

Ugly duckling mole rats might hold key to longevity

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What good is longevity if you end up looking like this? WUSTL biologist Stan Braude, working on a book about the critters, says the naked mole rat is being studied for its tendency to live a long life. Image courtesy of the BBC

Who would have thought that the secrets to long life might exist in the naked, wrinkled body of one of the world's ugliest animals? Probably not many, but current research may be leading seekers of the Fountain of Youth to a strange little beast — the naked mole rat.

The naked mole rat is certainly not one of nature's cuddliest species. These small rodents are hairless, wrinkled, blind and buck-toothed. Stan Braude, Ph.D., lecturer in biology in Arts & Sciences at Washington University in St. Louis, however, is attracted to these animals and has been studying them for over 25 years, with about 20 of those years being in the field in Kenya.

Braude is currently working on a new book that will serve as a synthetic review of the past 20 years of research on naked mole rats. While various research has been conducted on naked mole rats in a lab setting, Braude and his students are the only researchers out in the wild with them.

"I make the case [in my book] that if you really want to understand the lab work you also have to know what these animals are doing in the wild," said Braude.

Some of the "hottest" research on naked mole rats today concerns senescence, or aging. Naked mole rats in the lab have reached up to 28 years of age. And it's not just the controlled environments of their captivity that are doing this. Braude has observed mole rats in the wild that are 17 years and older. But these are the breeders. Lab researchers didn't realize that in the wild workers only live two or three years.

"For a rodent of this size, they are ridiculously long-lived," said Braude.

Hairless wonder

A key component in the aging of any species is oxidative damage, where the cells accrue damage from poisons, environmental toxins and other effects throughout life. In such a long-lived rodent, it was thought that naked mole rats had a very efficient way of repairing oxidative damage. This wasn't the case, however, and current theory points to the strange metabolism of this hairless wonder.

Naked mole rats appear to deal with oxidative stress in pulses, largely due to their ability to essentially shut down their metabolism when there are hardships, such as lack of food. In this way, mole rats may be able to rid their body of harmful reducing agents and poisons more easily during these metabolic pulses.

"Another way to think of it is, their gross life span might be 28 years, but their metabolism is going in these short bursts so maybe the net damage is only 3 or 4 years of net use," said Braude. "They're living their life in pulses."

Shelley Buffenstein, Ph.D., of the University of Texas, San Antonio, is one of the researchers leading the way in senescence research and the naked mole rat. She is hoping to accompany Braude to Kenya in 2009 to observe mole rats in their wild habitat.

So how are these naked guys going to help us? Parrots and sea turtles are also long-lived, and perhaps one day humans will be able to harness whatever biological process these animals are using and apply it to our own lives.

"If we understand how these different species do it, then the next step is to figure out how we can get those benefits with either drug treatments or changing diet or changing lifestyle," says Braude. "It's nice that we have a mammal that is also [living long], so there's hope that it's not just a bird and reptile thing."

The senescence of naked mole rats is not Braude's primary concentration. He considers himself a behavioral ecologist and takes his perspectives on physiology and applies it to these animals in the wild. He was originally drawn to these animals, as were many researchers at the time, because of their eusocial behavior. Naked mole rats, like bees and ants, have a queen and workers.

Kidnapped! By a naked mole rat, no less

During his time with naked mole rats in Kenya, Braude has observed many traits and behaviors that make this animal unique. Naked mole rats in nature kidnap pups from other colonies and bring them back to serve

as workers in their own tunnels; naked mole rats will invade neighboring colonies and fight for hostile takeover; and when naked mole rats disperse, or leave the colony to found a new one, they have often been found up to two kilometers away.

"They're blind, they're hairless, they're small, but they're running...two kilometers from where they're born when it's time to disperse. That's pretty dramatic," Braude said.

In the wild, Braude has survived a leopard jumping past him to maul the man standing next to him in the back of a pickup truck and an angry cobra in a sack of potatoes he reached into. But "on a good day" he describes his work as "ice fishing at the equator," as he waits for naked mole rats to emerge from their burrows.

Braude is writing a synthetic monograph that will pull together all the different threads — from the ecology in the wild, from the behavior, from the physiology — with the unique perspective of living with these animals in their natural environment for almost 20 years.

Braude has also written an illustrated children's book about the day in the life of a naked mole rat. Imagine that as a bedtime story.

Source: WUSTL

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