

## Aerosolized snow-crab allergens in a processing facility

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**Key words:** allergen; asthma; occupational asthma.

• OCCUPATIONAL asthma (OA) to snow-crab (SC) is documented in up to 16% of processors (1). The disease is mediated through the production of IgE against allergens found in the cooking water and crab meat (2). In a previous study (3),

environmental monitoring in a SC-processing plant

**Immunoassays revealed allergen concentrations of 50–5000 ng/m<sup>3</sup>.**

confirmed the presence of aerosolized allergens, generated in the boiling section. However, the amount of allergens recovered from the personal PVC filters at different working sites was undetermined.

The purpose of this study was to determine airborne concentrations of SC allergens and to establish whether there is a gradient of exposure to SC allergens according to the type of job involved in a processing plant where sensitization to SC is high (25% of workers with positive skin tests to SC allergens).

*SC-processing plant.* A general scheme of the same plant as studied by Malo et al. (3) is shown in Fig. 1. Processing starts with SC cracking where the SC body is broken and the legs are brushed; this is followed by the boiling and cooling processes. Next, the SC is sorted according to leg size and visual aspect. It is then packed in boxes before being frozen for shipping.

*Air sampling.* Area samples were collected with "air sentinels" (Quan-Tec-Air, Inc., Rochester, MN, USA) operating at a flow rate of 3 l/s. Personal breathing zone sampling was done with 224-43XR samplers (SKC, Inc., EightyFour, PA, USA) operating at a flow rate of 3.4–4.5 l/min. Polytetrafluoroethylene (PTFE) or Teflon® filter membranes were used for all air-sample collections. Sampling was done during a production period of 2–4 h and during a nonproduction period for the control filters.

*Immunoassay.* A pool of reactive sera from SC-sensitized individuals was assembled for the inhibition assays. SC cooking water proteins were immobilized on the surface of Immulon IV (Dynex Corp, Chantilly, VA, USA) plastic microtiter wells. The cooking water protein was diluted to a concentration of 10 µg/ml in 200 mM carbonate buffer, pH 9.2, and 100 µl was added to each well and the mixture incubated at room temperature overnight. After washing the wells, we added

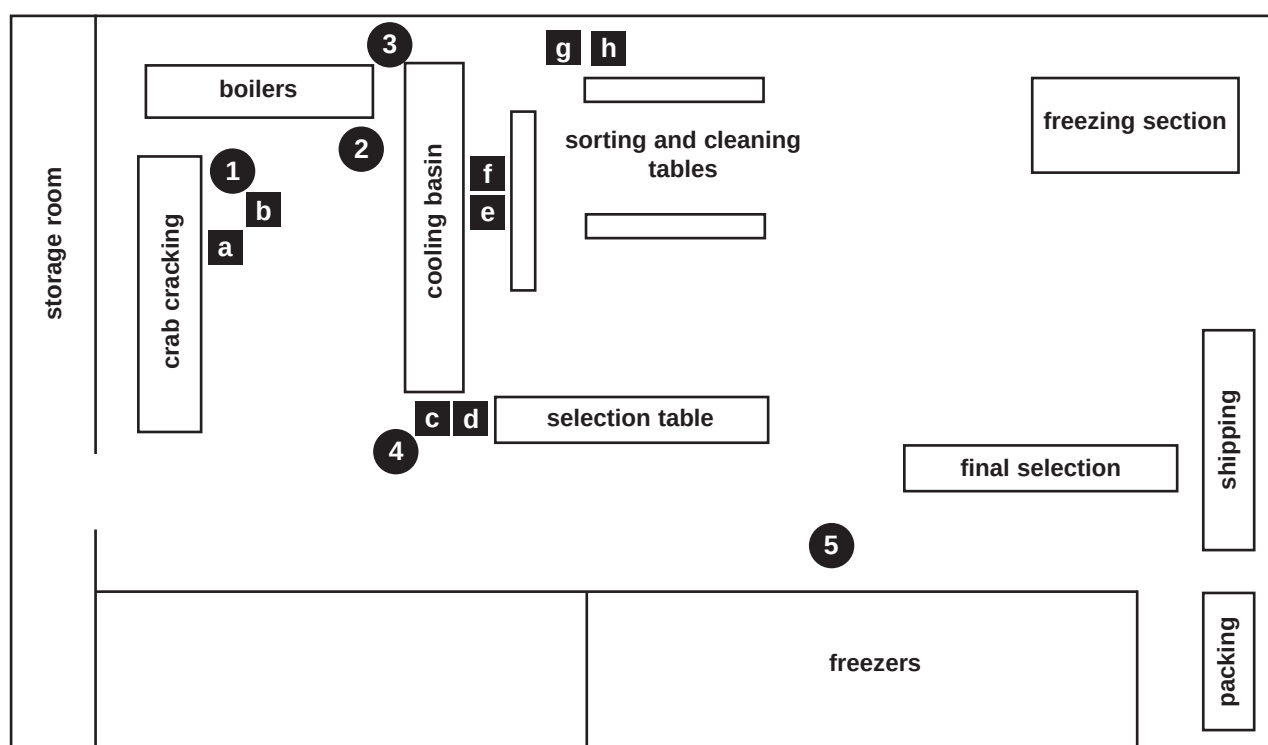
50 µl of the filter extract or dilutions of the SC cooking water protein reference standard containing defined mass units, along with 50 µl of the serum pool. This reaction mixture was incubated overnight at room temperature. We added rabbit <sup>125</sup>I-labeled anti-IgE to each well (100 µl) and again incubated and washed the mixture as before, prior to gamma-scintillation counting. Detection limits were determined at 4 ng/m<sup>3</sup> for area samples and 28 ng/m<sup>3</sup> for personal samples.

