Long live the ovary: Mutant mice keep eggs

It's among the most wasteful phenomena in the human body. A female starts her life with millions of immature eggs, or oocytes, in her ovaries. Yet over the years, most of those cells commit suicide, eventually leaving the ovaries barren.

A similar squandering occurs in many mammals, but researchers have now found that a gene mutation can thwart this process in female mice. When they lack normal copies of the gene called *BAX*, aged rodents—the equivalent of women 100 to 120 years old—retain the egg-filled ovaries of a young mouse.

"Not only can a [mutation in a] single gene protect a large number of egg cells, it can actually prolong ovarian life span in mice," says Jonathan L. Tilly of the Massachusetts General Hospital in Boston.

Tilly and his colleagues describe the seemingly healthy, mutant mice in the February NATURE GENETICS. With age, the animals still become infertile, the researchers find, presumably because their brains stop sending hormones that command the ovary to release mature eggs, or ovulate. "Apparently, the neuroendocrine system that drives the ovaries is not functioning," says Frank Bellino of the National Institute on Aging in Bethesda, Md.

Artificial means, however, can jump-start the elderly ovaries of the mutant mice. Tilly's group showed that the injection of a hormone that normally triggers ovulation stimulates 20-to-22-month-old mice to release mature eggs into their oviducts. When fertilized by sperm, the eggs begin to divide as expected. The researchers are now testing the quality of the aged eggs by fertilizing them and then implanting them in surrogate mothers.

The gene mutated by Tilly's group encodes a protein employed by oocytes when they start to commit suicide. Its absence appears to stop such egg cell death.

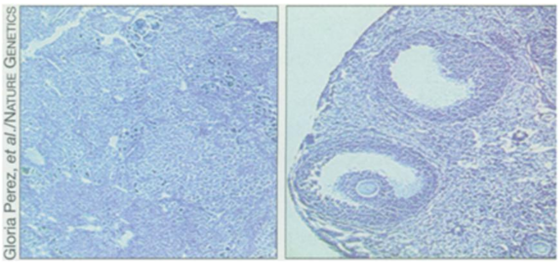
While this research may one day suggest means of extending a woman's fertility, Tilly is more concerned with preserving a woman's overall health. Throughout their egg-bearing lives, ovaries secrete hormones such as estrogen that ward off heart disease, osteoporosis, and other illnesses. That's why after menopause, which coincides with the ovaries running out of eggs, many women undergo estrogen replacement therapy.

If scientists could learn how to make ovaries survive longer, they might improve on such treatments. In addition to estrogen, "there may be other things coming from the ovaries that are also beneficial to the body that we're just not aware of yet," notes Tilly.

"Until now, there's really been no animal model to test whether or not sustained ovarian function would truly have a beneficial impact on any parameter—bone mass, heart function, et cetera."

"This is a very hot area," says oocyte investigator John J. Eppig of the Jackson Laboratory in Bar Harbor, Maine. "A lot of people view the idea of regulating [ovarian] development as a potential way of prolonging female health. In theory . . . you could delay the onset of menopause."

Bellino notes that Tilly's mutant mice may shed light on whether menopause is triggered solely by the ovaries or whether the brain's hormonal signals also play a role. Noting that *BAX*'s protein is missing in all the tissues of the mice, not just the ovaries, Bellino cautions that "one doesn't know how that particular property is affecting the observations." Consequently, he says, it's unclear how the mutant mice compare with normal mice and with people. —*J. Travis*



Gloria Perez, *et al.*/NATURE GENETICS

Aged ovarian tissue (left) is normally bare of eggs, but that of mutant mice (right) still harbors such cells.

New element leaves lightweights behind

A long-sought new element has apparently sprung into existence in a Russian laboratory. Heavier than any previously known element, it crams an unprecedented 114 protons into its nucleus. The real excitement, however, say nuclear physicists and chemists, is that it lasted 30 seconds before breaking down into lighter elements.

Bucking the trend toward briefer lives for increasingly heavy nuclei, the new element lasts 100,000 times longer than number 112, the last new element found (SN: 3/2/96, p. 134). The creators of element 114 believe they have finally set foot on the so-called island of stability, a postulated region of atomic properties populated by extraordinarily long-lived superheavy nuclei.

"Sure, they've found a new element and that's important, but what's really important is the island," says Albert Ghiorso of Lawrence Berkeley (Calif.) National Laboratory (LBNL).

For 30 years, theorists have predicted the existence of this island—a kind of Shangri-La where exotic elements stick around long enough to allow exhaustive studies of their nuclear behavior and chemistry. Researchers anticipate that the elements may display unusual properties.

Scientists from the Joint Institute for Nuclear Research in Dubna near Moscow and Lawrence Livermore (Calif.) National Laboratory collaborated to create the new element. In a prolonged experiment that produced just a single atom, the Russian scientists bombarded a film of plutonium-244, supplied by Livermore, with a beam of calcium-48 atoms for 40 days, says Dubna's Yuri Ts. Oganessian. They completed the work at the end of December 1998. A report of the find appeared Jan. 19 on SCIENCE's online news service.

The atom signaled its presence by disintegrating into lighter and lighter elements, from atomic number 112 to 110 to 108 and so on. Livermore's Kent Moody says his team's data analysis, completed Monday, identifies element 114 "to greater than a 99 percent probability."

Although the claim has yet to undergo peer review for publication, it's being well received in the heavy-element field. "The more we hear, the better it sounds," says Kenneth E. Gregorich, head of a LBNL team gearing up to rejoin the superheavy-element hunt next fall.

During more than a half-century of making increasingly proton-laden nuclei, scientists have found that such nuclei generally decay sooner than lighter ones. Repulsions between the many positively charged protons shatter the nucleus.

However, nuclei also contain uncharged neutrons, which can arrange themselves among the protons to make nuclei more durable than would otherwise be expected. Theorists have long suspected that element 114 would show remarkable nuclear stability.

Oganessian says he is confident that he and his colleagues have reached the shore of the long-sought island. Not only did the purported 114 atom last a long time, but certain isotopes in the decay chain, which also had never been seen before, had extraordinary life spans. For instance, isotopes of elements 112 and 108 in the decay chain lasted 15 minutes and 17 minutes, respectively, before disintegrating. Isotopes of an element have its allotted number of protons but varying numbers of neutrons.

The difficulty of identifying these novel decay products makes it hard to prove unequivocally that element 114 was created, says Sigurd Hofmann of GSI, the German center for heavy-ion research in Darmstadt. Further experiments at GSI, Dubna, and elsewhere—including perhaps a repeat of the recent Dubna experiment—should help settle any doubts about the 114 claim, he says.

With a beachhead on the island established, Oganessian calls for forays inland. "We have to go now for more heavy isotopes," such as 116, he says. —*P. Weiss*