Technical Brief

Accuracy and Reproducibility of Point-of-Care Lipid Test Methods Are Certified by the Cholesterol Reference Method Laboratory Network

Abstract

The Centers for Disease Control and Prevention (CDC) has established the Cholesterol Reference Method Laboratory Network (CRMLN) to ensure nation-wide standardization of lipid measurements consistent with National Cholesterol Education Program (NCEP) analytical goals. In the present study, accuracy and precision of the Alere Cholestech LDX® total cholesterol (TC) and high density lipoprotein cholesterol (HDL-C) tests were certified by the CRMLN. Alere Cholestech LDX® triglycerides (TRG) and low density lipoprotein cholesterol (LDL-C) performance was also found to meet NCEP analytical goals. These results confirm that accuracy and reproducibility of a point-of-care lipid profile method is comparable to centralized laboratory testing.

Introduction

The third Adult Treatment Panel (ATP III) of the National Cholesterol Education Program (NCEP) recommends a complete lipid profile for coronary heart disease risk assessment and patient management.[1] The lipid profile consists of total cholesterol (TC), high density lipoprotein cholesterol (HDL-C), and triglycerides (TRG). Using the Friedewald equation, the low density lipoprotein cholesterol (LDL-C) can be calculated from these parameters.

The Centers for Disease Control and Prevention (CDC) has established the Cholesterol Reference Method Laboratory Network (CRMLN) to ensure nation-wide standardization of lipid measurements consistent with NCEP analytical goals.[2] Manufacturers of lipid testing reagents for TC and HDL-C can certify their methods as traceable to CDC reference methods by conducting precision and accuracy studies involving a CRMLN laboratory. Certification is not available for TRG or calculated LDL-C.

Alere, a manufacturer of point-of-care testing (POCT) methods for lipids, followed CRMLN protocols using 55 donor samples to characterize its performance and obtain certification.

Methods

CRMLN protocols were utilized for analysis of TC and HDL-C.[3] The TRG testing protocol was recommended by CRMLN laboratory personnel. Three donor samples were selected for analysis of precision to ensure that the one level specified by protocol was met. All samples were tested once each day for 20 days. Fifty-five donors were identified for the accuracy analysis to obtain a minimum of 40 samples distributed across each assay range per protocol. All donors provided informed consent. Serum was collected by standard venipuncture technique. These samples were tested immediately following collection using Alere Cholestech LDX® System lipid profile test cassettes. Testing was completed per protocol by one individual using a single analyzer.

Aliquots of the samples were frozen and shipped in one batch to Northwest Lipid Metabolism and Diabetes Research Laboratories (University of Washington, Seattle, WA), one of three US CRMLN laboratories. They were analyzed using CDC reference methods for TC and HDL-C and for TRG using Roche/Hitachi methods. TRG results were not blanked. LDL-C values were calculated for each method using the Friedewald equation. All protocol data was furnished to the CRMLN laboratory for analysis. Method agreement was assessed according to CRMLN protocol. Data presented are for single testing of donor samples.

Results

CRMLN certification was achieved for Alere Cholestech LDX® TC and HDL-C POCT methods. NCEP precision goals were met for all analytes at all tested levels: TC, 1.9–2.4%; HDL-C 2.7–3.1%; TRG, 1.6–3.7%; LDL-C 2.6–4.3% (Table). The Figures illustrate the strong correlation between the POCT system and the CRMLN laboratory methods. Correlation coefficients exceeded 0.987 for all analytes. The NCEP accuracy goals for average bias are 3%, 5%, 5% and 4% for TC, HDL-C, TRG and LDL-C, respectively. The POCT methods achieved these goals with average biases compared to the CRMLN laboratory's methods of 2.6%, 0.2%, 1.9% and 1.7%, respectively.

