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Evaluation of biochemical biomarkers in brain tumors with different grade of malignancy

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Molecular oncology is in need of the application of structural methods which are capable of monitoring biochemical processes and interactions within the neo-plastic tissues. A sort of elemental fingerprinting of brain tumors could provide a very useful tool assisting the process of diagnosing of tumors in difficult or disputable cases. The purpose of our studies was investigating if concentrations of minor- and trace elements in the malignant tissues can be used for differentiation and/or classification (diagnosis) of brain tumors. The X-ray fluorescence micro spectroscopy (XRF) and total reflection X-ray fluorescence spectroscopy (TXRF) were applied for chemical elemental analysis of brain tumors. The results of analysis were evaluated with the use advanced statistical methods. The samples designed to elemental analysis were taken intra-operatively from brain tumors of different types and with different degrees of malignancy. It was found that S, Cl, Cu, Fe, K, Br and Zn are the most significant elements in the general discrimination of tumor type. Studies including the imaging of the areas containing calcifications in brain tumors showed that the high level of Ca was accompanied by the increased level of Cl, K, P, S and Zn. Increased levels of iron, zinc, bromine and rubidium in the wall of the blood vessel were observed as well as slight penetration of these elements into the tissue surrounding the vessel. The results obtained showed that the elemental composition of a relatively small fragment of homogeneous tissue represents satisfactorily the biochemical signature of cancer.

Biography

Marek Lankosz is a Professor at the Faculty of Physics and Applied Computer Science at the AGH University of Science and Technology, Krakow, Poland. He is a Head of the Chair of Medical Physics and Biophysics. His scientific activity has mainly focused on XRF microanalysis, X-ray absorption micro-spectroscopy, infra-red micro-spectroscopy. His latest research interest includes application of synchrotron radiation in biological and medical research in relation to morbidities, with focus on tumor, Parkinson disease and amyotrophic lateral sclerosis. The results of his studies were published in numerous articles.

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