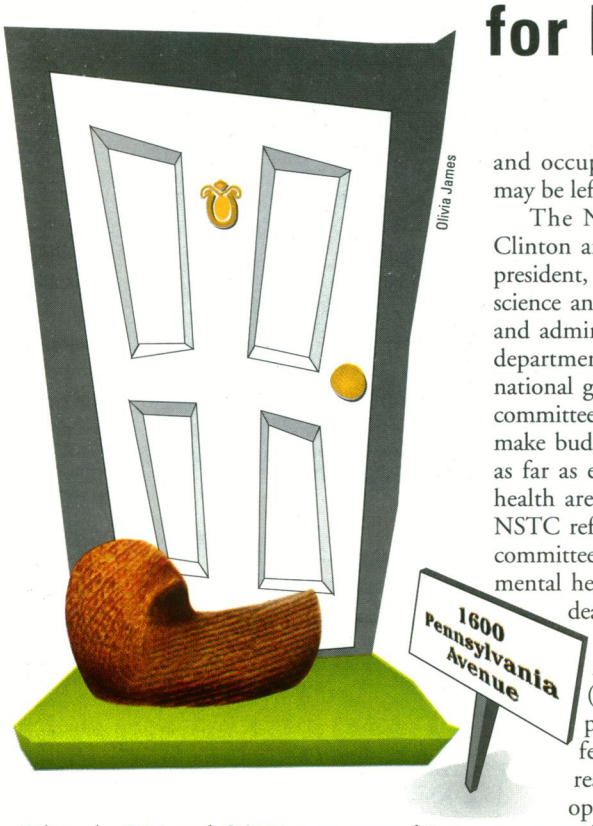
Finding a Home for Environmental Health



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When the EPA and OSHA were created in 1970, environmentalists and workers alike heralded a new age of federal responsibility and responsiveness to the need for a clean environment and safe workplaces, and to a great extent they have been justified. Almost 25 years later, however, the federal government is attempting to find a home for the unanticipated victim of the mostly amicable divorce of environment and occupation from the direct purview of the Public Health Service. Left with no natural organizational parent, environmental and occupational health research has been disseminated throughout various agencies of the federal government including both EPA and OSHA, but also DHHS, DOD, and others. Though a strong movement exists to create a National Institute of the Environment, the Clinton administration is looking instead to the National Science and Technology Council (NSTC) to bring coordination of federal health research under one roof again. Though the effort is still in preliminary stages, it is already becoming clear that unless the various federal agencies involved take the concept of coordination truly to heart, environmental and occupational human health research may be left out in the cold.

The NSTC is chaired by President Clinton and its members include the vice president, the assistant to the president for science and technology, and the secretaries and administrators of major governmental departments and agencies. To accomplish national goals, the NSTC established nine committees to develop R&D strategies and make budget recommendations. Currently, as far as environmental and occupational health are concerned, the structure of the NSTC reflects the status quo. Of the nine committees, two deal with issues of environmental health to some extent, and neither deals with these issues completely.

The Committee on Environment and Natural Resources (CENR) states as its goals improving the coordination of all federal environment and natural resource R&D activities and developing and overseeing a federal environmental R&D policy and strategy. The Committee on Health, Safety and Food Research and Development (CHSF) is charged with improving the effectiveness of federal R&D efforts in the health, safety, food, and agricultural sciences. An even division of health R&D responsibilities between these two committees will be difficult. And in an era of limited economic and human resources, overlapping of programs defeats the purpose of a coordinated effort. So how should the federal government approach the problem of classifying this hybrid breed of science and assigning responsibility for its direction? The committees have already set out on different paths to reach this goal.

CENR: Surveying the Situation

The CENR met soon after its formation and established 10 subcommittees organized by environmental issues and by science discipline. The issues were chosen according to their socioeconomic relevance; local, regional, national, and global significance; scientific and technological importance; and level of interest to the public and policymakers.

The committee consists of three cross-cutting disciplinary subcommittees and seven issue subcommittees, along with a science and policy assessment group. The disciplinary subcommittees include social and economic sciences; technology and engineering; and risk assessment. The issue subcommittees include global change; biological diversity and ecosystem dynamics; resource use and depletion; toxic substances and hazardous and solid waste; air quality; water resources and coastal and marine environments; and natural disasters.

During the last year, the CENR subcommittees have each established their own working group structure to develop a strategy and implementation plan to present to the NSTC. The subcommittees were directed by the chairs of the CENR to develop a balanced, comprehensive R&D program that covers several aspects of their respective issues. The aspects include structure and function of the system; socioeconomic driving forces of, impacts of, adaptation to, and the mitigation of environmental change; and assessment of the state of knowledge. The CENR has taken the approach of surveying the resources available and the programs already in existence to identify gaps in knowledge that need to be addressed.

