

Deriving AMS Radiocarbon Age of Fossil Bone by Pretreatment with XAD-2 Resin : Comparison with the Gelatin Extraction Method

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Accurate radiocarbon (^{14}C) and carbon isotope measurements of fossil bones require complete removal of all exogenous carbon. XAD-2 chromatography was used to eliminate the foreign organic matter from bones. The fossil bones used in the experiment were animal bone fragments collected at the Awazu submarine archeological site. The bone samples were demineralized with 0.8M HCl at 4°C, and the acid-insoluble residue was concentrated by centrifugation and lyophilized. The demineralized bone powder was hydrolysed with 6M HCl at 110°C. Solid components were removed by centrifugation before the filtered hydrolysate was passed through the XAD-2 resin used for removal of fulvic acids. In addition, the gelatin extraction method of decalcification in a cellulose tube with 1.2M HCl, followed by heating at 90°C in water was used for the same species to compare the ability of the two methods to remove organic contaminants.

The purified hydrolysates obtained from XAD-2 chromatography have more positive $\delta^{13}\text{C}$ values and older ^{14}C ages than gelatin collagens extracted from hot water. The difference tends to become greater for poorly preserved fossil bones containing less than 0.7% collageneous materials. The fulvic phases give apparently younger ages and significantly more negative $\delta^{13}\text{C}$ values than bone organic carbon. Furthermore, the XAD-treated hydrolysates of gelatin collagens give the same ^{14}C ages (older than those of gelatin collagens) as the XAD-purified hydrolysates. The result indicates that the gelatin extraction method is sufficient for ^{14}C dating on well-preserved bones, but insufficient on poorly preserved bones, because hot-water extraction does not totally remove exogenous organic carbon. Therefore, XAD-2 resin is recommended for accurate ^{14}C and carbon isotope measurements.