"The Future of Environmental Health and Protection"

Richard G. Bond Memorial Lecture
University of Minnesota School of Public Health
October 8, 1992

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Nothing about environmental health and protection is simple anymore.

When I first entered the field in 1950 with the position title of County Sanitarian, the field and its organizational setting were much better defined, but much narrower and less complex. The term "environmental health" was not commonly used.

Within a few years after becoming engaged in the field of public health, I began to have second thoughts regarding the traditional textbook pattern of organization and delivery of environmental health services at the state and local levels. Had I been the only person having such concerns, I would probably have moved into a different career track. But I found that many of my most respected peers were having similar questions. I recall contacts with some of the nation's environmental health "giants" in schools of public health, state and local health departments, as well as the U.S. Public Health Service. Communicating and visiting with leaders elsewhere was invaluable in helping me to develop my evolving concepts regarding the future of environmental health at that time.

All of these discussions helped me to formulate my concepts, and had a direct bearing on my role in developing the nation's first local environmental health department in Albuquerque, the New Mexico Environmental Improvement Agency (the most comprehensive in the Nation), the still-unique and comprehensive New Mexico Scientific Laboratory System, the New Mexico Public Health Agency, the New Mexico Health and Environment Department, and the testimony I presented to President Nixon's Committee on Executive Reorganization regarding the scope and organization of the proposed EPA.

I have mentioned a few things regarding the past as it is essential to understand the past in order to work for the future.

- We must collectively understand that organizations, programs and public expectations are not static.

- We must realize that are no final answers and that organizational, programmatic, and personnel competency changes will continue to evolve.

- We must remember that public and environmental "healthers" have mistakenly
tended to resist rather that lead changes in programs, organizations, and personnel competencies.

• We must believe that anything as important as environmental health and protection deserves and demands organizational support, visibility and effectiveness which may translate into organizational change and programmatic change, and we must understand that environmental constituents and political leaders frequently demand such change.

• We must understand that every community and state has many "health agencies", but that only one is specifically titled a health department.

• We must recognize that the cause of environmental health and protection may be more effectively served in agencies separate from health care.

• We must understand that in some jurisdictions, public health is being subsumed by health care, and that it takes a high degree of fantasy to develop a working relationship between health care and hazardous waste management, or pollution control, or safe drinking water, or food protection, or any other environmental health and protection activity.

• We must encourage environmental health professionals to seek key leadership roles in all environmental health and protection agencies, whatever their organizational titles.

• We must insure that academic environmental health science and protection programs are providing students with the competencies to be knowledgeable and effective for today as well as in the future.

But now, a few comments regarding some current national issues which have an impact on the future of environmental health and protection. And I'll start with The Institute of Medicine Report on the Future of Public Health. The IOM Report of the Future of Public Health provides thoughtful discussions which should be mandatory reading for every public and environmental health and protection professional. The emphasis of the report is on personal health, and health care with occasional, though significant reference to the importance of environmental health. Environmental health and protection agencies outside health departments were not visited or included in the IOM study. By relying on inadequate and misleading data provided by the Public Health Foundation, the IOM report contributes to misunderstanding of, and inadequate emphasis on, environmental health and protection by the public health community as well as civic and political leaders.

The IOM document provides inadequate emphasis regarding the complexity and magnitude of environmental problems facing our nation and the world. Only two of the 22 Committee members were well-known environmental health and protection experts. I do not find that consultation was developed with any of the various national environmental health and protection associations.
The IOM Report discusses the important issue of effective relationships with the medical care profession, but is silent of the equally important relationships with planning agencies, transportation authorities, environmental groups, agricultural groups, engineering societies, developers, manufacturers, educators, and economic development officials with whom environmental health and protection programs must network and coordinate.

Most of us support many of the IOM recommendations, and all of it provides excellent "food for thought" even if one disagrees or notes flagrant gaps or inadequate emphasis.

Healthy People 2000: Disease Prevention and Health Promotion Objectives for the Nation, is another well-publicized and timely national report. But a few details regarding the Year 2000 Report are noteworthy.

