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Industrial Hygiene Summary Reports

This Journal welcomes brief comments derived from daily activities which may be useful to other members of the profession. Address your communications to: Richard F. Scherberger, Health and Safety Laboratory, Building 320, Kodak Park Works, Eastman Kodak Company, Rochester, New York 14650.

Asbestos, Talc and Nitrites in Relation to Gastric Cancer

Recently, Merliss¹ suggested that the high incidence of gastric cancer in Japan may be associated with treatment of rice with talc in Japan. He noted that some commercial "talcs" contain asbestos, which he proposed as an etiologic agent in gastric cancer. Merliss cited a report of a small excess of gastric cancer in a group of insulation workers exposed to dusts containing asbestos and a larger excess of pulmonary carcinomas and pleural mesotheliomas in miners who appear to have had mixed exposures to asbestos and talc. He noted that some geologic deposits of talc are associated with tremolite, anthophyllite and chrysotile varieties of asbestos, accounting for the presence of fibrous particles of asbestos together with platy particles of talc in some commercial preparations of "talc."

Our group has carried out tests for carcinogenicity of various preparations of asbestos through experiments with animals. The present paper summarizes some results and reports a new experiment with a preparation of talc containing asbestos. A possible alternative mechanism involving nitrites in gastric carcinogenesis is discussed.

In 45 hamsters maintained throughout their lives on diets containing 1% of the chrysotile or amosite varieties of asbestos, we found no gastric carcinomas and no tu-

mors in the gastrointestinal tract except for a neoplasm in the mesentery of the colon.² We are unable to relate that lesion to the treatment, since ashing has revealed no asbestos fibers in it.

After intrapleural injection of 25 mg chrysotile or amosite into hamsters, we reported tumors diagnosed as pleural mesotheliomas.² Eight to 10 such tumors were found in each of 3 groups of 50 hamsters treated at this dose level.³

We have now completed an experiment in which the hamster-intrapleural method was used to test for carcinogenicity of a sample of talc containing asbestos. For this work, we obtained samples of commercial talcs from Whittaker, Clark & Daniels, Inc., New York City. A sample of cosmetic talcum powder grade was seen by microscopic examination to be composed of platy particles typical of the mineral, talc (hydrous magnesium silicate). Another sample of a grade used for some industrial purposes ("#13 Talc") was found to be a mixture of platy and fibrous particles. X-ray diffraction analysis revealed the presence of major amounts of tremolite asbestos and talc and a minor amount of a serpentine mineral (antigorite).

Each of 50 hamsters were given right intrapleural injection of 25 mg of this sample suspended in 0.5 ml saline. The animals were followed for their life spans. No tumors attributable to the treatment were found. Granulomatous lesions were com-

This work was supported by USPHS Research Grant EC 00226 from National Institute of Occupational Safety and Health, and by a grant from Fannie E. Rippel Foundation.

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mon on pleural surfaces, but these lesions tended to be small and focal in contrast to larger and more fibrotic lesions induced in hamsters by chrysotile or amosite.

The negative results of this test for carcinogenicity of a talc containing asbestos, and our earlier test on feeding asbestos to hamsters, do not offer support to the view that asbestos-containing talc contributes to the incidence of gastric cancer in Japan.

Although death rates reported for gastric cancer are notably high in Japan in comparison to other countries, the highest reported rate comes from Chile.⁴ Studies of gastric cancer in Chile have been reported from our laboratory with an hypothesis that high rates for esophageal and gastric cancer may be due to conversion of nitrates to nitrites by soil bacteria with subsequent synthesis of nitrosamine carcinogens in plants used as food or through interaction in the stomach with secondary amines in food.⁵

Chile has the world's largest known geologic deposits of nitrates, which are used as fertilizers. Nitrosamine has been reported in wheat plants and wheat grains.⁶ Nitrosamines can form through interaction of nitrites with secondary or tertiary amines in the stomach, and have been shown to induce esophageal and gastric cancers in rats.^{7,8} High concentrations of secondary amines have been reported from Japan in dried fish.⁹

The situation invites attention to a potential role of the nitrogen cycle in environmental carcinogenesis. A source for direct ingestion of nitrites by human populations

arises from use of nitrites as food additives. Other potential factors in gastric carcinogenesis have been recently reviewed by Haenszel *et al.*¹⁰ who found no support for the talc-asbestos hypothesis on epidemiologic grounds.

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William E. Smith, M.D.
Health Research Institute
Fairleigh Dickinson University
Madison, N.J. 07940

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