

Temperature-Related Alterations to Mineral Levels and Crystalline Structure in Porcine Long Bone: Intense Heat Vs. Open Flame

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Abstract : The outcome of fire related fatalities, along with other research, has found fires can have a detrimental effect to the mineral and crystalline structures within bone. This study focused on the mineral and crystalline structures within porcine bone samples to analyse the changes caused, with the intent of effectively 'reverse engineering' the data collected from burned bone samples to discover what may have happened. Using Fourier Transform Infrared (FT-IR), and X-Ray Fluorescence (XRF), the data collected from a controlled source of intense heat (muffle furnace) and an open fire, based in a living room setting in a standard size shipping container (8.5ft x 8ft) of a similar temperature with a known ignition source, a gasoline lighter. This approach is to analyse the changes to the samples and how the changes differ depending on the heat source. Results have found significant differences in the levels of remaining minerals for each type of heat/burning ($p < 0.001$), particularly Phosphorus and Calcium, this also includes notable additions of absorbed elements and minerals from the surrounding materials, i.e., Cerium (Ce), Bromine (Br) and Neodymium (Nd). The analysis techniques included provide validated results in conjunction with previous studies.

Keywords : forensic anthropology, thermal alterations, porcine bone, FTIR, XRF

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