The first draft of the environmental health component was not only dismal, but counter-productive to the cause of environmental health. There were glaring inadequacies and errors pertaining to professional education, air quality, and hazardous wastes. And a list of the issues ignored in the draft was, at the same time, a list of some of the priority areas in environmental health and protection. Those overlooked included: solid waste management, water supply, water pollution, noise pollution, food protection, radiation protection, vector control, institutional and recreational environmental health; as well as the environmental health aspects of energy production, transportation systems, land-use, resource consumption, and overpopulation. And finally, the draft did not include such global environmental health and protection issues as possible global warming and ozone depletion, desertification, deforestation, planetary toxification, and over-population.

On behalf of the American Public Health Association Section on Environment, I transmitted a critique regarding the environmental health and protection inadequacies in the draft Year 2000 Report to the U.S. Health Service Office of Disease Prevention and Health promotion and had a number of discussions with personnel in that Office. For the most part, I was pleased with their timely and positive reaction. The environmental health chapter was entirely revised and changes were made that addressed many of my concerns. The environmental health objectives in the final document are certainly not perfect, but they are much improved while still lacking in comprehensiveness.

Some of thought we had made our point regarding the Year 2000 document prior to the follow-up USPHS conference designed to publicly release the final recommendations. This conference was a most laudable effort. However, the conference provided an instructive case study regarding top level Public Health Service attitudes regarding environmental health and protection. Specifically:

- There was no workshop on environmental health and protection.
• There was no program participant charged with discussing environmental health and protection.

• I did not identify any participant from EPA, the nation’s leading environmental health and protection agency.

• Few of the speakers even mentioned public health or environmental health and protection, but chose to discuss "health care." Environmental health and protection does not identify with health care, the one-on-one treatment or rehabilitation of a patient.

• A film was shown purporting to depict health status in the Year 2000, but not a frame or word thereof was devoted to air, water, wastes, food protection or other environmental health and protection issues.

• I had called four of the major program participants prior to the conference requesting that they provide some balance, some indication of support, interest or even recognition of the environmental health objectives. None of them even mentioned the issue.

Perhaps the most significant environmental health experience at the conference was the invited EPA band. And that served to remind me of the book titled "And The Band Played On."

And then another instructive episode occurred following adoption and distribution of the Year 2000 Objectives. The USPHS developed a draft of criteria for selecting health status indicators for the use of federal, state, and local health agencies. This was an eight page document which may have been useful for disease prevention, health promotion, and health care. However, the PHS had again essentially ignored environmental health, environmental quality, environmental standards, environmental regulations, air, water, water supply, food, solid wastes, hazardous wastes, toxic chemicals, occupational health and safety, noise, radiation, environmental health and protection personnel, environmental health and protection laboratories, and global environmental problems.

Once again, I responded to this draft on behalf of the APHA Section on Environment requesting inclusion of the afore-mentioned issues.

To make a long story short, guess what? The final criteria were distributed and did not include any of our recommendations. It is as if the USPHS doesn’t know or care that the environment exists!

But despite these few seemingly negative comments, the future of environmental health and protection is bright for those professionals who have the necessary knowledge, skills, demonstrated leadership ability, and understand the organizational changes which will
continue to take place. Those who are inflexible and rely on past accomplishments, the status quo, and organizational turf inflexibility will be numbered among extinct species.

WHAT IS ENVIRONMENTAL HEALTH AND PROTECTION?

Environmental health and protection refers to protection against environmental factors that may adversely impact human health or the ecological balances essential to long term human health and environmental quality, whether in the natural or man-made environment. These factors include but are not limited to air, food and water contaminants, radiation, toxic chemicals, wastes, disease vectors, safety hazards and habitat alterations.

CURRENT CONCERN

Concern for the quality of our environment and related public health implications has never been more intense. Political leaders and ordinary citizens, whether liberal, moderate or conservative, express concern over the quality of our environment, as well as the need for professional environmental health and protection leadership.

The nation does not have an environmental health and protection system, but has a confusing patchwork of often overlapping and competing agencies having different and sometimes conflicting missions and divergent priorities. While this non-system is costly, it also leads to confusion, inefficiency and ineffectiveness, it may be an understandable product in a democratic society.

