

The Accuracy and Reproducibility of a Rapid, Fingertstick Method for Measuring Alanine Aminotransferase Is Comparable to Reference Laboratory Methods

Abstract

Alanine aminotransferase (ALT) levels are valuable for assessing damage to the liver that may be due to infection, chronic alcohol or drug ingestion, or as a side effect of therapy with certain drugs. A new method combines enzymatic methodology and solid-phase technology to measure ALT in blood obtained from a fingerstick, in venous whole blood, or in serum. To assay ALT levels, a 35 μ L sample was dispensed into an ALT test cassette and then processed in the Cholestech L•D•X[®] Analyzer. Results were available in 5 minutes. Precision of the L•D•X ALT method was determined with commercial control materials, a frozen serum pool, and a whole blood sample using a modified NCCLS protocol. Accuracy was assessed by comparing the L•D•X ALT method with clinical diagnostic laboratory reference methods (n = 309). Specimens were obtained from healthy individuals and from patients afflicted with liver disease or receiving drug therapies known to increase serum ALT levels. Within-run coefficients of variation (CVs) for L•D•X ALT ranged between 3.1% and 4.2%. Total precision CVs were from 4.6% to 6.5%. Serum L•D•X ALT values were highly correlated with serum ALT values measured by a reference method: L•D•X ALT = 1.00 x Reference ALT - 2, r = 0.98. Similar data were obtained for comparisons between L•D•X ALT and an IFCC standardized reference method using venous whole blood. L•D•X ALT is a rapid, reproducible method for measuring ALT yielding results that are comparable to those obtained by reference methods in a clinical diagnostic laboratory.

Introduction

Alanine aminotransferase (ALT, formerly known as glutamate pyruvate transaminase or GPT) is an enzyme that catalyzes the conversion of alanine to pyruvate. ALT is found in muscle, liver and other tissues but it is most prevalent in the liver. ALT levels are a reflection of alterations in liver function and therefore are a valuable measurement of damage to the liver. Liver damage may be due to chronic alcohol or drug ingestion, or infection.

There are a number of lipid-lowering drugs available to treat hyperlipidemia. A side effect of such therapy can be a persistent increase in serum ALT (to more than 3 times the upper limit of normal) in about 1% of patients receiving lipid-lowering therapy. It is suggested that patients undergoing lipid-lowering drug therapy should be tested for ALT before (baseline) and shortly after initiation of therapy and then periodically thereafter to determine the ALT levels.

A complete lipid panel can be measured in 5 minutes using 35 μ L of whole blood obtained by fingerstick applied to the CLIA-waived Cholestech L•D•X System. This testing methodology enables baseline and follow-up assessments during a patient visit with a physician or other allied health professional. Until now, however, assessing the potentially toxic effects of lipid-lowering and other therapies on the liver required that a blood sample be sent to a moderate complexity testing laboratory.

In the present study, the precision of the L•D•X ALT method was assessed and accuracy of L•D•X ALT was

determined by comparison with reference methods performed in clinical diagnostic laboratories.

Methods

Healthy individuals, patients with clinically diagnosed liver disease due to drugs or alcohol, hepatitis B or C infection, thiorazine, or acetaminophen, or patients receiving atorvastatin, pravastatin, or troglitazone, participated in this study. Venous whole blood (lithium heparin) and serum were collected by standard venipuncture technique. Serum and plasma were stored frozen until assay. Capillary whole blood specimens were obtained by fingerstick using a 35 μ L lithium heparin-coated capillary tube and tested immediately.

All specimens were analyzed using ALT test cassettes and the Cholestech L•D•X Analyzer (Cholestech, Hayward, CA). Venous serum and plasma specimens were also analyzed using one of two clinical chemistry methods: routine ALT method and IFCC-standardized ALT method (both Synchron CX[®], Beckman Coulter, Fullerton, CA).

L•D•X ALT precision was assessed according to NCCLS protocol EP5-A, Evaluation of Precision Performance of Clinical Chemistry Devices; Approved Guidelines (1998). ALT methods were compared using least squares linear regression.

