

NEW: Find **great deals** on the latest gadgets and more in the **ScienceDaily Store!**

Science News

from research organizations

Gotta Have Heart: Crocodilians Bypass Their Lungs To Improve Digestion

Date: February 7, 2008

Source: University of Chicago Press Journals

Summary: Crocodiles are among nature's most fearsome predators. When the opportunity arises, crocodilians will gorge, voluntarily consuming meals weighing 23% of their own body weight. This is analogous to a 130-pound woman eating, at one sitting, a hamburger weighing 30 pounds. New research on American alligators' circulation systems finds that crocodilians bypass their lungs to improve digestion.

Share:

FULL STORY



Crocodile.

Credit: Courtesy of Dr. Adam Summers

As perhaps confirmed by their ubiquity on nature cable channels, crocodiles are among nature's most fearsome predators. When the opportunity arises, crocodilians will gorge, voluntarily consuming meals weighing 23% of their own body weight. This is analogous to a 130 -pound woman eating, at one sitting, a hamburger weighing 30 pounds. But what to do with all of that food? If they do not digest their meal quickly, crocodilians risk death from within, or if they are young, by predators.

While it has long been known that reptiles have the ability to shunt blood past their lungs, the physiological function of this ability is poorly understood. In a new article in the *Physiological and Biochemical Zoology* Professor C.G. Farmer and her colleagues at the University of Utah, along with the Utah Artificial Heart Institute, were able to demonstrate through their experiments with American alligators that the bypass function is central in their digestion process, and ultimately, their survival.

After feasting, crocodilians like to find a warm place to lie down while they digest their meal. Although on the outside this behavior seems ordinary, inside their bodies an extraordinary event takes place. During this period of digestion crocodilians divert blood through a special vessel that bypasses the lung, named the left aorta. Humans, other mammals, and birds lack this special vessel, and so all blood pumped by the right side of the heart flows through the pulmonary artery into the lungs, where carbon dioxide (CO₂) moves from the blood into the gases of the lungs.

Crocodilians can chose not to use the left aorta, in which case their cardiovascular system is very much like the mammalian system. However, when crocodilians are digesting a meal, they chose to shunt and direct CO₂-rich blood straight to the stomach where glands make use of the CO₂ to form gastric acid and bicarbonate. Consequently this shunt enables crocodilians to secrete gastric acid at a rate that is approximately 10 times the highest rates measured in mammals. If crocodilians

are deprived of this ability to sidestep their lungs, their rates of acid secretion drop significantly and their ability to dissolve bone, a regular part of their normal diet, is impaired.

There are many reasons crocodilians may need this super secretion. First, these huge meals, which are stored in the stomach while they are gradually broken down, would putrefy due to the overgrowth of bacteria without the constant acid bath that inhibits bacterial growth. A second reason may be related to the hunting tactics of crocodilians.

Concealed below the water's surface, crocodilians stealthily approach animals that have come to drink, spring upon their prey, and drag them into the water and drown them. This powerful burst of activity generates an extraordinary amount of lactic acid in their muscles, which, unless cleared rapidly from the body, can be lethal. The shunting of this acidic blood past the lungs and to the stomach allows the acid to quickly leave the blood and provides the blood with bicarbonate, an important buffer.

Last but not least is the possibility that the shunt helps runts. Within the first year of hatching over 50% of young crocodilians end up as somebody's lunch, but the bigger they get the less likely they are to be eaten. Crocodilians are cold-blooded animals that rely on basking in the sun for warmth, and a warm belly is essential for high rates of acid secretion, good digestion, and rapid growth, but basking sites are not always plentiful and the biggest animals dominate these sites. Thus it may be critical for little crocodilians to make hay while the sun shines; that is, to rapidly secrete acid while they have the opportunity to get warm.

Journal reference: Farmer, C.G., T.J. Uriona, et al. "The Right-to-Left Shunt of Crocodilians Serves Digestion," *Physiological and Biochemical Zoology* 81:2 .

Story Source:

Materials provided by **University of Chicago Press Journals**. *Note: Content may be edited for style and length.*

Cite This Page:

 MLA

 APA

 Chicago

University of Chicago Press Journals. "Gotta Have Heart: Crocodilians Bypass Their Lungs To Improve Digestion." ScienceDaily. ScienceDaily, 7 February 2008. <www.sciencedaily.com/releases/2008/02/080204133135.htm>.

Recommended Articles

Alligators breathe like birds, study finds
University of Utah, *ScienceDaily* , 2010

Alligators' Muscles Move Lungs Around For Sneaky Maneuvers In Water
University of Utah, *ScienceDaily* , 2008

The mystery of lizard breath: One-way air flow may be 270 million years old
University of Utah, *ScienceDaily* , 2013

Gastric bypass surgery alters hormones to relieve diabetes symptoms
The Endocrine Society, *ScienceDaily* , 2013

The spice of life: Cinnamon cools your stomach
RMIT University, *ScienceDaily* , 2016

Plasma Insulin Profiles After Subcutaneous Injection
PracticeUpdate , 2015

Hypothermia in trauma: The cold, hard facts
Daria C. Ruffolo, RN, MSN-CS, CCRN, ACNP, *Modern Medicine* , 2002

A new age for childhood diseases: Cystic fibrosis
Karen Ellmers, RN, MS, CCRN, *Modern Medicine* , 2002

Maximizing oxygenation in the critically ill
Barbara McLean, RN, MN, CCRN, CCNS-NP, FCCM, *Modern Medicine* , 2003

Maximizing oxygenation in the critically ill
Barbara McLean, RN, MN, CCRN, CCNS-NP, FCCM, *Modern Medicine* , 2003

Powered by

Free Subscriptions

Get the latest science news with ScienceDaily's free email newsletters, updated daily and weekly. Or view hourly updated newsfeeds in your RSS reader:

 Email Newsletters


 RSS Feeds

Follow Us

Keep up to date with the latest news from ScienceDaily via social networks:

 Facebook

 [Twitter](#)


 [Google+](#)

 [LinkedIn](#)

Mobile Apps

Get the latest news from ScienceDaily via our free mobile apps, available for download on the following platforms:

 [iPhone/iPad](#)

 [Android](#)

Have Feedback?

Tell us what you think of ScienceDaily -- we welcome both positive and negative comments. Have any problems using the site? Questions?

 [Leave Feedback](#)

 [Contact Us](#)

[About This Site](#) | [Editorial Staff](#) | [Awards & Reviews](#) | [Contribute](#) | [Advertise](#) | [Privacy Policy](#) | [Terms of Use](#)

Copyright 2016 ScienceDaily or by third parties, where indicated. All rights controlled by their respective owners. Content on this website is for information only. It is not intended to provide medical or other professional advice.

Views expressed here do not necessarily reflect those of ScienceDaily, its staff, its contributors, or its partners.