Additionally, there is widespread disagreement and confusion regarding environmental health and protection priorities, goals and resources, as well as defining acceptable risk.

RISK AND PRIORITIES

- Environmental health and protection continues to be a matter of local, national and global discussion and debate. Globally, priority issues include species extinction, possible global warming and stratospheric ozone depletion, wastes, desertification, deforestation, planetary toxification and (most importantly) overpopulation. Excessive population contributes to all the foregoing as well as to famine, war, disease, social disruptions, economic woes, and resource and energy shortages.

A 1990 Roper poll found that, in terms of public perception, at least 20% of the public considered hazardous waste sites to be the most significant environmental issue.

But contrary to public perception, the 1990 report of the Environmental Protection Agency’s prestigious Science Advisory Board, titled Reducing Risk: Setting Priorities and Strategies for Environmental Protection, lists ambient air pollutants, worker exposure to chemicals, indoor air pollution and drinking water pollutants as the major risks to human health. Childhood lead poisoning and food protection are not EPA programs, but should be
added to any list of priorities impacting human health.

EPA’s REDUCING RISK also states that:

"...there is no doubt that over time the quality of human life declines as the quality of natural ecosystems declines....over the past 20 years and especially over the past decade, EPA has paid too little attention to natural ecosystems. The Agency has considered the protection of public health to be its primary mission, and it has been less concerned about risks posed to ecosystems....EPA’s response to human health risks as compared to ecological risks is inappropriate, because, in the real world, there is little distinction between the two. Over the long term, ecological degradation either directly or indirectly degrades human health and the economy....human health and welfare ultimately rely upon the life support systems and natural resources provided by healthy ecosystems."

As risks to the natural ecology and human welfare, Reducing Risk listed habitat alteration and destruction; species extinction and overall loss of biological diversity; stratospheric ozone depletion; global climate change; herbicides/pesticides; toxics, nutrients, biochemical oxygen demand and turbidity in surface waters; acid deposition and airborne toxics. Among relatively low-risks to the natural ecology and human welfare, the list also included oil spills, groundwater pollution, radionuclides, acid runoff to surface waters and thermal pollution.

A December 1991 survey conducted by the Institute for Regulatory Policy of nearly 1300 health professionals in the fields of epidemiology, toxicology, medicine and other health sciences entitled The Health Scientist Survey: Identifying Consensus on Assessing Human Health Risk, indicated that:

"Over eighty-one percent (81%) of the professionals surveyed believe that public health dollars for reduction of environmental health risks in the United States are improperly targeted."

Taking all of this into consideration, it must be emphasized that the issue of how risk is identified, assessed, defined, understood, prioritized, communicated and managed, and the manner in which perception, emotion and hysteria are handled, is itself among the most critical environmental problems of today and tomorrow. While resources should be allocated to address actual and significant risks, understandably, public perception drives the response of elected officials and public agencies. Environmental health and protection professionals usually have greater expertise in the technical program issues than in the realm of assessment, hazard analysis, epidemiology, prioritization, economics, communication, management and public policy.
Environmental health and protection personnel must:

- Understand the role of science in determining public policy.

- Recognize the misuse or absence of science in an effort to justify a position or alarm the public.

- Recognize that the media is frequently a conduit for an abundance of misinformation and a shortage of critical scientific inquiry behind many of the "catastrophe-of-the-week" issues.

- Recognize that if all the alleged environmental catastrophes were scientifically factual, we would have many times the morbidity and mortality rates that we actually have. The interests served by numerical exaggeration include those entities whose funding or political importance varies with the hysteria surrounding a particular issue. Environmental health and protection personnel and agencies must refute scare stories which are not based on sound epidemiology, toxicology and risk assessment.

- Question reports which base a problem on finding one anecdotal example, e.g., one cancer patient near a hazardous waste site, that capitalizes on appeal to the emotions. Epidemiologists term this the "I know a person who ...." syndrome.

- Beware of individuals and organizations who use "science" to front and further their organizational and political objectives. Peer-reviewed science does not depend on media manipulation, Hollywood personalities, or slick public relations.

- Beware of "predicted" morbidity and mortality figures pulled out of the air by self-styled "experts".

