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## BAKER'S ASTHMA WITH OCULORHINITIS: CASE REPORT

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### Summary

**Introduction.** Baker's asthma is one of the most common causes of occupational asthma worldwide. Beside bread production, all occupations in contact with flour (confectioning, pastry making, milling, farming, cereal handling) can be affected.

**Objective.** To illustrate, through the presentation of a clinical case, an updated interdisciplinary diagnostic approach for the evaluation of suspected occupational asthma, with the aim: to identify the possible causal link between the occupational exposure and the disease, and to formulate a correct judgment for job fitness.

**Materials and methods.** Interdisciplinary (occupational medicine and allergology) specialist evaluation, blood and urine analysis, patch tests, total and specific IgE dosage, eosinophilic cationic protein assay, spirometry, non-specific metacholine bronchostimulation, specific inhalation challenge, with monitoring of airway resistance by FOT (forced oscillation technique), and of nasal and bronchial FeNO (fractional exhaled nitric oxide).

**Results.** Fifty-four year-old man, baker since 1993. In recent months, dyspnoea and dry cough, accompanied by ocular and nasal flogosis, as well as itchy skin rash, mainly during work shifts. High total and specific IgE values. Increased eosinophilic cationic protein. Negative metacholine test. Specific inhalation challenge with buckwheat stopped after 15 minutes due to the onset of rhinitis, conjunctivitis, cough with shortness of breath and wheezing. Post-exposure FEV<sub>1</sub> decrease (> 12%) and +76% FOT increase. Progressive and persistent nasal FeNO increase with normalization after 24 hours. These findings indicated bronchial and oculonasal allergic response to buckwheat and other cereals.

**Conclusion.** The diagnostic protocol allowed demonstrating the causal link between occupational exposure and the disease, which was reported to the competent authorities. The patient was advised to refrain from further exposure. The evolution of processing techniques and the new substances used in bread production, require continuous updating of diagnostic and health surveillance protocols.

**Keywords:** occupational allergopathy, flour, job fitness, inhalation challenge, exhaled nitric oxide, eosinophilic cationic protein

### Introduction

First described in 1700 by Bernardino Ramazzini [1], baker's asthma is still very common, especially considering the variety of new potentially allergenic substances [2]. The disorder is mainly caused by inhalation of cereal flour or powder, usually through an IgE-mediated allergic response to inhaled cereal proteins, and it is characterized by a latency period, necessary to acquire sensitization to the causal agent [2, 3].

Beside bread makers, any worker exposed to flour allergens can develop the disease such as confectioners, pastry factory workers, millers, farmers, and cereal handlers. The incidence among bakery workers ranges between 1 to 10 cases per 1,000 person-years. As other forms of allergic asthma, baker's asthma is often preceded and accompanied by oculorhinitis [2, 4].

By presenting a clinical case, we describe here an updated interdisciplinary diagnostic protocol for the evaluation of suspected occupational asthma, necessary to identify the possible causal link between the occupational exposure and the disease, for medical legal purposes, and to formulate a correct judgment for job fitness.

### Materials and methods

The protocol included occupational medicine and allergology evaluation (with careful work history and physical examination), routine laboratory blood and urine analysis, patch tests (standard and baker's series), assay of total and specific IgE, as well as dosage of eosinophil cationic protein (ECP), a protein which increases in case of airway inflammation and asthma [5]. Total IgE were considered increased when >250 KU/L, specific IgE when >0.35 KU/L. ECP was considered normal when <15 µg/L.

Additionally, the patient underwent basal spirometry, non-specific bronchostimulation with metacholine, and specific inhalation challenge (SIC) by exposure to flours in an isolation chamber, according to the latest medical consensus [6]. During the bronchial challenge, the patient was monitored with forced oscillation technique (FOT), a technology that determine the airway resistance using small-amplitude pressure oscillations [7], and (nasal and bronchial) fractional exhaled nitric oxide (FeNO) measurement, cut off 25 parts-per-billion (ppb), which provides an indication of the level of inflammation in the respiratory tissues [8].

### Results and discussion

The patient was a 54 year-old male, active smoker (20

cigarettes a day), working as a baker since 1993. His duties included mixing several types of flours (wheat, corn, oats, rye, barley, rice), and hand kneading of the dough. During the year preceding our evaluation, he experienced dry cough, shortness of breath, and oculorhinitis manifestations (conjunctival reddening, lacrimation, sneezing, rhinorrhea). The symptoms appeared mostly during working hours. Recently, they were worsening and accompanied by an itchy skin rash on both hands and arms up to the elbow, as well as on the forehead and neck.

At the time of our consultation, the subject was asymptomatic. Physical examination, basal spirometry, and routine laboratory data were normal. Standard and baker's series patch tests were negative. Serum total IgE were increased (429 KU/L). Specific IgE showed evidence of sensitisation to several pollen and flours (wheat 10.60 KU/L; peach extracts 5.93 KU/L; rye 14.20 KU/L; barley 10.80 KU/L; oats 5.91 KU/L; corn 8.73 KU/L; rice 4.52 KU/L). ECP was increased up to 102 µg/L.

Non-specific bronchial challenge with metacholine and SIC with wheat flour (for 40 minutes) were negative. When the patient was tested with buckwheat, the challenge was stopped after 15 minutes due to the onset of rhinitis, conjunctivitis, cough with shortness of breath, and wheezing on chest auscultation. The respiratory function showed a progressive fall of FEV<sub>1</sub> (forced expiratory volume in one second) (> 12% after 15 minutes from the end of exposure), and a notable increase of airways resistance measured by FOT (+76% after 15 minutes from the end of exposure). Lung FeNO monitoring was not altered, while nasal exhaled nitric oxide progressively increased after exposure, with normalization after 24 hours. Serum ECP values gradually decreased post-exposure, indi-

cating eosinophils sequestration by target tissues.

The clinical, laboratory and instrumental findings are clearly diagnostic for occupational bronchial asthma (baker's asthma), with associated oculorhinitis, due to type I allergic sensitization to buckwheat and other allergens [2, 9]. The patient was advised to refrain from further exposure. The case was reported to the Judicial Authority, as established by the Italian Penal Code, and referred to the Italian Workers' Compensation Authority (INAIL).

Cereal flours play the key role as sensitizers in the bakery environment, however several yeasts and fungus may also be involved in the development of baker's asthma. Moreover, the innovation in the baking industry have led to the introduction of new ingredients, including enzymes, which could have a strong potential to cause allergy [10]. Prompt diagnosis is important, as prolonged exposure to a sensitising agent may result in poorer clinical outcomes that, on turn, may lead to significant work limitations and impair a patient's ability to maintain employment.

### Conclusion

The reported case indicate that baker's asthma continues to come to the attention of the occupational physician. In this circumstance, collaboration with the allergist is of paramount importance to address the diagnostic reasoning. The interdisciplinary, updated approach described here is useful to demonstrate the etiological link between occupational exposure and bronchial asthma, to allow job preservation, and to facilitate compensation. The evolution of bread production techniques, with the introduction of new, potentially allergenic substances, requires continuous updating of diagnostic and sanitary surveillance protocols.

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