Magnetic fields can diminish drug action

The low-level electromagnetic fields present in some North American homes today can diminish or wipe out a widely prescribed drug's action, at least in test tubes. Researchers have found that when exposed to such fields, the drug tamoxifen lost its ability to halt the proliferation of cancer cells grown in the laboratory. Tamoxifen is a synthetic hormone used to prevent the recurrence of breast cancer.

These findings, reported last week at a Washington, D.C., meeting sponsored by the U.S. Public Health Service, also heighten concern that these electromagnetic fields may be triggering hitherto unrecognized biological changes in people.

The new study is an extension of research that Robert P. Liburdy, a cell biologist at Lawrence Berkeley (Calif.) National Laboratory, reported on 4 years ago. At that time, he showed that while melatonin, a natural antioxidant hormone, would inhibit the growth of breast cancer cells exposed to 2 milligauss (mG) magnetic fields, its activity was essentially erased when the cells were bathed in a 12 mG field (SN: 7/3/93, p. 10).

Though the average magnetic field associated with the 60 hertz current in U.S. homes is 2 mG or lower, it can reach 12 mG in a small share of homes, such as those with unusual electric wiring. Values range as high as 1,000 mG in some occupational settings. People may also be exposed briefly to 12 mG or higher magnetic fields from electric razors and hair dryers, the sides of computer monitors, or appliances with large motors, such as refrigerators.

Liburdy and Joan D. Harland, also at the national lab, have now incubated one type of breast cancer cell treated with tamoxifen—at concentrations typical of those found in the breast cells of women taking the drug—in the presence of the same two field strengths.

Untreated cells appeared to grow equally well in each field. The growth rate of cells treated with tamoxifen fell by 40 percent in the 2 mG environment but exhibited no drop-off in the 12 mG field. Liburdy told SCIENCE NEWS, "We've shown that you can overcome this field's suppression of tamoxifen, but to do it you've got to increase the drug dose by up to 10-fold."

Liburdy and Harland report their findings in BIOELECTROMAGNETICS (vol. 18, no. 8).

At last week's meeting, Liburdy also described follow-up research on a second type of breast cancer cell. Again, both melatonin and tamoxifen inhibited cell growth in a 2 mG environment but failed to do so under the influence of a 12 mG field.

At a Bioelectromagnetics Society meeting earlier this year, Liburdy presented laboratory data indicating that 12 mG magnetic fields from a computer monitor, which have a slightly different waveform than those associated with home wiring or many appliances, also erase the antiproliferative action of a hormone—in this case, melatonin.

"As basic science, this is very interesting stuff," notes Richard Stevens of the Pacific Northwest National Laboratory in Richland, Wash. Most of the new experiments were done with the most widely studied line of breast cancer cells, he notes. Moreover, "the [magnetic] field levels used are certainly relevant to humans."

While it's far too early to suggest that residential fields pose a risk to the efficacy of tamoxifen, Stevens does argue that "this study provides the rationale for wondering about and investigating such implications."

Carl F. Blackman, a biophysicist with the Environmental Protection Agency in Research Triangle Park, N.C., has recently confirmed Liburdy's finding that magnetic fields can suppress melatonin's action and is now probing the ability of low-level fields to affect the action of tamoxifen. In other experiments, he finds that electromagnetic fields can affect the development of nerve cells when concentrations of nerve growth factor are too low.

What all these studies suggest, he says, is that "in a system that is stable and unstressed, you may see no effect of these fields. But if you stimulate it or depress it a little bit"— with drug treatment or insufficient growth factors, for example—"the field may show an effect." *—J. Raloff*

Cave finds make point about early humans

Much anthropological attention is focused on whether anatomically modern humans emerged in Africa some 100,000 years ago. A related question of increasing concern is whether sophisticated tool making and other advanced cultural behaviors emerged in the earliest representatives of our species or much later, beginning perhaps 40,000 years ago.

Sparse and often contested archaeological evidence exists for cultural innovations by the earliest modern humans. Now, a report in the December CURRENT ANTHROPOLOGY details two sharpened bone artifacts that date to more than 40,000 years ago.

The artifacts, along with associated remains of stone points and large fish apparently caught for food, add weight to arguments for more ancient advances in tool manufacture and social activity, contend Christopher Henshilwood and Judith Sealy, both archaeologists at the University of Cape Town in South Africa.

Henshilwood and Sealy have conducted excavations at Blombos Cave, located just off the coast near the tip of South Africa. Fieldwork earlier this year and in 1993 yielded more than 20 bone artifacts. These include two thin bones—each about 2 1/2 inches long—that were ground and polished to a point at one end and one bone fragment bearing a series of parallel grooves. Incisions on the latter were probably made with a single stone tool, either to remove meat from the bone or to produce a decorative image, the researchers hold.

Sharpened stone points and the remains of shellfish and large fish were found in the same sediment as the bone specimens. Radiocarbon dates for one piece of charcoal and four shell samples from this soil indicate that their age exceeds the limit of carbon dating, which goes back about 40,000 years.

The bone artifacts and associated animal bones also display low concentrations of nitrogen and carbon. These substances would have leached out of the bone during a long period of burial. Animal bones found in more recent soil layers at Blombos Cave exhibit much higher concentrations of nitrogen and carbon, the researchers note.

The tip of one bone point is slightly darkened, suggesting that it may have been heated over a fire in an attempt to harden the bone, according to Henshilwood and Sealy. Both bone points were fashioned so that they could be attached to poles or handles and used as spears or harpoons, they maintain. Stone points found in the South African cave also contain tab-shaped areas at their base that could have been lashed onto handles or shafts.

Examples of bone tools that date to between 150,000 and 40,000 years old are rare (SN: 4/29/95, p. 260). The Blombos Cave finds indicate that at least some of the people living during that period regularly made and used bone tools, Henshilwood and Sealy conclude.

"These are very intriguing bone points," remarks archaeologist Stanley H. Ambrose of the University of Illinois at Urbana-Champaign. "It's possible that they're more than 40,000 years old, but the evidence is not yet conclusive."

Ambrose awaits a more extensive analysis of sediment layers in Blombos Cave before accepting the minimum age proposed by Henshilwood and Sealy.

Based on the tools' condition and other archaeological evidence, Ambrose says that prehistoric humans apparently carried the bone points around with them, sharpened and otherwise maintained the implements from time to time, and eventually discarded them in the cave. *—B. Bower*