

MULTIELEMENTAL CHARACTERIZATION OF BIOLOGICAL SAMPLES IN HUMAN AND ANIMAL NUTRITION BY NEUTRON ACTIVATION ANALYSIS

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Inorganic elements are involved in a large number of biological processes in the human and animal bodies. There are several studies in the literature indicating the association of many disorders with mineral deficiencies or excess.

In contribution to studies in human and animal nutrition, Neutron Activation Analysis (NAA) has been applied to determine essential and toxic elements in the several studies.

1) Assessment of mineral, trace and toxic elements in diet samples from different regions of Brazil:

1.a) Estimates of essential and other trace element intake by the daily diets of different population groups are being carried out periodically by the Neutron Activation Analysis Laboratory-CRPO of IPEN/CNEN in collaboration with the Department of Food and Experimental Nutrition of the University of São Paulo. In this period, diets have been evaluated regarding nutritional status of mineral, trace and toxic elements, in pre-school children (Amazon region).

1.b) Another study is being performed in collaboration with Adolfo Lutz Institute (IAL-SP), Food and Technology Institute (ITAL-Campinas) and Isotopic and Chemical Characterization Division at IPEN/CNEN-SP. In this study, workers' diet samples are being evaluated by different analytical methodologies such as NAA, ICP-AES, WD-XRFS, AAS-Flame and Graphite Furnace and Voltametry to determine mineral, essential and toxic trace elements. The diets of 26 workers from the steel industry were collected by duplicate portion technique. The diets represented 3-day food consumption.

2) Determination of mineral, toxic and trace elements in foodstuffs by Instrumental Neutron Activation Analysis The purpose of this study was to establish the chemical composition of different foodstuffs (mineral and trace elements) by using INAA:

2.a) typical fruits and vegetables from Amazon region. This study is being carried out in cooperation with Dra. Lucia K. Yuyama from INPA (Instituto de Pesquisas da Amazônia);

2.b) diets from the Amazon region in order to assess the Hg and mineral contents.

2.c) Multi-mixture samples - these samples are composed of a mixture of eggshells, rice and wheat skin flour, sunflower and pumpkin seeds and manioc leaves. Both multi-mixture and its components individually are being analyzed. This study is being carried out in collaboration with Dalva M.N. Furtunato and Dr. Sérgio L. Costa Ferreira from Universidade Federal da Bahia.

3) Effect of liming and fertilizer use on mineral content and productivity of *Brachiaria decumbens* grass forage. Forage grass suffers constant loss of vigor, productivity and quality in the pasture degradation process, on account of inadequate nutrient management, besides of stocking rate. Thus, to restore or to maintain good tropical pastures it is of priority to know the adequate supply of acidity correctives and fertilizers, to be applied. It is well known that the pH increase in soil surface layers may result in undesirable changes of nutrient elements levels in forage tissues. Neutron activation analysis has been applied to estimate inorganic element concentrations in aboveground part of *Brachiaria decumbens*. This forage was grown on a degraded pasture, submitted to a recovery process and in intensive management phase, where different limestone doses were applied to the soil surface, and fertilizer was top dressed after each cutting or grazing in the rainy season.

4) Multielemental characterization of mineral and organic fertilizers. Actions aimed at the production of foods in a sustainable way and preserving the environment should be the concern of the current and of the future economically powerful nations. Most of the raw materials used to produce fertilizers have a tendency to hold toxic elements to plant, animal and man. Therefore, it is necessary a better understanding and controls of the qualitative characteristics of input used in agriculture. Neutron activation analysis presents potential for quality input control. In this way, it has been applied to characterize several mineral fertilizers available commercially and widely used in Brazilian agriculture and, organic fertilizers just as "biossolid" and composed of urban garbage.