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Editor’s note: In accordance with Journal policy, Dr. Davis and his coauthors were given the opportunity to reply to the above letter, but they chose not to do so.

RE: ELECTROMAGNETIC FIELD EXPOSURE AND LUNG CANCER

In a letter to the editor, Erren (1) pointed to five studies, three occupational and two residential, where exposure to electromagnetic fields of various types showed an association with lung cancer. Although there has been no hypothesis regarding a specific carcinogenic effect of electromagnetic field exposure on the lung, Erren pointed out that because lung cancer in the United States is epidemic, a link between electromagnetic field exposure and lung cancer would have considerable public health relevance.

Research at Bristol University has recently demonstrated (2) the ability of the electric field component of power frequency electromagnetic fields to attract and concentrate airborne radon progeny in their vicinity. Radioactive radon progeny atoms when formed rapidly attract water molecules in air growing into a so-called ultrafine aerosol around 10 nm in size. Depending on availability, such aerosols may then attach to larger aerosol particles up to 1 μm in size. The Bristol observations are therefore indicative of the behavior of aerosols in general, and they demonstrate that airborne chemical pollutant aerosols, bacteria, and viruses would be expected to be similarly concentrated by electric fields.

Two main physical processes govern these observations: the oscillation of electrically charged aerosols, which mainly affect the ultrafine aerosols and the movement up field gradients by the polarization force affecting mainly larger aerosols. These processes lead naturally to possible mechanisms of increased skin deposition, inhalation, and lung retention of aerosols as well as transport to all body organs. In the case of radon progeny aerosols, the dose to red bone marrow following inhalation has been specifically modeled (3). The possibility of increased lung cancer in relation to electromagnetic field exposure constitutes one prediction from the Bristol observations. Therefore, the finding of lung cancer in several studies suggests the possibility of a causal relation.

Most epidemiologic studies of electromagnetic field exposure have concentrated on magnetic field exposure because, unlike electric fields, these readily penetrate the human body. The Bristol findings, however, suggest the importance of electric fields. Miller et al. (4) reported a nonsignificant odds ratios for leukemia incidence of 1.6 in Ontario electric utility workers exposed to magnetic fields, but this increased to 11.2 (95 percent confidence interval 1.3–97.2) when combined exposure to electric and magnetic fields was considered. Furthermore, there was a suggestion of a dose-response curve in relation to electric field exposure as well as a suggestion of increased risk of melanoma. As has been pointed out elsewhere (5), the leukemia risks are some of the highest ever reported in a major epidemiologic study. Miller et al. (4) conclude that their analysis shows associations for all leukemia and its subtypes with increasing electric field exposure, with a dominant effect of electric field exposure on leukemia when both electric and magnetic field exposures are considered together.

The findings of Miller et al. therefore represent a further epidemiologic test of an electric field/aerosol interaction. This strengthens the possibility that the findings are causal.

The above considerations suggest that an urgent assessment of electric field exposure in both previous and future epidemiologic studies of the possible health effects of electromagnetic field exposure is warranted.

REFERENCES

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Editor’s note: In accordance with Journal policy, Dr. Erren was given the opportunity to reply to the above letter, but he chose not to do so.