- Be scientifically critical. Too many so called "professionals" are actually only regulators and functionaries, ever ready to accept, promote and enforce the current party line or misinformation. Examples of environmental regulatory extremism surround the issues of radon, asbestos removal, alar, infrequent low levels of atmospheric carbon monoxide, below regulatory concern (BRC) disposal of low level radioactive wastes, and the Waste Isolation Pilot Project.

- Be wary of accepting problems based only on extrapolations and correlations rather than on good epidemiological and toxicological cause-and-effect studies. If we consider correlations only, we would probably conclude that:

**CARROTS WILL KILL YOU!** After all,

- Nearly all sick people have eaten carrots. Obviously the effects are cumulative.
- An estimated 99.9% of all people who die from cancer have eaten carrots.
• 99.9% of people involved in auto accidents ate carrots within 30 days prior to the accident.
• Some 93.1% of juvenile delinquents come from homes where carrots are served frequently.
• Among people born in 1849 who later ingested carrots, there has been a 100% mortality.
• All carrot eaters born between 1900 and 1910 have wrinkled skin, have lost most of their teeth, and have brittle bones and failing eyesight, if the ills of eating carrots have not already caused their deaths.

Additionally, keep in mind that:

**STORKS BRING BABIES, AND POLLUTION CAUSES CANCER AND BIRTH DEFECTS.**

The number of storks in Europe has been decreasing for decades. Concurrently, the European birth rate has also been declining. Obviously, we would be foolish to accept this correlation as evidence that storks bring babies. The science of epidemiology attempts to sort out from myriad chance correlations those meaningful ones which might involve cause and effect. It is important to understand, however, that epidemiological methods are inherently difficult and that it is not easy to obtain convincing evidence. There are also many sources of bias. For example, because there are so many different types of disease, by chance alone one or more of them may occur at a higher frequency in any given small population. The science of toxicology provides evidence as to whether correlation is credible.

• We must recognize the difference between science based facts and public perception.

• We must learn and practice the art of risk communication on the level at which our audiences are listening and comprehending. Few environmental health and protection professionals understand and practice effective risk communication. Instead, risk communication is erroneously considered to be a speech, a press release, a letter or a leaflet. This is one of the precursors to the fact that public perception of risk is at variance with that of scientists.

• We must always question, challenge, investigate alternative solutions, and analyze existing and proposed regulations and standards to determine the validity of their scientific base. Existing programs, standards and regulations tend to be magical and take on a life of their own. They are seldom challenged. A standard in motion tends to remain in motion in a straight line unless impeded by an equal and opposite force. Environmental health and protection professionals should provide the scientific "equal and opposite force" to challenge the prevailing understanding of risk.
• We must place a high value on scientific excellence when developing public policy.

• We must remember that people tend to overestimate risk from rare but dramatic events. People also tend to underestimate common events such as unintentional injuries and deaths, and the slow homicide and suicide caused by tobacco. People disdain changing preconceived notions about risks and priorities. People are quick to dismiss evidence as erroneous or biased if the information contradicts their preconceived opinions.

• We must understand that many Americans, and even some environmental practitioners, seem to exhibit a love of calamity. Some extremists are applauded and profit from false predictions of environmental calamity, some of which become translated into public hysteria and public perception, thence into political action, and finally into expensive and unnecessary programs and public policy. Those promoting such hysteria accept no responsibility for their false statements and predictions.

• We must understand the problem before proposing a solution, and fit the solution to the problem rather than the problem to the solution. A number of extremist groups seem to consistently have solutions waiting for problems.

• We must realize that the proper standard for environmental health and safety is not "zero-risk", but "net societal benefit." Zero-risk may not be economically or practically attainable, and the cost of pursuing zero-risk for one particular issue may preclude resources essential for addressing more important problems.

• We must understand that an unnecessary or poorly designed or overly expensive program becomes even more difficult to stop or alter once a bureaucracy or an industry is developed to promote the program. The issues of asbestos removal and radon detection and management provide excellent examples.

