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Electrical Equipment Believed To Affect Mental Processes

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LOS ANGELES—Power lines and electrical equipment around us create and emit weak electrical fields that conceivably might affect human brain wave patterns and mental processes, a group of University of California investigators have found.

Dr. Ross Adey and his associates—Drs. Rochelle Medici, Suzanne Bawin, and L. K. Kaczmarek, of the U.C.L.A. School of Medicine—have established that electrical fields measuring as little as 10 to 30 volts per M. at frequencies between 2 and 15 Hz can significantly alter behavior and learning in monkeys and cats.

"We don't have the data yet that says look out for your electrical appliances, but generally I would say that our research says yes, we may have an electrical pollution problem that may be similar to, say, the noise pollution problem in that it might have an effect on working efficiency," Dr. Medici told HOSPITAL TRIBUNE.

Electrical fields might also prove useful therapeutically, Dr. Medici indicated, such as for insomnia and learning or memory disabilities.

To study the influence of electrical fields, the investigators first trained a monkey to estimate the passage of time in five-second intervals. Every time the monkey believed five seconds had passed, he would push a button. If he was correct, he received a squirt of apple juice as a reward. At the end of the preliminary training period, the monkey was, with a good deal of consistency, pushing the button about every 5.6 seconds.

Time Estimation Changed

However, once the trained monkey was placed in a weak electrical field of about 10 volts per M., something happened to his ability to estimate time intervals. Instead of pressing the button every 5.6 seconds, Dr. Medici said, the monkey now pressed it every 5.2 seconds. Moreover, EEG recordings showed that, under the influence of the electrical field, the brain production of theta waves—the waves generated when an animal is supposedly engaged in higher-level thinking processes—quicken.

The team worked with electrical fields of various frequencies but found that only those that corresponded to the brain's own electrical activity potential seemed to exert an influence on mental processes.

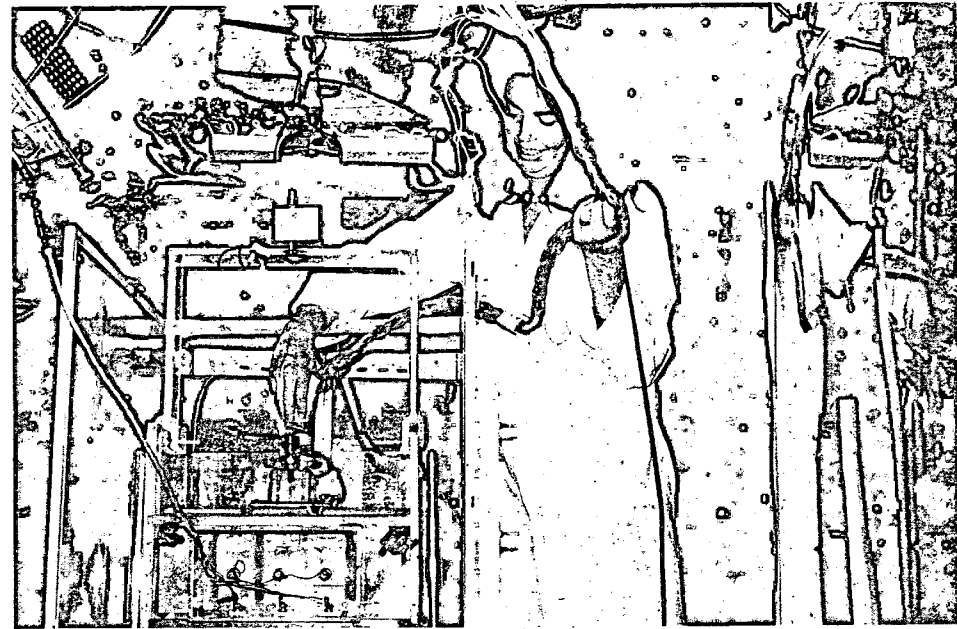
"For the monkey, for example, we chose a field of 7 Hz, the frequency at which the theta waves are produced," Dr. Medici said. "The brain's EEG activity ranges up to 32 Hz, and when we worked with fields above that, we got no results at all. So we are left with the impression that for electrical fields to affect the brain, it is important that they be relevant to what is going on in the brain."

The work with the monkey proved that weak electrical fields could speed up the occurrence of theta waves that are produced regularly as an animal carries out a particular learned skill. Further work with cats yielded information that electrical fields, tuned to the frequency of theta waves (or any brain wave), could be modulated to enhance the brain waves arising spontaneously in the brain as the cats were beginning to learn a task.

The fields thus could be used to speed up the production of brain waves in trained animals and to increase the production of brain waves in learning animals. Abilities learned under the influence of the modulated electrical field, Dr. Bawin said, stay with the animal longer than skills learned under normal training procedures.

"Cats subjected to the amplification of waves continued to perform a given task for 50 days without any reinforcement training," Dr. Bawin said. "Cats used as controls and not subjected to the electrical field performed the same task only 10 days before they had to be retrained."

The physiologic explanation behind the effect of electrical fields on the brain is still to be worked out, the investigators said. They suspect, however, that electrical fields somehow impinge on the biochemical processes in the brain's nerve tissue and on the tissue's ability to generate and carry its own electrical impulses.



During the investigation a monkey was trained to estimate the passing of five seconds. When he was correct, he was rewarded with apple juice. An electrical field was found to alter his ability to estimate correctly.

Although some very preliminary work has been conducted to test the effect of electrical fields on human beings (a German research group exposed a few volunteers to an electromagnetic field in underground bunkers and reported that some changes in the volunteers' circadian rhythms could be detected), the U.C.L.A.

group feels that more laboratory work must be done on animals before human experimentation is undertaken.

"We are not eager to test humans until we fully understand the mechanisms involved and until we understand the safety parameters," Dr. Medici said. "We are fairly sure that the results of experimentation would be benign and reversible, but we have to be certain."

"If our results are valid and electrical fields can be used to influence the brain

without causing other ill effects," she observed, "these fields could be used to alleviate insomnia by inducing brain wave rhythms conducive to sleep. It might even be possible to manufacture electrical blankets that not only keep you warm but that put you to sleep as well.

"It is even conceivable," she said, "that electrical fields could be used to influence brain waves like the theta wave to help people stay alert, help them with memory problems, or help them learn faster."

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