

Long-lived rodents have high levels of brain-protecting factor

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The naked mole rat, a burrowing rodent native to East Africa, has many advantages that enable it to have a long, healthy life. Because of this, it is an ideal model for the study of healthy aging. Credit: UT Health Science Center San Antonio

The typical naked mole rat lives 25 to 30 years, during which it shows little decline in activity, bone health, reproductive capacity and cognitive ability. What is the secret to this East African rodent's long, healthy life?

Scientists from the United States and Israel found a clue. From [infancy](#) to old age, naked [mole rats](#) are blessed with large amounts of a protein essential for normal [brain function](#).

"Naked mole rats have the highest level of a growth factor called NRG-1

in the [cerebellum](#). Its levels are sustained throughout their life, from development through [adulthood](#)," said Yael Edrey, doctoral student at The University of Texas Health Science Center San Antonio's Barshop Institute for [Longevity](#) and Aging Studies.

Comparison across 7 species

The Barshop Institute has the largest colony of naked mole rats in the U.S. — 2,000 rodents scampering around a network of tubes and cages in humid conditions that mimic their natural underground habitat. Edrey is the lead author of research that compared lifelong NRG-1 levels across seven species of rodents, from mice and guinea pigs to blind mole rats and Damaraland mole rats.

NRG-1 levels were monitored in naked mole rats at different ages ranging from 1 day to 26 years. The other six rodent species have maximum life spans of three to 19 years.

The cerebellum coordinates movements and maintains bodily equilibrium. The research team hypothesized that long-lived species would maintain higher levels of NRG-1 in this region of the brain, with simultaneous healthy activity levels.

Among each of the species, the longest-lived members exhibited the highest lifelong levels of NRG-1. The naked mole rat had the most robust and enduring supply. "In both mice and in humans, NRG-1 levels go down with age," Edrey said.

Protection of the brain

Researchers have documented various characteristics of naked mole rat physiology, revealing the integrity of proteins in the liver, kidney and

muscle. This is the first set of data evaluating species' differences in a key factor involved in maintaining the integrity of the rodent's brain.

"The strong correlation between this protective brain factor and maximum life span highlights a new focus for aging research, further supporting earlier findings that it is not the amount of oxidative damage an organism encounters that determines species life span but rather that the protective mechanisms may be more important," said senior author Rochelle Buffenstein, Ph.D., professor of physiology and cellular and structural biology at the Barshop Institute. She is Edrey's research mentor.

The finding, while not directly applicable to humans, has many implications for NRG-1's role in maintaining neuron integrity.

Co-author Dorothée Huchon, Ph.D., a senior lecturer at Tel Aviv University in Israel, was a sabbatical scholar at the National Evolutionary Synthesis Center (NESCent) in Durham, N.C., during the project. Dr. Huchon conducted analyses revealing, she said, that the correlation between maximum life span and NRG-1 levels was independent of evolutionary lineage of the seven species.

[Naked mole rats](#) are burrowing rodents with a distinctive appearance — hairless with wrinkled pinkish skin, tiny eyes and protruding front teeth. Their native habitat is the Horn of Africa. The rodent's capacity to resist cancer and maintain protein integrity in the face of oxidative damage makes it an ideal animal model for aging and biomedical research.

The finding is described in an issue of *Aging Cell*.

Provided by University of Texas Health Science Center at San Antonio

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