Cancer increase found in DES moms

Problems with diethylstilbestrol (DES), an estrogenlike substance once used to prevent miscarriage, first showed up in the daughters of women who had taken it — they have a higher rate of cancer of the reproductive tract. Then DES sons were found to produce abnormal sperm, though this relationship is far less solid. Now a study in the Nov. 29 NEW ENGLAND JOURNAL OF MEDICINE links DES to a slight but statistically significant increase in breast cancer in the mothers who took the drug.

The risk, which according to the study is greatest 20 years or more after exposure, is 40 to 50 percent higher than in mothers who did not take DES. In a survey of women who received care at four medical centers, Robert Greenberg of the Dartmouth-Hitchcock Medical Center in Hanover, N.H., Ted Colton of Boston University and others found 118 cases of breast cancer in 3,033 DES-exposed women and 80 cases in an equal number of unexposed women.

Death from breast cancer was only very slightly higher in the DES group (a relative risk of 1.1), but mortality figures bear watching as this group ages. "Although our current estimate is that the risk is not greatly elevated," the researchers note, "it seems to become more pronounced with time and may prove to be of greater concern in the future."

The problem facing the investigators was to tease apart the role of DES from whatever reproductive problems the women may have had. "You can never completely disentangle the effects causing DES to be given from the effects of DES itself," Greenberg told SCIENCE NEWS.

But they carefully considered confounding effects such as a differential rate of detection, family history, age at menarche and first delivery, as well as other factors.

Previous, smaller studies of DES mothers were at odds with one another: Two showed no effect, and a third showed a small but statistically insignificant effect. "This is the largest study so far, so the results are a little more firm," says Greenberg.

"We don't want to generate a tremendous amount of alarm in these women," he says. The DES-associated risk is smaller than the risk associated with having a close relative with breast cancer. Exposed women, he says, should take the same measures all women should take: regular breast self examination, periodic examinations by a physician and, if the physician recommends it, mammography. This suggestion is echoed in an accompanying editorial by Arthur L. Herbst of the University of Chicago, who notes, "The cliché that more data and additional follow-up studies are needed obviously applies."

—J. Silberner

Mapping the earth's magnetic reversals

Ever since the Chinese balanced a lodestone spoon on a brightly polished board, creating the first compass in the first century B.C., people have been fascinated by the earth's magnetic field. But after centuries of research, the origin of the magnetic field — and the even more confounding mystery of why the field completely reverses direction every several hundred thousand years — remains the earth's best kept secret.

Detailed geological records of ancient magnetic field reversals are so hard to come by that scientists have had a difficult time trying to document, let alone explain, the directional path taken by the field every time it changed polarity. Even less is known about the intensity of the field during a reversal; limited data suggest that the strength of the field drops to about 20 percent of its ordinary value sometime during the few thousand years it takes for a transition to occur, but the details of that change remain obscure.

Now Scott W. Bogue in the Department of Geological Sciences at the University of Washington in Seattle and Robert S. Coe of the Earth Sciences Board at the University of California at Santa Cruz are enriching the meager body of data with the first detailed measurements of the magnetic field intensity recorded in volcanic rocks 3 to 4 million years ago. Their findings, published in the Nov. 10 JOURNAL OF GEOPHYSICAL RESEARCH, help to rule out one theory describing reversals and add constraints to another.

The researchers did their fieldwork on the volcanic island of Kauai in Hawaii, where lava flows "trapped" the ancient magnetic fields; as the volcanic rocks cooled, the iron-rich magnetic grains within the lava were frozen into a position aligned with the earth's field. Using the Thellier paleointensity method, developed 15 years ago for dating pottery and other archaeological objects, the researchers heated the lava samples to a series of temperatures in the presence of a known magnetic field. By comparing the samples' magnetic strengths before and after heating, the researchers could deduce the intensity of the earth's magnetic field when the lava originally erupted.

Bogue and Coe unexpectedly found that the intensity pattern was asymmetric, as the field changed from a reversed (R) or southward orientation to the normal (N) direction: The field intensity first dropped by 77 percent and then partially recovered without moving much from the R direction, while the final recovery of the field strength was accompanied by much more directional change toward the N orientation. Subsequent work elsewhere by Coe and others has revealed similarly asymmetric, but more complex, intensity changes during other reversals.

According to the researchers, this asymmetry eliminates one of the heuristic, or descriptive, theories of reversals. The so-called standing field model — in which a small part of the magnetic field stands guard while the main component of the field decays and then builds back up in the opposite direction — predicts an unobserved symmetric rise and fall of the transition intensity.

One theory that can account for the asymmetry is the zonal flooding model, which divides the earth's core into cells, each containing a separate magnetic source. The reversal begins in a small set of cells and works its way over the rest of the core. Bogue can fit the Kauai results to a hybrid flooding theory in which the reversals begin both at the poles and at the equator of the core.

Bogue and Coe also traced the directional path the magnetic field took in both the R to N transition and the following N to R reversal at Kauai. They discovered that, unlike some other back-to-back reverals, the path taken by the field in the R to N transition was almost identically retraced in the opposite direction during the field's journey back to the R orientation. Bogue says the differences between these data and other observed reversal patterns are still compatible with the zonal flooding model if some of the parameters in the theory are allowed to vary from one reversal to the next.

As more data are amassed, it becomes clear that simple descriptive models won't always fit, says Coe. The fundamental problem is that these heuristic theories don't really explain the origin of the field or why it reverses. Theorists do have a more physically realistic approach — they model the earth as a dynamo in which electric currents, resulting from the convection of molten iron and nickel in the earth's outer core, create a magnetic field that can, in principle, be shown to reverse polarity. But for the most part the physical equations governing the dynamo have been far too complex to solve, so geologists play with the heuristic theories instead.

"In a broader sense, what we're doing with this study and others like it is providing observational constraints that will have to be explained by the more realistic dynamo model," says Coe. But with the magnetic transitions occurring faster than nature's geologic recording system can respond, even the observations are difficult to make. "It would be a lot easier," he says, "if the earth would just reverse itself once, while we have all our observatories set up."

—S. Weisburd