• We must develop improved methods to prevent environmental problems, as differed from curative efforts and clean-up. While the field of environmental health and protection identifies with prevention, a preponderance of effort is devoted to solving problems created as a result of earlier decisions and actions taken by the public or private sectors. Therefore, environmental health and protection personnel must become effectively involved in the planning and design stages of energy production and alternatives, land use, transportation methodologies, facilities construction, and resource utilization: as well as design, development and production of products which may negatively impact human health or delicate ecological balances. Environmental policy must be
based on prevention if there is to be any hope of preventing further resource depletion, ecological destruction and minimizing the health impacts of environmental contaminants.

• We must utilize the environmental health and protection model in the decision making process for environmental health and protection issues, rather than the medical model. The former looks at the community, nation or planet as the patient and, in principle, allocates resources to maximize health and environmental quality for all. The latter, once a pathology is diagnosed, provides everything possible to cure the pathology without regard for resources, priorities or effects beyond that one particular patient.

ORGANIZATIONS AND PROGRAM SCOPE

There are many agencies which administer environmental health and protection programs at all levels of government. There is no standard model for environmental health and protection programs. Every level of government has numerous agencies with environmental health and protection responsibilities. Three prominent models are health departments, "little EPA's", and superagencies.

At the federal level, these agencies include the Environmental Protection Agency, the Occupational Safety and Health Administration, the U.S. Public Health Service (including the National Institute of Environmental Health Sciences, the Centers for Disease Control, the Indian Health Service, the Food and Drug Administration, and the Agency for Toxic Substances and Disease Registry), the National Institute for Environmental Health and Safety, the Coast Guard, the Geological Survey, the National Oceanographic and Atmospheric Administration, the Fish and Wildlife Service, the National Marine Fisheries Service, the Nuclear Regulatory Commission, the Corps of Engineers; and the Departments of Transportation, Agriculture, and Housing and Urban Development. Major departments administering proprietary programs include Defense, Energy, and Interior.

Environmental health and protection programs continue to be transferred to state "EPAs" as they were 20 years ago at the federal level. State level agencies include health departments, EPAs, and departments of ecology, conservation, environmental quality, natural resources, pollution control, agriculture, atomic energy, and occupational health and safety.

Local environmental health and protection programs are typically components of local health departments. However, a number of jurisdictions in the western U.S. have established separate environmental health or environmental management departments. Environmental health and protection activities are also located in such local agencies as public works, housing, planning, solid waste management, special purpose districts, regional authorities, etc.
These organizational changes occur for a variety of reasons including political perception of the importance of the environment, demands of environmental advocacy groups, political responsiveness of the agencies, and differences regarding program emphasis and priorities in existing health departments.

The trend to organizationally separate environmental health and protection agencies from health department programs will continue in response to the demands of environmental advocates, and in response to many health departments becoming substantially involved in health care issues. It is unrealistic to develop programmatic relationships between water pollution control, for example, and any one of a number of treatment and rehabilitation programs (health care). Further, the drift of federal, state and local health departments toward more and more health care (as providers of last resort) may translate into less and less leadership for environmental health within such health departments. The movement of environmental health and protection programs away from health departments is a part of our evolving governmental system. Health department based environmental health professionals have often exhibited a preference for such traditional programs as food protection, liquid waste disposal, solid waste management and vector control. In spite of public demand for local agency involvement in air, land and water pollution programs there often appears to be a reluctance to acquire the necessary skills and resources to participate in some of what are often referred to as environmental protection programs.

However, regardless of the titles or organizational arrangement, the lead agencies for environmental health and protection should be comprehensive in programmatic scope; staffed by personnel having the requisite competencies and leadership skills; have program design and priorities bases on sound epidemiology, toxicology and risk assessment data; and have adequate analytical, data, legal and fiscal resources.

Environmental personnel who identify only with traditional health departments may be an endangered species eking out an existence in a constantly shrinking programmatic environment.

As separate environmental health and protection organizations are created, every effort should be also made to insure that all environmental health and protection programs are transferred, so as not to further fragment the environmental health and protection effort itself. Many misguided jurisdictions have rationalized that such programs as food, water supply, and liquid wastes are "health," while air, water pollution and waste programs are not "health." In fact, all such programs have a health goal, are based on health standards, and would not exist except for their health implications. All such programs should be prioritized together. All require the same type of program methods, laboratory support, legal resources, epidemiology, prioritization, risk assessment, risk communication, risk management, surveillance and data.

