

mine to minimize
 her investigations
 tobacco smoking
 be taken into ac-
 count and other
 cancer incidence
 comparison the

involved no match-
 ing of the other
 cases. The figures
 and they indicate
 is recognized as
 recorded in the

NORTH-WESTERN

North-Western Cape
 Crocidolite

31

49

85

145

en mined on a
 excessive lung
 (olite) mining
 1969 (TABLE 1)
 of amosite in
 -Western Cape.
 cases, observed
 either occupa-
 asbestos mines
 . On the other
 ed to amosite
 me of the geo-

graphed and environmental considerations which apply to the apparent
 difference in carcinogenicity in man of these two types of closely-related
 amphibole asbestos. He has reported that none of the factors examined
 explains satisfactorily the absence of pleural mesothelioma in the Trans-
 vaal. These include mineralogical differences between the two areas, in-
 tensity of production and the extent of environmental pollution and
 asbestososis. Recently, in North America, primary peritoneal tumors have
 been found in workers exposed to chrysotile."

PREVIOUS EXPERIMENTAL STUDIES

Sarcomata have been produced in rats after the subcutaneous and intra-
 peritoneal injection of asbestos of an undisclosed type." The fibers were
 longer (0.5 to 1.0 cm.) than those used in other studies. Two other sili-
 cates, augite and tremolite, failed to produce tumors under the same condi-
 tions. Augite belongs to the pyroxene group of minerals, the most important
 group of rock-forming ferromagnesian silicates," and has the formula
 $(Ca, Mg, Fe^{2+}, Al)_2 (Si, Al)_2 O_6$. Tremolite is an amphibole mineral,
 commonly of fibrous nature and with the formula $Ca_2 Mg_5 [Si_8 O_{22}]$
 $(OH, F)_2$.

Wagner, in 1962," induced pleural mesotheliomata by inoculating various
 dusts directly into the pleural cavity of rats. Pleural tumors were found
 in two animals inoculated with crocidolite fibers, one with chrysotile, and
 one with finely-divided silica powder (99.9 per cent SiO_2). A rat exposed
 to a chrysotile dust cloud also developed a pleural mesothelioma. No tumors
 developed in rats which had received carbon black. Experiments at present
 in progress and reported by Skidmore and Wagner elsewhere in this mono-
 graph," show that crocidolite, chrysotile, silica powder and to a lesser
 extent, amosite, all induce pleural mesotheliomata in guinea pigs after
 intrapleural injection. Malignant tumors have been produced in fowls by
 crocidolite and amosite," though it is too early to determine their relative
 carcinogenicity in this species.

POSSIBLE MODES OF ACTION OF ASBESTOS AS A CARCINOGEN

At present the following possible mechanisms of carcinogenesis are un-
 der consideration:

- (1) That carcinogenesis is due entirely, or in part, to organic materials
 associated with the fiber, either naturally or as a result of contamina-
 tion or treatment of the asbestos during processing;
- (2) that it is due to the presence of certain carcinogenic metals or metal-
 complexes in asbestos;
- (3) that it is an "Oppenheimer Effect," that is to say, that it is induced
 by the prolonged residence in the tissues of chemically-inert material
 incapable of being rapidly removed by phagocytosis.

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