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EVALUATION OF CHEMICAL BIOMARKERS IN SELECTED TUMORS WITH DIFFERENT GRADE OF MALIGNANCY

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Abstract: The literature studies indicate an essential role of minor and trace elements in a carcinogenesis. The elemental abnormalities in various forms of cancer were reported over the past decade. However, the exact role of elements in carcinogenesis remains unknown. Molecular oncology is in need of the application of structural methods which are capable of monitoring biochemical processes and interactions within the neoplastic 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 investigated if concentrations of minor- and trace elements in the malignant tissues can be used for differentiation and/or classification (diagnosis) of brain and ovarian tumors. The X-ray fluorescence micro spectroscopy (XRF) and total reflection X-ray fluorescence spectroscopy (TXRF) were applied for elemental analysis of brain and ovarian tumors. The results of analysis were evaluated with the use advanced statistical methods. The samples designed to elemental analysis were taken intraoperatively from brain and ovarian tumors of different types and with different degrees of malignancy. Two types of samples were measured, cryo-preserved thin slices and frozen fragments of resected tumor tissues. The XRF microscopy was performed in thin freeze-dried cryo-sections. Prior to TXRF analysis, the tissue samples were digested in nitric acid in a pressure vessel. The aim of the digestion was to remove from the tissue sample light elements such as N, C, P, and S. The samples were prepared by placing a droplet of fluid on a microscopic slide, which was dried in vacuum. From XRF imaging and TXRF analysis it was found that S, Cl, Cu, Fe, K, Br, and Zn are the most significant elements in the general discrimination of brain tumor types. It was also found that K, Cl, S, Br, Fe are the most significant elements in the general discrimination between types of ovarian cancers. With results obtained it was found that trace metals could be used to correctly identify cancerous tissue and effectively classify the cancer stage.

Key words: Ovarian cancers, brain tumors, chemical elemental analysis, biochemical biomarkers.

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