Journal of Exposure Analysis and Environmental Epidemiology (2005) 15, 121–122

www.nature.com/jea

EDITORIAL

The Major Themes from the Plenary Panel Session of the International Society of Exposure Analysis — 2004 Annual Meeting on: The Application of Exposure Assessment to Environmental Health Science and Public Policy — What has been Accomplished and What Needs to Happen before Our 25th Anniversary in 2014

Journal of Exposure Analysis and Environmental Epidemiology (2005) **15,** 121–122. doi:10.1038/sj.jea.7500417

Introduction

The panel discussion was framed around the NRC/NAS Report (1991) on Human Exposure Assessment for Airborne Pollutants. Although not referenced as much as some risk assessment and biomarker reports, it has provided a significant and scientifically sound framework for conducting exposure assessment and analysis. Also, it has provided a template for the types of tools required to expand the field and its influence, and laid the foundation for the formation of ISEA in 1989. The goal of this plenary session was to review the programs that have evolved in the field since the report was published, and how they have (or have not) influenced and improved research in environmental health sciences and influenced environmental health policy. It was emphasized that the report and subsequent development in the field have gone beyond compartmentalization of exposure to develop and employ the concepts, methods, and analyses of total exposure assessment. The focus of the session was on current approaches and needs in sampling, chemistry, biomarkers, survey methods and modeling. We need to determine what has been accomplished and focus on the future of the field. Thus, the time has come for an evaluation of the field and to provide critical thinking for the future.

State of the science

The discussion indicated that the field is now involved with public health protection. The science of Exposure Assessment (EA) is now involved with understanding determinants and characterizing exposure. It was stated that we need to think bigger, specifically becoming involved in global observation. At the same time, we need to think smaller, specifically in molecular terms (e.g., applications of genomics, proteomics, etc.). Thus, the field needs to expand and improve its abilities to identify potential hazards and the populations at risk. To do so, we need to understand the populations exposed and all their stressors, the multiple low-level exposures, the bio-systems involved, and the target tissue doses at the biological level. In the process, the field needs to enhance its accountability, in part by developing new public health indicators and ensure their application in partnership with those in the health sciences and other related fields.

This theme was expanded by a discussion of biomonitoring, its advances and current status. Biomonitoring is becoming part of public health policy, as demonstrated in legislation on lead levels and control, on control of exposures to environmental tobacco smoke, and in the Food Quality Protection Act (FQPA). Legislation has dictated also that US Centers for Disease Control and Prevention (CDC) now reports regularly on levels of various biomarkers of exposure. These monitoring and reporting efforts permit evaluation of sub-population levels and exposure, and of the life stages of exposures, providing a basis for interpretation and action. However, it was clear as well that biomarkers have been some times regarded as equivalent to dose estimates or effect estimates, implying that their development, analysis and use need work. Parallel thoughts indicated that exposure biomarkers need to be coupled with biomarkers elucidating mechanisms. Finally, they must be used in conjunction with other markers of exposure to ensure the effective develop strategies for prevention or mitigation of exposure. It was appropriately stated that exposure assessment and analysis is performed to determine the ''who, where, when, what and why''. Certainly, we have managed to decrease uncertainty and increase the quantity of exposure data and analysis. However, it was noted that current efforts have had more impact on risk assessment than on environmental health. We need to determine whether exposure assessment has been a significant contributor and what is the evidence for its contributions. This brought into question whether or not we have also increased the quality of exposure assessment for use in environmental health. To achieve the latter, a long term goal should be the continued development of biomarkers

(e.g., those of health effects and susceptibility) and encourage the development other cellular and molecular approaches, including more involvement in genomics, proteomics and similar approaches to molecular–environmental interactions. These can augment current external marker applications and move toward better accountability in public health practice

It is clear that we have made great strides in our science and work. As stated by some of the audience, we now focus on total exposure assessment, but we need also to expand the field and set goals for growth in the future. We also need to expand our student population in exposure assessment, and increase mentoring for them and other young scientists. Thus, one can state that we have multiple, interlinked future scenarios for improvements in the science and in order to have greater impact. A good news sign is the addition of exposure assessment researchers to the faculty at major Universities. They can make a difference in encouraging more students to seek careers in the field.

Conceptualization and actualization — science and policy

The big public health questions are those regarding the public health threat of certain chemicals and are further supported by the determination of who caused/did what. It was indicated that a major advantage of our science is in being more prospective, examining the pathways from sources through exposure and dose to determine the health responses, including potential diseases. Thus, the information can be used prevent exposures and health effects or intervene to stop current health problems. This contrasts with the frequent public health approach of looking for the causes of diseases by tracing the pathways back to sources. Both approaches have held sway in the past, but the discussion emphasized that we need to take a balanced approach where both health hazard and exposure assessment are equal parts of the research. In other words, we need both approaches in combination and need to consider all links in the chain, where exposure is the central link. We, in growing numbers, need to be a voice for balance. This balanced approach will necessitate interdisciplinary research and integration of interpretations. Thus, as clearly enunciated during the discussion, our field need to go beyond publishing excellent science, and we must use our science to gain a seat at ''the tables of influence'' — the tables used by policy and decision makers.

The discussion emphasized again that exposure assessment is pivotal in the source–exposure–dose–outcome paradigm, and that we should remove the silos separating all of us involved in this paradigm. Further, we need to be more transnational in this endeavor. Further, it is important to consider exposure assessment in ecosystem analyses as well as in human health research. It was stated also that exposure assessment is now part of the latest EU environmental action plan, implying that it may have a role in decision-making as well.

A primary question we really need to ask ourselves is the following: Is exposure science making a difference in environmental health and public policy? It was implied that such evaluation would indicate some shortcomings in our current activities and that we need to improve the paradigms of exposure assessment/analysis so that the field obtains its rightful place at the policy table, and have more of an impact on environmental health and public policy. Others present indicated the need for more emphasis on policy applications as there are policy needs of our science and its results. It was indicated that many policy makers do not understand the value of EA, especially regarding control of exposures. Further, there is a danger that our science will not be heard due to a different ordering of priorities by us and policy makers, implying a need for some education and reorientation.

There is a growing literature on how to use EA in policy, and we can learn from our own experiences as well to become more relevant and participatory in policy making. Others present also pointed out that some US states (e.g., California) now use EA more in policy-making. It was indicated that there is hope in some current legislation (e.g., the FQPA), but there is still too much ''stovepipe'' legislation on how to prevent or environmental health impacts. An example provided was the indication there is a change in policy formulation in Europe, that sectors are broader and more strategic. As a result, EA in Europe could change based on the different policy requirements. However, it was also noted that the EPA Air Quality Criteria Documents now have a full Chapter on Exposure to help evaluate the level and form of the standards.

In summary, there is a need to make the field accountable, to partner with others to be more relevant, and to insure that we are invited to the decision and policy tables. The latter requires us to ensure that our highly relevant results are placed in a form that is easily understood by and communicated to the general public, industry and policy makers. This is an important goal to achieve before ISEA reaches its 25th birthday.

PAUL LIOY, BRIAN LEADERER, JUDITH GRAHAM,
ERIK LEBRET, LINDA SHELDON,
LARRY NEEDHAM, EDO PELLIZZARI
AND MICHAEL LEBOWITZ
(DISCUSSANT & RAPP.)