High naturally occurring radioactivity in fossil bones of Mammuthus Meridionalis from Irimești, Dacian Basin, Romania

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Fossil bones of Mammuthus Meridionalis excavated from Irimești fossiliferous site has been found to be highly radioactive. The site is part of the Plio-Peistocene mammalian succession of the western Dacic Basin. Located in the middle Olteț valley, the deposit contains a basal succession of clays and sands which underlies the fossiliferous sequence consisting predominantly of sands with gravel lenses.[1] The Olteț river crossing these deposites, is washing upstream metamorphic and magmatic rocks, and lignite deposits.

Radiometric analysis of the fossil bones was made using a gamma ray spectrometry with high purity germanium (HPGe) detector. The results show a high uranium specific activity, reaching in some cases values as high as 4100 Bq/Kg ^{238}U, whereas ^{232}Th and ^{40}K have insignificant average values of specific activity, 4.07 Bq/Kg for ^{232}Th and 56 Bq/Kg for ^{40}K. A marked disequilibrium between ^{226}Ra and its parent ^{238}U was found, probably due to the leaching of radium from fossil bones. Also ^{214}Bi and ^{214}Pb are in disequilibrium with ^{226}Ra, respectively ^{238}U generated by radon escaping.

The texture and mineral contents of a selected bone fragment (femur) were examined under Scanning Electron Microscope The femur bone is characterized by fibrous and porous features with cracks occurring locally. Partially the original dense bone material has been replaced by amorphous collophane or massive cryptocrystalline variety of apatite. The Haversian canals are filled with autigenic crystals of calcite, manganese oxide, iron oxide, calcium silicate. No uranium minerals could be identified in the femur bone despite the high uranium content determined radiometrically. The uranium bearing substance is evidently distributed together with organic bone material, probably associated with collophane.

The presence of lignite seams upstream the fossilifeurs deposit can explain high levels of uranium found in fossil bones. All data suggests that the fossil bones were richly mineralized during diagenesis, uranium being mobilized as uranyl ion, precipitated from surface and ground waters and strongly absorbed by organic matter from bones.