

Accuracy of a Rapid, Fingerstick Method for High Sensitivity CRP Is Comparable to a Commercial Laboratory Method

Abstract

Measurement of high sensitivity C-reactive protein (hs-CRP) is an independent marker of risk and may help direct further evaluation and therapy in cardiovascular disease. A simple, rapid method utilizing lateral flow immunometric methodology enables hs-CRP testing from fingerstick or venous whole blood, serum, or plasma. To assay hs-CRP levels, a 50 μ L blood sample (40 μ L if serum or plasma) is dispensed into a test cassette and then tested using the Cholestech LDX[®] Analyzer. Results are available in 6 minutes. In the present study, accuracy was assessed by comparing the Cholestech LDX hs-CRP method with a commercial clinical diagnostic laboratory method in 49 individuals and in diluted World Health Organization Certified Reference Material (WHO CRM) 470 standards. Hs-CRP values measured with the Cholestech LDX for fingerstick, venous whole blood & serum samples and diluted WHO CRM 470 standards were all highly correlated with serum values measured by the commercial method ($r \geq 0.97$). Cholestech LDX hs-CRP is a rapid method for measuring hs-CRP yielding results that were comparable to those obtained by a commercial diagnostic laboratory method.

Introduction

The Centers for Disease Control and Prevention (CDC) and the American Heart Association (AHA) published a scientific statement on inflammation markers and cardiovascular disease in 2003.¹ The statement noted that measurement of high sensitivity C-reactive protein (hs-CRP) is an independent marker of risk and may help direct further evaluation and therapy in the primary prevention of cardiovascular disease.

The CDC is working to standardize hs-CRP methods.² At present, manufacturers utilize a World Health Organization (WHO) standard: Certified Reference Material (CRM) 470. It is essential that a new hs-CRP method accurately quantifies the WHO standard and patient samples.

The present study reports on method comparisons to characterize performance of Cholestech LDX[®] hs-CRP test cassettes relative to a commercial clinical diagnostic laboratory method.

Methods

The study protocol involved testing 49 donors identified to provide samples distributed across the hs-CRP assay range. All participants provided informed consent. Capillary whole blood specimens were obtained by fingerstick using 50 μ L lithium heparin-coated capillary tubes. Serum and whole blood (in lithium heparin) was collected by standard venipuncture technique. Fingerstick samples were tested immediately following sample collection. Venipuncture samples were tested subsequently using both the Cholestech LDX and the commercial laboratory methods.

In the Cholestech LDX hs-CRP method, a cassette is placed into the Cholestech LDX Analyzer where a unique system on the cassette separates the plasma from the blood cells. Plasma is then incubated with a colloidal gold anti-CRP conjugate. A lateral flow system transfers

the gold conjugate through an anti-CRP antibody capture zone. Gold conjugate containing CRP is captured by the antibody while the rest of the gold conjugate is washed away. The signal in the capture zone is measured by reflectance photometry in the Cholestech LDX Analyzer. A magnetic stripe on each cassette contains the calibration information required for the analyzer to convert the reflectance reading to hs-CRP concentration in mg/L. 50 μ L of capillary of venous whole blood was used for analysis. 40 μ L was used for serum. A single lot of test cassettes was used for this study. Precision for this lot was measured in a 20-day NCCLS protocol (EP5-A) and ranged between 12.3% and 15.9%CV for samples between 2.00 and 6.00 mg/L. In the samples below 1.00 mg/L, SDs ranged between 0.08 and 0.12 mg/L. The functional sensitivity of the method was previously shown to be 0.30 mg/L.

