

Occupational Rhinitis



Leslie C. Grammer III, MD

KEYWORDS

- Occupational rhinitis • Allergic occupational rhinitis
- Nonallergic occupational rhinitis • High molecular weight • Low molecular weight
- Laboratory animals • Flour • Acid anhydrides

KEY POINTS

- Occupational exposures associated with a high prevalence of occupational rhinitis (OR) are laboratory animals, flour, other foods, acid anhydrides, cleaning products, and strong irritants.
- OR is rhinitis developing as a result of workplace exposure in a previously asymptomatic individual.
- OR can be divided into allergic OR, which has an immunologic basis, and nonallergic OR, which does not.
- The primary therapy for OR is avoidance of the implicated exposure.
- In those with OR, the possibility of coexisting occupational asthma should be considered.

INTRODUCTION

Occupational rhinitis (OR) is 1 of 2 forms of work-related rhinitis ([Fig. 1](#)). The other form is work-exacerbated rhinitis, in which the individual has preexisting rhinitis made worse by exposures in the workplace.¹ The European Academy of Allergy and Clinical Immunology published a consensus definition of OR in 2009, “an inflammatory disease of the nose, which is characterized by intermittent or persistent symptoms (ie, nasal congestion, sneezing, rhinorrhea and itching) and/or variable nasal airflow limitation and/or hypersecretion owing to causes and conditions attributable to a particular work environment and not to stimuli encountered outside the workplace.”² OR can be further subdivided into allergic and nonallergic rhinitis. Allergic OR has an immunologic basis and is associated with a latency period. Allergic OR can be caused by high-molecular-weight (HMW) or low-molecular-weight (LMW) agents. Nonallergic OR has no latency and can occur with one high level exposure to irritants such as chlorine gas, giving rise to reactive upper airway dysfunction syndrome.² In contrast,

This work was supported by The Ernest S. Bazely grant to Northwestern University and Northwestern Memorial Hospital.

The author has no financial conflicts of interest.

Division of Allergy-Immunology, Department of Medicine, Northwestern University Feinberg School of Medicine, 211 East Ontario Street Suite 1000, Chicago, IL 60611, USA

E-mail address: l-grammer@northwestern.edu

Immunol Allergy Clin N Am 36 (2016) 333–341

<http://dx.doi.org/10.1016/j.iac.2015.12.009>

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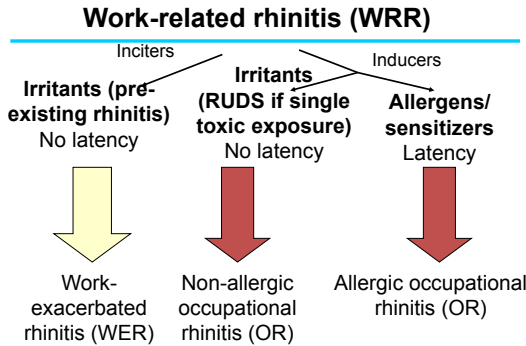


Fig. 1. There are 2 major forms of work-related rhinitis (WRR): (1) work-exacerbated rhinitis (WER) in those with preexisting rhinitis and (2) occupational rhinitis (OR). OR can be divided into 2 types. One type, called nonallergic OR, has no latency period and is caused by irritants. The other type, called allergic OR, has a latency period and is caused by sensitizers that can be either high or low molecular weight. RUDS, reactive upper airway dysfunction syndrome.

multiple exposures to irritants at a more moderate level is probably the most common cause of irritant-induced OR.

Irritant-induced OR has a range of severity, from annoying, reversible irritation to chronic erosive rhinitis. A number of different chemicals have been associated with irritant-induced OR, among those reported include ammonia, bleach, chlorine, volatile organic solvent vapors, aldehydes, sulfur dioxide, nitrogen dioxide, and hydrogen sulfide. When encountering a new chemical to which a worker is exposed, obtaining a material safety data sheet for the chemical can be helpful. Whether or not the agent is a known respiratory sensitizer or respiratory irritant will be stated under the section entitled Health Hazard and Toxicologic Data.

