ANALYSIS OF METAL CONTENT AND DISTRIBUTION IN PROFILING NORMAL AND TUMOR TISSUES FROM THREE HUMAN CARCINOMAS

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Abstract: Studies have shown that elemental / metal homeostasis is very essential to the development of the cancer phenotype in many cancers including lung and liver carcinomas. The balance in the composition of trace elemental metals was recognized to be essential to normal human homeostasis. To this end, accumulation of potentially toxic or nonessential trace metals was implicated in toxicity and in the development of many diseases including cancer. Overall, experimental evidence has scientifically substantiated that metal concentrations place an important role in carcinogenesis, etiology and development of the cancer phenotype. The aim of this study was to investigate the differential relationship of metal concentrations and profiles in cancer and normal tissues of humans. The study hypothesized that elemental/metal concentrations and profiles will show significant differences between cancer and normal tissues as well as between different tissue types in humans. The study will also establish critical elemental /metal profiles that provide correlations with the development of three major cancers. Normal human and tumor tissues of lung, breast and liver tissues used in this study were obtained from US Biomax Company. Tissue samples were prepared using standardized digestion procedure and the ICP-AES (Inductively Coupled Plasma-Atomic Emission Spectrometry) was used to determine the concentrations and profiles of 21 elements including Ag, Al, As, Ba, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Na, Ni, Pb, Sb, Se, Sr, Ti, V, and Zn. Results showed that nine major elements of Al, Ba, Ca, Cr, Cu, Fe, Mg, Na, and Zn were found to be significantly different in term of their concentrations/profiles in normal and tumor tissues of human lung, breast and liver. These critical elements appeared to be respectively five to ten times more abundant in human lung and breast tumor than in their respective normal tissues. In contrast, Ba, Cr, Cu, Fe, Zn, concentrations have shown to be lower in liver tumors than they were in normal liver tissues, and that Ca and Na appeared to be higher in human liver tumors than in normal liver tissues.. Analysis of data showed significant variations in elemental concentrations and profiles consistent with the hypothesis. It is concluded that metal / elemental homeostasis is essential for normal tissue function and that shifts in elemental distribution and content are tissue specific as well as carcinoma specific. These results are promising and warrant further studies to confirm and exploit the possibility of manipulating elemental distribution / content as a cancer therapeutic modality.

Keywords: Metal homeostasis, Cancer, elements, Normal tissues, carcinoma, Profile

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