The results of the immunoassays are summarized in Table 1. The highest allergen concentrations were detected in the crab-cracking section, followed by the exit point of the cooling basin. Allergen exposure was lowest at the end of the production line.

This study represents an improvement in the detection of SC antigen in comparison with a previous study (3) in which crab allergen was detected only in the crab-cracking section near the boilers, with a borderline presence found near the cooling basin.

**Table 1.** Airborne snow-crab allergen estimates

| Filter no. type | Job/location                          | Estimated concentration (ng/m <sup>3</sup> ) | ng for total filter |
|-----------------|---------------------------------------|----------------------------------------------|---------------------|
| <b>Area</b>     |                                       |                                              |                     |
| 1               | Crab cracking                         | 547                                          | 11 806              |
| 2               | Crab cracking                         | 84                                           | 1156                |
| 3               | Outlet of boiler                      | 53                                           | 1927                |
| 4               | Outlet of cooling basin               | 100                                          | 2502                |
| 5               | Near final selection                  | 63                                           | 1568                |
| Sham            | –                                     | –                                            | 68.5                |
| <b>Personal</b> |                                       |                                              |                     |
| a               | Crab cracker                          | 5061                                         | 3664                |
| b               | Crab cracker                          | 4961                                         | 4862                |
| c               | Crab sorter – outlet of cooling basin | 604                                          | 568                 |
| d               | Crab sorter – outlet of cooling basin | 196                                          | 174                 |
| e               | Crab sorter – underwater jet          | 220                                          | 169                 |
| f               | Crab sorter – underwater jet          | 204                                          | 194                 |
| g               | Crab sorter/cleaner                   | 191                                          | 191                 |
| h               | Crab sorter/cleaner                   | 179                                          | 154                 |



1 - 5 Air sentinels

a - h Personal 224-43XR samplers

Figure 1. General scheme of processing plant. Area (1-5) and personal breathing zone (a-g) samples were collected at different sequential crab-processing stations. Dotted line represents plastic curtains, and continuous lines represent walls.

Although we do not have an adequate medical history of all plant workers, our results of environmental exposure seem to correspond to the clinical manifestations of the workers at the different sections, suggesting that the level of exposure is a risk factor for the sensitization to SC. Indeed, 4/6 crab crackers (67%) had positive skin tests to SC allergen, while the incidence of skin-test positivity in the plant was 25% (41/163 workers); at least one of the crab crackers had a history of OA (unpublished data).

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## Immediate and delayed hypersensitivity to ammonium persulfate

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**Key words:** ammonium persulfate; contact dermatitis; occupational asthma.

- AMMONIUM persulfate (APS) is known as a cause of occupational type IV

hypersensitivity in hairdressers (1, 2) and as a rare cause of occupational asthma (3, 4). Here we present a hairdresser with both type IV and type I hypersensitivity to APS acquired during work.

A 20-year-old hairdresser was admitted to our department because she had developed rhinitis and asthma during her work at the reception desk of a hairdressers' shop. After 1 year of her apprenticeship, she had developed hand eczema, caused by delayed-type hypersensitivity to *p*-phenylenediamine, *p*-toluylenediamine, and APS. All three substances are relevant to the work of a hairdresser. As the patient did not want to quit her job, her employer had allowed her to work at the reception desk without direct contact with hair-care products. Two years later, the patient developed a running nose, coughing, and shortness of breath while leading customers from the reception desk to a seat in