EPIDEMIOLOGY

The epidemiology of occupational diseases, in general, and OR, specifically, is unclear. In the United States, OR is not a reportable condition. There is also the issue of the “healthy worker effect,” in which those who are not affected by a given workplace exposure stay in the job and those who are made ill are likely to simply leave and find alternative employment.

It is clear that certain exposures, such as flour and laboratory animals, seem to be 2 agents commonly reported to cause OR.³ The range of the prevalence of OR among bakers in Norway has been estimated to be between 23% and 50%.⁴ Among laboratory animal handlers, one review reported a range of 10% to 42% of exposed individuals had OR.⁵ In a skin test study of sensitization, it was found that 16% of laboratory animal handlers were sensitized as compared with 3% of nonhandlers.⁶ In a 1997 Finnish study, it was reported that the risk of developing OR was highest in the following occupations: bakers, food processing workers, farmers, veterinarians, furriers, livestock breeders, electronic product assemblers, and boat builders.⁷

RISK FACTORS

Risk factors for OR include the particular agent, level of exposure, and atopy. The relationship between smoking and OR is not clear.² As reviewed, some agents such as flour and other foods as well as animal dander, are more likely than other exposures to result in OR. The level of exposure and the relationship to immunoglobulin (Ig)

E-mediated sensitization has been reported for several HMW agents, such as detergent enzymes,⁸ flour,⁹ laboratory animals,¹⁰ and latex.¹¹ In most reports, the correlation between exposure and IgE-mediated sensitization is clear, but the relationship to OR is less clear. In any event, IgE sensitization seems to be a strong predictor of developing rhinitis as well as asthma symptoms. In some cases of LMW agents, in particular acid anhydrides, this relationship between exposure level and IgE sensitization has been reported.^{12,13}

The prevalence of OR reported in selected exposures in various industries is shown in **Table 1**. In a number of studies of HMW agents including laboratory animals and flour, atopy has been associated with an increased risk of sensitization. Atopy is also associated with an increased risk of OR from those HMW agents.³¹ The results of studies assessing atopy as a risk factor for OR caused by LMW agents has been inconsistent.²

PATHOPHYSIOLOGY

The pathophysiology of IgE-mediated OR is thought to be the same as IgE-mediated rhinitis from nonoccupational causes such as pollens. This has been studied extensively using nasal allergen challenges and evaluating nasal airway resistance, nasal lavage cells, and mediators.³² In 1 nasal lavage study comparing 22 patients with asthma and rhinitis owing to house dust mites, 25 patients with OR and asthma owing to laboratory animal allergens, and 15 healthy subjects, those with OR actually had higher levels of eosinophils, basophils, and albumin in lavage fluid compared with normal subjects as well as compared with those with nonoccupational house dust mite allergy.³³ Other immune mechanisms may also cause OR; in particular, IgG or other agents of the adaptive immune system have been speculated as causal.^{34,35}

Nonimmunologic OR has been studied very little. A number of agents including biocides and cleaning agents have been reported to cause non-IgE-mediated rhinitis, but their mechanisms remain unclear.³⁶ In a study of nasal smears from 27 indoor pool workers with OR and 49 control subjects, it was reported that the OR subjects had more epithelial cells and more eosinophils than the control subjects.³⁷ Others have

Table 1
Prevalence, selected industries and exposures associated with occupational rhinitis

Industry/Exposure	Prevalence (%)	References
Laboratory animal workers	10–42	5
Bakers	23–50	4
Latex exposed workers	0.12–20	11,14
Foodstuffs (spices, vegetables, lupin) workers	5–54	15–17
Seafood (shrimp, crab, turbot) workers	5–50	18,19
Wood dusts (processing, carpentry)	10–78	20–22
Detergent enzymes (production, hospital use)	2–19	8,23
Organic acid anhydrides (epoxy resin production)	10–28	12,13
Diisocyanates (2 component paints, polyurethane workers)	1–54	24,25
Platinum workers	28–43	26
Nondomestic cleaners (janitors, hotel housekeepers)	35	27
Hairdressers	18–27	28,29
Swine confinement workers	8–23	30

