

Meet the naked mole-rat: impervious to pain and cancer, and lives ten times longer than it should

June 18 2019, by Ewan St. John Smith



Credit: [Smithsonian's National Zoo/flickr](#), [CC BY-NC-ND](#)

The naked mole-rat is perhaps one of the most bizarre beasts on the planet. At first glance, it looks like little more than a cocktail sausage with legs and teeth. But beneath its wrinkly pink skin, this creature's strange and beautiful biology has me fascinated—so much so that I set up a whole [research group](#) devoted to studying them. Largely immune to cancer, impervious to some forms of pain, and seemingly blessed with

the elixir of life, you may well owe your life to them one day.

As the name might suggest, naked mole-rats buck the mammalian trend by almost completely lacking hair or fur. Living underground in complex networks of tunnels in East Africa, their thermally stable environment means that a few orientation-aiding bodily hairs and facial whiskers are all they need. Lacking evolutionary pressure to regulate their body temperature, they're also the only known [cold-blooded mammal](#) on the planet.

The way naked mole-rats mate and socially organise is more akin to certain [insect species](#) than to mammals. Like some species of bees and ants, naked mole-rats are eusocial, living in 100-strong groups headed by a sole breeding female, the queen. But while insects command their colonies with [pheromones](#), the naked mole-rat queen uses physical aggression to keep their groups digging tunnels, foraging, and defending entrances.

A key tool for both digging and combat is their teeth. Their incisors are exterior to their lips, so that when they bite through hard soil they don't get a mouthful of earth each time. Naked mole-rats can also [move their lower incisors](#) to manipulate objects, and have a large sensory area of their brains [dedicated to their teeth](#) in the same way that hands have dedicated brain space in humans.



Credit: CC0 Public Domain

The peculiarities of naked mole-rat behaviour are captivating in themselves. However, to most scientists, what makes them really exciting is the potential some of their incredible biology holds for making biomedical breakthroughs.

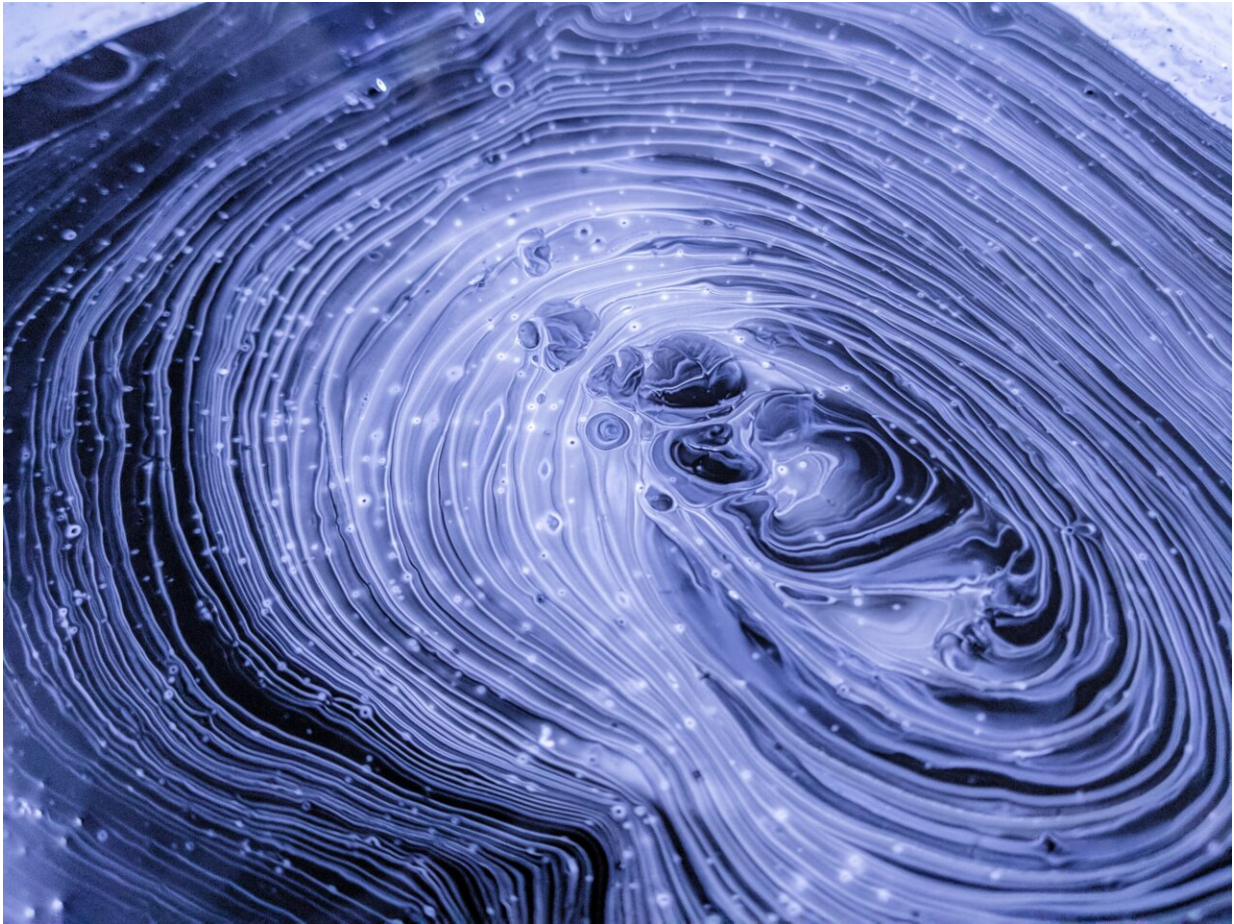
The naked mole rat's resistance to cancer, diagnosed in humans [every two minutes](#) in the UK alone, is a particular area of focus for researchers. In studying why there are just a few documented cases worldwide in naked mole-rats, scientists are hoping to identify new ways to prevent or treat the deadly disease.

