

The deadliest RAT in the world!

Albert Scholtz

AFRICA HAS some of the most iconic, strangest and unique animals in the world. However, arguably one of the strangest and least-known of these is the crested rat (*Lophiomys imhausi*). It is the only rodent in the world known to be poisonous!¹

The crested rat (also commonly known as the maned rat) lives in the highlands of East Africa between altitudes of 1,200 m (3,900 ft) and 2,700 m (8,900 ft). It is distributed across Somalia, Ethiopia, Sudan, Kenya, Uganda, and Tanzania.² These nocturnal rodents sleep in hollow tree stumps and rock crevices during the day. The crested rat is the only living species classified under the subfamily Lophiomyinae (there are several extinct ones known from fossils).³

A mature crested rat is 360–530 mm (14–21 in) long. Short black fur covers its head, while the rest of its body is covered in long, black-and-white-banded hair. This long fur forms the crest from which the crested rat derives its name.² Not only does this fur protect it against the elements, but it also conceals a deadly secret.



Beneath the long outer fur lies another layer of shorter fur that covers the flanks of the rat. This shorter fur consists of different coloured bands of hair, arranged in a symmetric pattern. The outer bands consist of black hair, followed by bands of white. The centre of the pattern consists of coarse, specialized hairs.⁴ These hairs are unique to the crested rat and harbour a deadly surprise for any predator foolish enough to attack these rats.

At its base and tip, each specialized hair looks like any other hair. However, the central part consists of an outer cylindrical lattice structure that surrounds bundles of fibre-like strands in the hair's core.⁵

As part of its defence mechanism, the crested rat chews the bark of the African poison arrow tree (*Acokanthera schimperi*). Poison within the bark is released into its saliva. The rat then licks its flanks, applying this poisonous saliva to the specialized hairs.⁵ These hairs act as miniature sponges, quickly absorbing the poisonous saliva.

The crested rat has a lot of potential predators. E.g., black-backed jackals, honey badgers, hyenas, leopards, wild dogs, caracals, servals, and domestic dogs.⁶

When the crested rat feels threatened, it parts the fur of its outer coat to expose the dark and light bands hidden beneath it. These act as a target that lures the predator to attack the rat's poisonous flanks. As the predator tries to take a bite, the specialized hairs release the poison they contain. This enters the predator's bloodstream through the mucous membranes in its mouth.⁵ Within seconds, it begins to take effect, incapacitating or even killing the predator and allowing the rat

(a) *Lophiomys imhausi* warning display; note lateral hair tract at visual centre of signal design. (b) Outline of skinned specimen in same position with lateral-line tract outlined; note how long hair transforms visual appearance. (c) Skeleton; note robust and elongated vertebral column, and possible role of scapulae as protective shields above vital centres.



to escape.⁶ (See ‘This poison can kill an adult elephant’ below.)

The crested rat is the only mammal known to isolate poison from plants to use for its own self-defence.^{2,4,5,6}

The poison can, however, only protect the rat *after* a predator tries to take a bite out of it. There is thus a very real chance the predator will severely wound the rat before being incapacitated.

To insure against this, the rat has several other antipredator design features. For example, the skin of the crested rat is unusually dense and tough. Only the sharpest of claws and teeth can pierce it. The rat also has an elongated backbone with extra vertebrae. This makes the backbone extremely robust and flexible. Also, an extra layer of bone covers the rat’s skull, providing further defence.^{2,4,5}

Since the crested rat needs to chew the bark of the African poison arrow tree to obtain the needed poison, why doesn’t it succumb to the poison itself? The short answer is—*nobody knows*. However, scientists do have a few hypotheses. One possibility is that the poison is unable to bind to the rat’s target protein, which may have the wrong structure to allow this.⁵ Another hypothesis is that bacteria in the rat’s gut quickly break down the poison.² Clearly, further research is needed to find out what makes the rat immune to the poison.

Created, not evolved

As usual, all the credit for the crested rat’s remarkable defence mechanism is given to evolution.^{2,5} At first glance, it might appear that for the rat to survive, all the different components of this defence mechanism needed to have been present at the same time. However, one has to be careful not to overstate the case. There are possible ‘just-so’ scenarios in which several of the individual items *would* provide a selective benefit. For example, the thick fur would be protective in its own right against a predator attack, and likewise the thickened skull.

What about the poisonous fur? It is tempting to think that if the rat died of wounds inflicted before the poison took effect, it could not pass its genes on, so selection would end there. However it could be argued that a predator who got very sick would be deterred from attacking the dead rat’s siblings, which share its genes.

