

## MULTIELEMENTAL ANALYSIS OF BIOLOGICAL SAMPLES FOR CLINICAL STUDIES BY NEUTRON ACTIVATION ANALYSIS

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During the last two decades, increased attention has been given in clinical practice and research to trace element contents in various biological materials, mainly in tissues and biological fluids from humans. Thus the biologically significant elements, which include toxic ones and ones needed to maintain vital activities and normal mineral metabolism, have been analyzed in these biological samples to elucidate their role in human health and nutrition, to be used in the diagnose of diseases as well as to evaluate risks originated from environmental and occupational factors. At the Neutron Activation Analysis Laboratory, detailed protocols for sampling and treatment of biological samples have been established and the neutron activation analysis has been applied in the following research projects:

1). Multielement analysis of human bone tissue. Human rib bone samples were provided from Serviço de Óbitos da Capital (SVOC-USP) and the cortical and trabecular bone tissues were analyzed separately. Statistical test applied to the results obtained in these analyses showed significant difference between the concentrations obtained for cortical and trabecular tissues. Ca, Mg, Na, P, Sr and Zn presented higher concentrations in cortical tissues than those in trabecular ones.

Concentrations of Br, Cl and K presented in cortical tissues were slightly lower than those obtained in trabecular ones. Besides results obtained for total calcinated rib bones were higher than those obtained for freeze-dried cortical and trabecular bones because of different procedure used for sample drying.

The calcination is an easy process for bone treatment, however it showed loss of Br and Cl.

2). Trace element determinations in serum samples from healthy elderly population in São Paulo city, SP. There is an increasing interest of trace element determinations in serum samples to investigate their vital role in human metabolism, as well as, to provide an important basis for clinical disorders and intoxication diagnosis. However, data of reference values or reference intervals of elemental concentrations in sera are very scarce since these determinations require the establishment of an adequate protocol for sampling, reference population selection, control of possible sample contamination and quality control of the analytical results. In this study a protocol for trace element determination in serum was defined and preliminary results were obtained for samples from healthy elderly volunteers attended at the Hospital das Clínicas, FMUSP.

The analyses of serum from elderly population are relevant to study the association of the level of elements found in this population group with problems in aging. The blood contamination of trace elements leached from sampling and storage devices were evaluated using diluted nitric acid

solution. The donors were submitted for medical history, biochemical exams and they were selected based on the SENIEUR protocol. Blood samples were collected in tubes without anticoagulant and the serum was separated by centrifugation. The freeze-dried serum samples were analyzed by instrumental neutron activation analysis and the elements Br, Ca, Cl, Fe, Na, Rb, Se and Zn were determined.

These results were within the accepted value ranges used by doctors for a normal population.

3). In vitro evaluation of the enamel dental wear by glazed and polished dental porcelains. The disadvantages of using dental porcelain are its low impact strength and the possibility of causing wear to natural teeth or to dental materials. It is also known that texture of porcelain surface may affect on the tooth wear. The aim of this study was to evaluate the influence of the glazed and polished porcelains on its abrasiveness by measuring the wear caused to human dental enamel. For this study, the flattened dental enamel samples were irradiated at the IEA-R1 nuclear reactor and then they were submitted to the surface wear test with the antagonistic materials constituted of three brands of commercial porcelains (Ceramco, Noritake and Finesse). The dental loss or the wear was evaluated by measuring the beta activity of <sup>32</sup>P released from the tooth surfaces. Results obtained for these three brands of porcelains showed no statistical difference between the enamel wear caused by glazed and polished porcelains.

4). Element determinations in Casearia medicinal plants and their extracts. Medicinal plants are being used as remedies for various diseases across the world and the elemental determinations in these plants have becoming of increasing interest since several elements can play an important role in human health and disease and in their pharmacological effect. In this study three species of Casearia genus (*C. sylvestris*, *C. decandra* and *C. obliqua*) medicinal plant collected at the Atlantic Forest have been analyzed to verify if there is a correlation between their elemental concentrations and pharmacological effects. The Casearia leaves are used as an antiseptic, cicatrizing and topical anesthetic agent and have been widely studied for its antiulcer property. Comparisons were made among the element concentrations obtained in these three Casearia species and significant differences were found for the elements Cl, Co, Cs, Cr, La, Mn, Na and Sc.