Environmental Tobacco Smoke: The Price of Scientific Certainty

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The causal relationship between environmental tobacco smoke and lung cancer is now clearly established. Several agencies have conducted reviews of the scientific evidence and concluded that environmental tobacco smoke exposure is a cause of lung cancer. These agencies include the World Health Organization (1), the National Academy of Sciences (2), the U.S. Public Health Service (3), the National Institute for Occupational Safety and Health (4), and, most recently, the U.S. Environmental Protection Agency (EPA) (5). These reviews validate the judgement made 20 years ago by Surgeon General Jesse L. Steinfeld (6) that the very high carcinogenicity of cigarette smoke for the smoker made it probable that the lower exposures of nonsmokers would also create a risk for lung cancer.

According to the recent EPA review (5), we now have abundant data to establish the following points: 1) Carcinogens present in mainstream cigarette smoke are present in environmental tobacco smoke; 2) environmental tobacco smoke is present at levels at which a risk would be expected; 3) environmental tobacco smoke is absorbed by nonsmokers in amounts at which a risk would be expected; and 4) epidemiologic investigations, such as that described in the article by Stockwell et al. (7) in this issue of the Journal, demonstrate a higher risk of lung cancer among nonsmokers with more intense exposure to environmental tobacco smoke. The scientific case against environmental tobacco smoke is now overwhelming. It is sobering to count the number of lung cancer deaths that might have been avoided had appropriate action been taken following Dr. Steinfeld’s public health warning a generation ago. Several tens of thousands of lung cancers and other illnesses might have been avoided if the risk of low-dose exposure to tobacco smoke had been assessed by using the same methods applied for low-dose exposures to other agents established as carcinogens at higher doses.

The data presented by Stockwell et al. (7) also invite consideration of exposure patterns that are often overlooked in discussions of environmental tobacco smoke carcinogenicity and which may be important. Regular cigarette smoking usually begins during adolescence, generally after age 12. Exposure to environmental tobacco smoke, in contrast, often begins at birth (or possibly in utero). Studies of the risks associated with active smoking establish that risk is related to the intensity of exposure (number of cigarettes smoked per day) and its duration, but duration has the more powerful effect (8). Discussions of the risk associated with various levels of exposure often ignore the probability that the exposure of the nonsmoker to environmental tobacco smoke, while of much lower intensity than the exposure of active smokers to mainstream smoke, will be 12 or more years longer. This longer exposure may partially offset the lower intensity of the exposure, resulting in a higher risk of lung cancer than that predicted by a simple dose–response extrapolation from the doses received by active and passive smokers.

Stockwell et al. (7) examine a related question by calculating separate odds ratios for childhood and adulthood exposures to environmental tobacco smoke. Odds ratios for both periods are positive, indicating that children exposed to parental cigarette smoke have a level of risk as do spouses of cigarette smokers. The duration of such exposure during childhood is usually shorter than it is during the adult years and has often been ignored in studies of exposure. The distribution of intensity of exposure, however, may be more biphasic in children than in adults, with some children receiving heavy exposure and many receiving almost none. Children who have nonsmoking parents (who tend to have nonsmoking friends) and no siblings who smoke may have few sources of exposure to environmental tobacco smoke. Adults, in contrast, have a wide variety of exposure sources, including work and recreational activities. Consequently, even those married to nonsmokers are likely to have some exposure to environmental tobacco smoke. Among children, the absence of smokers in the home may be a marker for low or nonexistent exposure.

Exposure of children to environmental tobacco smoke is then doubly distressing. Children experience the respiratory...
effects of smoke exposure directly, and they begin to accumulate exposures during one of the few periods in life when a smoke-free environment might be readily achieved. Children whose parents and siblings smoke may have exposures comparable to those of spouses of smokers and will have begun those exposures 20 or more years sooner. From our knowledge of the effects of duration of exposure in active smoking, we would expect the prolongation of exposure to environmental tobacco smoke in passive smoking to have a powerful effect on the number of lung cancers produced.

Clearly, our current knowledge of the risks stemming from exposure to environmental tobacco smoke makes the justification for allowing continued exposure of adults untenable and continued exposure of children unthinkable. Our task now is to develop and implement public policies that appropriately reflect our scientific understanding. It would be a public health tragedy if, 20 years in the future, we are obliged to total the costs, in human lives and suffering, of our failure to act on scientific certainty.

References


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