Draft strategies were discussed at the National Forum on Environment and Natural Resources R&D held last March at the National Academy of Sciences. The drafts were reviewed by the Office of Science and Technology Programs as well as various other forum participants from academia, industry, nongovernmental organizations, and state and local governments. Final reports are expected to be available around the first of the year.

From the individual subcommittee reports, the OSTP is working to develop a consolidated report. "We are reading and looking at overarching themes to incorporate the subcommittee plans into a cohesive national strategy," said JoAnn Rodman, the program policy analyst for the OSTP. When the subcommittees convened in March to discuss strategy plans, the Office of Management and Budget

participated in the forum to provide guidance for the subcommittees on budget issues. One of the major issues, Rodman said, was "trying to see at a time when budgets are flat that we can address as many priorities as possible."

The CENR has now developed a draft of its 1996 budget proposal highlighting its priorities. "It is necessary to assure that investments in environmental and natural resource R&D provide the information needed to support the Administration's goals and policies while recognizing the reality of limited fiscal resources," the draft proposal says. Rodman said the final overall strategy would be available at the time Clinton submits the 1996 budget, which should be in early February.

In the draft, the committee pinpoints seven areas of research that need augmentation. Of the seven priority areas, the one that deals most specifically with environmental health focuses on reducing human health effects. The CENR estimates a needed budget increase of $51 million to address these issues. The committee points out that risk estimates are being developed differently among the agencies, and actions to reduce risks are not well coordinated. This initiative would cut across environmental threats, focusing on the vulnerability of humans to toxic agents, accounting for differences among humans (e.g., in diet, genetics, lifestyle); characterizing exposure (e.g., across subpopulations, cultural and economic differences); the vulnerability of humans to small particles through health studies; and the vulnerability of humans to seismic hazards. The CENR budget report also recognizes an additional $6–7 billion in funds concentrated in programs in other NSTC subcommittees that contribute to understanding environmental and natural resources issues, some of which undoubtedly flows to health science programs.

CENR Strategies

Although the impact on human health of environment and natural resources would seem an obvious component of this committee, and in fact, several high-ranking scientists from the NIEHS contribute to various subcommittees of the CENR, environmental health issues are addressed in the draft strategies of only 3 of 10 subcommittees. These three subcommittees include air quality, toxic substances and hazardous and solid waste, and risk assessment. Of the other seven, almost all would seem appropriate areas for coordinating at least some environmental health issues, but NIEHS scientists attempting to work with these subcommittees are meeting with resistance.

For example, the subcommittee on global change research fails to even mention the environmental health aspects of climate change in its draft strategy, much less include them as a research priority. Says James Fouts, senior scientific advisor to the director of the NIEHS and a member of the subcommittee, "These people are concerned with weather, not human health. The closest they come is marine health, and they still don't see the connection between that and human health." According to Fouts, NIEHS scientists' attempts to incorporate human health concerns into the strategy have been virtually ignored. Likewise, in other subcommittees where the connection between environment and health would seem obvious, these issues are conspicuously absent. For instance, the draft of the subcommittee on water resources and coastal and marine environments concentrates overwhelmingly on water supply and ecosystems and gives mere mention to drinking water quality. The subcommittee on social sciences and economics states as part of its vision the better scientific understanding of the relationship between humans and their environment, yet focuses primarily on human impacts on conservation of natural resources and gives little acknowledgement of the effect of the environment on human health.

Nevertheless, a few subcommittees under the CENR have attempted to factor human health into the environmental R&D strategy with varying levels of success. The subcommittee on air quality has chosen to address issues including indoor air, ozone, and other ambient air pollutants, and health effects of airborne particles and other hazardous air pollutants. Of its two major goals, clarifying the health effects of airborne fine particles is one.

The vision statement of the subcommittee on toxic substances and hazardous and solid waste includes a focus on reducing or eliminating human exposure to environmental toxins and their adverse human health consequences. Of the subcommittee's three research priorities articulated in its draft strategy (risk assessment, site remediation, and pollution prevention) risk assessment is the only one to specifically address human health issues. This priority calls for increasing research into models for predicting adverse public health effects, biological mechanisms of action of toxic materials, variability of susceptibility and effects on vulnerable populations, models for estimating exposure and environmental fate, and biological doses of toxic materials. These issues appear to be mirrored in the draft strategy of the subcommittee on risk assessment, and it is unclear how the two differ.

The cross-cutting subcommittee on risk assessment states in its draft strategy and implementation plan that its overarching goal is to use risk assessment in the most effective, efficient, and fair manner to characterize, prevent, and reduce health and environmental hazards.

