New study of fossil bone growth reveals the ancestry of mammalian 'warm-bloodness'

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Most people know that 'warm-bloodedness' is a characteristic of mammals. This trait actually encompasses a suite of physiological processes that help to maintain a relatively high, constant body temperature using heat generated internally. A new study by Christen Don Shelton of the University of Cape Town, South Africa and his colleague, Martin Sander at the University of Bonn, Germany, presented at this year's Society of Vertebrate Paleontology meeting, shows that this character may have shown up in the ancestors of modern mammals far earlier than was previously thought.

One associated effect of being 'warm-blooded' is a relatively fast growth-rate. Mammals (and birds, who are also 'warm-blooded') tend to grow much faster than 'cold-blooded' vertebrates, like fish and reptiles. This fast growth rate is in turn associated with a particular type of bone growth pattern, called fibrolamellar bone (FLB). Both mammals and birds have FLB, and Shelton and his colleague investigated its presence in an early fossil relative of mammals, Ophiacodon.

Ophiacodon is distantly related to the large sail-back reptile, Dimetrodon, that people may be familiar with, and lived in North America around 280-300 million years ago. Although it didn't look particularly mammal-like (you could be forgiven for calling it a 'lizard'), it has many characters that link it with mammals. The highly vascularized tissue had previously been observed in Ophiacodon, but its presence had been written off to ecological factors, like its aquatic lifestyle, rather than to its fundamental physiology. Shelton looked at a

number of bones of Ophiacodon of individuals of different ages, and found that the more likely explanation is that Ophiacodon was at least partly 'warm-blooded'

"It is surprising that even in some of the earliest representatives of our own lineage from 300 million years ago, there already was a tendency towards warm-bloodedness", said Sander. Ophiacodon probably isn't directly ancestral to modern mammals, and its 'warm-blooded' characters show that it may have evolved it in parallel with mammals, which itself is interesting.

Says Shelton, "Warm-bloodedness is one of the great inventions of evolution, but we do not completely understand its advantages. We can never fully appreciate the physiology of an extinct organism, but studies like ours will help."

Provided by Society of Vertebrate Paleontology