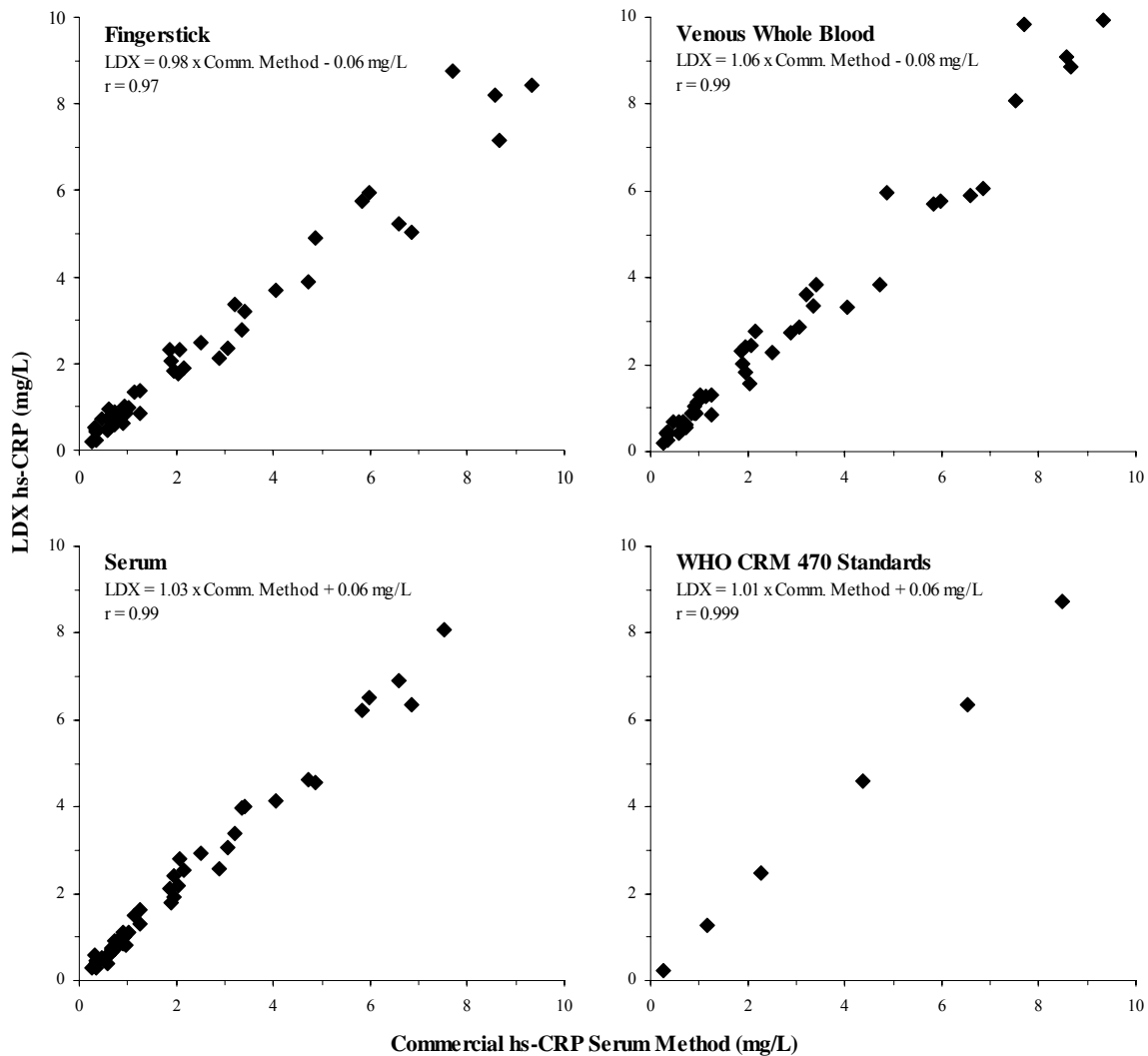
Serum samples were tested for comparison using a commercially available, particle enhanced immunonephelometry method. This method has been used as a benchmark to compare other commercial laboratory methods.³

A set of six standards was prepared volumetrically from the WHO CRM 470 material in a serum sample pool containing a very low concentration of CRP and tested using both methods. Method comparison data were analyzed by Deming's regression.

Results

The Figures present method comparison data for the three sample types tested and for the diluted WHO CRM 470 standards. Serum samples with hs-CRP levels >8.00 mg/L were excluded as this is the upper limit of the Cholestech LDX hs-CRP method for serum. All sample types yielded correlation coefficients (r) ≥ 0.97 . The average bias was -3%, 2%, and 7% for fingerstick, venous whole blood, and serum, respectively.

Figures. Method Comparisons for Fingerstick & Venous Whole Blood, Serum, and WHO CRM 470 Standards.



Conclusions

Cholestech LDX hs-CRP is a rapid method for measuring hs-CRP yielding results that were comparable to those obtained by a commercial diagnostic laboratory method. This platform combines capabilities to analyze a complete lipid profile, glucose, liver enzymes, and hs-CRP, providing a comprehensive menu of cardiovascular disease management tests.

References

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