NATURE

Ancient Dinosaur Remains Contain Something That Looks And Acts Shockingly Like DNA

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A microscopic look at dinosaur cartilage from roughly 75 million years ago has turned up a cluster of exquisitely-preserved cells, and they just might contain something rather familiar.

Dusting off the skulls of two juvenile duck-billed dinosaurs (*Hypacrosaurus stebingeri*), shelved after their discovery in the 1980s, researchers noticed a bunch of tiny circular structures at the back - some linked together, others standing apart, all of them frozen in time.

Looking closer, several of these circles contained a dark material reminiscent of a nucleus, and others held tangled coils resembling chromosomes.

"I couldn't believe it, my heart almost stopped beating," recalls vertebrate paleontologist Alida Bailleul from the Chinese Academy of Sciences.

In her shock, Bailleul told no one for several days, and even now, a decade later, the research team is cautious of saying too much.

Leading molecular paleontologist Mary Schweitzer, who joined the research after first seeing the skulls, has claimed in the past that *Tyrannosaurus rex* fossils can preserve protein cells for millions of years, and it was met with much controversy. Today, she chooses her words carefully.

"I'm not even willing to call it DNA because I'm cautious, and I don't want to overstate the results," Schweitzer told *National Geographic*.

"There is something in these cells that is chemically consistent with and responds like DNA."

If those hints turn into something more, it would mean genetic material can survive for much, much longer than we thought.

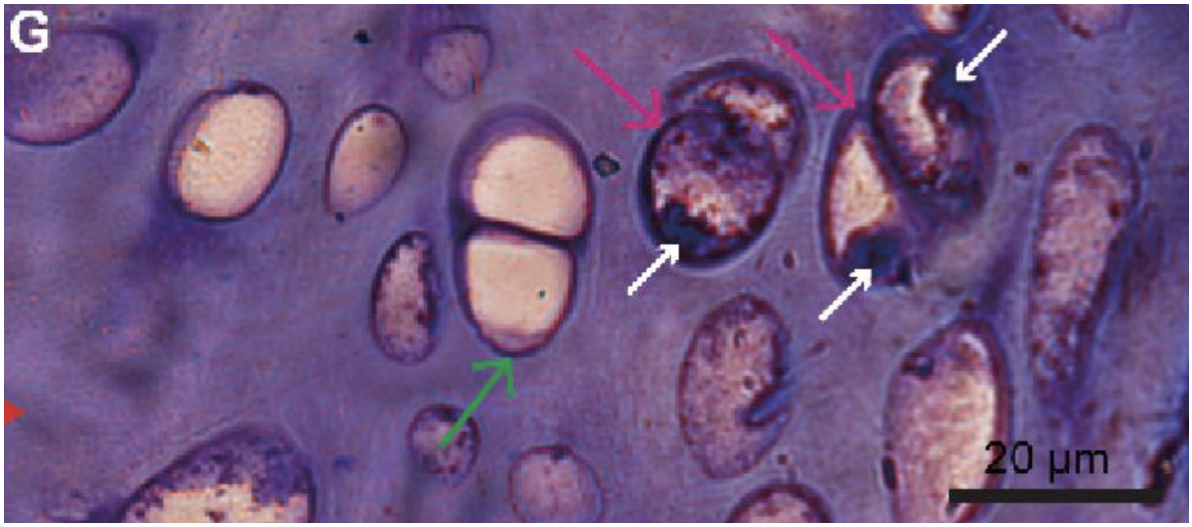
One of the many reasons the scenario of dinosaur resurrection in *Jurassic Park* is unbelievable, is because DNA is not thought to last that long - not even trapped in amber.

The half-life of this precious organic information has been calculated at about 521 years, so even under the best conditions, scientists predict it would only take about 5.3 millions years before the strands were completely unreadable.

Duck-billed dinosaurs were alive in Montana roughly 75 million years ago, which is 15 times longer than that; if their DNA is still around today, it would be astonishing.

Applying a couple of DNA stains to the fossilised cartilage cells, researchers now claim to have found several circular structures with potential.

Two of these examples were actually still linked, as though caught in the final stages of cell division.



(Bailleul et al., NSR, 2020)

All of the features observed were carefully summed up and compared to stained cartilage cells from emus, which showed similar intracellular contents, like proteins and nuclei.

To find out more, the team added antibodies of a dominant cartilage protein, known as Collagen II, to the cells. The way the organic matrix responded suggested a similar protein might be lurking inside.

"This immunological test supports the presence of remnants of original cartilaginous proteins in this dinosaur," Schweitzer explained.

But even if these ancient cartilage cells do hold remnants of intact dinosaur DNA, don't expect a real-life *Jurassic Park* to become any more viable.

In all likelihood, the information these cells might dish up would be too limited to sequence a whole genome. Currently, the oldest complete genome we've put together is only 700,000 years old.

But even a small dose of knowledge could tell us more than we ever knew about this long-extinct herbivorous dinosaur.

"These new exciting results add to growing evidence that cells and some of their biomolecules can persist in deep-time," Bailleul says.

"They suggest DNA can preserve for tens of millions of years, and we hope that this study will encourage scientists working on ancient DNA to push current limits and to use new methodology in order to reveal all the unknown molecular secrets that ancient tissues have."

This idea is still very much in its infancy, but it's true that recent studies have pointed towards a longer life for organic material than we thought possible.

In 2014, researchers in Sweden said they found fossilised nuclei and chromosomes in a 180 million-year-old fern. Last year, another study claimed to have found fossilised biomolecules in a now extinct creature over a half a billion years old.

And then, there's Schweitzer's own research on *T. rex*. While some critics in the past claim she mistook *T. rex* cells for bacteria or other forms of contamination, this time, she and her colleagues are adamant that's not the case.

"It is reasonable and logical to propose that fossil dinosaur bone contains contaminating microbial communities," they write in their new paper, "but the specific case that we present here... does not match the staining pattern of 'cell clusters' of contaminating biofilms."

Collagen II, for instance, is not produced in microbes, so the matrix shouldn't have reacted to that antibody. Plus, the comparisons to emu cells were done in a separate lab, so the risk of contamination from that source is also low.

Perhaps, the authors suggest, this ancient cartilage is simply better at preserving intracellular matter than bone. It's less porous, after all, and is exposed to less oxygen damage.

If they're right, there's a possibility this ancient tissue might be the carrier of unknown molecular secrets from long, long ago. The clue might be cartilage.

The study was published in the *National Science Review*.