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Activation by Neutrons and Related Analytical Methods as a Tool of Medical Elementology

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The new direction in medicine that emerged in the second half of the XX century –medical elementology – opens fundamental basis for the development and use of new methods of diagnosis and treatment of various diseases, including oncological ones, as well as for solving many other problems facing modern medicine. The subject of research in this new direction consists of four points:

- study of patterns of content and distribution of chemical elements (ChE) in various systems of the human body, organs, tissues, liquids, cells, subcellular structures and biological molecules, under conditions of constant contact and exchange with the environment, considering gender, age, physiological cycles, nationality, race, profession, social status, everyday traditions, lifestyle and bad habits of the individual;

- determination of the role and degree of participation of ChE in the construction and normal functioning of vital systems of the body at all levels of its organization during the periods of origin, formation, maturity and involution, under conditions of constant contact and exchange with the environment;

- study of adaptive shifts in the content of ChE in the body at all levels of its organization with changing conditions in the environment, extreme loads and external influences;

- identification of the role of ChE in the etiology and pathogenesis of various diseases, as well as the effectiveness of using chemical elements in corrective and therapeutic measures.

The outlined subject of the new direction implies a wide range of tasks and their scale. The selected tool - neutron activation analysis (NAA) and related analytical methods, having unique advantages over other methods of determining ChE, allows successfully solving the set tasks.

These unique advantages include the ability to simultaneously determine the content of about 45 ChE in the studied medical and biological samples without their destruction and preliminary preparation for analysis, as well as the ability to in vivo determine some ChE in organs and tissues of the human body. The non-destructibility and multi-element nature of the tool determine its productivity, and in vivo analysis capability is of exceptional interest for the development of non-invasive diagnostic methods.

This report presents specific examples of the use of NAA and related analytical methods in oncology, environmental medicine and pharmaceuticals.

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