

Role of trace elements in early detection of cancer

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Abstract

Introduction: According to the International Agency for Research on Cancer (IARC) 19 million new cases of cancer are diagnosed every year worldwide. In Poland above 171 000 new cases of cancer are diagnosed each year. Due to a large number of cancers, it is important to try to identify new early detection markers. For many years, elements' effects on human life and health, including the occurrence of cancer, have been widely studied. In this research we want to find whether selected elements (Se, Cu, Cd) levels in serum/blood could be related to the cancer occurrence.

Methods: For analysis, 10 mL of peripheral blood was collected for elements levels in serum/blood and were determined at the time of diagnosis of cancer, before the start of treatment. Elements levels were quantified by inductively coupled mass spectrometry (ICP-MS). We assigned patients to one of four categories of elements levels based on the distribution of selected element levels in the entire study group. All statistical calculations were performed using: R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria (R version 4.04). The studies was conducted in accordance with the Helsinki Declaration and with the consent of the Ethics Committee of Pomeranian Medical University in Szczecin under the number KB-0012/73/10. All participants provided written consent to be enrolled in the herein studies.

Findings: Low selenium level was associated with an odds ratio of 5.81 (95% CI: 2.18 to 16.52; $p = 0.0001$) for lung cancer, 5.44 (95% CI: 2.14 to 14.62; $p < 0.001$) for laryngeal cancer and 13.78 (95% CI 6.31 to 29.82; $p < 0.001$) for colorectal cancer. Moreover, odds ratio for colorectal cancer for those in the highest quartile of copper level (versus the lowest) was 12.7 (95% CI: 4.98 to 32.3; $p < 0.001$). In research on blood cadmium level as a marker for early lung cancer detection - odds ratio for those in the highest quartile of cadmium level (versus lowest) was four-fold higher (OR = 4.41, 95% CI: 2.01 to 9.67; $p < 0.01$). The association was present in former smokers (OR = 16.8, 95% CI: 3.96 to 71.2, $p < 0.01$), but not in current smokers (OR = 1.23, 95 % CI: 0.34 to 4.38) or in never smokers (OR not defined).

Conclusion: Low selenium level ($<60 \mu\text{g/l}$; serum) may be a marker for early detection of the lung, larynx and colorectal cancers. High copper level ($>930 \mu\text{g/l}$; blood) may be a marker for early detection of colorectal cancer. High level of cadmium ($>0.47 \mu\text{g/l}$; blood) may be a marker for early detection of lung cancer, especially in former smokers. It seems that determining the level of Se, Cd and Cu could be a marker for selection for control examinations in surveillance as a valuable complement to existing diagnostic procedures.