San Francisco, March 12, 2016

Occupational rhinitis

Andrea Siracusa, MD
Professor of Occupational Medicine (retired)
University of Perugia, Italy

Disclosures

I have nothing to disclose
Workplace scenarios (1)

- The owner of a small family bakery decides to employ 2 young adults as apprentices
- Exposure to agents used in bread making may provoke work-related respiratory symptoms
- A number of sensitizing agents (e.g., flours and α-amylase) and irritants (e.g., chlorine) are identified
- Exposure to these agents can cause work-related asthma and rhinitis

Workplace scenarios (2)

The occupational physicians recommends a medical surveillance program including

- a baseline assessment (i.e., clinical history, skin prick tests to common and occupational allergens, and lung function tests)
- regular follow-up visits, more frequent in the first years of exposure (6, 12, 18, and 24 months)
- environmental control measures
**Workplace scenarios (3)**

At the baseline assessment
- one young adult is found to be atopic and suffering from seasonal rhinoconjunctivitis
- neither of the 2 apprentices shows sensitization to occupational allergens by skin prick tests (SPT)
- they are informed about occupational risks and educate to recognize and report early the onset of any work-related respiratory symptom to the physician

*(baseline medical and occupational history, immunological tests, surveillance program)*

**Workplace scenarios (4)**

At the first follow-up visit (at 6 months)
- the atopic subject reported the onset of nasal obstruction and rhinorrhea related to the task of pouring out flour into the kneading machine
- skin prick tests with occupational allergens show a positive result to wheat flour
- occupational rhinitis (OR) due to flour is suspected
- the specific inhalation challenge (occupational method) confirms the diagnosis of allergic OR

*(medical & occupational history, investigation & diagnosis at follow-up)*
Workplace scenarios (5)

The apprentice with occupational rhinitis
- is prescribed pharmacological therapy
- is advised to avoid the task of pouring flour into the kneading machine (reduction of exposure)

Ventilation at the workplace is improved by installing and upgrading extractor fans in strategic points

(management, i.e., environmental control and avoidance, pharmacotherapy)

Workplace scenarios (6)

- At 12, 18, and 24 months of follow-up visits, the apprentice with OR reports only occasional rhinitis symptoms but no lower airway symptoms when accidentally exposed to wheat flour
- Lung function tests and nonspecific challenge with methacholine are within normal limits
- The other apprentice remain asymptomatic

(medical & occupational history, lung function and bronchial challenge tests at follow-up, checking the results of preventive interventions)
REVIEW

Epidemiology of occupational rhinitis: prevalence, aetiology and determinants

A. SIRACUSA, M. DESROSIIERS* and A. MARABINI

Occupational Medicine and Toxicology, Department of Clinical and Experimental Medicine, University of Perugia, Italy.  
*Department of Otorhinolaryngology, Centre Hospitalier Universitaire de Montréal (CHUM), Montréal, Canada
Introduction

The nasal passage serves several critical functions
✓ it is the first of the respiratory mucosa to encounter inhaled particles, gases, vapors and fumes
✓ it warms and humidifies inhaled air and filters large particles, including many allergens
✓ it is the primary absorptive surface for water-soluble gases, such as sulfur dioxide
✓ it removes substantial quantities of less soluble gases, such as ozone
✓ when is obstructed, it may results in a change from nasal to oral respiration
  o loss of the filtering function of the nose
  o increased risk to the lower airway and the lungs

The nose and work

✓ Definition and classification
✓ Causal agents
✓ Epidemiology
✓ Relationship with occupational asthma
✓ Investigation and diagnostic approach
✓ Management
✓ Prevention
**Occupational rhinitis - Definition**

*Inflammatory disease* of the nose characterized by

- intermittent or persistent *symptoms* (i.e., nasal congestion, sneezing, rhinorrhea, itching)

and/or

- variable *nasal airflow limitation* and/or *hypersecretion* due to

  causes and conditions attributable to a particular work environment and not to stimuli encountered outside the workplace

(EAACI Position paper on OR, 2008)
Parallel classification of occupational rhinitis and asthma

Work-related chronic rhinosinusitis

- Recent studies provide evidence that occupational exposure may be involved in more severe forms of chronic rhinosinusitis
- Exposure at work appear to be a risk factor for the occurrence, recurrence and persistence of chronic rhinosinusitis

Non-IgE-mediated and irritant-induced occupational rhinitis (2011-2012)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nail technicians</td>
<td>Acrylates</td>
</tr>
<tr>
<td>Hairdressers</td>
<td>Persulfates</td>
</tr>
<tr>
<td>Cleaners &amp; Healthcare workers</td>
<td>EDTA, detergent enzymes</td>
</tr>
<tr>
<td>Farmers</td>
<td>Paraquat</td>
</tr>
<tr>
<td>Pool lifeguards</td>
<td>Chlorine</td>
</tr>
<tr>
<td>Pepper mill workers</td>
<td>Capsaicin</td>
</tr>
<tr>
<td>Restaurants, shopping mall &amp; hotel employees</td>
<td>Second-hand smoke</td>
</tr>
</tbody>
</table>

