The upper limits of survivability of bone material

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In 2015, then-graduate student Dr Hirotsugu Mori created a stir[1] by proposing a new species of duckbill dinosaur; and then again (though this was not reported in the popular media) when others began to realize he had let it slip in his paper that these bones were mostly unpermineralized (figure 1).[2] Permineralization refers to the process (often colloquially known as fossilization) whereby the original organic substances of the specimen are replaced by minerals, turning it to stone. This is in contrast to 'biomineralization', which simply refers to the use of minerals in various life forms to harden structures in their bodies (like bones containing calcium, for example).[3]

Similar to Mary Schweitzer's finding soft tissue, red blood cells, etc., in dinosaur bones[4], finding these 'fresh' dinosaur bones in Alaska raises many important questions. As we have argued, it is inconceivable that these bones could have lasted the alleged 69 Ma since the 'Cretaceous period'[5] when these bones were supposed to have been laid down according to evolutionary dating.[6]

Bone decay as a dating method

Any ongoing predictable process can, in theory, be used as a 'dating method' by the process of extrapolation. Could bone decay rates be a dating method independent of other factors that are often used to assign dates? Forensic scientists have long been interested in determining the length of time that has elapsed since death of remains (postmortem interval), due to the applicability of this to criminal investigations. Unfortunately, this has proven a difficult challenge because of the sheer number of factors that influence the rate at which decay proceeds (things like insect activity, environmental factors like water, exposure to air, soil acidity, etc.).[7]

A general picture of the length of time

In general, the bones of a cadaver would begin to decay and break down within a decade if left on the surface.[8] However, buried remains generally decompose at roughly one eighth the speed of those left above ground.[9] Via some simple math, we would then arrive at an assumption that buried bones should be mostly decayed away within the first 80 years after burial (unless they are permineralized).

This highly oversimplified generalization may hold true in many cases, but known cases of bones being discovered from many hundreds of years ago proves that unfossilized bone can certainly last longer than a mere 80 years:

> "The time required for complete degradation of buried skeletal and dental remains is extremely lengthy, with breakdown taking anywhere from several years to hundreds, as demonstrated by the survivability of archaeological specimens."[10]

For example, in one study, ancient bone samples from various eras were evaluated. Although "post-medieval bones were solid", the "Roman/early medieval bones were fragile, and many graves contained only slight traces of bone, if any."[11]

All things considered, there appears to be a case to be made that the upper limit of 'fresh' bone survivability over time would be in the range of a few thousand years at the absolute uppermost, barring other factors such as permineralization, mummification, etc. which would extend the timespan of durability. The idea that these

Figure 1. Original pores in spongy bone from freshly exposed interior of a Triceratops brow horn core from the Upper Cretaceous Lance Formation shows that minimal permineralization has occurred.

largely unpermineralized hadrosaur bones could be 69 Ma old is certainly at odds with everything we know about decomposition. It is even strange that we should still find them intact after the roughly 4,500 years that have elapsed since the Flood.

How did they last 4,500 years?

Bone consists in large part of type 1 collagen, and is hardened and strengthened by interwoven calcium hydroxyapatite crystallites.[12] The estimated upper limit for the survival of bone collagen is between 0.2 and 0.7 Ma at 10°C, though it might be imagined to last up to a couple million years if kept constantly below freezing temperatures.[13] Original experimentation in artificial diagenesis by Dr Brian Thomas showed a half-life of (porcine) bone collagen at 7.5 °C of 1,678 years—much less even than the half-life of ^{14}C (5,730 years).[14] Given that a "a lump of ^{14}C as massive as the earth would have all decayed in less than a million years",[15] what does this imply about the maximum possible age of unpermineralized bone samples still containing bone collagen (which were by no means kept at constant ideal temperatures in the field)? Alaska's freezing temperatures, combined with the fact that the bones display a light outer coating or 'stain' of permineralization,[16] may provide an explanation for how the hadrosaur bones were able to persist as long as they have in their relatively pristine condition.[17] However it should be noted that on an evolutionary timescale, the climate of the area in which they were found would have been significantly warmer than it is today.[5]

Concluding remarks

This research (both from laboratory and field studies) strongly suggests that the discoveries of unpermineralized bone in strata dated to periods of deep geologic time represent a powerful and persuasive argument against the entire secular worldview and its geologic ages, offering instead strong support for a relatively 'young' Earth. According to one popular source, the oldest bones to be discovered in a non-permineralized state are human remains from Ethiopia dated to 2.8 Ma. Apparently the author was unaware of Mori's research into the hadrosaur remains dated at 69 Ma.[18] Unpermineralized bones within deep-time strata are likely a more widespread phenomenon than the popular media lead the public to believe, judging by the complete omission of this aspect in all reporting on the Alaskan hadrosaur finds and the subsequent scuffle in the reporting journal over the wording of the description.[19]

This is an area calling for much more study in the future, including the excavation and examination of specimens in the field when possible. Much good work has been done recently by researchers such as Dr Brian Thomas of the Institute for Creation Research[14] as well as the ongoing iDINO II project of the Creation Research Society.[20] Considering the extreme weight of prejudice in the secular world to regard these sorts of finds as 'anomalous' (as well as a lack of impetus to search them out to begin with), the creation science community should not rely on the mainstream secular scientific community to complete these tasks on our behalf.

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16. See the descriptions of researchers Kyle Davies (1987) and Hirotsugu Mori (2015), as recounted in ref. 2.
17. Mori *et al.*, ref. 6, describe the bones thus: "The hadrosaurid remains are almost entirely disarticulated, show little evidence of weathering, predation, or trampling, and are typically uncrushed and unpermineralized …".
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19. See Price, ref. 2, for a full explanation of this 'scuffle'.
20. See: creationresearch.org/idino-investigation-of-dinosaur-intact-natural-osteo-tissue/.