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Occupational asthma caused by sarsaparilla root dust

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Occupational asthma has been documented in workers exposed to a wide variety of plant-derived materials including grains, beans, seeds, leaves, roots, exudates (latex and gums), and wood dusts.¹ An IgE-mediated mechanism has been demonstrated in most cases, with the exception of wood dusts.¹

We describe a case of occupational asthma resulting from exposure to sarsaparilla (*Smilax*; botanical family, Liliaceae) in an herbal tea worker.

CASE REPORT

A 36-year-old man first experienced rhinitis and asthma 6 months after starting employment as a foreman in a small factory where various herbal teas were manufactured. Plants were manually unloaded from bags and fed into rollers where they were ground into 0.8 to 1.5 mm pieces. The components from a variety of

Abbreviation used

SPT: Skin prick test

plants were manually blended to obtain the desired medicinal properties and were then packed into small paper bags.

The symptoms occurred at work and improved within about 30 minutes, when the subject moved away from the production area. The subject noticed persistence of nasal obstruction and wheezing in the evening, but he never experienced nocturnal asthma attacks. Only on occasion did he use an inhaled bronchodilator at work, and he had no symptoms on weekends or holidays. He noticed that his symptoms were specifically related to the production of a depurative herbal tea, and he believed that the reddish dust from sarsaparilla roots was the causal agent. Twenty-one months after the onset of symptoms, he was removed from work by his attending physician and became free of symptoms except for wheezing on exercise. Six months later, he was asked to manage the transfer of the herbal tea production facility to another factory. When re-exposed to plant dust, he noticed recurrence of rhinitis and asthma symptoms. Seven months later, he lost his job because the production of herbal teas was discontinued.

The subject was investigated in our center 15 months after his last workplace exposure. He reported no personal or familial history of atopic disease. He

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had smoked 20 cigarettes a day for the previous 19 years. Baseline spirometry showed an FEV₁ of 3.31 L (82% of predicted value) and an FEV₁/forced vital capacity ratio of 69% (86% of predicted value). The subject showed mild bronchial hyperresponsiveness because the histamine PC₂₀ was 0.29 mg/ml.² Inhalation challenges were carried out by pouring ground plant components from one tray to another for gradually increasing periods (Fig. 1). A control exposure to common tea dust for 30 minutes did not induce significant changes in FEV₁. At the end of the control day, histamine PC₂₀ value was 0.47 mg/ml. Inhalation challenge by pouring the depurative herbal tea (200 gm) for 30 minutes elicited an immediate asthmatic reaction with a maximal fall in FEV₁ of 32%. Late bronchial response was not observed, but nonspecific bronchial hyperresponsiveness was significantly increased 7 hours after the end of exposure (histamine PC₂₀ < 0.01 mg/ml). Inhalation challenge with sarsaparilla root dust (20 gm) for 3 minutes induced an immediate asthmatic reaction with a maximal fall in FEV₁ of 33%. In contrast, exposure for 2 hours to the other plants (20 gm each) contained in the depurative tea did not cause an asthmatic reaction. Two control asthmatic subjects (histamine PC₂₀ values of 0.03 and 0.5 mg/ml) did not demonstrate significant changes in FEV₁ after exposure to sarsaparilla root dust for 1 hour.

Skin prick tests (SPTs) with 1:100 dilution of a sarsaparilla extract (10% wt/vol in phosphate-buffered saline) elicited a 7 mm reaction, whereas extracts of three other randomly selected plants contained in the depurative tea (*Parietaria officinalis*, *Calendula officinalis*, and *Cassia angustifolia*) did not induce a skin response. Results of SPTs with common allergens, as well as with extracts of garlic and onion (Stallergènes SA, Brussels, Belgium), which are botanically related to sarsaparilla, were negative. Ten unexposed atopic control subjects did not show positive SPT responses to the various plant extracts.

Direct-binding ELISA showed that the subject's serum contained specific IgE antibodies to sarsaparilla (Fig. 2) but not to the other plants present in the depurative tea. ELISA inhibition studies with the various plant extracts confirmed the specificity of the IgE binding to sarsaparilla. No significant inhibition was obtained with extracts of garlic and onion.

The subject reported that at least two other workers experienced work-related respiratory symptoms. Unfortunately, a medical survey of the 18 production workers could not be conducted, and workers with symptoms could not be traced.

DISCUSSION

Inhalation challenges with the various plants used for the production of the depurative tea demonstrated that sarsaparilla root dust was the