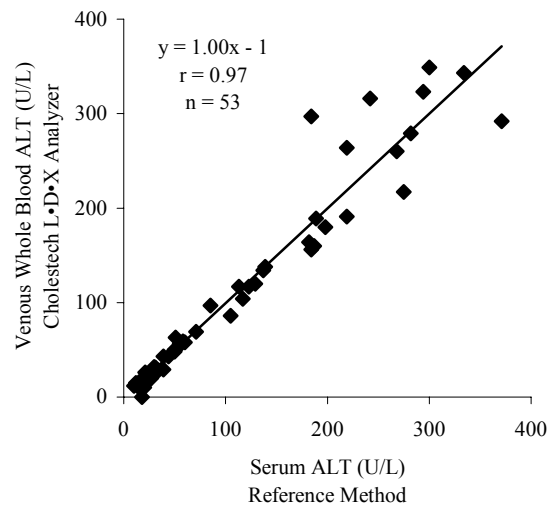
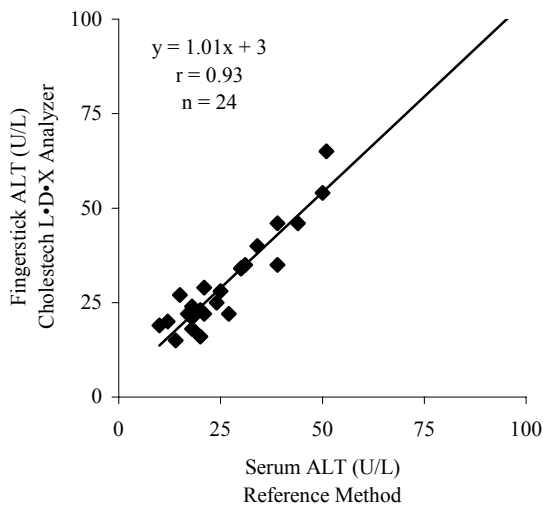
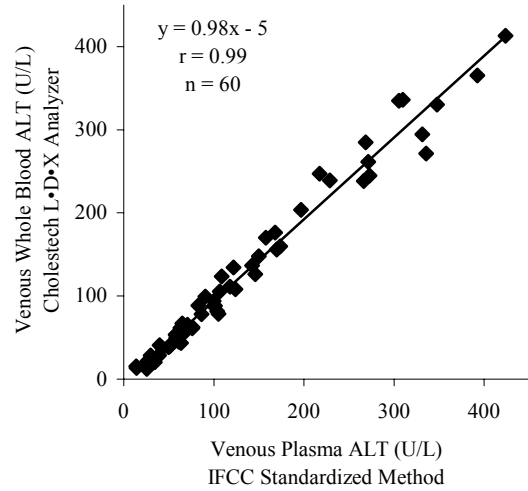
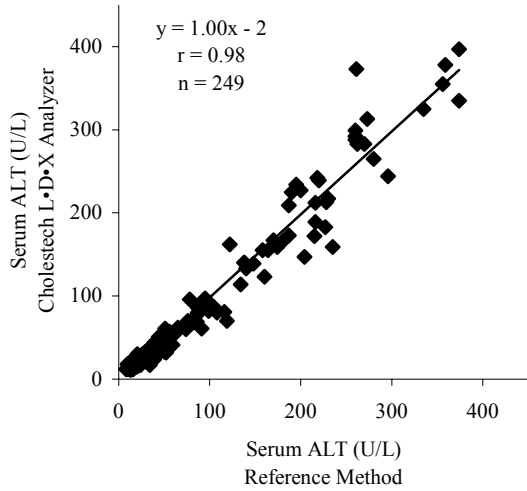
Results

Total and within-run precision of the L•D•X ALT test cassettes was less than 7% CV (Table). Serum L•D•X

Table. Precision of Cholestech L•D•X ALT

	Control Level 1	Control Level 2	Frozen Serum Pool	Whole Blood	
Mean (U/L)	31	58	169	Mean (U/L)	55
Within-run CV (%)	3.2%	3.1%	3.4%	Within-run SD (U/L)	2.3
Total CV (%)	5.4%	4.6%	6.5%	Within-run CV (%)	4.2%

Figures. Comparisons between the Cholestech L•D•X ALT method and clinical diagnostic laboratory reference and IFCC Standardized methods.



ALT values were highly correlated with serum ALT values measured by a reference method (Figures). Capillary whole blood values obtained by fingerstick were similarly correlated with a reference method (Figures). Comparisons between L•D•X ALT (venous whole blood) and an IFCC standardized reference method (plasma) also yielded a strong correlation (Figures).

Conclusions

A new method enables rapid ALT measurement with a fingerstick whole blood sample. Accuracy and reproducibility of Cholestech L•D•X ALT is comparable to that obtained by reference methods used routinely in clinical diagnostic laboratories.