Research priorities to fill the gaps in information necessary for the most effective and efficient use of risk assessments in the area of human health include identifying and predicting the magnitude of noncancer human health effects and intermediate endpoints with research on both human and ecological biological mechanisms to understand variations in human susceptibilities to hazards, research on multiple or cumulative exposures and alternative pathways of exposure to hazardous pollutants, especially regarding particularly susceptible populations or communities, and risk communication.

Strategies for fulfilling the subcommittee's goals include identifying key data gaps and developing mechanisms for filling them; encouraging the exchange of health and environmental hazards data among federal agencies; increasing the involvement of academic institutions in the science of risk assessments; directing intramural risk assessment research and joint, multi-agency extramural grant programs; and effectively characterizing the natures and magnitudes of uncertainties and assumptions in risk assessment.

Although the cross-cutting risk assessment subcommittee would seem to be the logical unit for tying environmental health into all of the subcommittees of the CENR, so far it hasn't been used in this way. The inability to have environmental health concerns incorporated into the priorities of many of the various subcommittees has led scientists and administrators alike to question whether the CENR is the appropriate venue for addressing environmental health R&D policies and plans.

CHSF: Forging Ahead

Under the NSTC, the CHSF has embraced environmental health issues far more consistently than the CENR, at least as far as its articulated strategy is concerned. The CHSF is made up of five subcommittees including human nutrition research, biomedical and sociocultural and behavioral research, health promotion and disease and injury prevention research, food safety, security and production research, and health systems and services research. Of the five subcommittees, all but the last include environmental health-related R&D programs in their final strategies.

In the CHSF approach, each subcommittee has developed a strategic implementation plan that includes, like those of the CENR, a statement of goals and research priorities. In addition, though, the CHSF

plans also include strategies for implementation that describe ongoing efforts in various areas and identify new efforts focused on meeting the committee's goals. Although estimates of funding needs are made in some of the strategies, the CHSF had not, as of late November, prepared a budget proposal to accompany these plans. In November, the CHSF co-chairs invited approximtely 200 government health agency heads, academic scholars, and private sector leaders to a forum at the National Academy of Sciences to discuss implementation of the committee's strategic plans.

CHSF Strategies

The strategic plan of the human nutrition research subcommittee acknowledges the relationship between dietary factors and growth, development, and risk of disease. A priority area of the plan examines the interaction of nutrients with environmental agents in processes such as oxidative damage to cellular components, modulation of gene expression by nutrients, and altered bioavailability of nutrients. Research areas to be explored include investigating the role of nutrients in regulation of gene expression, development and differentiation of tissues, the aberrant cellular processes that lead to disease, and the potential effects of neurotoxins acquired through the food chain. These areas will be targeted with a number of new efforts beginning in 1995, including an NIH request for applications on "nutrient modulation of cell integrity and repair mechanisms" and a National Cancer Institute request for applications on "program projects in nutrition and basic biology research for cancer prevention."

The clinical research priority area of the subcommittee on biomedical, sociocultural, and behavioral research seeks to foster fundamental biomedical and clinical research, including research in areas such as molecular biology and genetics through which discoveries of the genes for colon cancer, familial breast cancer, Huntington's disease, and cystic fibrosis have been made. The tools of molecular biology and genetics have been used to uncover the link between environmental factors, genetic susceptibility and disease. In addition to promoting advancements in these fields, a priority of this subcommittee is to develop strategies aimed at increasing understanding of the impact of gender, race, and ethnicity on the risk for disease and the likely success of interventions.

The executive summary of the subcommittee on food safety, security, and production states that environmental and economic constraints and paradoxes are among the significant obstacles to providing abundant, safe, and healthful food to the populace. Where food is concerned, environmental health means safety. In addition to a national food safety program to identify, monitor, control, and prevent hazardous substances and organisms in food, the subcommittee has identified research priorities in three areas of food safety.

A major goal is to reduce human exposure to microbial pathogens, biotoxins, and chemical contaminants through the development of rapid, reliable methods to isolate and quantify such agents in food, and through dermination of the interactive role of biological, chemical, and environmental factors on growth and survival of pathogens and the persistence and fate of toxins in food systems. A second priority is to identify significant risk factors for adverse effects of chemicals, pharmaceuticals, and animal drugs used in food production. A third priority is to identify the nature and extent of emerging foodborne diseases, the human populations at risk, and behaviors that increase risk.

Strategies to address food safety issues include continued support of DHHS and USDA research programs and existing programs such as the Hazard Analysis and Critical Control Point (HACCP) program and NOAA programs aimed at prevention and intervention of food hazards. The USDA will also continue research focused on reducing pesticides in food production.

By far the most comprehensive inclusion of environmental health concerns into a strategic plan is evident in the goals and priorities of the subcommittee on health promotion and disease and injury prevention. The importance of these environmental health concerns and plans to address them are elucidated most clearly in two goals of the subcommittee.

