# Fetal cells may trigger autoimmune disease

Researchers got a jolt some years ago when they tested the blood of a young female laboratory technician. A powerful molecular technique detected the presence of genetic material from the Y, or male, chromosome. The researchers feared something had gone wrong with the test.

Once they realized the technician was 6 weeks pregnant, however, that solved the mystery, recalls Diana W. Bianchi, a pediatric geneticist at the New England Medical Center in Boston. The test had homed in on male DNA in fetal cells that were circulating in the woman's bloodstream.

That 1992 observation suggested that researchers could find a few fetal cells very early in a pregnancy. Then, in 1996, Bianchi's team made a dramatic discovery. Fetal cells can linger in the maternal bloodstream, sometimes for decades after childbirth (SN: 2/10/96, p. 85).

Now, Bianchi has hints that this biological legacy may be linked to an autoimmune disorder in the mother.

After the 1996 report, the team wondered whether lingering fetal cells in the mother's bloodstream might, in some cases, incite her immune cells to attack her own tissue. The team focused on scleroderma, a sometimes deadly autoimmune disorder in which degeneration of skin, lungs, and internal organs occurs. Middle-aged women suffer most frequently from this disease.

The team found male DNA circulating in the bloodstream of women with scleroderma who had given birth decades ago to at least one son. When the researchers looked at healthy women who had teenage or adult sons, however, they at first found no sign of fetal cells. Subsequent, more sensitive tests revealed small numbers of fetal cells in some of these women. Healthy women either don't have such cells or have few of them, Bianchi concludes.

She reported the findings on July 21 at Press Week 1997, a meeting sponsored by the Jackson Laboratory and Johns Hopkins University and held in Bar Harbor, Maine.

Male fetal cells aren't likely to be the only culprits in such diseases. The research team looked for male DNA because of the ease of finding the Y chromosome in a woman's blood, Bianchi says, but female fetal cells may also underlie autoimmune attacks.

During the trauma of labor and delivery, hundreds of thousands of fetal cells surge into the mother's bloodstream, Bianchi says. The researchers believe that the immune system usually clears most of those cells from the mother's body. In some cases, however, large numbers of fetal cells persist. The mother's immune system then may recognize the cells as foreign and begin a blitz that eventually runs amok and leads to scleroderma or another autoimmune disorder, Bianchi speculates.

The team now plans to turn its attention to other autoimmune disorders, such as Sjögren's syndrome. "There are a whole host of diseases that are much more common in women," Bianchi says. "Most of those diseases have been explained on the basis of hormonal differences." The new work hints at another mechanism, however, one that involves the lasting legacy of pregnancy, she says.

Although the unpublished study demonstrates the existence of fetal cells in the blood of women with scleroderma, it doesn't prove that such cells directly lead to disease in the mother. Additional research must be done to discover whether the fetal cells or other factors actually kick off the damaging autoimmune reaction, comments David L. Valle of the Howard Hughes Medical Institute at Johns Hopkins Medical Institutions in Baltimore.

The study raises some tantalizing possibilities for the treatment of autoimmune disorders in women, Valle says. If additional work confirms the notion that fetal cells trigger disease, then physicians might work to develop a treatment that would facilitate clearance of fetal cells at the time of delivery, he says. Such an approach might prevent the development of an autoimmune disorder decades later. *—K. Fackelmann*

# Craters and extinctions: Time of reckoning

Like fashion, geology goes through fads. In the 18th century, natural historians believed that a primeval ocean sculpted the landscape. These days, extraterrestrial impacts are all the rage as an explanation for major events in Earth's history.

In keeping with the current style, a team of scientists reports evidence that a giant body slammed into South Africa 145 million years ago, at the close of the Jurassic period. The crash may explain a surge of extinctions among reptiles and marine life at the time, says Christian Koeberl of the University of Vienna.

The impact carved a large crater, now hidden beneath Kalahari Desert sands near Morokweng, in the northwest part of South Africa. Koeberl's group and a South African team, working independently, found the crater while studying gravity and magnetic measurements of the region. They reported their discovery last year but could not tell the crater's age and size at that time.

Koeberl and his colleagues from Australia and South Africa have now dated rocks drilled from the crater. They used two methods, one that measures the radioactive decay of uranium and another that charts the decay of thorium. Their analyses peg the crater's age at 142.8 million to 147.7 million years, they report in the August GEOLOGY.

"That is indistinguishable from the currently determined age of the boundary between the Jurassic and Cretaceous periods," says Koeberl. The correspondence raises the question of whether the impact caused the moderate extinctions at that time, he says.

The Morokweng crater ranks as one of the largest on Earth. Judging from the available evidence, Koeberl says that the circular structure measures at least 120 kilometers across. Some data hint that it may be 340 km in diameter, which would make it the biggest crater known.

"I think it's really exciting," comments C. Wylie Poag of the U.S. Geological Survey in Woods Hole, Mass. "It will give people an incentive to look more carefully at the Jurassic-Cretaceous boundary."

Poag notes that the connection between the crater and the extinctions is far from airtight. Geologists do not have a firm idea of exactly when the Jurassic ended because they have not yet dated the boundary using radiometric techniques. Instead, they have estimated an age of 145 million years, using dates of rocks above and below the boundary. That means the impact could have preceded or postdated the extinctions by several million years.

Geologists have much better evidence that a comet or meteorite knocked life for a loop 65 million years ago, at the boundary between the Cretaceous and Tertiary periods. The crash left a global layer of debris and a 180- to 280-km-wide crater beneath the Yucatán Peninsula. The age of this impact coincides with the disappearance of the last dinosaurs and half of the genera alive in the Cretaceous (SN: 3/1/97, p. S20).

At other times in Earth's history, impacts seem to have had little effect. Last week, Canadian and Russian geologists reported that two large bodies hit nearly simultaneously in the late Eocene epoch, but they apparently did not decimate life.

In the July 24 NATURE, Richard Bottomley of Canadian Union College in College Heights, Alberta, and his colleagues dated a Siberian crater called Popigai at 35.7 million years old. That time falls within a few hundred thousand years of the age of a crater beneath the Chesapeake Bay. "Right now, there doesn't appear to be any dying out associated with these impacts," says Bottomley. The nearest major extinction came some 2 million years later, at the end of the Eocene epoch. *—R. Monastersky*