Industry has learned that products and services must be continuously redesigned and repackaged in order to compete and survive. Environmental health and protection personnel
must follow the example of the private sector and redesign, repackage and re-title their products (programs) when appropriate to ensure effective marketing, public service, and protection of public health and the environment.

A LACK OF DATA

The data profiling state health agencies, collected and published by the Public Health Foundation (PHF) are incomplete and thereby misleading for environmental health and protection throughout the nation. The PHF's annual questionnaire is distributed to a designated "state health official" in each state, while not addressing the need for data from other environmental health and protection agencies. These PHF data include only those environmental health and protection activities under the purview of the designated "state health official."

Inasmuch as there are more environmental health and protection activities outside than within the scope of each "state health official," there is no comprehensive national data collection effort for environmental health and protection. Accurate, comprehensive reporting would portray a many-fold increase in environmental health and protection activities beyond that reported by the PHF, thereby indicating a radically higher percentage of effort and emphasis on environmental health and protection as compared with other reported health services.

Another data shortfall is in health and environmental status information. This includes morbidity and mortality data, occurrence data of different chemical contaminants in the environment, and health effects data from the exposure to those contaminants.

A solution to data needs in environmental health and protection can be found through additional resources, new technology (i.e., for health effects research) and improved measures of health status. However, until data needs are met, there will continue to be confusion, misunderstanding and differences between perception and reality that cannot be easily resolved.

The lack of a nationwide, comprehensive data collection system is a critical problem.

RESEARCH ESSENTIAL TO THE FUTURE

The ultimate effectiveness of environmental health and protection services lies in the capacity to identify, understand and control environmental problems. As our technological society becomes more complex and population stresses increase, the need for increased environmental health and protection research is essential. Well designed, targeted research is a prerequisite to preventing and solving problems, as well as an essential tool in prioritizing and designing effective programs. Research and development funds have routinely been inadequate to address the research needs that exist. Without the development of new technology through research and development, it will be difficult to move forward in areas
such as remedial action and cleanup design, improved laboratory analytical capabilities and product substitution, as examples.

PUBLIC EDUCATION A "MUST"

Increased public environmental health and protection education is essential not only to address public concerns, but to provide students and other citizens with knowledge and skills to allow them to make informed decisions about environmental matters. Education will allow our citizens to factually understand risk and relative risk of the complex variety of potential environmental insults which they may face. Such education will also help them decide which risks are acceptable and which are not.

When risk assessment includes active public education and participation, the outcomes are more likely to be supported by the public and the business community.

PROFESSIONAL PERSONNEL ESSENTIAL

A wide variety of personnel from routine surveillance and inspection levels through management, policy, communication, education and research levels are essential to modern environmental health and protection efforts in the private, governmental and voluntary sectors. At the professional levels, this necessitates a supply of appropriately educated and trained personnel from the baccalaureate through the doctoral levels. It also dictates a need for both environmental health and protection professionals, and professionals in environmental health and protection.

- Environmental health and protection professionals are those who have been adequately educated in the various environmental health science and protection technical (programmatic) components, and in epidemiology, biostatistics, toxicology, management, public policy, risk assessment and reduction, risk communication, environmental law, social dynamics and environmental economics.

- Professionals in environmental health and protection include but are not limited to such other essential personnel as chemists, geologists, biologists, meteorologists, physicists, physicians, economists, engineers, attorneys, planners, epidemiologists, social marketing professionals, sociologists, biostatisticians, public administrators, toxicologists, and planners.

A U.S. Public Health Service Bureau of Health Professions report indicates shortages in a number of environmental program areas, estimates that only 11 percent of the environmental health and protection work force have formal education in environmental health science and protection, and estimates a need for 120,000 more professionals to address problems in several key program areas.
The 1990 EPA Science Advisory Board publication, Reducing Risk, states that:

"The nation is facing a shortage of environmental scientists and engineers needed to cope with environmental problems today and in the future. Moreover, professionals today need continuing education and training to help them understand the complex control technologies and pollution prevention (emphasis added) strategies needed to reduce environmental risks more effectively. ....Most environmental officials have been trained in a subset of environmental problems, such as air pollution, water pollution, or waste disposal. But they have not been trained to assess and respond to environmental problems in an integrated and comprehensive way (emphasis added). Moreover, few have been taught to anticipate and prevent (emphasis added) pollution from occurring or to utilize risk reduction tools beyond command-and-control regulations. This narrow focus is not very effective in the face of the intermedia (emphasis added) problems that have emerged over the past two decades and that are projected for the future."

