Avoid contact with skin and mucous membranes.
2. Reagent 1 contains animal material. Handle the product as potentially infectious according to universal precautions and good clinical laboratory practices.
3. Artificial lipid mixtures (e.g. Intralipid®) may interfere with the test. Serum samples from patients treated with such solutions should not be used.
4. Determination of samples from patients with a rare type of Hyperlipoproteinemia (Hyperlipoproteinemia Type III) may lead to false results.
5. In very rare cases, samples of patients with gammopathy might give falsified results [7].
6. N-acetylcysteine (NAC), acetaminophen and metamizole medication leads to falsely low results in patient samples.
7. Please refer to the safety data sheets and take the necessary precautions for the use of laboratory reagents. For diagnostic purposes, the results should always be assessed with the patient's medical history, clinical examination and other findings.
8. For professional use only!

Waste Management

Please refer to local legal requirements.

Reagent Preparation

The reagents are ready to use.

Materials required but not provided

NaCl solution 9 g/L
General laboratory equipment

Specimen

Serum or heparin plasma

Stability [3]:			
	1 day	at	20 – 25°C
	7 days	at	4 – 8°C
	3 months	at	–20°C

Discard contaminated specimens. Only freeze once!

* fluid stable

Assay Procedure for Analyzers

Application sheets for automated systems are available on request.

Wavelength	600/700 nm (bichromatic measurement)
Optical path	1 cm
Temperature	37°C

	Blank	Sample or calibrator
Sample or calibrator	-	3.0 µL
Dist. water	3.0 µL	-
Reagent 1	280 µL	280 µL
Mix, incubate 5 min. at 37°C, read absorbance (A1), then add:		
Reagent 2	70 µL	70 µL
Mix, incubate for 5 min. at 37°C, read absorbance (A2).		

ΔA = [(A2 – A1) sample or calibrator] - [(A2 – A1) blank]

Calculation

With calibrator

$$\text{LDL - C [mg / dL]} = \frac{\Delta A \text{ Sample}}{\Delta A \text{ Calibrator}} \times \text{Conc. Cal. [mg / dL]}$$

Conversion factor

LDL-C [mg/dL] x 0.02586 = LDL-C [mmol/L]

Calibrators and Controls

For the calibration of automated photometric systems, DiaSys TruCal Lipid calibrator is recommended. The assigned values of the calibrator have been made traceable to NIST-SRM®-1951 Level 2. DiaSys TruLab L control should be assayed for internal quality control. Each laboratory should establish corrective action in case of deviations in control recovery.

	Cat. No.	Kit size
TruCal Lipid	1 3570 99 10 045	3 x 2 mL
TruLab L Level 1	5 9020 99 10 065	3 x 3 mL
TruLab L Level 2	5 9030 99 10 065	3 x 3 mL

Performance Characteristics

Measuring range

The test has been developed to determine LDL concentrations within a measuring range from 1 – 400 mg/dL (0.03 – 10.3 mmol/L). When values exceed this range samples should be diluted 1 + 1 with NaCl solution (9 g/L) and the result multiplied by 2.

Specificity/Interferences

No interference was observed by ascorbic acid up to 50 mg/dL, free bilirubin up to 50 mg/dL, conjugated bilirubin up to 40 mg/dL, hemoglobin up to 500 mg/dL and lipemia up to 600 mg/dL triglycerides. For further information on interfering substances refer to Young DS [5].

Sensitivity/Limit of Detection

The lower limit of detection is 1 mg/dL.

Precision

Intra-assay precision n = 10	Mean [mg/dL]	SD [mg/dL]	CV [%]
Sample 1	101	0.64	0.63
Sample 2	121	0.79	0.66
Sample 3	164	1.10	0.67

Inter-assay precision n = 20	Mean [mg/dL]	SD [mg/dL]	CV [%]
Sample 1	108	1.40	1.29
Sample 2	135	1.96	1.45

Method Comparison

A comparison of DiaSys LDL-C Select FS (y) with a commercial available test (x) using 50 samples gave following results:
y = 0.970 x + 4.70 mg/dL; r = 0.993

Reference Range [4]

Desirable	≤ 130 mg/dL (3.4 mmol/L)
Borderline high risk	130 – 160 mg/dL (3.4 – 4.1 mmol/L)
High risk	> 160 mg/dL (> 4.1 mmol/L)

Each laboratory should check if the reference ranges are transferable to its own patient population and determine own reference ranges if necessary.

Clinical Interpretation

The European Task Force on Coronary Prevention recommends to lower TC concentration to less than 190 mg/dL (5.0 mmol/L) and LDL-cholesterol to less than 115 mg/dL (3.0 mmol/L) [2].

Literature

1. Rifai N, Bachorik PS, Albers JJ. Lipids, lipoproteins and apolipoproteins. In: Burtis CA, Ashwood ER, editors. Tietz Textbook of Clinical Chemistry. 3rd ed. Philadelphia: W.B Saunders Company; 1999. p. 809-61.
2. Recommendation of the Second Joint Task Force of European and other Societies on Coronary Prevention. Prevention of coronary heart disease in clinical practice. Eur Heart J 1998; 19: 1434-503.
3. Guder WG, Zawta B et al. The Quality of Diagnostic Samples. 1st ed. Darmstadt: GIT Verlag; 2001; p. 22-3.
4. Schaefer EJ, McNamara J. Overview of the diagnosis and treatment of lipid disorders. In: Rifai N, Warnick GR, Dominiczak MH, eds. Handbook of lipoprotein testing. Washington: AACC Press; 1997. p. 25-48.
5. Young DS. Effects of Drugs on Clinical Laboratory Tests. 5th ed. Volume 1 and 2. Washington, DC: The American Association for Clinical Chemistry Press 2000.
6. Bachorik PS. Measurement of low-density lipoprotein cholesterol. In: Rifai N, Warnick GR, Dominiczak MH, eds. Handbook of lipoprotein testing. Washington: AACC Press,; 1997. p. 145-60.
7. Bakker AJ, Mücke M. Gammopathy interference in clinical chemistry assays: mechanisms, detection and prevention. ClinChemLabMed 2007;45(9):1240-1243.

Manufacturer

IVD CE

DiaSys Diagnostic Systems GmbH
Alte Strasse 9 65558 Holzheim Germany