

## Determination of Lead in Blood by Laser Ablation ICP-TOF-MS Analysis of Blood Spotted and Dried on Filter Paper: A Feasibility Study

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### Abstract:

Screening programs for pediatric lead (Pb) poisoning routinely collect blood by finger stick onto specially designed filter paper (FP) for subsequent laboratory testing. Here, laser ablation inductively coupled plasma time-of-flight mass spectrometry is evaluated as a novel method for the determination of Pb in blood spotted onto FP cards. The method requires no sample pretreatment and may be particularly suitable for rapidly screening a large number of samples. Signal intensity from the ICP-MS strongly correlated ( $r^2 = 0.996$ ) with Pb target values for five blood cards from a laboratory proficiency testing program. Better precision was obtained by replicate ablation line scans (<15% rsd) compared to a grid of 25 individual ablation spots (>30% rsd). Because <2% of the sample is consumed in the laser ablation analysis, selected samples can also be analyzed by traditional techniques or archived. Lead isotope ratios determined during the same total-Pb analysis appear to be effective for discerning contamination extraneous to the blood sample. Determining that an elevated result was due to contamination may negate the need for retesting with invasive pediatric venipuncture. Some elements monitored along with Pb exhibited signal profiles conducive to potential quantitation (Ca, V, Fe, Cu Zn), whereas others did not (Cr, Mn, Co, Ni, Cd, Hg, Tl, U). Copper, Ca, and V were inversely correlated with Pb ( $r = -0.89$ ,  $-0.90$ , and  $-0.92$ , respectively). Scanning electron microscope images revealed surface modality differences between FP spotted with fresh whole blood and reconstituted freeze-dried blood reference material.

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