

The patient's total IgE was 233 kU/l. Prick tests with common inhalation allergens were positive for grass pollens (++). A prick-to-prick test with powder of red yeast rice dissolved in water (Food Line GmbH, Offenbach, Germany) was strongly positive (+++). The skin prick test, as well as specific IgE antibodies, was negative to rice. A subsequent prick-to-prick test with *Monascus purpureus* cultivated on agar (Department of Food Technology, University of Bonn, Germany) gave a similar, strongly positive result (+++), whereas 10 healthy controls remained negative.

The cellular antigen stimulation test (CAST) was positive to red yeast rice and *M. purpureus* in different concentrations. Additionally, a disk was prepared with *M. purpureus* solution to detect serum IgE antibodies to *M. purpureus* by the radioallergosorbent test (RAST). Serologic analysis revealed specific IgE to *M. purpureus* (class 2 positive, 1.10 Allergopharma units, Allergopharma, Reinbek, Germany).

Red yeast rice is produced by solid-state fermentation of washed and cooked nonglutinous rice by the fungus, *M. purpureus*, an ascomycete, which is red in color. Red yeast rice is a traditional East Asian product that has been used in China since the Tang Dynasty. It is called "ang-kak" or "koji" in Japan. Health-promoting effects are ascribed traditionally to the product, which is mostly sold as a powder.

However, red yeast rice is mainly used as a food additive, particularly in meat as a preservative and condiment. It was shown in animal and human studies that *M. purpureus* extracts effectively lower serum lipid levels due to microbial metabolites such as monacolin K (mevinolin) with 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibitor activity (2–4). Additionally, the observed bacteriostatic effects (5) have led to the use of *M. purpureus* fermentate as at least a partial substitute for nitrite in meat preservation.

There is considerable global interest in the development of natural food additives that provide health benefits. However, possible

adverse effects have to be considered. Our case highlights the importance of a detailed allergologic assessment of natural allergens by *in vivo* and, if available, by *in vitro* tests.

To our knowledge, this is the first documented case of anaphylaxis to red yeast rice due to immediate-type sensitivity to *M. purpureus* in which specific IgE antibodies could be shown.

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## Cross-reacting allergens in natural rubber latex and jelutong

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**Key words:** *Dyera costulata*; jelutong; natural rubber latex; RAST inhibition; Western blotting.

● DURING the last two decades, IgE-mediated reactions to tropical plant material have come into focus, best exemplified by allergy to natural rubber latex (NRL) (1). Many NRL-sensitized individuals show allergic reactions to a wide range of plants, originating from different plant families (2).

Another rubber-producing tree, *Dyera costulata*, a member of the Apocyanaceae family, grows in the lowland forests of Malaysia, Borneo, and Sumatra. The sap, named jelutong sap, is used as the base in chewing gum (3), and the soft, easily cut wood is used for products such as pencils, matchsticks, and wooden models, and in woodwork teaching. Contact allergy to jelutong sawdust has been previously reported (4).

Occupational exposure to wood dust is associated with health problems, including respiratory allergy and allergic cutaneous reactions. In a previous study (5) on Swedish woodwork teachers regarding the health effects of wood dust, 64% of 127 woodwork teachers reported the use of jelutong, and several of them reported symptoms from the eyes and nose during exposure to jelutong dust. In view of these observations, we wanted to investigate whether IgE antibodies to jelutong could be observed among these teachers. We also wanted to investigate whether there were concomitant allergic reactions to NRL and whether allergens common to jelutong and NRL could be identified.

**Jelutong sap, used in some chewing gum, is allergenically related to latex.**

Serum samples from the previous study (5) on 127 woodwork teachers and 111 controls were investigated for the presence of IgE antibodies to jelutong and NRL. In seven sera, IgE antibodies to NRL were found. Three of these sera, from one woodwork teacher and two controls, also contained IgE to jelutong sap. The jelutong-positive woodwork teacher reported having work-related symptoms from the eyes and respiratory tract for more than 10 years. He had previously used jelutong daily at work, but he had stopped this after exacerbation of respiratory symptoms. The two jelutong RAST-positive controls had no occupational exposure to jelutong, but both were exposed to sawdust during their leisure time without reported symptoms.

Sensitization to NRL was found in seven subjects, two woodwork teachers and five controls. This corresponds to a total prevalence of 3.4%, a percentage somewhat below the prevalence found in occupationally NRL-exposed populations (1). The only symptoms from NRL in this group were reported by a control person with hand dermatitis after wearing rubber gloves and swollen lips after changing bicycle inner tubes.

SDS-PAGE followed by immunoblotting was performed on the saps of jelutong and NRL with NRL- and jelutong-positive sera. A larger number of allergenic components were

identified in the NRL than in the jelutong sap extracts. In both extracts, bands were found in the molecular range around 14, 30, 36, and 45 kDa (Fig. 1), which is in the same molecular range as important NRL allergens (1).

The cross-allergenicity between jelutong and NRL was studied with a RAST inhibition assay, in which allergens block specific IgE antibodies, resulting in a reduction of the remaining free IgE, as measured by latex ImmunoCAP, k82, in the Pharmacia CAP System (6). A concentration of 10–70 µg/ml of the jelutong and NRL extracts gave 50% inhibition of the two systems. The inhibition curves obtained were similar for the two sap extracts. Jelutong allergens were also demonstrated in jelutong sawdust extracts, and more than 95% inhibition was achieved with undiluted extract.

In this study, we have demonstrated allergenic cross-reactivity between NRL and jelutong and shown the existence of jelutong allergens in jelutong sawdust. We have also previously found minute amounts of NRL allergens in sawdust from *Hevea brasiliensis* (unpublished data), a notable fact, since woods from rubber trees are commercially used.

Airborne exposure to sawdust is one possible exposure route for these allergens; another exposure route for jelutong is through chewing gum since natural rubbers and resins are still used as bases in chewing gum, even if

synthetic bases have to some extent replaced natural saps. The exposure conditions that represent the greatest hazard remain to be elucidated. In the light of the highly differing clinical patterns seen in the NRL-allergic individuals, we find further studies on cross-reactivity between rubber trees and natural gum bases essential.

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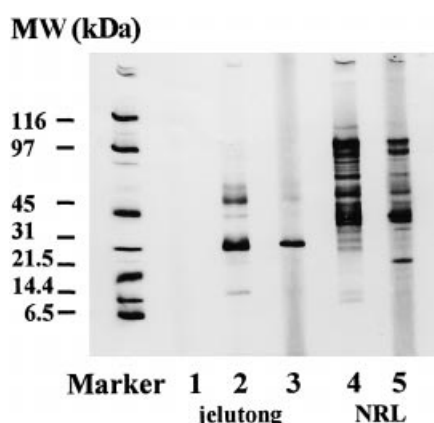


Figure 1. IgE-binding components in jelutong sap and NRL. Lane 1) Jelutong sap on nitrocellulose (NC) membranes incubated with negative control serum; lanes 2 and 3) jelutong sap on NC membranes incubated with two different sera positive to both jelutong and NRL; lanes 4 and 5) NRL on NC membranes incubated with two different NRL-positive sera. MW: Molecular weight.

## Sensitization to aeroallergens in Ankara, Turkey

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**Key words:** allergic rhinitis; atopy; bronchial asthma; skin prick test.

• RECENT data on the prevalence rates of respiratory, nasal, and skin symptoms in