



## Baker's asthma: Old disease persists

The earliest reports of illness associated with milling flour and baking were recorded in 1713, with descriptions of cough, shortness of breath, hoarseness, asthma and eye problems among bakers. Baker's asthma and the underlying causes were further described in the 1970s and 1980s, as immunological techniques were developed that could measure allergens. It became clear that baking and wheat flour, in particular, caused irritation, sensitization and asthma, including detectable IgE against certain ingredients. Allergic sensitization can lead to asthma and baker's eczema; eye, nose and respiratory irritation were more common adverse health effects.<sup>1</sup>

Peer-reviewed medical articles about wheat and other cereal flours, such as rye and barley, helped establish the evidence regarding the capacity of proteins from a variety of flours to induce specific IgE sensitization after inhalation. Information was subsequently published about amylase (enzyme), a dough conditioner that is routinely added to baking flour (in milligrams per kilogram) to hasten the baking process and improve bread quality. This enzyme is frequently derived from *Aspergillus oryzae* and added to flour to compensate for low natural amylase levels in cereal flour and economize the baking process. In one study, efforts to reduce baker's asthma by reducing overall inhalable dust failed to reduce the incidence of baker's asthma in the UK.<sup>2</sup> Researchers concluded that amylase was likely the most important cause of allergy.<sup>2</sup> Short term peak exposures may contribute to sensitization, even when exposures appear low over a full work shift.<sup>3</sup> There are now several allergens documented to cause baker's asthma; baker's asthma is often preceded by rhinitis, and atopy is frequently present.<sup>4</sup> The identity of a causative agent in

any single case may be unclear because employees are frequently exposed to many agents at once, but the risk is increased by high exposure to bakery dust.

Baker's asthma is one of the most common forms of occupational asthma.<sup>4</sup> In France, baker's asthma ranked first among cases reported to the national observatory of occupational asthma.<sup>5</sup> It is estimated that 7-15% of bakers have baker's asthma.<sup>6,7</sup>

Nine cases of baker's asthma have been reported to the Occupational Health Surveillance Program (OHSP) from 1993 to the present. Two cases are presented below from a commercial bakery. Four persons with baker's asthma were reported in retail bakeries or stores, and 3 others in food manufacturing, including a dog biscuit producer.

## Case presentations

**Case 1.** A primary care physician diagnosed a case of new-onset work-related asthma in a 48-year-old patient who works in a large commercial bakery. He prescribed medication and, in consultation with a pulmonologist, advised him to leave his job. The physician reported the case to OHSP, as required by the state mandatory reporting regulations, after learning about reporting requirements at a statewide asthma meeting. In a telephone interview, OHSP learned that the worker's main responsibilities included operating production lines, cleaning the mixers, taking out trash, substituting for workers when they take lunch breaks, and more recently maintenance. After about 4 years of work he began developing chest pain and pressure, coughing, especially at night, and difficulty breathing, especially "when he

<sup>1</sup> Cullinan P, Cook A et al. 2001. Allergen and dust exposure as determinants of work-related symptoms and sensitization in a cohort of flour-exposed workers; a case-control analysis. *Ann Occ Hyg* 45:2;97-103.

<sup>2</sup> Smith TA. 2004. Preventing baker's asthma: an alternative strategy. *Occ Med* 54:21-7.

<sup>3</sup> Elms J, et al. 2001. Development and validation of a monoclonal based immuno assay for the measurement of fungal alpha-amylase: focus on peak exposures. *Ann Occup Hyg* 45:2;89-95.

<sup>4</sup> Brisman J. 2002. Baker's asthma *Occup Environ Med* 59:498-502.

<sup>5</sup> Kopferschmitt-Kubler MC et al. 2002. Occupational asthma in France: a 1-yr report of the Observatoire National de Asthmes Professionnels project. *Eur Respir J* 19:84-9.

<sup>6</sup> Bernstein JA. Chapter 17. Occupational Asthma in Ed. Mahmoudi M. *Allergy and Asthma: Practical Diagnosis and Management*, 2007.

