Seminars in Zoophysiology at Aarhus University

Loopy Lungs in Crocodilians

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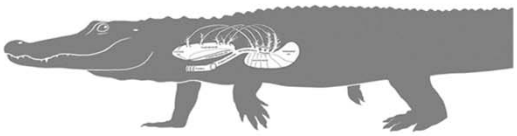
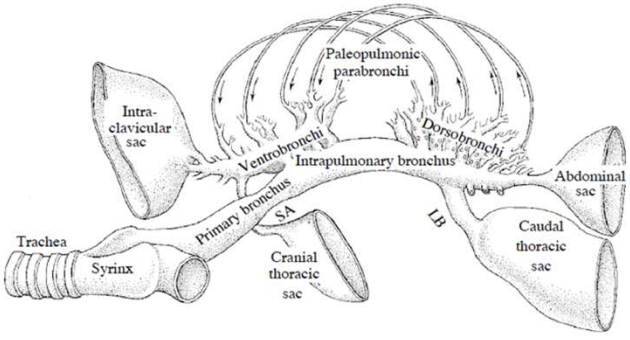
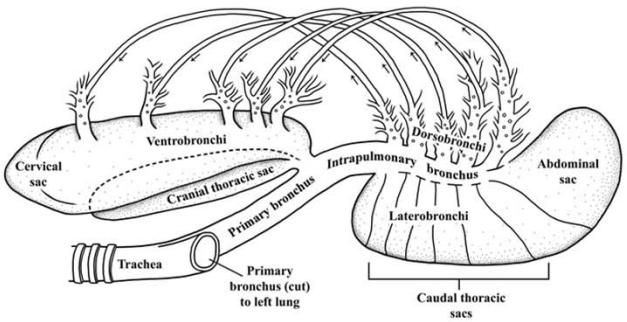
When birds breathe, air flows unidirectionally through most of their bronchi. This design is conventionally presumed to be unique to birds and to have arisen to meet the high oxygen demands of flight. I will show that airflow is unidirectional within the lungs of crocodilians, members of the extant sister taxon of birds. These data indicate that airflow was probably unidirectional in the lungs of basal archosaurs of the Triassic and their descendents: phytosaurs, aetosaurs, rauisuchians, crocodylomorphs, pterosaurs, and all dinosaurs including sauropods, theropods, and ornithischians. The discovery of unidirectional airflow in crocodilians poses new questions regarding the evolution of the respiratory systems of reptiles, but also regarding the divergent evolution of mammalian lungs. Mathematical models, derived to assess the sensitivity of pulmonary gas exchange to differing levels of environmental oxygen, suggest ambient oxygen was an important selective driver in the evolution of these lungs and may underpin the ecomorphological restriction of Mesozoic mammals to niches of small body size.

Goose Lung



Alligator Lung





Monday July 18th at 10.15 at Zoophysiology