Electromagnetic fields may damage hearts

Men who worked in the presence of high electromagnetic fields (EMFs) were up to three times as likely to die from heart attacks and several other cardiovascular conditions as were their colleagues who had far smaller EMF exposures, a new study finds.

The observations emerge from a reanalysis of information collected during a 38-year study of almost 140,000 electric-utility workers.

EMFs are invisible lines of force that surround all electric devices and wiring. Their strength increases with the current running through the devices or wires.

Though high EMFs, especially their magnetic components, can promote the growth of cancers in laboratory animals (SN: 1/10/98, p. 29) and some evidence links them to cancers in people (SN: 6/30/90, p. 404), little attention had been paid to whether they might affect the heart.

Last year, however, Antonio Sastre and his coworkers at the Midwest Research Institute in Kansas City, Mo., published experimental data showing that 8-hour exposures to intermittent, 60-hertz fields altered heartbeat variability in healthy men.

Everyone's heart rate changes slightly from beat to beat, reflecting fine tuning by the nervous system in response to respiration and other factors, explains Sastre, a cardiovascular physiologist. Yet the magnitude of variance can differ dramatically between individuals, he notes. Even when two people each have a heart rate averaging 60 beats per minute (bpm), the heart rate of one might vary from 59 to 61 bpm, while another's swings broadly from 50 to 70 bpm.

Several studies have shown that low heart-rate variability correlates with a higher-than-normal risk of heart attacks and certain other heart conditions, particularly when the slowing occurs in the component of heart rate known as the low spectral band. In the February 1998 BIOELECTROMAGNETICS, Sastre's team reported a slowing in the low spectral band among men exposed to magnetic fields that cycle on and off every 15 seconds for an hour at a time.

When David A. Savitz, an epidemiologist at the University of North Carolina at Chapel Hill, learned of the findings, he invited Sastre to help him sift through data on heart-disease deaths within the large group of electrical workers.

The two researchers and their team now report that compared with men who worked in low-EMF jobs, men in trades exposed to high EMFs—such as linemen and power-plant operators—were far more likely to have died from heart attacks and heart conditions related to abnormal rhythms, or arrhythmias.

Moreover, risk of death from these conditions climbed as average EMF exposure increased. Savitz notes that men in the highest risk group tended to have worked in EMFs at least twice as high as those that people typically encounter in their homes.

Taken together, these data "suggest a possible association between occupational magnetic fields and arrhythmia-related heart disease," the researchers conclude in the Jan. 15 AMERICAN JOURNAL OF EPIDEMIOLOGY. Savitz now plans to follow up with more-detailed studies, perhaps simultaneously monitoring heart-rate variability and EMFs among electricians at work.

Meanwhile, Jack Sahl, a Pasadena, Calif.–based consulting epidemiologist, is already leading a most recent study to test the Savitz team's most recent findings. Several years ago, while probing cancer rates among 50,000 southern California electrical workers, Sahl also detected an increased rate of heart disease among electricians, machinists, and others in "craft" trades with high EMF exposures. However, "I ignored the result," he now recalls, "because of my sense that heart disease was more likely to be related to lifestyle."

Indeed, Sahl remains "quite skeptical" of the putative EMF link, arguing that a heart-risky lifestyle—with heavy smoking, drinking, and consumption of a high-fat diet—"is more common among those craft workers with the high exposures to magnetic fields." —*J. Raloff*

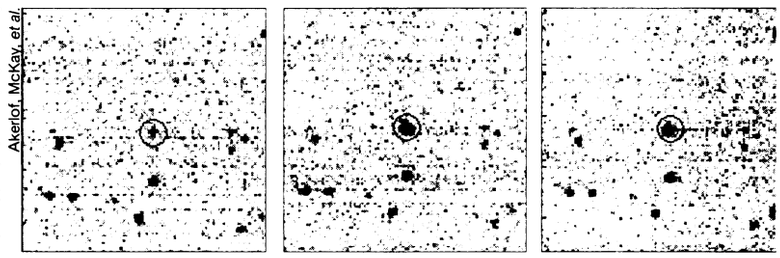
Catching a burst's visible glow

When James Wren's beeper woke him just before 3 a.m. last Saturday, he knew the routine. From his home computer, he checked that a robotically operated telescope 8 kilometers away was recording images from the correct patch of sky. Then Wren, an astronomer at the Los Alamos (N.M.) National Laboratory, went back to sleep.

Little did he know that the event that made the telescope swing into action was the most energetic cosmic eruption ever detected. Or that the telescope had for the first time captured the visible glow of a gamma-ray burst while it was still spewing high-energy radiation.

Although optical telescopes have recorded the glowing embers of some 12 bursts, "this is the first time we've seen the counterpart of the fire," says Bradley E. Schaefer of Yale University. Carl W. Akerlof and Timothy A. McKay of the University of Michigan in Ann Arbor reported the find in a Jan. 23 circular of the Gamma-Ray Burst Coordinates Network.

The optical observations, taken at Los Alamos with a telephoto-camera array known as ROTSE-I (Robotic Optical Transient Search Experiment I), owe their success to an early warning network set up by Scott D. Barthelmy of NASA's Goddard Space Flight Center in Greenbelt, Md. Whenever one of several satellites detects a burst, the network instantly alerts ground-based telescopes to search for a visible glow.



Images, 20 seconds apart, show visible glow of a gamma-ray burst.

On Jan. 23, just 22 seconds after NASA's Compton Gamma Ray Observatory found a burst in the constellation Boötes, ROTSE-I began scanning the same region. To the surprise of many astronomers, the glow spied by the telescope was so bright that it could have been seen with a pair of binoculars.

Spectra reveal that the burst came from a galaxy some 9 billion light-years away. At that distance, the intensity of the gamma-rays unleashed during the 100-second-long burst indicates that it was the most energetic ever recorded, surpassing a burst dubbed the second Big Bang (SN: 5/9/98, p. 292). If the burst emitted radiation equally in all directions, its total output equaled the explosive energy of 2,000 supernovas.

The actual energy could be less. Stan E. Woosley of the University of California, Santa Cruz has proposed that bursts are produced by asymmetric explosions that beam their energy in one direction. One aimed at Earth could appear 100 times more energetic than it is.

In addition, a cosmic mirage might have caused the Jan. 23 burst to appear brighter, says S. George Djorgovski of the California Institute of Technology in Pasadena. Either of two galaxies that apparently lie in front of the burst's home galaxy could have acted as a gravitational lens, bending and focusing the light. Such lenses can also create time-delayed images, raising the possibility that new pictures of the burst may only appear after days or months. —*R. Cowen*