


The strange tale of the lizard's breath

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Paris — Air flows through lizard lungs in one direction, a finding that may prompt a rethink about how some species evolved following Earth's biggest mass extinction, a study said on Wednesday.

Humans and most other animals in contrast have a so-called "tidal", or two-way, breathing system.

Air is drawn into the lungs until it reaches a dead end -- bunches of cells called alveoli. There, oxygen is drawn into the bloodstream and exchanged for carbon dioxide, which is then breathed out with the used air.

Birds, though, are a notable exception to this.

Their breathing is predominantly a one-way flow into the lungs -- the air enters the trachea, or windpipe, flows through the lung in one direction and then exits the way it came in.

This unusual pattern of breathing has raised much debate among biologists.

One theory is that a one-way flow is a highly efficient way of providing oxygen for strenuous activity: it helps birds cope with the exertion of flying and dealing with thinner concentrations of oxygen at altitude.

But, surprisingly, lizards -- a sleepy group of land-loving animals -- can also be counted as members of the club, according to the new probe.

University of Utah biologist C.G. Farmer led a team that carried out 3-D scans of the lungs of African monitor lizards (*Varanus exanthematicus*) and then implanted flow metres in five of the animals to see how the air moved.

They also pumped air into the lungs of 10 dead lizards, and then water, laden with sunflower pollen as a tracer. These too showed a unilateral flow.

The investigators found that air enters the lizards' trachea and then splits into two airways -- one for each lung.

It then winds its way through a series of chambers in each lung, passing through perforated walls, before doubling back. The used gas heads out through the trachea. As with birds, there is some "tidal" flow, but not much.

A similar one-way flow also appears to exist among American alligators, helping them quite literally to hold their breath, whether they are under water or not, Farmer said in a phone interview.

If so, some of the thinking about unidirectional breathing -- that it helps to sustain high metabolism -- has to be scrapped.

"I think it's probably not an adaptation allowing an animal to be active," Farmer said.

"In fact, (it's likely to be) an adaptation to allow them to sit quietly for long periods of time without moving, without breathing," she said.

How did one-way flow become established in a few species, but not others?

There's no clear answer, but one clue might lie in a massive extinction that occurred 251 million years ago, at the boundary between the Permian and Triassic geological periods.

Almost all marine species and two-thirds of land vertebrate species were wiped out by some catastrophic event

linked to a drastic and prolonged fall in atmospheric oxygen.

Animals that had unidirectional air flow, or the precursor for it, may have had an advantage in the oxygen-poor environment of the early Triassic, Farmer suggested.

The ancestors to birds and crocodilians "may have gone into the Triassic period with a lung that already had a unidirectional flow", she said.

"And once that flow was established, it could be a pre-adaptation for organising the blood vessels in such a way that animals become more effective at extracting oxygen when there isn't very much oxygen in the air."

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A picture taken on February 5, 2004 shows a monitor lizard flicking its sensor tongue as it freely roams around the Puerto Princesa Subterranean River National Park in Palawan island (AFP/File, Romeo Gacad)

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