Data from Refs. 4,5,8,11–30

proposed mechanisms involving neurokinin release, nociceptors and epithelial damage and may reflect the mechanisms discussed for non-allergic rhinitis (See [Baroody FM: Non-allergic rhinitis: mechanism of action](#), in this issue).^{38–40}

CLINICAL FEATURES

The clinical manifestations of OR are similar to non-OR. The individuals generally have symptoms of nasal congestion, sneezing, rhinorrhea, and/or postnasal drip. Those with IgE-mediated disease often also have pruritus. Those with IgE-mediated disease have a latency, with usual onset of symptoms being 1 to 5 years after initial exposure. Those individuals with nonimmunologic disease may have symptoms with the first exposure. Once the disease of OR is established, the individual generally develops symptoms within a short period of time (ie, a few minutes to an hour or so) after exposure to the causal agent.

On physical examination, an individual with OR will have findings of rhinitis such as boggy turbinates and increased nasal secretions may be visualized. Individuals with OR may also have associated ocular or chest symptoms owing to occupational conjunctivitis or occupational asthma.²

ACUTE MANAGEMENT

Avoidance is the principal strategy used to reduce signs and symptoms of OR over time. Acutely, the same pharmacologic therapies that are used in non-OR may be of benefit, as outlined in the current guidelines.¹ The most effective class of medications for control of rhinitis is intranasal glucocorticoids and intranasal antihistamines.⁴¹ Nasal cromolyn could benefit some patients; nasal saline irrigation may be helpful. H1 antihistamines and leukotriene inhibitors may also be useful. Sedating antihistamines should, of course, be used cautiously, especially for workers who are involved in dangerous work processes.⁴² Although immunotherapy is used in nonoccupational IgE-mediated rhinitis, it has not been adequately studied for OR and, therefore, is generally not advised.

CHRONIC MANAGEMENT

The chronic management of OR involves avoidance strategies, once the implicated agent has been identified.⁴³ In some cases, the employee can be moved to another location and complete avoidance can be achieved. In other cases, personal protective equipment such as a mask or respirator may suffice. Sometimes, improved ventilation or containment of a process may be useful. Whether reduction of exposure is sufficient is an area of controversy. If reduction rather than avoidance of exposure is implemented, careful surveillance for persistent symptoms or the progression to OA is in order.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of OR is rhinitis owing to any other causes. The clinical history alone has a relatively low specificity for verifying the diagnosis of OR, and therefore additional evaluation is generally necessary.⁴⁴ [Fig. 2](#) presents an algorithm for the evaluation of a patient with rhinitis symptoms related to work. Of course, the evaluation starts with a careful history, focusing on the onset of symptoms and their temporal relationship to possible workplace exposures. Material safety data sheets can be obtained for LMW agents to determine whether the exposures are known respiratory sensitizers or irritants. Most HMW exposures do not have material safety data

