



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
THE ADMINISTRATOR

May 11, 1992

EPA-SAB-RAC-LTR-92-009

Honorable William K. Reilly
Administrator
U.S. Environmental Protection Agency
401 M Street SW
Washington, DC 20460

Subject: *Review of A Research Strategy for Electric and Magnetic Fields:
Research Needs and Priorities (EPA/600/9-91/016A)*

Dear Mr. Reilly:

In response to an October 12, 1990, memorandum by EPA's Office of Health and Environmental Assessment, Office of Health Research, and Office of Radiation Programs, the Radiation Advisory Committee's Nonionizing Electric and Magnetic Fields Subcommittee reviewed the above referenced document at a public meeting on July 24-26, 1991. This report represents the consensus of the Subcommittee, with the exception of one Member, who expressed fundamental disagreement with EPA's approach to developing a research strategy.

Response to The Charge of October 12, 1990

1. Does the document identify the major research topics for electric and magnetic fields? Specifically, are any identified topics inappropriate and are all topics identified?

The June 1991 *Research Strategy* contains chapters on health effects, biophysical mechanisms, exposure assessment, and control technology. Although the topics identified in the document are relevant to EPA's mission, the Subcommittee notes that a national research agenda should also consider occupational, diagnostic, and therapeutic uses of extremely low frequency fields. The document itself does not specify the breadth of the audience for this research strategy.

2. Is the level of detail sufficient to set priorities among the research topics?

The document, which is well written and informative, describes both the relevant issues and EPA's responsibilities. However, the level of detail in the document is insufficient for setting specific research goals and priorities. Setting a research agenda, for either the nation or the Agency, would require considerably more detail and an explicit philosophy for setting priorities. If EPA chooses to develop a scientifically credible research strategy independently, it should also propose a mechanism by which such a strategy can be implemented, preferably through the collective efforts of an appropriate interdisciplinary advisory committee of experts familiar with both electric and magnetic field health research and with current Federal activities in the area.

The Subcommittee anticipates that such an advisory committee would call for a strategy of systematically laying out and testing alternative hypotheses about the nature of the biophysical and biological mechanisms and causal pathways involved. The Subcommittee also expects that such an advisory committee would rank priorities for each broad group and allow sufficient latitude in scoring so that specific areas of important research within a broad group, such as control technology, might be given a higher rank than the group as a whole. The advisory committee's activity should not be limited to the scientific aspects of the problem, but the committee should also be directed toward identifying appropriate sources of funding and related oversight activities.

3. Do any research topics stand out as higher priority issues for assessing human health risk?

The EPA document properly focuses on cancer and on exposure-definition issues as priority areas for human health research; however, effects on nervous system and sensory structures should receive more emphasis than indicated in the EPA document because there is evidence of interaction of electric and magnetic fields with neural tissue from cellular and animal studies. A research strategy must emphasize the more fundamental and far-reaching need for basic understanding of biological effects and biophysical mechanisms because, without such basic knowledge, research regarding cancer risks and exposure parameters is likely to be ignored.

Comments and Recommendations

Research is Needed. The Subcommittee therefore recommends that scientific information sufficient to support credible formal risk assessment of exposure to electric and magnetic fields be developed. Current scientific information suggesting links between electric and magnetic fields and human health effects is far less persuasive than that for chemical exposures related to workplace settings, ambient air pollutants, indoor air pollution, or pollutants in drinking water. The recommendation for research is justified by the almost universal exposure of populations to electric and magnetic fields throughout life, the limited options for individual exposure reduction, and the years needed to implement widespread measures for reducing population exposure. Furthermore, the health effect endpoints suggested by epidemiology studies include childhood leukemia which results in many years of useful life lost per case. In the absence of data to support a credible quantitative risk assessment, public concern could result in sizable expenditures that may be unwarranted. The Science Advisory Board's report *Reducing Risk* (EPA-SAB-EC-90-021) explicitly recognizes the need for data collection in this area when it states (p.18)

EPA's health-related data collection efforts should not be limited to those areas where risks to human health already are recognized. EPA also needs to develop an ability to predict the potential future risks of emerging problems (e.g., low-level exposures to electromagnetic fields). Therefore EPA should establish . . . long-range research on emerging problems.

