ELF could heal or hurt humans — OU researcher

Human tissue can be affected for better or worse by continued exposure to low level electromagnetic frequencies, an Oakland University physicist has learned.

That effect can be beneficial and stimulate healing of human bone fractures.

But some recent studies also suggest an increased risk of fatal leukemia, said Abraham R. Liboff of Birmingham.

LIBOFF HAS just returned from two years with the Navy Medical Research Center in Bethesda, Md.

There he studied the electromagnetic stimulation of bone healing and the possible biological implications of ELF, the proposed Navy submarine communication system causing controversy in Michigan and Wisconsin.

Liboff has long been interested in the electromagnetic interaction with human tissue and in the early 1970s assisted in a New York operation where a boy's congenital bone defect had resisted all methods of healing.

Electrodes were inserted in the limb and a small electric current passed through. The limb knit. Since that time, approximately 20,000 such cases have been treated electrically, Liboff says.

This is now an accepted operating technique although how the process works is still a mystery, the researcher says.

Liboff's Navy work consisted in part of breaking down and studying the wave forms used in these surgeries. He found that no specific wave form was crucial for the healing effect to take place, contrary to the claims of some firms who have patented devices for use in these operations.

EVEN THOUGH these non-union surgeries are about 80 percent successful, they should be undertaken in a careful, conservative manner and only when a patient may be threatened with the loss of a limb, not just to speed the healing of a simple fracture, Liboff warns.

Several papers in the last couple of years suggest that low level electromagnetic fields may have a tendency to enhance the occurrence of fatal leukemia, he says.

The researcher stresses that he is not a physician but a physicist who is fascinated with the mechanics of the problem. What he has found is that low level frequencies do indeed markedly affect bone growth and repair.

But the long-term implications for human tissue will have to be studied carefully, he says.

HIS SECOND project was to assist the Navy in looking at the biological implications of ELF.

To test the electromagnetic influence on cell tissue culture, he set up two large incubators, one experimental, one for control.

He used large coils to generate electromagnetic fields directly into the cells and looked at the uptake of nucleic acid in the experimental incubator.

In approximately 250 separate experiments using mostly human fibroblast cells and mouse lymphocyte cells, Liboff found that there was consistent increased DNA synthesis in the cells subjected to the electromagnetic waves. DNA is the master molecule needed for the cell to function. The effect of these low level waves over the long term need careful study, Liboff claims.

The levels used in the experiment were from approximately 15 Hertz to 4 Kilohertz, within the range normally encountered by ELF (the normal wall electric outlet is in the range of 60 Hertz).

Liboff found that the threshold level for interaction between the electromagnetic waves and tissue was astonishingly small. He also found that this interaction did not appear to increase as the signal dosage increased.

LIBOFF REPORTED to the Navy that ELF would emit signals strong enough to have an impact in human tissue but that other electromagnetic signals already in the proposed construction area were strong enough to have the same impact.

As there appears to be no increased interaction with human tissue with increased dosage, adding ELF to the area would not add to the human burden, Liboff feels.

The physicist says the nature of the interaction between magnetic fields and human tissue may stem from a fundamental law of science (Farady's Law) in which changing magnetic fields induce eddy currents in a conductor (in this case, human tissue).

He found that these eddy currents affect the way the cell receptors behave and may bring about change deep within the cell, perhaps even in the nucleus.

Liboff is continuing his research in the OU Kettering Magnetics Lab to explore the threshold for these effects. He will examine how cells react to vanishingly small magnetic fields.