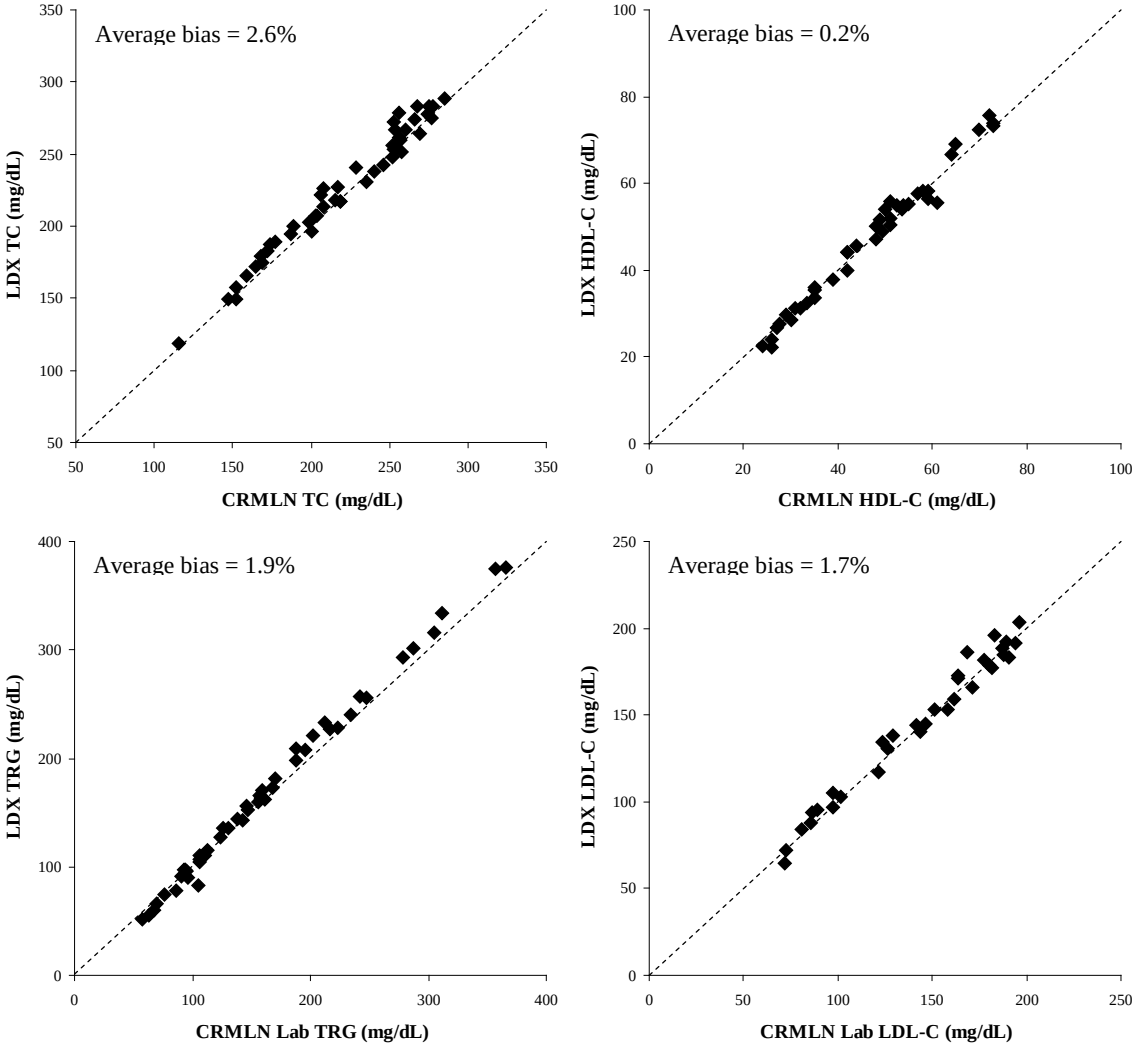
Conclusions

Accuracy and reproducibility of the Alere Cholestech LDX® TC and HDL-C tests were certified by the CRMLN. TRG and LDL-C performance was also found to meet NCEP analytical goals. These results confirm that accuracy and reproducibility of this POCT lipid profile method is comparable to centralized laboratory testing.

Table. Precision of the POCT Methods.

	NCEP CV Goal	Sample #1 Mean (mg/dL)	Sample #1 CV (%)	Sample #2 Mean (mg/dL)	Sample #2 CV (%)	Sample #3 Mean (mg/dL)	Sample #3 CV (%)
TC	**3%**	241.6	1.9	249.5	2.3	235.5	2.4
HDL-C	**4%**	49.4	3.1	52.3	3.1	67.6	2.7
TRG	**5%**	89.2	2.4	273.7	1.6	61.8	3.7
LDL-C	**4%**	174.3	2.6	142.5	4.3	155.5	3.8

Figures. Accuracy of POCT Methods Compared to CRMLN Laboratory Results.



CRMLN, Cholesterol Reference Method Laboratory Network laboratory; LDX, Alere Cholestech LDX® System; dotted line is the line of identity ($y = x$)

References

1. Expert Panel on Detection, Evaluation, and Treatment of High Cholesterol in Adults. Executive summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Cholesterol in Adults (Adult Treatment Panel III). JAMA 2001; 285:2486-97.
2. Working Group on Lipoprotein Measurement. National Cholesterol Education Program: recommendations on lipoprotein measurement. NIH Publication No. 95-3044, 1-186. 1995. National Institutes of Health, National Heart, Lung, and Blood Institute.
3. www.cdc.gov/labstandards/crmln.html