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The pursuit of proteins in palaeontology

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Despite extensive published literature, scepticism over the claim of original biochemicals, including proteins preserved in the fossil record, persists. Workers using many different techniques, including mass spectrometry and various optical spectroscopic techniques, have attempted to verify proteinaceous or other biochemicals that appear endogenous to fossils found throughout the geologic column. This presentation shows a review of the relevant literature published over the last 50 years, comprising a survey of the analytical techniques. Protein sequencing by mass spectrometry is typically used to assess the identity and quantity of organics, including bone collagen. However, this process can be costly, time consuming and often requires extraction protocols that may reduce analytical precision. In contrast, Fourier-transform infrared (FTIR) spectroscopy offers an expedient and high precision alternative. In order to assess the decay kinetics of collagen, Attenuated Total Reflectance (ATR) FTIR spectra were obtained from artificially decayed porcine and bovine bones for temperatures in the range 80-90ºC. Resulting Arrhenius plots with r^2 values > 0.95 suggest that ATR-IR has the potential to be a precise and simple tool for thermal kinetic studies of bone collagen and possibly other biochemicals. The results are significant for forensic archaeologists and the protocols used serve as an inexpensive, rapid and useful means of evaluating the presence and integrity of ancient bone collagen. Morphological and molecular investigations by ourselves and others show that original biochemistry is geologically extensive, geographically global, and taxonomically wide-ranging. The fossil limits of endogenous organics are not yet clear, and remain the subject of investigation.

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