Elemental bones

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Exposure to chemical pollutants is of growing concern to regulators, health workers, and environmentalist groups alike. Now, researchers in the US and Russia have demonstrated that samples of human bone can act as a biological marker for dozens of metals and toxic elements across the periodic table. They describe details in a study published in the *International Journal of Environment and Health*.

Sofia Zaichick of the Department of Immunology and Microbiology, at Northwestern University, in Chicago, and her father Vladimir Zaichick of the Department of Radionuclide Diagnostics, in the Medical Radiological Research Centre of Russian Academy of Medical Sciences, in Obninsk, describe analyses of rib bones. The team used Instrumental Neutron Activation Analysis (INAA) and Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES) to analyze the intact rib-bone post mortem of 84 previously healthy 15 to 58 year-old citizens of a non-industrial region in the Central European part of Russia. They applied statistical methods to observe any effect of age and gender on major, minor and trace element content of the bone.

Of the 92 natural chemical elements in the periodic table, not counting those from which human tissues are mainly composed, including carbon, hydrogen, oxygen, and nitrogen, the team demonstrated the presence of 44 additional elements. Among them are toxic elements, such as aluminum, arsenic, samarium and thallium, as well as the trace elements necessary for life, including calcium, iron, magnesium, and phosphorus.

"Bone is a tissue in which the turnover of these elements, particularly those that have an affinity for bone, is extremely slow and their biological half-lives are estimated to be from few years to decades," the team explains. "This gives bone several important features as a subject of environmental monitoring."

The amount of any particular element in bone at a given time correlates with a person's intake or exposure to that element over a period of years. For elements with a strong affinity for bone, then accumulation is higher than in other tissues and so can reveal even low-level exposure after a long period. Moreover, given that the skeleton constitutes much of our body mass, the element level in bone may reflect total body content. "Bone is therefore a suitable index medium for evaluation of low-level and long-term exposure and the body burden of toxic bone-seeking elements," the team adds.

The current research paper provides a base line for bone analysis of a wide range of elements that might now be monitored in terms of environmental and dietary exposure in which gender, age, domicile and other factors are taken into account.

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