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A Call for More Science in EPA Regulations

William J. Madia

The need for a more credible, scientific basis for environmental regulation continues. Current models of exposure to environmental pollutants and their associated health effects are based on conservative and often outdated assumptions. A stronger science basis for environmental regulation becomes even more pressing as the costs of preventing and remediating contaminants in the environment increase. The lack of adequate peer-reviewed science leads to environmental policy that is at best overly stringent and at worst ineffective. In either case, we experience unacceptable societal costs.

In setting standards, government regulators must rely on the research performed in their own laboratories, as well as in private laboratories and universities. This research must be directed at understanding the underlying biological mechanisms by which the population experiences health effects. One of the more important issues today, for instance, is the extrapolation from high doses of chemicals administered via a single pathway in laboratory animals to lower-dose, chronic exposures of populations. Although we test and evaluate pollutants one chemical at a time, the population is exposed to these constituents as mixtures, via a number of different pathways. The synergistic effects of exposure to toxins combined with genetic contributions to the development of disease and the process of aging are poorly understood. Only by understanding the mechanisms of harm can we begin to design solutions based on actionable scientific findings.

The problem is far too complex for any single agency.

Environmental problems require the combined insight of a variety of scientific disciplines to understand the complexity of exposure pathways and related health effects, from the cellular levels at which mutations and repair mechanisms are initiated to the organ and system levels where symptoms of disease are most often observed. Recent advances in molecular chemistry and physics have led to increased understanding of the transport and reaction of pollutants in the environment and to the development of more effective mitigation technologies. Yet understanding the links to biological mechanisms, as well as how living organisms are affected by pollutants, remains an enormous challenge.

For instance, chlorine used to disinfect drinking water sources is now known to generate byproducts that appear to have negative health effects.* Finding ways of delivering drinking water that minimize both microbial and chemical risks requires a much better understanding of the health effects of each. In addition, it points to a need for much better understanding of alternative technologies that might be used in treatment. Dealing with this level of complexity requires not just more research but a revolutionary new approach. Advances in computational capability and other physical, chemical, and life sciences must be integrated to address fundamental questions about mechanisms, exposures, and effects from environmental pollutants. Ken Olden, of the National Institute for Environmental Health Sciences, has highlighted the importance of "strengthening the links" between fundamental science, toxicology, epidemiology, and public health.† Interests and expertise cut across agencies and research institutions. A science program that draws on the best of the science institutions around the country, public and private, is needed. This program must be conducted as a collaboration across our national research system. In addition to the Environmental Protection Agency, we need to include the National Institutes of Health, with its expertise in life sciences and health issues, and the Department of Energy, with its user facilities and capabilities in advanced computation and molecular sciences.

Lambasting regulators for their lack of a scientific basis for their actions will not achieve the necessary results. The problem is far too complex for any single agency. As a nation, we have for too long ignored this pressing need, allowing the status quo to prevail. Now is the time for science to close the gap.

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*U.S. Environmental Protection Agency, 1997, Research Plan for Microbial Pathogens and Disinfection By-Products in Drinking Water. EPA-600-R-97-122, Office of Research and Development, Washington, DC.
†From a transcript of the keynote address by Kenneth Olden, *Bridging the Gap Between Environmental Health Research and Environmental Health Policy*, at the 75th anniversary of the Harvard School of Public Health, 27–29 April 1997, Cambridge, MA.