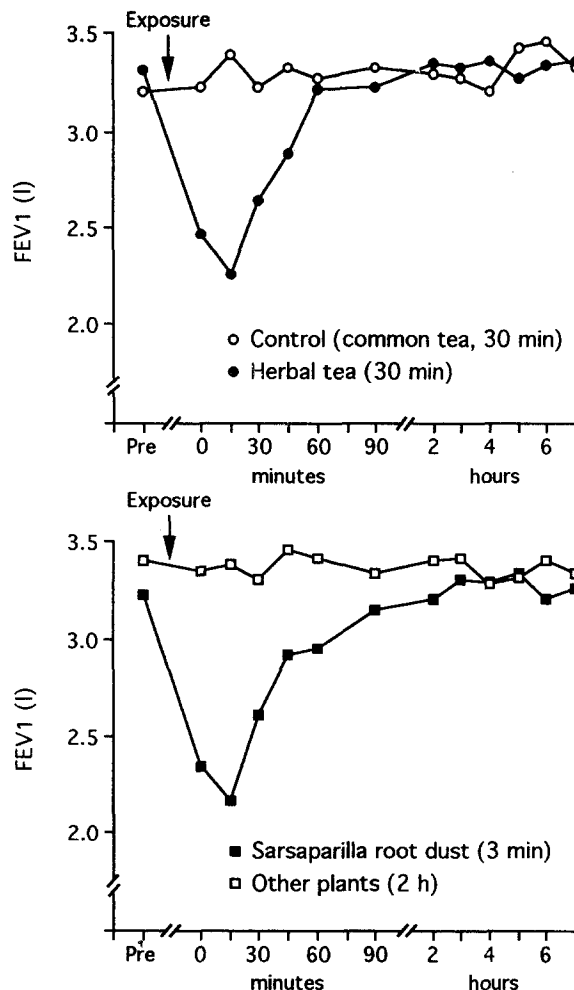


FIG. 1. Results of inhalation challenges. Changes in FEV₁ after exposure to common tea (control test, open circles), depurative herbal tea (filled circles), sarsaparilla root dust (filled squares), and other plants contained in the depurative tea (open squares) are shown.

agent causing asthma and rhinitis. The results of SPTs and specific IgE determination by ELISA provided evidence for an IgE-mediated mechanism.

Sarsaparilla consists of the dried roots of various species of *Smilax*, originating in Central and South America and belonging to the Liliaceae botanical family. In the past, sarsaparilla was widely used as a folk remedy for syphilis, arthritis, and skin diseases. It is now reported to have depurative, diaphoretic, tonic, and aphrodisiac properties.³ Sarsaparilla extracts are also used in baked goods and candies³ and as froth stabilizers in the brewing industry.

To our knowledge, this is the first report of occupational asthma caused by sarsaparilla.

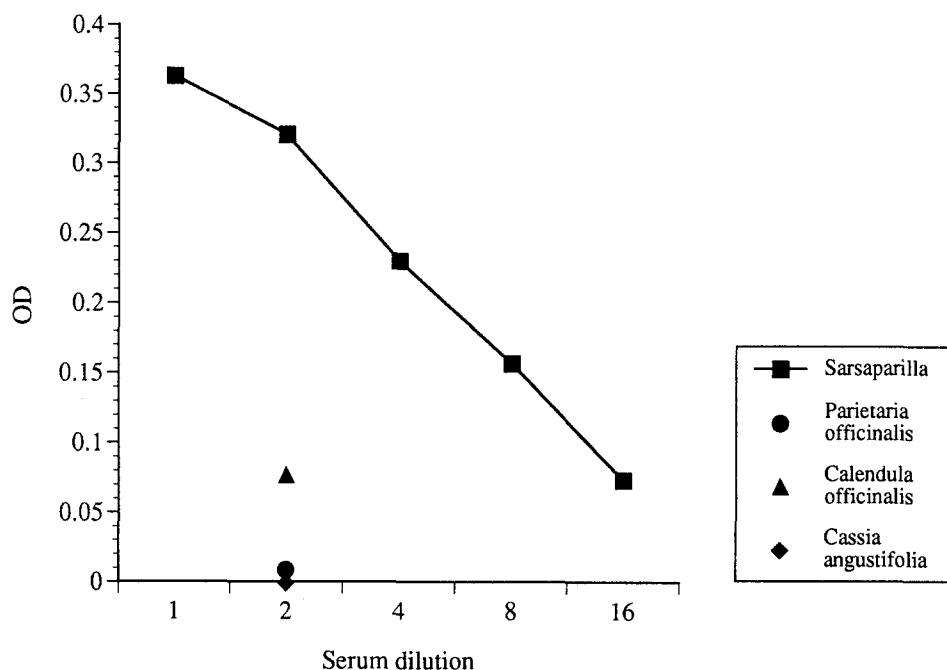


FIG. 2. ELISA dose-response curve showing the binding of IgE antibodies to sarsaparilla-coated plates. A 1:1000 dilution of sarsaparilla extract was used for incubation with the plates. Binding of IgE antibodies was detected by addition of human IgE-specific goat IgG and expressed in optical density at 492 nm. Binding to extracts of three other randomly selected plants contained in the herbal tea is also shown.

Other members of the Liliaceae family, including garlic^{4,5} and onion,⁶ have been identified as causing asthma through an IgE-mediated mechanism. Previous in vitro studies indicated that allergenic cross-reactivity among garlic, onion, and other members of the Liliaceae family (asparagus, chives) may exist.^{4,5} Our subject did not show positive SPT responses or specific IgE to garlic and onion, nor did he experience allergic reactions when eating them. Furthermore, ELISA inhibition studies did not support immunologic cross-reactivity between sarsaparilla and these botanically related vegetables. Hypersensitivity reactions have been described after ingestion of uncooked garlic.⁵ Our subject had never ingested the tea containing sarsaparilla and did not agree to undergo an oral challenge.

This report shows that sarsaparilla root dust should be considered a potential cause of occupational asthma among exposed workers. Considering the growing interest in medicinal plants, the prevalence of hypersensitivity reactions among subjects processing or ingesting such plants warrants further investigation.

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