Introduction

Environmental Lung Disease: Exposures and Mechanisms

We live in an era of awareness that the environment impacts human health. The human, as a biological system, engages the environment, distinguishes benefits from insults, and either embraces, ignores, or repels the environment. By virtue of its form and function, the respiratory tract interacts with the external world with every breath of particles and gases, making the lungs an excellent organ for researchers who wish to develop an understanding of the interaction between host and environment. Given the plethora of occupational and environmental hazards that cause or aggravate disease, lung research is a promising field for those interested in disease prevention.

Given the lung’s importance and the long list of new and known airborne hazards, we find it surprising that more attention has not been directed to understanding environmental exposure/response relationships. There may be many reasons why research in the field of occupational and environmental respiratory medicine moves slowly. Exposures are complex. Biological mechanisms are complex. Thus, it is daunting to study the exposure and host biological response. The adaptive response of investigators who conduct clinical and population-based research in our field has been to pay homage to the complexity of the biology but then to focus on defining exposures, circumstances of exposure, and the diseases they produce. Some argue that you do not need to know the biological mechanism by which a toxin affects the lungs. Eliminate exposure and you prevent disease. The adaptive response of bench researchers in our field has been to pay homage to the complexity of the environmental exposure but then focus on defining cellular, molecular, and genetic mechanisms relevant to disease pathogenesis. Some argue that you do not need to know the clinically relevant exposures or toxins encountered by the lungs if you understand the biological “lesions” that turn homeostatic mechanisms into pathogenic pathways to cancer, asthma, or fibrosis. If you understand mechanism, you can generalize and apply this fundamental knowledge broadly across many circumstances of exposure. Thus, investigators in the same field have shared similar goals, yet become increasingly compartmentalized as they conduct exciting occupational and environmental research that remains opaque to colleagues who choose other methodologic approaches. Is there common ground? This was the central question of the conference.

Quite deliberately, we resisted the urge to build the meeting around a particular scientific methodology, mechanism, exposure, or disease process. While any of those approaches would have likely produced enlightening, detailed discussion of particular diseases and mechanisms, we suspect that they would not have generated the kind of broad interactions and cross-fertilization that we hoped to achieve. The challenge of this meeting was to foster exchange of seemingly disparate ideas among basic scientists, population scientists and clinicians within the field of occupational and environmental health. We charged each participant with the task of translation: making their science as broadly understandable as possible to those in their field who are not in their niche. Among the subjects that were included were the following: (1) molecular mechanisms through which toxins induce carcinogenesis; (2) effects of environmental toxins on airway epithelium; (3) growth factor genes in experimental pneumoconiosis; (4) epidemiologic approaches to occupational asthma; (5) applicability of animal models in predicting human responses to inhalational exposures; and (6) use of transgenic modeling in lung disease. We hoped that from this eclectic dialogue we would gain a broader understanding of where the disciplines of epidemiologic research, clinical medicine, and bench research intersect or even merge. We hoped the audience would leave with new ideas, new collaborations, and new commitment to integrate bench, bedside, and field.

The second agenda of the meeting was to foster tolerance and understanding through free intellectual exchange. We hoped that the relaxed environment of a small meeting in beautiful Aspen would help those of us in a sometimes polarized field to hear one another, to share new ideas openly, and to embrace our differences. We learned that to encourage even wider participation by the next generation of investigators requires sensitivity to our cultural, racial, and gender differences, as well as to our methodologic preferences. The challenge: a culture-shift in which scientific synthesis leads to both better understanding of relevant basic biological processes and to applications that prevent occupational and environmental lung disease.

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