As yet, we're not exactly sure what gives them their resistance. Some evidence [suggests](#) that a key difference in one of the meshwork of substances providing structural and nutritional support to cells prevents them from reproducing uncontrollably. However, others have observed [different](#) results, so further investigation is needed.

Not content with just being immune to cancer, naked mole-rats are also [impervious](#) to some normally agonising [chemical stimuli](#), such as capsaicin (the substance that makes chilli peppers taste hot) and acid (what gives lemon juice and vinegar their kick). For their acid-insensitivity, researchers are clearer about why. A subtle difference in one particular molecule of the animal's pain-sensing nerves turns acid into an [anaesthetic](#). That is, rather than stimulating pain-sensing nerves, it actually numbs them—just like an anaesthetic that your dentist administers before the drilling starts. Sadly, this superpower only works with specific chemical stimuli—heat and pressure are just as damaging to them as us.

Scientists are now further studying the naked [mole-rat](#) to see whether we might be able to make the human pain system similarly impervious to acid pain. This could be extremely useful for cancer and arthritis sufferers, for whom build-ups of acid in body tissue can be a [major contributor](#) to chronic pain. The molecule responsible for insensitivity to acid in mole-rats also plays a role in human genetic conditions that drastically alter [pain perception](#), and as a result of this convergent research, potential painkillers targeting this molecule have made it into clinical trials in humans.

Naked mole-rats are also highly resilient to low oxygen conditions. Their nerve cells can function for [almost one hour](#) in the complete absence of oxygen, by instead using fructose to [power energy production](#). In studying this remarkable ability, my lab and others are hoping to uncover novel treatments to prevent [brain damage](#) in stroke patients.



Credit: CC0 Public Domain

Naked mole-rats are also renowned for their longevity. Broadly speaking, a [larger body equals longer life](#) in mammals. Standard lab mice weigh around 35 grams, and usually live a maximum of two to three years. Naked mole-rats can be up to twice as heavy, so might be expected to live four to six years, but can actually survive for more than [30 years](#) in captivity. That's longer than the lifespan of polar bears and giraffes. And while humans experience from many ageing-associated health problems (for example, osteoarthritis), naked mole-rats appear to

age without issue. Research into the ageing processes of [naked mole-rats](#) is only in its infancy, but could have multiple implications for treating ageing-related conditions in humans.

Naked mole-rats may look comical, but their magical biology is no laughing matter. Studying their hidden powers will not always result in preventions, cures and treatments for human ailments because of fundamental differences between the species. However, every new insight has the potential to lead to a breakthrough—as animal research has continually done throughout [recent history](#). By unlocking the secrets held within their cells in a responsible manner, we may one day improve countless human lives.

This article is republished from [The Conversation](#) under a Creative Commons license. Read the [original article](#).

Provided by The Conversation

Citation: Meet the naked mole-rat: impervious to pain and cancer, and lives ten times longer than it should (2019, June 18) retrieved 25 April 2024 from <https://phys.org/news/2019-06-naked-mole-rat-impervious-pain-cancer.html>

| |
|--|
| <p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p> |
|--|