

HAIR ANALYSIS: APPLICATIONS IN THE BIOMEDICAL AND ENVIRONMENTAL SCIENCES

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In 1954, Flesch suggested the use of hair as a biopsy material for trace elements in the body. He proposed that hair could function as an excretory organ for arsenic and maybe for other toxic elements. Since then, extensive experimental work has been accomplished in order to investigate if hair can be used as a reliable biomonitor for the assessment of nutritional status, diagnosis and prevention of diseases, identification of systemic intoxication and monitoring of environmental and occupational exposure. The developments in analysis of trace elements in hair have accompanied the developments in trace analytical techniques, such as atomic absorption spectrometry, neutron activation analysis and inductively coupled atomic absorption spectrometry (ICP-AES). Today more than 40 elements have been detected in hair and the concentrations of most elements are at least a power of ten higher than they are in blood and urine. Hair as a biopsy tissue has the advantage that it is very easy to collect, not causing any pain to the donor. Besides, it is very stable at room temperature, which makes its transport and handling much easier. Another important advantage of hair as a tool for biomedical studies is that it can reflect the concentration of several elements along a given period of time, which does not happen with blood and urine, for instance, which give instantaneous concentrations.

In the present paper, results are presented of hair analysis carried out at the Radiochemistry Division of IPEN (Brazilian Nuclear Energy Commission), by neutron activation analysis (NAA). NAA is a very powerful multielemental technique for trace analysis, presenting high accuracy, precision and sensitivity, specially when a nuclear reactor is used as the neutron source, such as the IEA-R1 nuclear research reactor of IPEN.

The elements As, Br, Ca, Cd, Cl, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Sb, Se and Zn have been determined in hair samples from patients of the Deucher Clinic in São Paulo and of a control group, at the ppb to the ppm level. In an environmental study related to Hg intoxication by fish consumption, this element has been determined in hair of several population groups: a control one, a group of people living near the Billings Dam in S.Paulo and in three Indian tribes from the Amazonian region.

The results obtained in both studies are discussed in the present paper. Financial support: AIEA, FAPESP, CNPq.