But other aspects present more difficult problems for evolution. For instance, the specialized hairs would provide no benefit if the rat was poisoned every time it chewed the poisonous bark. And developing immunity to an easily avoidable poison would have far less point without the hairs to store it. Countless other mammal species are susceptible to the poison, without this causing them any difficulty. Finally, how did the crested rat initially become immune to the poison? Surely not by chewing the poisonous bark from time to time over millions of years until the right



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THIS POISON CAN KILL AN ADULT ELEPHANT

The African poison arrow tree (*Acokanthera schimperi*) serves as the main poison source for the crested rat. For centuries, it has also provided the poison native elephant hunters used to coat their arrows.^{1–3}

Scientific analysis of this poison has shown that the main active compound in the poison is known as ouabain, which is a Na^+/K^+ -ATPase (sodium-potassium pump) inhibitor.^{1–3}

Na^+/K^+ -ATPase is a crucial protein, an enzyme that is found in all animal cells. It uses ATP (the energy currency of life) to pump Na^+ ions out of the cell and K^+ ions into the cell against their respective concentration gradients. The Na^+/K^+ -ATPase plays a crucial role in regulating cell volume and maintaining cell membrane potential. Without this pump, cells are unable to transport nutrients into their interior, to excrete waste products or to send certain intracellular signals.⁴ This is crucial for nerve and muscle function, particularly in the heart.

Ouabain is part of a family of substances known as cardiac glycosides, which act in the same way. These include digitalis, used in carefully controlled low dosage to treat cardiac failure in humans. Symptoms of ouabain poisoning often include intense nausea, vomiting, irregular beating of the heart, convulsions, difficulty breathing, and cardiac arrest leading to sudden death.³



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Not surprisingly, predators who survive an attack on the crested rat (many don’t) subsequently avoid these rats at all costs.

1. Glass, A., ref. 1 main text.
2. Kingdon, J. *et al.*, ref. 4 main text.
3. Weinstein, S. B. *et al.*, ref. 5 main text.
4. Lodish, H. *et al.*, *Molecular Cell Biology* (9th edn), Macmillan International Higher Education, New York, 2021.



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Mackinder's eagle owl—unaffected by the poison (ref. 6)

change to the protein structure or to its gut bacteria came along. Any inherited trait for such deadly behaviour would have quickly been eliminated by natural selection. Animals that like to chew poisonous things usually do not live long enough to produce offspring, unless they are already immune to the poison.

It's hard to believe such an amazing and integrated defence mechanism came about through random mutations, even with the benefit of natural selection. There are many things that would have to happen at just the right time and place for such a multi-faceted system to arise with its sophisticated, coordinated components. Each part is not only functional, but also optimally and economically designed. Regarding

the crested rat's specialized hairs, one research paper stated,

... the hair exemplifies unique, exceptional optimization and economy of structure for sequestration and delivery of toxins.⁵

Everyone knows that a design requires a designer. The more amazing the design, the more amazing the designer. The defence mechanism of the crested rat is a clear example of an exceptional design. The most logical cause for its origin is that an exceptional Designer created it.

Summary

Instead of undeservedly giving the credit to evolution, we should give it to the deserving Creator of the crested rat—the God of Genesis.

Some may argue that if a good Creator designed everything, He would design animals to live in peace with one another, removing the need for a defence mechanism. However, God foreknew the Fall and, in His benevolence, provided the crested rat with a mechanism to protect itself.⁷

The defence mechanism of the crested rat reminds us of the Creator's greatness and care for His creatures. We can only marvel and exclaim along with the Psalmist, "O LORD, our Lord, how majestic is your name in all the earth!" (Psalm 8:9).

References and notes

1. Glass, A., Meet the world's deadliest rat, which can kill an elephant with one bite, discoverwildlife.com, 5 Jan 2025.
2. Linseele, V. *et al.*, The first fossil record of *Lophiomys* in Egypt, *Mammalia* **74**:109–112, 2010.
3. Ogada, D., Insights into the natural history of the little known maned rat *Lophiomys imhausi* through examination of owl pellets and prey remains, *J. East Afr. Nat. Hist* **107**(1):1–7, 2018.
4. Kingdon, J. *et al.*, A poisonous surprise under the coat of the African crested rat, *Proc. R. Soc. B* **279**:675–680, 2012.
5. Weinstein, S. B. *et al.*, The secret social lives of African crested rats, *Lophiomys imhausi*, *J. Mammal* **101**(6):1680–1691, 2020.
6. Interestingly, the Mackinder's eagle owl regularly preys on the crested rat, but the poison does not seem to affect it.
7. The concept of attack and defence mechanisms before the Fall is explained in: Batten, D. (ed.), *The Creation Answers Book*, 9th edn, CBP, 2019; creation.com/s/10-2-505.

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