The Department of Defense Deputy (DOD) Assistant Secretary for Environment has stated that the shortage of properly qualified and trained environmental health and protection professionals constitutes a major impediment to DOD’s world-wide mission of environmental problem prevention and clean-up.

The Department of Energy (DOE) Secretary has charted a new course for DOE toward full accountability in the areas of environment, safety, and health to demonstrate that DOE is committed to complying with the nation’s environmental laws and discharging its many responsibilities, which include protecting public health and safety. This has required strengthening the environmental, safety and health technical capabilities of line managers within DOE; to do this, DOE officials need sufficient numbers of appropriately skilled DOE line managers to support them. The DOE Secretary has also greatly expanded emphasis on comprehensive epidemiological data on DOE and contractor employees.

The Congressional Office of Technology Assessment (OTA) concluded that a shortage of experienced and technical experts may be a factor in the current lack of quality performance and may cause a bottleneck in an expanded Superfund program. The OTA report also suggested that current educational programs may not be able to prepare some professionals in sufficient numbers.

LEADERS OR FOLLOWERS?

Environmental health and protection personnel managing programs and agencies should objectively evaluate their activities to insure that they are providing effective leadership as scientists, managers, policy formulators and risk communicators. Additionally, schools of public health, other academic environmental health science and protection programs, academic accrediting bodies, and funding agencies should evaluate their efforts and the proven competencies of graduates.
The dearth of effective environmental health and protection leadership must be addressed. It may well be that leaders and potential leaders are not attracted to such governmental agencies. This may be due to lack of professional identity, inadequate financial reward, lack of challenge, lack of responsibility, lack of advancement, or lack of adequate career opportunity. Or, perhaps lack of properly designed, targeted and effective education and training are not available.

Leaders should:
- be strategic planners addressing current and emerging issues;
- lead rather than resist desirable changes in organizations, priorities, goals and programs;
- be visionary, provocative, and become the agents in charge;
- show the courage and ability to direct public and political attention and action to science based priorities, rather than emotionally perceived priorities;
- develop and effectively implement necessary public policy;
- seek and capably fill positions at levels where policy is proposed, debated, and adopted;
- practice the art of networking, constituency development and diplomacy;
- practice total quality management internally and externally to their agencies;
- be sought by civic and political leaders for their expertise;
- insure that alleged problems are adequately defined prior to proposing expensive solutions and programs; and
- understand and communicate the net environmental, health, economic and social impact of proposed programs.

Education and training organizations and institutions should be teaching personnel the knowledge and skills essential to the foregoing.

Part of the leadership issue can be addressed through formal academic training and part of it through the work of individuals, agencies and associations to identify and seize opportunities to provide leadership in addressing key environmental health and protection issues.

PROFESSIONAL EDUCATION AND TRAINING

The public health community has not adequately perceived development of the environmental health and protection work force as a priority for the past 20 years. This inattention has contributed to the widespread deficit of properly educated and trained environmental health and protection personnel. Individuals with little or no knowledge of epidemiology, biostatistics, toxicology, public policy, risk assessment, risk communication, and environmental health science and protection program issues are filling key positions where such knowledge is essential.
Necessary competencies include:
- managerial and organizational behavior skills
- analytical skills
- communication and marketing skills
- policy development and implementation skills
- cultural awareness skills
- strategic planning skills
- financial planning and management skills
- basic environmental health and protection technical and scientific knowledge
- risk assessment skills
- risk management skills
- risk communication skills
- epidemiological skills
- biostatistical skills
- knowledge of the sciences of toxicology, chemistry, physics, biology, and geology.
- communicable disease/chronic disease knowledge
- environmental economics knowledge
- environmental law knowledge
- environmental health and protection planning knowledge (land-use, energy production, resource utilization, transportation methodologies, product design and development)
- knowledge of federal, state, and local environmental organizations
- ability to understand the net impact of proposed actions
- data collection and analysis skills

Many accredited academic environmental health programs and some schools of public health appear to believe that their market is health departments, rather than the full range of agencies and industries responsible for environmental health and protection activities.