<sup>7</sup> Palacin A et al. 2007. Wheat lipid transfer protein is a major allergen associated with baker's asthma. *J Allergy Clin Immunol* 120:1132-8.

worked hard.” He described being very tired after work. He could not afford the prescribed asthma medications and could not leave his job. With a doctor’s note, he was reassigned to an area away from the mixing room. He continued working, using an over-the-counter allergy spray, receiving injections to alleviate symptoms, and wearing a respirator at work. He remains employed at the same company, nearly six years after his diagnosis.

**Case 2.** In 2008, an allergist reported a case of baker’s asthma in a patient who was a dough mixer in the same commercial bakery. This patient was a nonsmoker who had worked in the plant for nine years. He had moved to a dough mixing job six years into his tenure, and was diagnosed with baker’s asthma a year later. This employee had applied for workers’ compensation; a decision was pending at the time of his interview.

## Discussion

These two cases of baker’s asthma were diagnosed and reported among employees at a commercial bakery in Massachusetts by a primary care physician and allergist respectively. They each had worked for years before they developed asthma, had different jobs, and were assigned to different areas of the plant. Both were immigrants, with limited English proficiency, though from different countries, speaking different languages. Neither had seen an occupational medicine physician.

OHSP conducted a walkthrough of the plant, accompanied by occupational medicine residents. Over 200 employees work at this bakery, which supplies bread products for supermarkets and restaurants. A number of different lines were used for baking breads and rolls. Potential for exposure to flour and bread ingredients was observed, in the mixing areas especially, and along the automated lines.

Flour was released from an opening in the lid of the mixers when the flour was automatically added from outside silos and mixing initiated. Dough conditioner, including amylase, was measured by hand and added to the mixers from open containers. Flour from mixing and the automated lines that fell onto the floor was routinely swept, allowing re-entrainment of the flour into the air. The company had no specific program addressing baker’s asthma.

These two cases illustrate the challenges physicians can face in managing their patients’ asthma. The physician caring for Case 1 urged him to leave the workplace, as is appropriate when individuals become sensitized to a workplace exposure that cannot be eliminated. But the patient could not take this advice, which would have required giving up his livelihood. The physician and bakery employee sought an alternative solution. The physician wrote a note to the company requesting reassignment to a safer area of the company and use of a respirator to reduce exposure. The reassignment was

warranted by previous studies that have shown lower flour exposures for oven workers (0.6 to 3.2 mg/m<sup>3</sup>) compared to weighing, mixing, and bread making workers (2.3 to 11 mg/m<sup>3</sup>).<sup>8</sup> Similarly, the voluntary use of NIOSH approved dust masks reduces exposure further without requiring administration of a complete respiratory protection program. At the time of the interview, Case 2 had not returned to work, and his compensation case was pending.

OHSP recommended methods to reduce exposures. These included covering the opening in the lid of the mixer, and seeking means to avoid handling dough conditioner by hand. OHSP recommended a hazard assessment and made one  $\alpha$  amylase supplier add information about asthma to its MSDS, advising about the risk of asthma. The company was further advised to provide accommodation to employees with asthma. Recommendations by other researchers have included adequate local exhaust ventilation, especially at flour release points such as weighing stations, and good work practices, such as careful bag emptying and vacuum cleaning and never using compressed air.<sup>4</sup> Further, Brisman advises relocation and change of job when necessary, when bakery employees are sensitized to flour or fungal  $\alpha$  amylase.<sup>4</sup>

## Asking about occupation and exposure

These 2 cases of baker’s asthma were diagnosed and managed because the physicians asked their patients about work. OHSP has an ongoing project to promote the collection of occupational information by community health centers. In conjunction with that project, a travel mug with the logo: “Thank you for asking your patients about their job,” in several languages, was developed. As a special incentive, the first 3 cases of work-related asthma reported to OHSP in May/June 2009 will receive a mug. Report all suspected and confirmed cases of work-related asthma, by confidential fax (617 624-5696) by telephone (617 624-5632) or by mail. The three recipients will be notified in July 2009.



<sup>8</sup> Mounier-Geyssant E et al. 2007. Exposure of bakery and pastry apprentices to airborne flour dust using PM2.5 and MP10 personal samplers. BMC Public Health 7:311. <http://www.pubmedcentral.nih.gov/picrender.fcgi?artid=2211311&lobtype=pdf>