

DETERMINATION OF MINERAL ELEMENTS CONTENTS IN HUMAN HAIR SAMPLE BY NEUTRON ACTIVATION ANALYSIS

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The knowledge of mineral elements contents in human hair samples can give valuable information about the health status of individuals and is gaining increasing use as a relevant clinical tool. It is of utmost importance the determination of two main groups of elements in hair samples, in order to obtain the so-called mineralogram as complete as possible: the essential and toxic elements.

In the first group are included elements such as: calcium, iron, potassium, magnesium, sodium, zinc and selenium. As to the elements that can be considered toxic to humans are, among others: arsenic, cadmium, lead and mercury. Although the contents of these elements in hair are at least a power of ten higher than in blood and urine, they still are present in ranges from $\mu\text{g}/\text{kg}$ to $\mu\text{g}/\text{g}$, so it is necessary to use analytical techniques that are sufficiently sensitive as well as accurate and precise for this kind of determination.

The mineralogram is generally obtained with the use of techniques like ICP-AES and ICP-MS that are able to determine a considerable number of essential and toxic elements. In the Radiochemistry Division of IPEN/CNEN-SP, neutron activation analysis (NAA) is being applied as an alternative method to obtain data on mineral elements contents in human hair samples. NAA is characterized by a good sensitivity as well as accuracy and precision and has been extensively applied to analysis of trace elements in biological samples.

The elements that can generally be determined by this method, using different irradiation conditions are: Al, As, Br, Ca, Cd, Cl, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Sb, Sc, Se, V and Zn. For quality assurance of the analytical results, several reference materials like NIES No.5 Human Hair SHINR-HH Human Hair , IAEA-085, IAEA-086 were also analyzed by NAA and there was good agreement with certified values. Hair samples from individuals from a control groups and also from groups of patients from medical clinicals are being analyzed by NAA. (FAPESP, CNPQ).