Respiratory challenges in digesting reptiles

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Many ectothermic animals easily tolerate several months of fasting, while retaining the capacity to ingest and digest meals that may amount to half of their own body mass. In these animals, metabolism is down-regulated during fasting; a response that prolongs survival given the finite energy resources. The subsequent ingestion is associated with a 3-5 fold increase in metabolism, and oxygen uptake during digestion may actually exceed maximal oxygen uptake during exercise in some animals. In these animals, the digestive period, therefore, serves as an interesting physiological state to study the cardio-respiratory responses to increased demand for oxygen.

In all air-breathing vertebrates pulmonary ventilation does not increase proportional to metabolism, which causes arterial PCO_2 to increase. This relative hypoventilation serves to maintain arterial pH in spite of the rise in plasma HCO_3^- concentration caused by gastric acid secretion. In all animals studied, heart rate and blood flows increase substantially during digestion. Part of these responses is caused by lower vagal tone on the heart, but the heart is also stimulated by novel circulating non-adrenergic-non-cholinergic factors and an increased histaminergic tone.