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Internal Correspondence

To: Paul Kotin, M. D.

Date: February 28, 1975

From: George W. Wright, M.D.

Copies: file & C

Subject: SHOULD CROCIDOLITE BE UTILIZED IN A MORE RESTRICTIVE MANNER THAN OTHER FORMS OF ASBESTOS?

The experience reported to date indicates that all types of asbestos have produced pulmonary fibrosis in workers exposed to these materials. An excess occurience of bronchogenic cancer has also been reported in workers exposed to each of the commercial varieties of asbestos. An excess occurrence of mesothelioma has been reported in workers exposed to each of the varieties of asbestos with the exception of anthophyllite and tremolite.

A marked variation in the proportion of workers exposed who give evidence of these biological end results has been reported. Why this variable response? There is clear-cut evidence that all of the biological effects are dose related and thus the variation may be entirely a function of different doses. It has been speculated that this variable response may also be related to variety of asbestos. To learn whether or not the specific variety plays a roll one must determine whether or not differing biological experiences are due to dose, which may in turn be a manifestation of the variety of asbestos, or whether it is also due to the specific physical-chemical nature of the variety under consideration. There is inadequate information at this time to resolve the dose vs. variety factor as explaining the marked variation of biological effect arising out of different work places.

The biological mainifestations of exposure to asbestos fiber as seen in the chrysotile mines and mills of Canada, Russia and Italy appear to be less severe than in various manufacturing operations. Dose, determinations in these contrasting settings are not sufficiently established to determine whether this difference in severity is the result of higher doses in the manufacturing work place or that in the manufacturing workplace there is exposure to amphiboles such as crocidolite or anthophyllite in addition to chrysotile.

The striking concentration of cases of mesothelioma on the Northwest Cape as compared to the rest of South Africa has suggested that the crocidolite mined in the Northwest Cape

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is the specific and sole cause of these mesotheliomas and since no excess of mesotheliomata has been reported from the amosite and chrysotile mining of South Africa, crocidolite is to be considered a more potent cause of mesothelioma than other varieties of asbestos are. This reasoning fails to take into account the fact that crocidolite in large quantities is mined in the Transvaal without the development of cases of mesothelioma. An explanation for this paradox has been offered along the lines that the fibers of airborne crocidolite in the Northwest cape are thinner than in the Transvaal and therefore will penetrate more deeply into the lung. This posibility deserves consideration but requires better substantiation in terms of evidence that the airborne dose in the Transvaal is actually the same as on the Northwest Cape (evidence that this is not so has been brought forward). Evidence in terms of the nature of the residual lung burden in these two contrasting geographic areas would also be very useful but is not at the moment available. The line of reasoning spoken of above also does not take into account the fact that where amosite has been used in manufacturing an excess of mesotheliomas has been reported whereas, in the mining and milling of amosite no excess of mesothelioma was found.

Enterline has reported data suggesting that respiratory cancer occurs more commonly when crocidolite is used together with chrysotile than when chrysotile is used alone. While these observations are provocative they are not more than that in view of the fact that the number of men involved in the combined chrysotile and crocidolite exposure is small and that in the combined amosite, chrysotile and crocidolite exposure there was no significant difference from chrysotile only. It is of interest that in this same study amosite alone also produced a far higher standard mortality ratio for respiratory cancer than was true of chrysotile alone. Again, however, the number of men exposed solely to amosite was extremely small. These data must therefore be considered provocative only. Wagner has stated that in one factory of which he has knowledge, all of the cases of mesothelioma occurred in persons who had crocidolite exposure as well as chrysotile and none had occurred in exposure to chrysotile alone. Data for this observation has not been published and the matter of dose relationships cannot be examined.

Animal experimentation in which various forms of asbestos were introduced directly into the pleural space by Wagner suggested that crocidolite was more effective

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in producing these tumors than were other forms of asbestos such as chrysotile. Nevertheless, all did produce mesothelioma. A subsequent report by Wagner using the inhalation route rather than direct intrapleural placement of fibers failed to show any difference between the various varieties of fibers in their ability to induce mesothelioma.

In view of the very scant and almost absent data for establishing dose relationships under the various circumstances where one can contrast the biological experience in terms of variety of fiber to which the worker is exposed, and in view of the animal experimentations highly suggestive that there is in fact no real difference in terms of capability of producing mesothelioma when various kinds of asbestos fibers are inhaled, I am forced to conclude that the evidence is inadequate to support a clear statement that crocidolite is more hazardous than other forms of asbestos by reason either of its inherent physical-chemical nature or its proclivity in some circumstances to fragment into thinner rigid particles. The evidence brought forth so far is, however, provocative and possibly would justify a more rigorous standard for airborne respirable sized crocidolite than chrysotile and there is also a suggestion that amosite might fall some place in between the two. Fortunately, where either crocidolite or amosite are used in a mixture together with chrysotile, adherence to a single standard will almost certainly lead to a more rigorous standard for that variety of asbestos comprising the smallest fraction of the whole. We have, as you know, some actual dust count evidence to support that this is true in the circumstances of AC pipe manufacture.

This has been dictated with rather severe time constraints and could be documented or buttressed with more information but on balance I think it states the position as I see it.

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