

of Abu Dhabi, UAE. The study population comprised 249 patients (146 females, mean age and range 28.4, 6–62 years, respectively) who suffered from nasal, conjunctival, or chest symptoms.

The patients were prick-tested by a standard technique. The prick test series changed somewhat with time, but the latest version included the allergens listed in Table 1. The allergens were purchased from Stallergènes, Fresnes Cedex, France, or from Bayer, Spokane, WA, USA. A prick test reaction was defined as positive if it gave a wheal with an area of at least 7 mm² (corresponding to a wheal diameter of 3 mm) and if the area of the wheal was at least half of that of the positive control (10 mg/ml histamine).

The concordance of prick test reactions among various representatives of taxonomically related species was estimated by calculating the kappa coefficient.

The results of the prick tests are shown in Table 1. Sensitization was common to the pollens of chenopods (Russian thistle, lamb's-quarters, firebush, sea blite, and scales), pigweeds, grasses, and legumes (mesquite tree, golden acacia, and alfalfa). Table 1 also shows how compatible prick test reactions were to taxonomically related species.

The family Chenopodiaceae is well represented in the UAE. Most local chenopods are perennial bushes called saltbush. In accordance with previous reports from Kuwait (2) and Saudi Arabia (3), chenopods seem to be commonly sensitizing allergenic plants also in the UAE. In most cases, it was not possible to obtain chenopod allergen extracts from locally growing species; therefore, extracts from the same genus had to be used. However, high levels of positive reactions to these commercial chenopod extracts were seen, and patients may have reacted to common allergen epitopes shared by different members of the Chenopodiaceae family.

Many species of Leguminosae, including trees, shrubs, and herbs, grow naturally in

the UAE. Several members of this family are also cultivated for animal fodder or ornamental purposes. The prick test panel used included three representatives of this family, and positive reactions to them were common. In addition, prick test reactivity to the mesquite tree was associated with that to acacia and alfalfa, and here again cross-reactivity may play a role. In investigations performed in other Gulf countries, sensitization to legume pollens was likewise common (2, 3).

Grasses are important inhalant allergens throughout the world, as in the UAE, where around 100 grass species are represented (4), and sensitization to grass pollens has been found to be frequent. Bermuda grass and a 12-grass mixture were selected for the prick test series since the former commonly grows here and the latter should provide a good selection of grass allergens.

I suggest that the basic inhalant allergen series for the inland area of the UAE include the following 15 allergens: cockroach, *Dermatophagoides pteronyssinus*, *D. farinae*, cat, Bermuda grass, 12-grass mixture, date palm, mesquite tree, acacia, Russian thistle, lamb's-quarters, scale mix, pigweed mix, mugwort, and plantain. This series could be complemented, when necessary, with animal epithelia or other relevant allergens. It is also desirable that more allergen extracts be available from locally growing plant species.

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Asthma to *Gammarus* shrimp

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Key words: asthma; fish food; *Gammarus*; IgE.

● THE amphipod *Gammarus* shrimp, or freshwater shrimp, belongs to the Crustacea family Gammaridae. It is used in several European countries to produce pet-fish food. So far, sensitization to *Gammarus* has not been reported. Our patient, a plant electrician who worked in a fish-food factory, appeared to suffer from allergic asthma due to the dust of these shrimp occurring in the workplace.

The patient was a 29-year-old man. About 8 weeks after he had started working in a fish-food factory, he developed chest tightness, cough, and dyspnea with wheezing. These symptoms appeared regularly at times when he was working near the production areas where dried *Gammarus* shrimp were mixed and packed with other fish-food ingredients. Sometimes the symptom of dyspnea would last until noon of the following day. On weekends or holidays, the symptoms decreased or disappeared completely.

