

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.

1. Merliss, R. R.: Talc-Treated Rice and Japanese Stomach Cancer. *Science* 173:1141 (Sept. 17, 1971).
2. Smith, W. E., L. Miller, R. Elsasser and D. Hubert: Tests for Carcinogenicity of Asbestos. *Ann. New York Acad. Science* 132:456 (Dec. 31, 1965).
3. Smith, W. E., D. Hubert, and M. Badollet: Biologic Differences in Response to Long and Short Asbestos Fibers. *Amer. Ind. Hyg. Assoc. J.* 33: Abstract #162 (Feb. 1972).
4. Macdonald, E., and P. Wolf: in *Epidemiological, Experimental and Clinical Studies on Gastric Cancer*. Japanese Cancer Assn. GANN Monograph 3 (1968).
5. Zaldivar, R.: Geographic Pathology of Oral, Esophageal, Gastric and Intestinal Cancer in Chile. *Ztsch. Krebsforsch.* 75:1 (1970).
6. Hedler, L., and P. Marquardt: Ueber das Vorkommen von Nitrosaminen in Nahrungs- und Futtermitteln. *Naunyn-Schmiedeberg's Arch. Pharm. exp. Path.* 259:176 (1968).
7. Sander, J., F. Schweinsberg, and H. Menz: Untersuchungen ueber die Entstehung cancerogener Nitrosamine. im Magen, *Hoppe-Seyle's Ztsch. physiol. Chem.* 349:1691 (1968).
8. Druckrey, H., S. Ivankovic, and D. Schmaehl: Organotrope carcinogene Wirkungen bei 65 verschiedenen N-nitroso-Verbindungen an BD-Ratten. *Ztsch. Krebsforsch.* 69:103 (1967).
9. Kawamura, T., K. Sakai, and F. Miyazawa: Studies on nitrosamines in foods (IV). Distribution of secondary amines in foods. *J. Food Hyg. Soc. (Japan)* 12:192 (1971).
10. Haenszel, W., M. Kurihara, M. Segi, and R. Lee: Stomach Cancer among Japanese in Hawaii. *J. Nat'l Cancer Inst.* 49:969 (1972).
William E. Smith, M.D.
Health Research Institute
Fairleigh Dickinson University
Madison, N.J. 07940

Jerome T
Stam
200
Chic
John A.
JM C
St. P
Edward
Nate
5600
Rock
Paul D.
Stam
200
Chic
Charles
Arge
9700
Arge
Bruce A
119
Univ
Urbe
William
66 S
Akn
William
Har
Emil E
Her
Julius A
IBM
David
Un
Bruce
Lo
Dobrm
Th
James
Un
Thoma
Un
Bruce
Un
John V
U.
Robert
Ge
Richard
Ea
William
Ar