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Increased levels of transition metals in breast cancer tissue

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Abstract

Objectives: High levels of transition metals such as iron, nickel, chromium, copper, and lead are closely related to free radical generation, lipid peroxidation, formation of DNA strand breaks, and tumor growth in cellular systems. In order to determine the correlation to malignant growth in humans, we investigated the accumulation of heavy metals in 20 breast cancer biopsies and compared the findings to the levels found in 8 healthy biopsies.

Methods: The concentration of transition metals in breast cancer and control biopsies was assessed by a standardized Atomic Absorption Spectrofotometry technique with acidic hydrolysis for sample preparation. Additionally, heavy metal analysis in control biopsies was also performed with an Inductive Coupled Plasma--Mass Spectroscopy technique. For statistical analysis of the results, the Mann-Whitney U Test was applied.

Results: A highly significant accumulation of iron ($p<0.0001$), nickel ($p<0.00005$), chromium ($p<0.00005$), zinc ($p<0.00001$), cadmium ($p<0.005$), mercury ($p<0.005$), and lead ($p< 0.05$) was found in the cancer samples when compared to the control group. Copper and silver showed no significant differences to the control group, whereas tin, gold, and palladium were not detectable in any biopsies.

Conclusions: The data suggest that pathological accumulation of transition metals in breast tissue may be closely related to the malignant growth process.