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RELATIVE HEALTH EFFECTS OF CROCIDOLITE AND CHRYSOTILE

Summary

Evidence that crocidolite poses a greater health risk than chrysotile comes principally from epidemiologic studies. These studies suffer from methodologic problems which make extrapolation of relative risk associated with exposure to the various asbestos forms tenuous at best. In addition, experimental animal studies suggest that asbestos may be acting solely as a vehicle for transporting cocarcinogens (trace metals and benzpyrene) into the lung. If this hypothesis for induction of asbestos cancer is valid for humans, then it is suggested that chrysotile would probably be the most potent cocarcinogen of the various forms of asbestos. Clearly then, the literature appears somewhat equivocal on the issue of relative risk associated with chrysotile and crocidolite, and each form of asbestos should be considered as a potential health risk.

Epidemiologic Studies

There have been several epidemiologic studies[1-4] which suggest that chrysotile is the least dangerous form of asbestos with respect to adverse health effects. The evidence, however, appears rather weak and there are numerous methodologic problems associated with these studies which should preclude extrapolation of such a hypothesis. In a 1971 report, titled Airborne Asbestos[5] and prepared for the National Research Council, the panel of experts on asbestos concluded:

> All epidemiologic studies that appear to indicate differences in pathogenicity among types of asbestos are flawed by their lack of quantitative data on cumulative exposures, fiber characteristics, and the presence of cofactors. The different types, therefore, cannot be graded as to relative risk with respect to either asbestosis or neoplasia.

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Although the N.R.C. statements predate the studies by Enterline et al[3] and Weiss[4], the same flaws cited in the statements apply to these two studies as well. In the former study[3] the authors could not determine smoking habits, admitted that exposure to mixtures of asbestos types probably occurred, and were only able to "roughly" classify dust levels needed for calculation of cumulative exposures. In the latter study[4], no exposure information of a quantitative nature was available, and the author also did not attempt to characterize smoking habits.

Experimental Animal Studies

The authors of the N.I.O.S.H. criteria document: Occupational Exposure to Asbestos[6] indicate that both chrysotile and crocidolite were found to be markedly toxic to guinea pig macrophages in vitro. The authors argue that animal studies suggest a possible hypothesis for the induction of asbestos cancers; trace metals play an active co-carcinogenic role along with the exogenously derived carcinogen benzpyrene, while asbestos plays a passive role as a metal carrier. It is further argued that if this hypothesis was valid then chrysotile should be the most potent cocarcinogen of the various forms of asbestos. This would be due to its relatively high adsorption rate for benzpyrene and due to the intimate association of large amounts of nickel, chromium, manganese, and iron with certain forms of chrysotile.

Conclusion

Until better epidemiologic studies are done (i.e., studies of asbestos miners where type of fiber can be ascertained with greater certainty), it is difficult to argue convincingly that crocidolite poses a greater health hazard than does chrysotile.

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