to induce genetic changes. This is highlighted by the fact that enzymes are necessary for this complex processes, including enzymes which induce the double-stranded breaks and facilitate template switching. Since this is the case, I fully expect that better understanding meiotic recombination will be one piece in the puzzle to better understanding how diversity has risen so quickly within created kinds since the time of the Flood.

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DNA and bone cells found in dinosaur bone

Jonathan Sarfati

For the last 15 years, Dr Mary Schweitzer has been rocking the evolutionary/uniformitarian world with discoveries of soft tissue in dinosaur bones.[1] These discoveries have included blood cells, blood vessels, and proteins such as collagen. But under *measured* rates of decomposition, they could not have lasted for the presumed 65 million years (Ma) since dinosaur extinction, even if they had been kept at freezing point (never mind the much warmer climate proposed for the dinosaurs). Specifically, Buckley *et al.* measured the half-life of collagen at 7.5°C to 130 thousand years (ka). This measurement has been reliably repeated many times, so it represents the optimal conditions for molecular longevity at that temperature.[2] Schweitzer said in the popular TV show NOVA,

> "When you think about it, the laws of chemistry and biology and everything else that we know say that it should be gone, it should be degraded completely."[3]

She similarly noted in the journal *Science*:

> "The presence of original molecular components is not predicted for fossils older than a million years, and the discovery of collagen in this well-preserved dinosaur supports the use of actualistic conditions to formulate molecular degradation rates and models, rather than relying on theoretical or experimental extrapolations derived from conditions that do not occur in nature.[4]"

A careful scientist, Schweitzer rechecked the elastic blood vessels and other soft tissue, saying,

> "It was totally shocking. I didn't believe it until we'd done it 17 times."[5]

Other evolutionists saw the baneful implications to their long-age dogma, and claimed in 2008 that the blood vessels were really bacterial biofilms, and the blood cells were iron-rich spheres called framboids.[6] Yet this ignores the wide range of evidence Schweitzer adduced, and she has answered this claim in detail.[7,8] For example, independent labs have identified by antibody blot reaction and have even sequenced non-bacterial, vertebrate-specific proteins including collagen, elastin, osteocalcin, and laminin.[9] However, Schweitzer herself maintains her faith in the long-age paradigm.[10]

Dino bone cells and proteins

Schweitzer's more recent research makes long ages even harder to believe. Here, she analyzed bone from two dinosaurs, the famous *Tyrannosaurus rex* (MOR 1125;[11] figure 1) and a large duck-billed dinosaur called *Brachylophosaurus canadensis* (MOR 2598).[12] Bone is an amazing tissue, having the ability to rework in response to stress,[13] and it uses the finely designed protein osteocalcin,[14] which has been found in the best known duck-billed dinosaur, *Iguanadon*, 'dated' to 120 Ma.[15] The most plentiful cells in bones are *osteocytes*. These have a distinctive branching structure that connects to other osteocytes, and have a "vital role" in "immediate responses to changing stresses."[11]

Schweitzer's team again removed the hard, bony mineral with the chelating agent EDTA. They found "transparent cell-like microstructures with dentritic [branching, just the shape expected for osteocytes] processes, some containing internal contents", from both dinos.

They also used antibodies to detect the globular proteins actin and tubulin, used to make filaments and tubes in *vertebrates*. The proteins from both dinosaurs had similar binding patterns to the same proteins from

ostrich and alligator. They are not found in bacteria, so this *rules out contamination*. In particular, these antibodies did not bind to the type of bacteria that forms biofilms, "thus a biofilm origin for these structures is not supported."[11]

Furthermore, they tested for collagen, a fibrous *animal* protein, and it was found in these bones—but *not* in surrounding sediments.

In addition, because actin, tubulin, and collagen are not unique to bone, they tested for a very distinctive osteocyte protein called PHEX. This stands for Phosphate-regulating endopeptidase, X-linked, which is vital in depositing the hard bone mineral. And indeed, antibodies specific to PHEX detected this unique bone protein.[16] Detecting a distinctive bone protein is very strong support for osteocyte identification.

The problem for long ages was highlighted in *Discover* Magazine, thus:

> "Cells are usually completely degraded soon after the death of the organism, so how could 'bone cells' and the molecules that comprise them persist in Mesozoic [evolutionary dino-age] bone?"[11]

Some, including Schweitzer, try to solve this problem by proposing that bone protects the cells from bacteria that cause degradation. Bone would hinder the cells from swelling that comes before cells self-destruct (autolysis) as well. They also propose that the surfaces of the mineral crystals attract and destroy enzymes that would otherwise speed up degradation. They suggest that iron may play a vital role too, both by helping to cross-link and stabilize the proteins, as well as by acting as an antioxidant.