The first goal is to enhance the identification of factors such as environmental and occupational exposures in injury, disease, and disability through an enriched science base and improved methods of measurement. According to the subcommittee, research necessary to achieve this goal includes developing, improving, and standardizing methods of measuring exposures to biological, chemical, radiological, physical, socioeconomic and other factors that may cause adverse health effects; developing methods for examining and quantifying environmental risk factors and genetic susceptibilities; improving the ability to accurately predict public health risks and hazardous exposures, including environmental and occupational exposures; using geographic information systems to correlate health status with data on nutrition, occupational hazards, and environmental quality; and identifying environmental, occupational, biological, and behavioral causes of illnesses, birth defects, injuries, disabilities, and other effects through analyses of data from linked surveillance systems.

The second goal of the subcommittee that deals directly with environmental health is to develop disease, injury, and disability prevention and intervention programs. The research necessary for implementation of this goal includes, among other things, using fundamental science information to test and evaluate new technologies, capitalizing on research advances in basic sciences such as molecular biology and genetics to enhance adoption of science-based interventions in communities, and providing increased support for evaluation of basic research findings with potential for morbidity and mortality from preventable health problems (intervention at the molecular level to prevent the effects of environmental and occupational hazards).

Ongoing efforts to achieve these goals, highlighted in the subcommittee's implementation plan, include:

- Research on the human genome;
- Epidemiologic, clinical, and molecular studies to determine risk factors;
- Research programs to characterize health risks resulting from environmental pollutants through test methods, mechanistically based dose–response models, and chemical-specific data from laboratory toxicology research, environmental epidemiology research, and mathematical modeling;
- Research projects to develop new ways to detect and measure contaminants in drinking water and characterize their human health risks;
- Radiation follow-up studies to analyze potential damage to DNA and the resultant disease risk; and
- Research programs to detect and measure airborne contaminants and characterize their potential health effects.

New efforts anticipated by the subcommittee include:

- Epidemiological studies of chronic diseases expanded to investigate the particular susceptibilities of minority and underserved populations including biomarkers to better define genetic and exposure risk;
- Research on mechanisms of action of chemicals and pollutants in producing endocrine disruption;
- Research to develop quantitative methods of measuring dermal absorption of toxic substances in both workplace and the general environment as well as exposure to multiple contaminants in indoor environments;
- Development of mechanistically based toxicologic research to identify environmental hazards and characterize human

health risk of cancer and noncancer effects; and
- Research to improve measurement of lead and identification of sources.

Hedging Their Bets

Although clearly both the CENR and the CHSF have an interest in promoting environmental and occupational health, neither offers a comprehensive, much less fully-coordinated, strategy in their draft plans for directing federal research and development in these areas. What is needed before these two factions go any further in the development or implementation of these plans is strong leadership at the highest federal level, and a coordinated plan for addressing areas of research and the allocation of resources to meet these goals.

At this point, skeptics say it remains to be seen whether this whole exercise is an honest effort to revamp, reorganize, and recreate government in the area of federal health research. It is clear that the Clinton administration is promoting the NSTC as a serious effort to accomplish just that. Unless or until such coordination is achieved, however, environmental and occupational health will continue their nomadic existence.

Kimberly G. Thigpen

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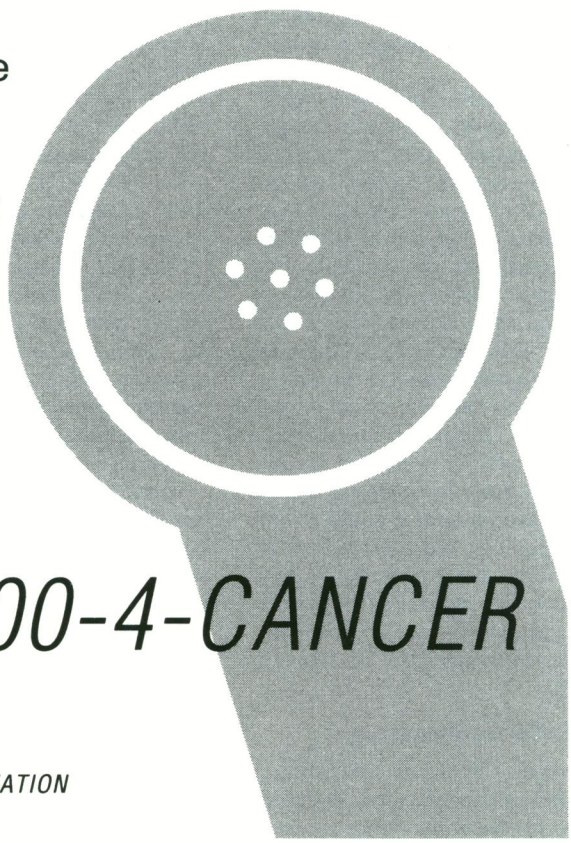

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