



Exhibit message

The constriction pressure used by constrictor snakes is more gentle and ongoing than most people expect.

Recent research suggests that medium sized constrictors may kill their prey by causing high blood pressure and heart attacks in their prey. Suffocation may still occur, but the time taken by constrictors in squeezing their prey does not seem to match the time required to suffocate prey.

Quick fact

The pressure exerted by a 5.5 metre python squeezing a rabbit was recorded for a Nature documentary.

A mechanical engineer placed a probe inside the coiled-up python. As the python squeezed the rabbit (and the probe), the professor said that the python exerted a force about six times more vigorous than a firm handshake (about 1 kilogram per square centimetre).

Graphic panel text

Constrictors are snakes (such as boas and pythons) that gently squeeze their prey to death over several minutes.

Small (and maybe large) constrictors seem to kill their prey by causing high blood pressure, heart attacks and strokes before suffocation.

Constrictors pin down their prey and coil themselves around or against the prey. If the prey struggles or breathes out, the constrictor tightens its grip and squashes the prey's blood vessels, almost doubling its blood pressure.

The constrictor may also stretch the prey to damage nerves controlling arteries and veins. The prey's bones are rarely ever broken.

Want to know more about constrictor snakes?

Some constrictor snakes hunt and squeeze lizards and other snakes, but most use constriction to kill birds and mammals such as mice and even antelopes.

Constrictor snakes loop their trunk against or around an animal and squeeze it to death before swallowing it whole. However, scientists are debating whether prey constricted by snakes die of suffocation, cardiac failure or a combination of the two.

For many years, scientists assumed that constrictor snakes suffocated their prey, because the prey's breathing seemed to be most affected.

However, constriction kills small mammals in time frames sooner than death by suffocation. In other words, if prey die from suffocation during constriction, the snake should be squeezing the prey longer than they actually do.

In 1928 and again in 1994, scientists hypothesised that constrictor snakes may cause heart failure in prey rather than suffocation. For example, when wild woodrats were constricted by a snake, they died in 65 to 93 seconds. But rats of similar size took three times longer to die when they were suffocated in isolation (without being constricted).

Prey probably experience suffocation as well as cardiac arrest when they are constricted, but scientists continue to debate these theories.



After prey has stopped moving (and assumed to have died), the constrictor adjusts its jawbones and starts to swallow the prey whole while holding the prey in its coiled posture. Snakes seem to prefer swallowing prey head first. If constrictors start to swallow prey from the middle or posterior end of the prey's body, they usually give up and try again from the front of the prey.

Large pythons have occasionally killed humans, although nobody knows whether their death was caused by suffocation or circulatory arrest. During the late 1990s, photographs of a human supposedly found in the stomach of a python were circulating on the Internet. These photos were fake. Visit the Urban Legends Reference Page <http://www.snopes.com/horrors/animals/anaconda.htm> for more information.

Warning: this page has photographic images that may distress some people.

Extra for experts

Constrictor snakes press themselves against prey in different ways. Boas and pythons tend to coil themselves around prey, while colubrid snakes (such as gopher and king snakes) tend to loop and pin their body sideways against the prey.

Constrictor snakes squeeze their prey in gentle but firm 'bursts', rather than applying a tight, constant pressure. This helps the snake to conserve energy by using their muscles economically, but also apply enough pressure to kill prey.

Constrictors may squeeze small prey continuously if they struggle, but simply hold the constriction posture while the prey is still. Holding the constriction posture, but not squeezing allows a snake to squeeze again very quickly if the prey starts to move.

Constriction pressures exerted by large constrictor snakes has not been studied, but one study has been done on medium sized constrictor snakes, such as gopher and king snakes (up to 1.5 metres long and 4 centimetres in diameter). These snakes usually constrict mice or small rats and when they squeeze a human's arm, it feels reasonably strong, exerting about 14 kilopascals of pressure.

In this experiment on king and gopher snakes, small instruments called pressure transducers were placed inside dead mice. These mice were then given to gopher and king snakes to constrict and measurements of the constriction pressure produced by the snakes were recorded (ranging from 6–30 kilopascals or 46–232 mmHg).

The mice were squeezed at pressures that ranged from half to double the mouse's normal systolic pressure and probably ten times greater than the mice's normal venous pressure.

The snakes in this experiment also stretched the mice using their mouth and coiled body. This stretching may have been used by the king and gopher snakes to stretch and damage nerves in the mice (which can reduce blood flow in normal live mice up to 50%) or to fatigue the mice so they die sooner.

The snake's epaxial muscles (the same muscles used for locomotion) are used intermittently during constriction. Scientists are continuing to research which muscles and tendons are actually used by the snake to constrict prey.

Further information

Special thanks to Dr Brad Moon, Assistant Professor of Biology, University of Louisiana at Lafayette for his help with the Squeeze and Serve exhibit. <http://www.uclouisiana.edu/%7Eb5101/constrct.htm>

Boa's Hold Measured. *Science*. 19 April 2002. Vol 296: 465.

The mechanics and muscular control of constriction in gopher snakes (*Pituophis melanoleucus*) and a king snake (*Lampropeltis getula*). *Journal of Zoology*, London. Brad Moon. 2000. Vol 252: 83–98. Free access this article at: <http://www.uclouisiana.edu/%7Eb5101/constriction.pdf>

Constriction: Suffocation or Heart Attack? *The Cold Blooded News*. Ed Ferrer. July 2000. Vol 27(7).

Constriction in Snakes <http://www.uclouisiana.edu/%7Eb5101/constrct.htm>