- The vast majority of personnel are professionals in environmental health and protection who are recruited from various professional disciplines such as chemistry, biology, geology, physics, administration, etc.

Continuing education and in-service training opportunities are in extremely short supply, but there is a consistent need and demand. Environmental health and protection problems associated with the modern environment are complex and constantly changing. Personnel who do not take affirmative steps to remain current are soon out-of-date and ineffective. Continuing education should be required and available in each state, or regionally.

ACADEMIA-AGENCY RELATIONSHIPS

Schools of public health, environmental health science and protection programs, and other environmental health science and protection education and training efforts, will function
most effectively when there is good two-way, continuing communication and involvement with the field of practice.

Likewise, the efforts of practitioners will be enhanced through the continuing and effective involvement of environmental health science and protection faculty.

Good rapport between academia and practitioners will not only enhance the quality of professional education and services, but will aid in ensuring the development of necessary applied research involving and benefitting both academia and practitioners.

FINANCING THE EFFORT

Total funding utilized by the public and private sectors in the United States ostensibly to protect health and the environment may be adequate. The real problem lies in how the money is being spent and on which issues. Uncounted millions are being spent on relative non-issues in response to public perception and concern that has been turned into political action and public policy. The issue of environmental health and protection priorities has been discussed earlier. If the funds being inappropriately utilized for such low priority issues as asbestos removal, radon detection and control, elimination of Alar, the Waste Isolation Pilot Project, infrequent low levels of atmospheric carbon monoxide and other such programs not adequately based on sound epidemiology, toxicology, and risk assessment were utilized to prevent problems which offer substantial risk reduction, the public and the environment would be better served.

Where funds cannot be reallocated from lower priority activities, state and local environmental health and protection agencies are increasingly required to rely on economic incentives, and fees for service.

CONCLUDING THOUGHTS

The future of environmental health and protection will, to a significant degree, depend on the ability of environmental health and protection agencies and personnel to:

1. Assess, prioritize and communicate environmental problems on the basis of sound epidemiology, toxicology and risk assessment rather than hysteria and reaction to self-serving advocacy groups. Prioritization among myriad complex and competing demands may be the most important responsibility of environmental health and protection professionals.

2. Exhibit a high measure of leadership and effectiveness in designing, promoting, gaining approval for, and implementing public policy. This may be the most difficult responsibility for most environmental health and protection practitioners as few have been trained or experienced in the public policy and constituent development process.
3. Assure the public that effective environmental health and protection services are provided.

To merely manage the environment in accordance with legislative and executive branch dictates is comparatively easy. Such legislative and executive elected officials, understandably, have their own priorities based on the demands of their constituents. Environmental health and protection may or may not be among these priorities, but the relative priorities of environmental health would be much different if they were based on sound epidemiology, toxicology and risk assessment rather than emotion and political perception. Frequently, it is not a matter of shortage of total budget, but rather how it is being spent or in some instances wasted on relative non-issues.

Leadership on the road to improved environmental quality is not an easy route. There are many potholes in the way of providing effective, priority environmental health and protection services. The journey requires vision and steadfastness of purpose, as it is beset by emotional pressures, tempting comfortable detours, political surprises, and frequently offers no short-term gratification or pay-off. There are few if any rest stops along the way.

The foregoing will require that schools of public health and other programs educating environmental health and protection personnel ensure that all graduates be competent in analytical skills, communication skills, policy development, program planning skills, cultural skills, basic public health sciences skills, and financial planning and management skills. It is also essential that incumbent personnel be "retreaded" with these skills through effective continuing education mechanisms.

Ensuring a quality environment will require the combined efforts of government, individual citizens and citizen groups, the private sector, professional and trade groups, and academia. Effectively addressing the foregoing challenges and recommendations will help ensure a quality environment for this and future generations.