

Abstract

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Direct determination of lipoprotein particle sizes and concentrations by ion mobility analysis.

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BACKGROUND: Current methods for measuring the concentrations of lipoprotein particles and their distributions in particle subpopulations are not standardized. We describe here and validate a new gas-phase differential electrophoretic macromolecular mobility-based method (ion mobility, or IM) for direct quantification of lipoprotein particles, from small, dense HDL to large, buoyant, very-low-density lipoprotein (VLDL).

METHODS: After an ultracentrifugation step to remove albumin, we determined the size and concentrations of lipoprotein particles in serum samples using IM. Scan time is 2 min and covers a particle range of 17.2-540.0 Å. After scanning, data are pooled by totaling the particle number across a predetermined size range that corresponds to particular lipoprotein subclasses. IM results were correlated with those of standard methods for cholesterol and apolipoprotein analysis.

RESULTS: Intra- and interassay coefficients of variation for LDL particle size were <1.0%. The intra- and interassay variation for LDL and HDL particle subfraction measurements was <20%. IM-measured non-HDL correlated well with apolipoprotein B ($r = 0.92$).

CONCLUSIONS: The IM method provides accurate, reproducible, direct determination of size and concentration for a broad range of lipoprotein particles. Use of this methodology in studies of patients with cardiovascular disease and other pathologic states will permit testing of its clinical utility for risk assessment and management of these conditions.

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