Environmental Asbestos Pleural Plaques in Northeast Corsica: Correlations with Airborne and Pleural Mineralogic Analysis

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We report a prevalence study of environmental pleural plaques in subjects over 50 years old from the northeastern Corsican village of Murato, built on asbestos surface deposits. The percentage of plaques was 41%, versus 7.5% in the control village of Vezzani. Although surface deposits contain both chrysotile and tremolite, airborne pollution and asbestos lung burden of exposed inhabitants consist essentially of tremolite as assessed by transmission electron microscopy (TEM). However, TEM analysis of the parietal pleura of three animals bred in exposed areas showed a predominance of short fibers of chrysotile. The respective roles of tremolite and chrysotile in inducing pleural plaques in Corsica should thus be considered.

— Environ Health Perspect 102(Suppl 5):251–252 (1994)

Key words: environmental pleural plaques, Corsica, airborne meteorology, pleural mineralogy, asbestos, pleural plaques, amphiboles, environmental diseases

Introduction

In Corsica, numerous asbestos outcrops of both chrysotile and tremolite are scattered in schist layers throughout the northeastern region. We have already demonstrated an excess of pleural plaques and mesotheliomas among inhabitants of this area (1,2). The present study assessed the prevalence of environmental pleural plaques in two villages in Northeast Corsica and correlated these data with mineralogic studies to characterize the asbestos fibers involved. The village of Murato, which is exposed to asbestos, and Vezzani, which is not exposed and was used as a control, were chosen because the necessary X-ray equipment was available locally.

Material and Methods

Population

All inhabitants over 50 years old, born in the villages and living there for more than 6 months a year, were X-rayed. Subjects with occupational exposure to asbestos and a history of pleural pathology were excluded. All had a 35 × 35 high-voltage anteroposterior chest X-ray.

Airborne Fiber Levels

Airborne chrysotile and tremolite concentrations were measured in each village. Samples were taken in four locations—outdoors at high, medium, and low altitude in the village, and inside representative houses. Specimens were analyzed by transmission electron microscopy (TEM) by the Laboratoire des Particules Inhalées (LEPI, Paris) using a previously reported technique (3).

Domestic Animals

Asbestos concentrations in the parietal pleura of three animals bred in exposed areas (one dog and two goats) were also studied: pleural specimens were taken at autopsy from the median part of the costovertebral gutter. Samples were analyzed by TEM by De Vuyst et al. using a technique similar to that of the LEPI.

Results

Prevalence of Pleural Plaques

After selection, the final study population was 48 men and 60 women with mean age 66 ± 1 year, a total of 108 in Vezzani; and 34 men and 49 women with mean age 68 ± 1 year, a total of 83 in Murato. Pleural plaques were documented in eight subjects in the control village of Vezzani, representing 7.4% of the population, compared

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Table 1. Prevalence of bilateral pleural plaques in two villages in Northeast Corsica.

|          | Murato | Vezzani |
|----------|--------|---------|
| Study population |        |         |
| Sex distribution | 34     | 48      |
| No. with plaques | 22     | 5       |
| % of plaques     | 64.7   | 10.4    |
| Total no. with plaques | 34     | 8       |
| Total % with plaques | 41     | 7.4     |

χ² = 30.81; p < 0.001; odds ratio = 8.67; relative risk = 5.53.
with 34 subjects with pleural plaques in Murato, 41% of the population (p < 0.000: relative risk 5.5) (Table 1).

Characteristics of Subjects with Pleural Plaques in Murato

The prevalence of pleural plaques significantly increased with age, and more than 60% of inhabitants over 70 years of age presented radiologically visible bilateral pleural plaques. Of the 34 subjects with pleural plaques, 22 were male and 12 were female, so that although 64.7% of males were affected, only 24.5% of females had pleural plaques. This unexpected sex difference suggests that the occupations of the males had increased their exposures, but the fact that a quarter of females had pleural plaques suggests nonoccupational asbestos exposure (Table 1).

**Fiber Levels in Airborne Samples**

Chrysotile was detected at low levels inside houses and in the open air in both villages. Though chrysotile concentrations were four times higher in Murato than in Vezzani, the difference was not statistically significant. In contrast, the tremolite concentrations were over 100 times higher in Murato than in Vezzani, with a mean concentration of 39 ng/m² (Table 2).

**Asbestos Content of the Parietal Pleura of Three Animals from Exposed Areas**

In this preliminary study, significant numbers of fibers were identified in the pleura of each of the animals, with a mean fiber count of 46 ± 27 x 10⁴ f/g of dried tissue. The fibers were short, with mean lengths ranging from 0.9 μm in one of the goats to 1.2 μm in the dog. Tremolite accounted for only 5 to 9% of the total fibers (Table 3).

**Discussion**

The northeastern region of Corsica provides an excellent opportunity to study the role of environmental exposure to asbestos surface deposits in inducing pleural plaques. The risk of developing plaques was evidently much higher in the exposed village of Murato, with 41% of bilateral plaques in subjects over 50, than in Vezzani with only 7.5% of plaques. In Greece (4), Cyprus (5) and Turkey (6,7) where environmental pleural plaques have been reported, chrysotile, but especially tremolite, were identified in air and soil specimens, in the coating material used to weatherproof houses, and in the lungs of human and animal inhabitants. In Northeast Corsica too, most airborne asbestos fibers are tremolite (3). Moreover, in eight Corsican patients, who had been environmentally exposed and who underwent thorascopic lung biopsy in our department (4 mesotheliomas, 1 lung cancer, 1 asbestososis, 1 pleural plaque and 1 benign effusion), TEM analysis revealed concentrations of tremolite of 21 ± 11 x 10⁴ f/g DL compared with 3.5 ± 2 x 10⁴ f/g DL for chrysotile. In contrast, the parietal pleural burden of the three animals studied was essentially composed of short chrysotile fibers, with tremolite fibers accounting for only 5 to 9% of the observed 46 ± 27 x 10⁴ fibers per gram of dried tissue.

Because both pleural plaques and mesothelioma develop from the parietal pleura, it is not possible to deduce from either the previous or the present data whether tremolite or chrysotile alone is responsible for the environmentally induced pleural diseases described in Corsica.

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