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SIMULTANEOUS MEASUREMENT OF MULTIPLE TRACE ELEMENTS IN HUMAN PLASMA BY USE OF A PROTON BEAM AND COMPARISON WITH OTHER METHODS (AA AND NEUTRON ACTIVATION) AND THE APPLICATION TO POPULATIONS AT RISK NUTRITIONALLY

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During the last two years, small plasma samples (µl) held on various foils have been subjected to a proton beam (2 MeV) in a Van de Graaff Accelerator. Multiple trace metals could be identified following several minutes of bombardment but for precise quantitation three problems existed: (a) sample preparation (b) type of foil to hold sample (c) selection of appropriate internal standard (which will not screen out Xray energy peaks of other important trace metals). It has been found:

(1) that contrary to other contemporary work (Vis *et al.*, Nuclear Instruments and Methods 142 p. 159, 1977) ashing of the plasma (600°C for 40 minutes) is necessary to offset background interference from protein;

(2) that gallium chloride (1µg) is satisfactory as an internal standard and

(3) that hostaphan foil polyester with very thin aluminium backing (4µm in thickness) is an optimal foil to hold the ashed plasma.

Our group is mainly concerned with plasma Zn, Cu, Cr, Fe and Se in individuals offered less than optimal diet (e.g. aboriginal peoples). It has been established by AA that high Cu and low Zn and Fe levels exist in the plasma of these peoples and our attention is directed to Cr (present in the glucose tolerance factor) due to the high incidence of diabetes mellitus. The methodology for Cr determination is very difficult and while Neutron Activation (carried out by one of us [TCH]) would appear to be the most precise but very tedious and time-consuming - it is possible that the proton beam may yield a more satisfactory approach, taking minutes instead of months.

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