Pneumoconiosis in Painters Dealing with Tonoko: Three Cases of "Tonoko-Lung"

MASAHIKO KAWAKAMI, SHIGERU SATO and TAMOTSU TAKISHIMA

First Department of Internal Medicine, Tohoku University School of Medicine, Sendai

KAWAKAMI, M., SATO, S. and TAKISHIMA, T. Pneumoconiosis in Painters Dealing with Tonoko: Three Cases of "Tonoko-Lung." Tohoku J. exp. Med., 1974, 114 (3), 295-297 — Tonoko, which is broadly used in processing wooden furnitures in Japan, has not been accepted as a causal substance of pneumoconiosis. Three cases of pneumoconiosis were found among four workers who have been engaged in wooden furniture painting and have dealt with tonoko daily for more than ten years. The atmosphere in their working room is always dusty and it is supposed that the main content of the dust is tonoko. Analysis revealed that tonoko was a soil substance which contained about 50% quartz. The results support the assumption that their disease may be referable to tonoko inhalation.

Pneumoconiosis has not been known to occur among painters in woodworking plants. Recently the authors have seen three cases of what seems to be pneumoconiosis out of four workers working in the painting section of a furniture-making shop in Sendai, Japan.

They have been engaged in painting wooden furniture for more than ten years. Two workers (Cases 1 and 2) had been pointed out their abnormalities for the first time when they had standard chest x-rays taken as part of a physical check-up for hypertension. They visited our clinic for further examination on June 10, 1974. Radiologically, miliary or nodular opacities were clouded throughout both lung fields; it was particularly so in the upper and middle parts of the lungs (Fig. 1). Moreover, in Case 1, a ring shadow about 2 cm in diameter was detected in the right apical region indicative of cavitation. Thus an occupational lung disease being suspected, the other two workers were called in for a radiological examination and the film of one of them (Case 3) revealed the same miliary shadows. The three cases are summarized in Table 1. Nobody had complained of hardly any of the respiratory symptoms. Spiromgrams revealed moderately restrictive and slightly obstructive impairment in Cases 1 and 3, respectively. Sputum smears were negative for malignant cells in all of them, but positive for tuberculous bacilli, Gaffky III, in Case 1.

They deal with a large amount of tonoko daily. Tonoko is whitish yellow-gray powder usually found in the form of small and massive clods, which is widely used in the production of wooden furnitures in this country. It is used as a wood filler to fill grains in the wood to obtain a durable, smooth and beautiful surface. Daily work done in this section is as follows. Several liters of muddy tonoko is mixed with the right color needed in preparing the furniture for painting. The surface of wood is coated with tonoko, which is subsequently scraped off with a spatula and wiped thoroughly with cloth. All this is done elaborately by hand. After drying, the furniture is removed to the next room for lacquer spraying.

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Dust rises up in thick clouds when they sweep off fallen and dried tonoko on the floor several times a day. A large fan is equipped in the wall of one side of the room, but it is not very effective in removing tonoko dust. Also, dried tonoko dust rises around them from the cloth they use while wiping the furniture. According to the workers, their sputum is colored with tonoko when expectorated during and after their work.

Tonoko seems to be the most probable component in the dust of the painting section, highly suggesting pneumoconiosis. Chemical analysis was carried out on tonoko by the method of Jackson (Jackson 1958). Content of SiO₂ quantified by the moribuden-yellow method (Jackson 1958) was 78.5% and Al₂O₃ by the aluminon method (McLean 1965) was 10.0%, showing a very high level of silica-alumina ratio, 13.4. Infrared absorption spectra of tonoko showed the absorption bands corresponding to quartz (1172, 1084, 800, 780, 697, 512 and 462 cm⁻¹) (White 1971). Also the bands probably attributable to some layer silicates were shown. X-ray diffraction analysis showed intense 3.34 Å and small 4.26 Å sharp peaks which are the (101) and (100) diffractions of quartz, respectively (Brown 1961). It also showed small 10 Å peak which was not altered even after heated at 300°C so that the peak corresponded to the diffraction of illite, a kind of clay mineral. Using the calibration curve based on the various ratios of standard quartz and kaolinite, tonoko is shown to contain 50% quartz.

Tonoko may be regarded as one of the respiratory irritants and accepted as a possible causal substance of the disease. Further studies will be arranged to ascertain the relationship between the disease and tonoko inhalation.

**Table 1. Summary of three cases**

<table>
<thead>
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<th>Case</th>
<th>Age</th>
<th>Sex</th>
<th>Years worked*</th>
<th>X-ray classification+</th>
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<td>Female</td>
<td>12</td>
<td>q 3/3 tb(+)</td>
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<td>Male</td>
<td>40</td>
<td>q 2/1</td>
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</table>

* Term for which they have been engaged in painting and dealt with tonoko.
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References