

Simultaneous Analysis of 25 Trace Elements in Micro Volume of Human Serum by Inductively Coupled Plasma-Mass Spectrometry

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Abstract : In recent years, trace elements have gained importance as biomarkers in many chronic diseases. Unfortunately, the requirement for sample volume increases according to the extent of investigation for diagnosis or elucidating the mechanism of the disease. Here, we describe the method development and validation for simultaneous determination of 25 trace elements (lithium (Li), beryllium (Be), magnesium (Mg), aluminium (Al), vanadium (V), chromium (Cr), manganese (Mn), iron (Fe), cobalt (Co), nickel (Ni), copper (Cu), zinc (Zn), gallium (Ga), arsenic (As), selenium (Se), rubidium (Rb), strontium (Sr), silver (Ag), cadmium (Cd), caesium (Cs), barium (Ba), mercury (Hg), thallium (Tl), lead (Pb), uranium (U)) using just 20 μ L of human serum. Serum samples were digested with nitric acid and hydrochloric acid (ratio 1:1, v/v) and analysed using inductively coupled plasma-mass spectrometry (ICP-MS). Seronorm®, a human-derived serum control material was used as quality control samples. The intra-day and inter-day precisions were consistently < 15% for all elements. The validated method was later applied to 30 human serum samples to evaluate its suitability. In conclusion, we have successfully developed and validated a precise and accurate analytical method for determining 25 trace elements requiring very low volume of human serum.

Keywords : acid digestion, ICP-MS, trace element, serum

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