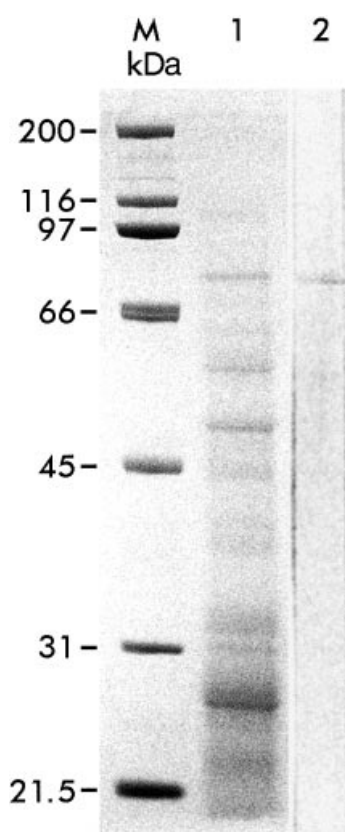


Figure 1. SDS-PAGE result of *Gammarus* extract (lane 1) and IgE immunoblot analysis with subject's serum (lane 2), showing IgE binding to protein band at about 80 kDa. Lane M indicates protein markers.

Skin prick testing with a standard series of 26 common inhalant allergens including herring, flounder, sole, cod, haddock, shrimp, and crab (ALK, Copenhagen, Denmark) revealed only sensitization to tree pollen. However, the patient showed a strong positive skin reaction to the extract of dried *Gammarus*, the product of the fish-food factory (wheal diameter ≥ 10 mm).

Positive IgE antibodies to the protein extract of *Gammarus* could be detected in the patient's serum (1.4 kU/l, RAST class 2) by the enzyme-linked allergosorbent test (EAST) with an Allergopharma RAST test kit (Allergopharma Joachim Ganzer KG, Reinbek, Germany). To prepare the solid-phase antigen, the dried *Gammarus* was extracted in 0.1 mol/l potassium phosphate buffer, pH 7.4. The proteins were then coupled onto paper disks at a protein

concentration of 1 mg/ml. IgE binding to *Gammarus* extract in two control sera from unrelated subjects was not observed.

Immunoblot of *Gammarus* extract was also performed by the method described previously (1). Protein staining after SDS-PAGE showed different bands in the range of 14 to >90 kDa. Immunostaining revealed a distinct IgE-binding band around the 80-kDa area (Fig. 1). No IgE-binding was observed with control sera.

Specific IgE to Chi t 1-9 (hemoglobin allergens of the nonbiting midge *Chironomus thummi thummi*, another pet-fish food) was also detectable (1.0 kU/l).

The clinical examination revealed FEV₁ of 76.4%, MEF₇₅ of 55%, MEF₅₀ of 46%, and MEF₂₅ of 32% of the predicted values of Quanjer et al. (2). The patient also displayed an unspecific bronchial hyperreactivity in the methacholine challenge test (PD₂₀=0.1 mg methacholine). An immediate asthmatic reaction occurred 30 min after an occupational-type inhalative challenge test in handling dried *Gammarus* shrimp (increase in sR_t to more than 250% of the baseline value).

From the above test results, we concluded that the occupational exposure to the dust of dried *Gammarus*, as well as the type I sensitization to *Gammarus* shrimp, was the major cause of the asthma episode in our patient.

Allergic disorders such as asthma, allergic rhinitis, and bronchitis induced by occupational contact with pet-fish food among workers in the fish-food industry have been reported. The most frequently studied allergens in fish food are the hemoglobin molecules Chi t 1-9 of *C. thummi thummi* (3, 4). Several cases of sensitization to *Daphnia* spp. in aquarium keepers have also been described (5). There has been no report on type I sensitization to *Gammarus* shrimp due to occupational exposure.

According to the patient, about one-third of the staff of the same factory complained of respiratory symptoms upon exposure to

dried *Gammarus* shrimp. Therefore, this case does not seem to be a single one. A similar sensitizing effect on fish fanciers using this product on a regular basis also cannot be excluded.

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Immediate-type allergy caused by poppy seed

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Key words: atopy; nut allergy; poppy seed allergy.

• The wide spectrum of clinical symptoms caused by food allergens includes potentially life-threatening immediate-type reactions. The association between sensitivity to diverse vegetables and sensitivity to different pollens is well