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Editorial

Occupational asthma from vegetable gums

Occupational asthma caused by the vegetable gums, acacia (gum arabic), karaya, and tragacanth, has been recognized for some time.¹⁻³ More recently, guar gum has been reported to cause asthma in three occupationally exposed individuals.⁴ Although vegetable gums are widely used in the food processing, pharmaceutical, textile, and printing industries, most studies of occupational asthma have appeared as scattered case reports. The article by Malo et al.⁵ in this issue of the JOURNAL is one of the first extensive epidemiologic evaluations of workers exposed to these products.⁵ In this survey of 177 carpet-factory workers, of whom 162 were evaluated, 5% demonstrated IgE sensitization to guar gum by skin testing. Of 133 workers who agreed to serologic assays, 8.3% demonstrated specific IgE antibodies to guar gum. Two subjects had confirmed occupational asthma related to guar gum, and a third subject had a high probability of occupational asthma, for an overall prevalence of 2% of the work force. Additional surveys of other industries that use vegetable gums are warranted to establish the health risks of exposure to these widely used products.

Gums are incompletely characterized substances derived from plants. They contain carbohydrates that, when they are reacted with water, produce mucilages. Gums are classified into two broad groups: gums ob-

tained as plant exudates and gums obtained from seeds. Important gums from exudates include acacia, obtained from *Acacia* spp. and used in the food, pharmaceutical, and printing industries and in manufacture of adhesives; tragacanth, obtained from *Astragalus gummifer*, used primarily in the printing industry; and karaya, obtained from *Sterculia urens*, grown in India and used as a substitute for tragacanth and as an adhesive for ostomy supplies. Important gums obtained from seeds include carob, from the Mediterranean *Ceratonia siliqua*, and guar, obtained from the Indian legume, *Cyanopsis tetragonolobus*, which is used as a thickening agent in numerous food and pharmaceutical products, including salad dressings, soups, ice cream, preserved foods, cheese products, emulsions, lotions, and creams,⁶ and also used as a sizing material for paper and textiles.

Vegetable gums are so-called high-molecular-weight allergens. This arbitrary classification designates sensitizing agents that most often are proteins or glycoproteins with molecular weights >20,000.⁷ Although vegetable gums are rich in polysaccharides, they are believed to be formed by enzymatic activity, and it is likely that they contain entrapped enzymes that have escaped inactivation.⁶ Biochemical analysis of vegetable gums has demonstrated measurable quantities of protein.⁶ The protein nature of the allergen is suggested by the IgE binding demonstrated in the RAST, in which coupling of the antigen to the solid phase occurs via a chemical reaction between cyanogen bromide and the aminoterminal portion of a protein molecule. Interestingly, another polysaccharide-rich, plant-derived product, psyllium, is also associated with occupational asthma.⁸ Recent investigations from our laboratory (unpublished) and The Johns Hopkins (Dr. Hugh Sampson, personal communication)

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suggest that a protein constituent is responsible for the IgE sensitization. Additional characterization of vegetable gum allergens may lead to improved diagnostic reagents.

Although sensitization to vegetable gums in occupational settings undoubtedly occurs through a respiratory route, ingestion of food products containing these gums may cause allergic symptoms, such as angioedema and laryngeal edema.^{3,4} In spite of their widespread use in food products, development of sensitization through the oral route is uncommon. Nonetheless, people who are sensitized to vegetable gums through the respiratory route are at risk for severe anaphylactic reactions on ingestion of these products.

Of further note is the method used by Malo et al.⁵ to confirm the presence of occupational asthma in their subjects by specific inhalation challenges. The authors used a new aerosolization device to produce a steady concentration of dust during exposure.⁹ The challenge apparatus is designed to provide information on the concentration and size distribution of inhaled particles. Additionally, dose-response curves can be constructed. Both of these advantages may improve the safety and accuracy of inhalation-challenge tests. In previous investigations, five individuals who had negative challenges using this apparatus also had negative challenges when they were tested in the traditional way of tipping the powder from one tray to another in a closed room.¹⁰ Additional investigations with this device will be necessary to determine its usefulness. Nonetheless, the potential for improving the delivery of known concentrations of antigen to the subject and improving the safety of the test is promising.

Vegetable gums and other organic dust are a frequent cause of occupational asthma. Epidemiologic studies, such as studies reported by Malo et al.⁵ may be useful in establishing methods to lessen the risk of sensitization to exposed workers. Further character-

ization of the allergens involved may lead to improved reagents for skin testing and in vitro diagnosis of IgE sensitivity. Finally, improved techniques for conducting inhalation challenges that will lessen the risk to the subjects are worthy of additional investigation.

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