Prevalence of occupational asthma (OA) and rhinitis (OR)

High-molecular weight agents

Low-molecular weight agents

(4iracusa et al., 2000)

Incidence rates for laboratory animal allergy symptoms

(Elliott, OEM 2005;62:766-71)
Potential determinants of occupational rhinitis

<table>
<thead>
<tr>
<th>Agents</th>
<th>High m.w.</th>
<th>Low m.w.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure</td>
<td>Yes</td>
<td>No$^\S$</td>
</tr>
<tr>
<td>Atopy</td>
<td>?*</td>
<td>No</td>
</tr>
<tr>
<td>Smoking</td>
<td>No$^#$</td>
<td>No$^#$</td>
</tr>
</tbody>
</table>

$^S$ Exposure is associated with sensitization to several low m.w. compounds

$^*$ Atopy is associated with sensitization to several high m.w. compounds

$^\#$ Smoking is associated with sensitization to high and low m.w. comp. in a few cases

(Folletti et al., 2008)
Smoking and Occupational Asthma (OA) or Occupational Rhinitis (OR) - Review of 38 studies

<table>
<thead>
<tr>
<th>Association between smoking and OA or OR</th>
<th>Yes</th>
<th>No</th>
<th>Results not given</th>
</tr>
</thead>
<tbody>
<tr>
<td>Association between smoking and OA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. of studies (%)</td>
<td>6 (16)</td>
<td>18 (47)</td>
<td>14 (37)</td>
</tr>
<tr>
<td>Association between smoking and OR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. of studies (%)</td>
<td>0 (0)</td>
<td>7 (29)</td>
<td>17 (71)</td>
</tr>
</tbody>
</table>

(Siracusa et al, 2006)

Occupational rhinitis (OR) Relationship with occupational asthma (OA)

- A majority of patients diagnosed with OA also suffer from OR, which most often precedes the development of OA
- OR is associated with an increased risk of OA
- OR may increase OA severity

(EAACI Position paper on OR, 2008)
Severities of OA according to the presence or absence of OcR

Investigation and diagnostic approach
Limits of medical history in the diagnosis of OR (and OA)

Clinical history
✓ the clinical presentation of OR is nonspecific
✓ risk of over-estimation of the true frequency of OR (information bias, i.e., workers know they are exposed to substances dangerous for their nose)
Investigation and diagnostic approach

Objective methods

- Anterior rhinoscopy
  - visualization of the nasal mucosa
  - but
  - no quantitative assessment of nasal changes

- Specific skin prick tests
  - may not be indicative of clinical disease
  - many substances are not available as extracts for SPTs

- Specific nasal challenge
  - in a laboratory setting
  - at the workplace

Management of OR

Two objectives

- Minimizing nasal symptoms and their impact on the workers' well-being
- Preventing the development of OA

Therapeutic options

- Environmental interventions
- Pharmacotherapy
Prevention

Primary prevention
- controlling exposure at the workplace
- identification of the susceptible workers

Secondary prevention
- surveillance of individuals at risk in the very first years of exposure

Key points (1)
- Sensitizers (high & low molecular weight allergens) and irritants may lead to occupational rhinitis (OR)
- OR is 2-4 times more common than occupational asthma (OA)
- the level of exposure is the most important determinant of OR
- a majority of patients diagnosed with OA also suffer from OR, which often precedes the development of OA
- clinical history has a low specificity
- skin prick tests are sensitive but not specific
- nasal provocation challenges should be recommended
Key points (2)

- complete avoidance of exposure should be recommended
- reduction of exposure with relevant pharmacotherapy may be considered an alternative approach
- primary prevention strategies should focus on reducing exposure to sensitizing agents
- surveillance of workers should focus on the first 2-5 years after entering exposure
- the possibility of occupational asthma should be carefully evaluated in all workers with occupational rhinitis

Three multiple choice questions
In bakers occupational rhinitis is associated with exposure to agents used in bread making. Which of the following agents has been associated with occupational rhinitis in bakers?

A. Lipase  
B. α-amylase  
C. Protease  
D. Persulfates

Please indicate in the following statements which you consider correct. Suggested measures of primary prevention that are effective in preventing occupational rhinitis include:

A. Surveillance of workers at risk  
B. Detection of sensitization to occupational agents  
C. Investigation of possible asthma in workers with occupational rhinitis  
D. Reducing/eliminating workplace exposure
Which of the following determinants has been associated with occupational rhinitis due to high-molecular weight agents?

A. Atopy
B. Smoking
C. Level of exposure
D. Family history of rhinoconjunctivitis