

The Importance of Information Dissemination in the Prevention of Occupational Cancer

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It is assumed that prevention of occupational cancer depends upon dissemination of research findings, resulting in changes in work processes and reduction of occupational exposures to carcinogens. Examples of successes and failures of information dissemination are found in the results of research on silicosis. Better assessment of the effectiveness of information dissemination is needed, along with greater understanding of the barriers to implementation of the information by workers and management and improved hazard surveillance. — *Environ Health Perspect* 103(Suppl 8):217–218 (1995)

Key words: occupational cancer, silica, prevention, hazard surveillance

Introduction

In reviewing the relationship between research on occupational cancer and prevention, it is important to recognize an implicit hypothesis that underlies the rationale for this research. The hypothesis is that the dissemination of research results eventually contributes to the initiation of changes in work processes, which lead to the reduction of occupational exposures to carcinogens. The process likely involves both the development of new governmental policies and independent use of this scientific knowledge by labor and management.

While not a formal proof of the hypothesis of the utility of information dissemination, a brief summary of some of the major research studies of silicosis illustrates the successes and failures of the dissemination of research findings. Exposure to silica has been recognized for a long time as a cause of occupational lung disease. Increasing in the last 10 years, it has been recognized as possibly one of the important occupational carcinogens (1). Workers

with silicosis have an approximately 4-fold increased risk of developing lung cancer (2). The relative risk for lung cancer in cohorts highly exposed to silica but without silicosis is much lower, with relative risks of approximately 1.3—still a significant problem given the large number of currently and formerly exposed workers.

Research conducted in the 1930s in Vermont established that the workers in granite quarries and sheds had substantial risks of silicosis. Similarly, in other industries, research was undertaken that found a substantial risk of silicosis. Shortly afterward, some industries such as the Vermont granite industry made major changes in work processes to reduce silica exposures (3). In the 1950s, there was a celebration in the technical and scientific literature because of a belief that silica exposures were no longer sufficiently high to cause silicosis (3).

This celebration was premature for two reasons. First, current surveillance data suggest that excessive exposure to silica is still occurring in the United States. In the 1980s, the National Institute for Occupational Safety and Health (NIOSH) conducted a national survey of 5000 workplaces in the private sector to estimate the number of workers exposed to a variety of chemical agents. In this survey, called the National Occupational Exposure Survey (NOES), NIOSH estimated that approximately 135,000 workers were exposed full time to silica. A much larger number of workers are exposed to silica less than full time—approximately 1.7 million (4). This survey did not measure the level of silica or include the mining industry, where silica exposure is also common. Although not a representative sample of all workplaces with

silica exposures, databases maintained by the Mine Safety and Health Administration (MSHA) and the Occupational Safety and Health Administration (OSHA) report the results of all the environmental sampling they have conducted (4). In the 1980s, 30% of the environmental samples analyzed were above their permissible exposure limit (PEL) (Table 1). In 1991, 22 and 30% of samples collected by MSHA and OSHA, respectively, were over the PEL. Combining these two sets of hazard surveillance information suggests that silica exposure is both relatively common and sometimes excessive in an unknown fraction of current workplaces. One risk assessment estimated that approximately 25% of workers would develop silicosis if they were exposed at the level of the current OSHA standard (0.09 mg/m³) for 30 years (2.7 mg/m³) (5). The number of deaths from silicosis has gradually declined from 1157 in 1968 to 342 in 1989 (2). Also, we do not know if the current exposure limits

Table 1. Mine Safety and Health Administration and Occupational Safety and Health Administration Environmental sampling data, 1984 to 1988.

Quartz dust (silica containing)	Samples <PEL (%) ^a	Samples ^b > PEL (%) ^a
Coal mining	12,977 (72)	5,074 (28)
Metal/nonmetal mining	13,571 (79)	3,579 (21)
General industry	1,811 (16)	1,146 (39)

^aQuartz dust level = 0.10 mg/m³ MRE for MSHA coal mine quartz dust sample; 10 mg/m³ divided by (% quartz +2) for MSHA noncoal mining and OSHA samples. ^bThe small number of samples for general industry reflects in part the number of inspectors for MSHA and OSHA rather than the number of exposed workers in mining versus general industry.

This paper was presented at the President's Cancer Panel Conference on Avoidable Causes of Cancer held 7–8 April 1994 in Bethesda, Maryland. Manuscript received 9 March 1995; manuscript accepted 24 March 1995.

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Abbreviations used: mg/m³, milligrams per meter cubed; MSHA, Mine Safety and Health Administration; NIOSH, National Institute for Occupational Safety and Health; NOES, National Occupational Exposure Survey; OSHA, Occupational Safety and Health Administration; PEL, permissible exposure limit.

will prevent all silica-related occupational lung disease or silica-related lung cancer. Nevertheless, dissemination of information about the risks of silica exposure probably has contributed to reductions in the levels of exposure and incidences of silicosis. However, it is also clear that information dissemination efforts have not completely solved the problem. At least in occupational health, there is a recurrent theme of declaring victory before the problem is eliminated, but that doesn't mean that there has not been very substantial progress since the 1930s in reducing the extent of the silica problem.

Conclusions

Several lessons can be drawn from this experience for effective prevention. To improve the effectiveness of information dissemination, we need to better understand whether our message is getting through to the right audience and whether we are delivering the right kind of

information. We also need to understand the barriers to implementation of the information by workers and management. For example, sometimes there is an effective method to reduce exposure, such as wet drilling of silica-containing material. Yet, this technology is not adopted universally, the research question becomes: What are the barriers to wide use of this technology (cost, lack of knowledge, technical problems, etc.)? We need to develop more effective hazard surveillance data to enable monitoring to determine if numbers of workers exposed and levels of exposures to occupational carcinogens are declining over time. Since the latency between exposure and the subsequent development of cancer often is greater than 20 years, hazard surveillance is particularly important for occupational carcinogens.

In the past, cohort mortality studies have been effective in identifying several carcinogenic exposures, such as asbestos and aromatic amino dyes, that increased

the risk of specific cancers severalfold (6). Currently, the research challenge involves exposures that occur at lower levels than those in the past, in a larger number of workplaces, each with fewer workers and to agents that may be less potent. Nevertheless, the number of workers exposed to agents that are known or suspected carcinogens is substantial when one considers such common exposures as perchloroethylene, diesel exhaust, radon, and man-made mineral fibers. In the future, epidemiological studies with careful exposure assessments will still contribute important information to our understanding of the effects of these agents. It is important to recognize that while much has been achieved in the prevention of occupational cancer, much remains to be achieved in better utilizing the existing information and in conducting further research to expand our knowledge about the occupational carcinogens.

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