These factors may actually play a role in extending the longevity of post-mortem collagen, but totally fail to explain the data. First, the collagen decay studies (e.g. Buckley *et al.*) already include these factors, since they measured the decay of bone collagen under optimum conditions. Second, even if one chooses to believe that collagen's interaction with bone bioapatite confers unnaturally long life, then one must still contend with the ever-increasing array of additional original fossil proteins, such as elastin and PHEX, that do not interact with bone.[17]

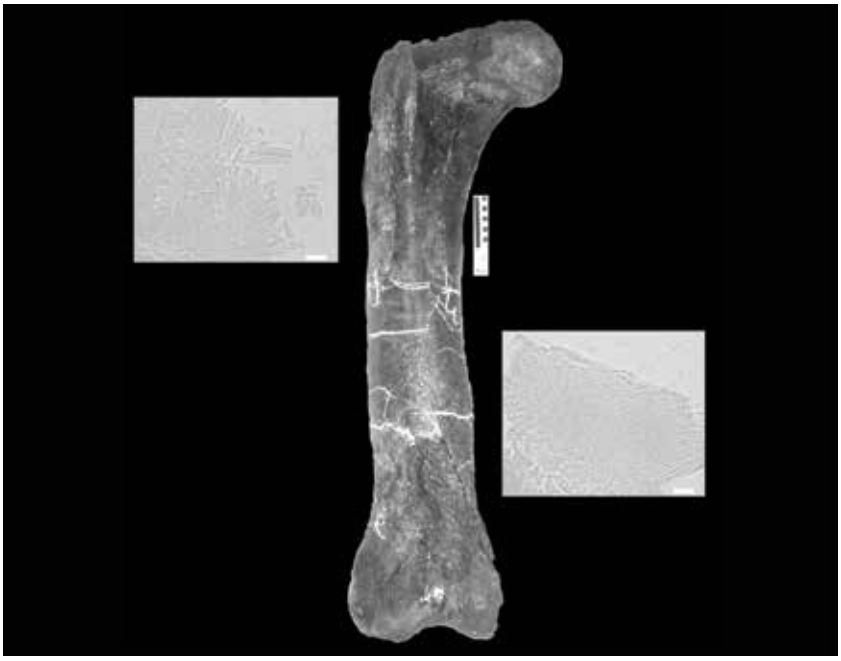

Figure 1. *Tyrannosaurus rex* femur from which demineralized matrix and peptides were obtained (from Antonio *et al.* ref. 26).

Measured decay rates of proteins are compatible with an age of about 4,500 years (since the Flood), but not with many millions of years. However, seeing not only proteins but even cell microstructures after 4,500 years is *still* surprising, considering how readily bacteria can degrade them. Protein adhesion to adjacent minerals could help explain survival over thousands of years. But they do not accommodate millions of years, since the above preservation proposals could not stop ordinary breakdown by water (hydrolysis) over vast eons.[18]

Dino DNA

The problem for long-agers is even *more* acute with their discovery of DNA. Estimates of DNA stability put its upper limit of survival at 125,000 years at 0°C, 17,500 years at 10°C, and 2,500 years at 20°C.[2] One recent report said:

> "'There is a general belief that DNA is "rock solid"—extremely stable,' says Brandt Eichman, associate professor of biological sciences at Vanderbilt, who directed the project. 'Actually DNA is highly reactive.'
>
> "On a good day about one million bases in the DNA in a human cell are damaged. These lesions are caused by a combination of normal chemical activity within the cell and exposure to radiation and toxins coming from environmental sources including cigarette smoke, grilled foods and industrial wastes."[19]

Allentoft *et al.* measured the decay rate of the control region of mitochondrial DNA[20] showing that the time until complete disintegration of DNA ("no intact bonds") is 22,000 years at 25°C, 131,000 years at 15°C, and 882,000 years at 5°C. Even if it could somehow be kept continually below freezing point at –5°C, it could survive only 6.83 Ma—only about a

tenth of the assumed evolutionary age. Allentoft *et al.* write:

> "However, even under the best preservation conditions at –5°C, our model predicts that no intact bonds (average length = 1 bp [base pair]) will remain in the DNA 'strand' after 6.8 Myr. This displays the extreme improbability of being able to amplify a 174 bp DNA fragment from an 80–85 Myr old Cretaceous bone."[20]

Yet Schweitzer's team detected DNA using three independent techniques. One of these chemical tests employed specific antibodies that detect DNA in its double-stranded form. This showed that the dinosaur DNA was still largely intact, since short strands of DNA less than about 10 bp don't form stable duplexes. The stain DAPI[21] lodged in a groove of stable double helix. The visualized stain was robust, and thus required dinosaur DNA lengths far in excess of 10 bp.

The first response by long-agers is typically to claim 'contamination'. However, the DNA was not found everywhere, but only in certain internal regions of the 'cells'. This pattern was just like in ostrich osteocytes, but nothing like biofilm taken from other sources and exposed to the same DNA-detecting pattern. This is enough to rule out bacteria, because the DNA in eukaryotic cells is stored in a small part of the cell—the *nucleus*.[22]

Another of the independent techniques used by Schweitzer's team detected a special protein called *histone H4*. Not only is yet another protein a big problem for millions of years, but this is a specific protein for vertebrates, and is exclusively associated with DNA. (DNA is Deoxy-riboNucleic *Acid*, so *donates* protons, so *negatively* charged; histones are *alkaline* so *accept* protons, so are *positively* charged, thus they attract DNA). In eukaryotes but *not in bacteria*, histones are tiny spools around which DNA is wrapped.[23] Therefore, "These data support the presence of non-microbial DNA in these dinosaur cells."[11]

Conclusion

It's hard to improve on one of Mary Schweitzer's early quotes:

> "It was exactly like looking at a slice of modern bone. But of course, I couldn't believe it. I said to the lab technician: 'The bones are, after all, 65 million years old. How could blood cells survive that long?'"[24]

But this just shows the grip of the long-age paradigm. A more reasonable and indeed scientific question would be:

> "This looks like modern bone; I have seen blood cells [and blood vessels] and detected hemoglobin [and now actin, tubulin, collagen, histones, and DNA], and real chemistry shows they can't survive for 65 Ma. So how could they possibly be millions of years old?"[25]

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