Here's venom in your eye: Spitting cobras hit their mark

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Spitting cobras have an exceptional ability to spray venom into eyes of potential attackers. A new study published in *Physiological and Biochemical Zoology* reveals how these snakes maximize their chances of hitting the target.

The name "spitting cobra" is a bit of a misnomer. Cobras don't actually "spit" venom, says the study's lead author Bruce Young, director of the Anatomical Laboratory in the Department of Physical Therapy at the University of Massachusetts, Lowell. Muscle contractions squeeze the cobra's venom gland, forcing venom to stream out of the snake's fangs. The muscles can produce enough pressure to spray venom up to six feet.

There are no points for distance, however. To be effective, venom must make contact with an attacker's eyes, where it causes severe pain and possibly blindness. Previous studies have found that cobras hit their targets with alarming frequency—nearly 100 percent accuracy from 60 centimeters.

Dr. Young and his colleagues, Melissa Boetig and Dr. Guido Westhoff, have found the secret to the cobra's success.

Cobra venom does not hit a victim in one spot. Instead, the venom lands in complex geometric patterns. This is no accident, according to the study. The patterns are actively produced by the cobra.

Dr. Young and his team used high-speed photography and

electromyography (EMG) to detect contractions of head and neck muscles. They found that cobras engage their head and neck muscles a split second before spitting. The muscle activity rotates the head, and jerks it from side to side and back again, producing complex venom patterns.

"The venom-delivery system functions to propel the venom forward while the [head and neck] muscles produce rapid oscillations of the head that … disperse the venom, presumably maximizing the chance that a portion of the spat venom will contact the eye," the authors write.

The ability to actively disperse venom means that cobras don't need dead aim on the eye. They just need to be in the ballpark.

The paper appears in an issue of *Physiological and Biochemical Zoology* on the focused topic "Functional Consequences of Extreme Adaptations." PBZ is edited by Dr. James Hicks of the University of California, Irvine and published by the University of Chicago Press.

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