DETERMINATION OF TRACE ELEMENTS IN HUMAN LUNG SAMPLES

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Neutron activation analysis has been applied to the determination of trace elements in lung samples. A detailed study of the elemental composition profile of tissue samples collected from smokers is of great interest in order to provide additional information on the effect of tobacco smoking on the lungs.

Tissue samples were obtained from seven smokers and six non-smokers classified according to information provided by their closest relative. As an internal control a sample was collected from one child dead by intrauterine events.

Samples of lung tissues and lung hilum lymph nodes were obtained from autopsies and submitted to cryogenic homogenization, lyophilization and sterilization using a ^{60}Co source. Precautions were taken during this preparation step to avoid contamination.

The analytical method used for the determination of trace element concentrations was the instrumental neutron activation analysis. Lung samples and environmental and biological reference materials were irradiated together with the synthetic standards of elements in the IEA-R1 swimming-pool type research reactor and after adequate decay periods, gamma ray measurements were carried out using a Ge(Li) detector.

Irradiations of 30 min under a neutron flux of 3.7 x 10^{11} n $cm^{-2}s^{-1}$ were performed to determine Cl, K, Mn and Na and longer irradiations of 16 hours under a flux of 10^{13}n $cm^{-2}s^{-1}$for the determinations of Br, Cr, Cs Fe, Hf, La, Rb,

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Sb, Sc, Se, Th and Zn.

Results of replicate determinations in a lung tissue sample showed a good reproducibility of the method for most elements analysed with relative standard deviations lower than 10.5% . Also the accuracy of the method was evaluated by analyzing IAEA Animal Muscle H-4, NIST Bovine Liver 1577a, IUPAC Bowen's Kale and NIES Vehicle Exhaust Particulates and their results showed in general a good agreement with published values.

Although a considerable inter-subject variability was observed, the elemental analysis results for non-smokers were within the range reported in the literature except for the Cl and Hf. Results obtained for lymph nodes could not be compared since literature published data for this type of tissue are scarce.

Sb levels in lung tissues were significantly higher in smokers in comparison with non-smokers. Lymph nodes presented the same behaviour observed for lung tissues. This finding indicates that hilum lymph nodes may due to their physiological function of draining and clearance of exogenous material, be used as indicator of elemental composition profile in lungs.

The analysis performed for stillborn tissue revealed either lower levels of most elements when compared to those obtained from adult non-smokers, or in some case they were not detected. (Work supported by CNPq and FAPESP from Brazil)