Priorities Should Be Determined. In terms of priorities for research, the Subcommittee notes first of all that there is widespread skepticism in the scientific community about the existence of mechanisms that might produce biological effects from weak, extremely low frequency fields such as the 60-Hz fields. Because biological plausibility is an important factor in considering the strength of epidemiological evidence, the lack of a widely accepted demonstrated mechanism currently limits the extent to which cancer causation may be inferred from the epidemiology studies. Much of the disagreement about mechanisms is based on the thin and sometimes inconsistent experimental base. The Subcommittee therefore recommends that high priority be placed on identifying and replicating in several laboratories the few key experiments that can determine the reproducibility of effects that appear to challenge simple biophysical models. The Subcommittee believes that specific biophysical and biological mechanisms can now be postulated and systematically explored.

A second limitation on the extent to which cancer causation may be inferred from the epidemiology studies is the current inability to quantify exposure in a useful way. Although many epidemiological studies have relied on time-averaged field strength, other specific attributes of the field (e.g., time rate of change, spectral content, and polarization) as well as the characteristics of the biological responses (e.g., thresholds, resonances, and multistage processes with differing rate constants) may be more important. The identification of the relevant metric is critical both to formal risk assessment and to risk management should a significant risk be found to exist. Therefore, the Subcommittee places a high priority on research that elucidates the precise nature of the association between environmental low-frequency electric and magnetic fields and human health effects.

Three applied research areas are not included in the EPA document in which the Subcommittee recommends some limited effort be undertaken: risk perception, risk communications, and risk management. This recommendation is made in recognition of the concerns the public expressed in the extensive (and often emotional) public testimony and is not based on the Subcommittee's own perception of the priorities of the scientific community. The Subcommittee recommends that EPA establish appropriate ways of responding to public questions and concerns.

Finally, the Subcommittee believes that resolution of the major research questions in this field is highly unlikely in a three- to five-year time frame as suggested by the EPA document and that the resources needed for such resolution may exceed by perhaps an order of magnitude the roughly \$10 million currently expended annually.

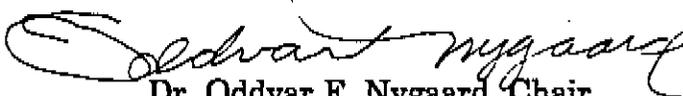
The Purpose for the Strategy. Although the EPA document is written in clear language and organized in a way that makes it easy to understand, its motivation and objectives are not adequately explained and need to be clarified. Whereas priorities for broad research categories are identified, the EPA document does not establish specific research priorities or provide estimates of resources and time needed to undertake the research. Without these features, the EPA document does not serve the scientific community as a research strategy document and is of doubtful value for government planning and budgeting.

The Subcommittee regards the process of setting research priorities and developing the interagency interactions necessary for the conduct of the research as very important. To ensure that the maximum benefit will be derived from the electric and magnetic field research now being conducted and contemplated, EPA should both develop a means of identifying research needs and priorities within a

broad interagency scope, and provide for communication of research plans and results among the various agencies. Such a scoping effort would provide a strategy or context in which each entity can develop its research agenda, recognizing where gaps may exist or interests overlap. This process would provide a basis for effective interagency cooperation and communication. Such an interagency committee should conduct meetings open to the public and interested scientists and meet at regular intervals to discuss the progress of the research, its funding and management, and related questions.

The Science Advisory Board is pleased to have had the opportunity to review the draft document and to offer its advice. We would appreciate EPA's written response to the major issues we have raised, particularly with regard to the eventual development of an implementable research strategy for EPA.


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