

Alligators breathe like birds due to shared dinosaur ancestor

Alligators breathe like birds due to a dinosaur ancestor they share in common, scientists have discovered.



Air flows in one direction as it loops through the lungs of alligators Photo: ALAMY

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Researchers found that, just as it does in birds, air flows in one direction as it loops through the lungs of alligators.

The breathing method is believed to have first appeared in ancient reptiles called archosaurs which dominated the Earth 251 million years ago.

In contrast, mammalian breath flows in and out of branching cul-de-sacs in the lungs called alveoli.

Archosaurs evolved along two different paths, one of which gave rise to the crocodylian ancestors of crocodiles and alligators.

The other produced the flying pterosaurs and eventually birds.

The research on alligators suggests that birdlike breathing probably evolved earlier than previously thought, before the archosaur split. It may explain why archosaurs became so dominant in the Early Triassic Period which followed a devastating mass extinction known as the "Great Dying".

Prior to the extinction event, which killed off 70% of all land life and 96% of sea life, reptile-like mammals called synapsids were the largest animals on Earth.

After it, mammals were overshadowed by reptiles in the form of archosaurs and, later, dinosaurs.

As the Earth recovered from the "Great Dying" conditions were warm and dry, with oxygen levels almost half what they are today.

But despite the lack of oxygen many archosaurs were capable of vigorous activity.

"Lung design may have played a key role in this capacity because the lung is the first step in the cascade of oxygen from the atmosphere to the animal's tissues, where it is used to burn fuel for energy," said lead researcher Colleen Farmer, from the University of Utah in Salt Lake City, US.

Little is known about the archosaur that was the common ancestor of crocodylians, pterosaurs, dinosaurs and birds.

It was likely to have been a "small, relatively agile, insect-eating animal," said Dr Farmer.

In modern birds, oxygen enters the bloodstream via tubes known as "parabronchi" through which air flows in one direction before exiting the lung. The efficiency of this design helped birds fly at altitudes that would "render mammals comatose" said Dr Farmer.

Some scientists have argued that unidirectional airflow only evolved after crocodylians split from archosaurs, arising among pterosaurs and meat-eating theropod dinosaurs such as Tyrannosaurus rex.

Dr Farmer measured the one-way passage of air through alligator lungs using surgically implanted flow meters in live animals. She also conducted experiments on dead alligators.

Her findings, published today in the journal Science, showed that air looped in a single direction through "aerodynamic valves" in an alligator's multi-chambered lungs.

"Our data provide evidence that unidirectional flow of air in the lungs predates the origin of pterosaurs, dinosaurs and birds," she said.

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