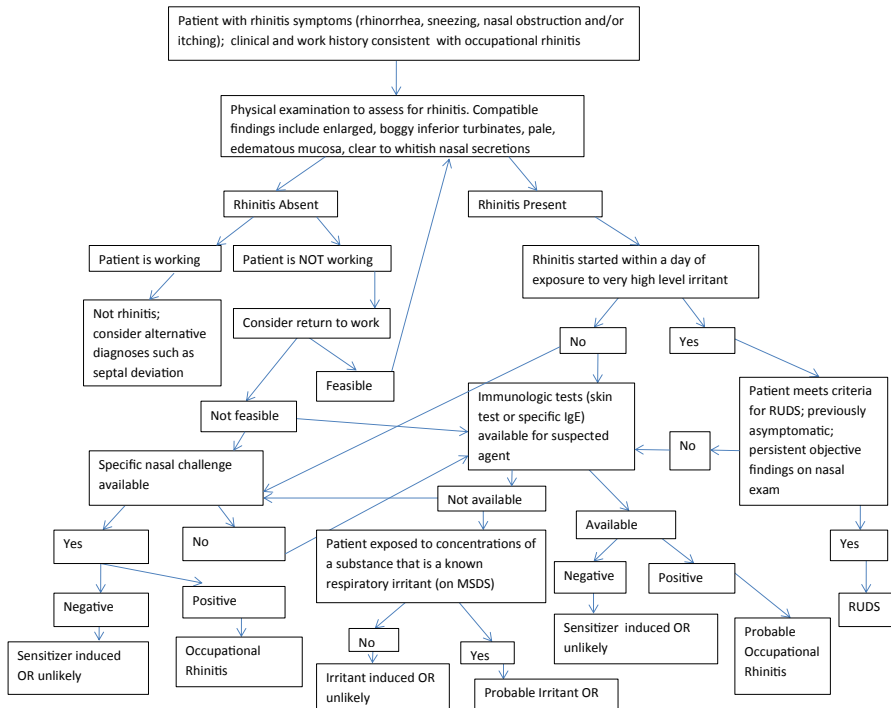


Fig. 2. This algorithm shows a general approach to the patient who has symptoms and exposure history compatible with occupational rhinitis (OR). IgE, immunoglobulin E; MSDS, material safety data sheet; RUDS, reactive upper airway dysfunction syndrome.

sheets. It should be recognized that any process that results in aerosolization of foreign proteins can result in sensitization to those foreign proteins.

IgE-mediated disease has a latency; in contrast, neither irritant-induced OR nor reactive upper airway dysfunction syndrome have a latency period.⁴⁵ On physical examination, the patient should have evidence of rhinitis: erythema, edema, and rhinorrhea. Given the known association of OR and OA, all OR patients should have a chest examination and objective screening for asthma, which may be sub-clinical. If the OR is thought to be IgE mediated, an in vitro or in vivo test of specific IgE could be performed, with the caveat that sensitization does not necessarily mean disease. Nasal provocation tests are the gold standard for the diagnosis of OR.^{2,44} However, nasal challenge studies are limited by the availability of appropriately characterized reagents, the lack of agreed upon criteria for a positive result, and the number of centers with expertise to perform well-controlled provocation testing.

PROGNOSIS

If avoidance of the causative agent can be achieved, the prognosis of individuals with OR is generally good. In a report of greenhouse employees with OR, those who avoided exposure reported a significantly improved quality of life as compared with those individuals who continued exposure.⁴⁶ In a prospective study of 20 individuals with allergic or nonallergic OR, when causative exposures were eliminated, the individuals noted both decreased nasal symptoms and improved quality of life.⁴⁷

AREAS REQUIRING FURTHER INVESTIGATION

OR remains an underrecognized and poorly investigated condition. The clinical features and pathophysiologic mechanism of nonallergic OR are unclear. The epidemiology and contribution of OR to the general burden of rhinitis is also unknown. Furthermore, a validated questionnaire to identify OR in epidemiologic surveys has not yet been developed. This lack has directly impeded the ability to identify the relevance of risk factors, such as smoking and other clinical characteristics for OR.

Standardization of occupational allergen extracts for in vitro or in vivo testing to confirm occupational allergen-specific IgE in workers suspected of HMW-induced OR are generally unavailable, as are standardized methodologies for performing nasal provocation tests to occupational agents and meaningful clinical endpoints are lacking. It has been speculated, but not proven, that OR can result from local allergic rhinitis.⁴⁸ Finally, understanding the magnitude of exposure reduction to the inciting agent(s) is needed that results in a good prognosis; at present, absolute avoidance is the recommended therapy.

FUTURE CONSIDERATIONS AND SUMMARY

Rhinitis affects up to 30% of individuals in Westernized societies.^{49,50} The prevalence and incidence of OR and the clinical and economic burden it has on industrialized countries is unknown. OR can be allergic or nonallergic. Some agents are frequently causal and exposure level seems to be a risk factor. Agents known to cause OR, such as lactase, can appear in previously undescribed environmental settings.⁵¹

OR can be associated with occupational asthma. New causes of immunologic occupational asthma are often associated with symptoms of OR.⁵² A diagnosis of OR cannot be made with clinical history alone. The prognosis seems to be good with avoidance of the offending exposure. However, OR is understudied and many questions and challenges remain, including criteria for nasal provocation tests and availability of standardized agents for testing.

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