

INVESTIGATIONS

Explorations and revelations



Queen naked mole-rats seem ageless and can reproduce throughout their lifetimes.

SECRETS OF THE NAKED MOLE-RAT

STRANGE RODENTS MAY HOLD THE KEY TO
BETTER FERTILITY AND ANTI-AGING PROPERTIES
IN HUMANS. | BY JASON BITTEL

With wrinkly pink skin, beady black eyes and a hellish set of chompers, the naked mole-rat is not the kind of creature many people gravitate toward. But increasingly, researchers have been drawn to this subterranean animal as a potential model for reversing human infertility and avoiding the typical effects of aging.

Sounds far-fetched, right?

“It sounds really far,” says Miguel Brieño-Enriquez, an MD, PhD assistant professor of obstetrics, gynecology and reproductive sciences at the University of Pittsburgh. “But it’s not that far.”

Here’s why. Although lab mice usually die after around 2 years of age, the naked mole-rat, which is native to East Africa, can live more than 30 years. That’s a long lifespan for a mammal that weighs less than a Snickers bar. What’s more, naked mole-rat queens never appear to go through menopause, successfully reproducing all the way up until their deaths.

And this has made scientists like Brieño-Enriquez wonder if there aren’t components of the naked mole-rat’s physiology that can be borrowed to create treatments for humans. After all, scientists developed life-saving insulin from dogs and then cattle, he says. And that’s just one example among many medicinal loans from elsewhere in the animal kingdom.

Doctors routinely prescribe: a drug derived from Gila monster saliva to diabetes patients, another drug that comes from cone snail venom for those suffering from chronic pain

and a heart-attack prevention drug from the venom of southern pygmy rattlesnakes. So there’s nothing particularly strange about looking to the naked mole-rat for a little inspiration.

To start chipping away at how the wrinkly critters continue to reproduce well into what should be their golden years, Brieño-Enriquez designed a series of experiments to test three hypotheses about how naked mole-rat ovaries work.

The first experiment investigated whether naked mole-rat females at birth simply have more germ cells, or eggs, as opposed to mice or people. They do. The second looked at whether the animals lose fewer egg cells as they age. They do. And the third sought to determine whether the naked mole-rats can create new germ cells after birth. They do.

(By the way, whether humans can create new germ cells after birth is a contentious topic in fertility, stem cell and aging research circles.)

At first blush, you might think the findings would be bad news for women experiencing problems with infertility. After all, the findings suggest that the naked mole-rat’s ovaries are just way too different from those of humans. But here’s the rub.

Naked mole-rat colonies are eusocial, which means they are led by a single queen who does all the breeding. All the other females in the colony are subordinate, and, by some mechanism scientists are still trying to understand, unable to breed. However, if you take a subordinate female out of the colony,

something shifts in her physiology and allows her reproductive organs to flip the switch into the on position.

In essence, the subordinate becomes a queen.

“What it seems like is that when you are a naked mole-rat, and you transform to a queen, somehow, you start to age slower,” says Brieño-Enriquez. “And the only thing that is different is that the ovary is actually working.”

Now Brieño-Enriquez and his team are mimicking the on switch found in naked mole-rat ovaries and producing some of the same results in genetically modified laboratory mice.

“The potential for this research is huge,” he says.

Clearly, a derived drug that could make women produce more eggs or keep the ones they have would give in vitro fertilization clinics more material to work with, which could result in higher baby-making success rates. But the aging aspects are important, too, he says. For both men and women, aging is associated with increased risks of cardiovascular disease, mental health diseases and cancer.

“If we cannot turn back time, perhaps we can at least slow the speed of aging, which would mean that people will be in better shape for longer,” says Brieño-Enriquez. “So it’s not just reproduction or just aging; I think it’s the marriage of the two.”

And to think, we could owe it all to a gnarly little mammal that spends its whole life in a hole in the ground. ■