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REVIEW

# Allergy genuflection? It's surmount with special focus on ear, nose and throat

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**Abstract** The system that protects body from infectious agents is immune system. On occasions, the system seldom reacts with some foreign particles and causes allergy. Allergies of the ear, nose and throat (ENT) often have serious consequences, including impairment and emotional strain that lowers the quality of life of patients. This is further responsible for the common cold, cough, tonsillitis, dermal infection, chest pain and asthma-like conditions which disturb one's day to day life. The present review enlightens some common ENT allergies which one can suffer more frequently in one's lifetime, and ignorance leads to making the condition chronic. Information regarding pathophysiology and the management of ENT allergy by this review could help clinicians and common people to better understand the circumstances and treatment of ENT allergy.


## Introduction

The inappropriate immune response to an allergen is known as allergy.[28] Broadly speaking, the inordinate reaction of the immune system against fungi, parasites, foreign particles like foreign organisms, organic molecules, dust, chemicals etc. leads to allergy. These foreign particles enter through the respiratory tract and react abnormally to the body cells.[70] This may also be defined as the hypersensitivity reactions of our body cells initiated by specific immunological mechanisms against particular particles. Hypersensitivity is a reproducible symptom or signs rudiment by exposure to a powerful stimulus at a dose tolerated by an individual.[36] The type-1 hypersensitivity reactions are encouraged by the non-scrounging antigen, i.e. allergen, in atopic individuals. In this type of hypersensitivity response cells like tissue mast cells and blood basophils are sensitised by the interaction with a Fc receptor of an IgE antibody produced in opposition to allergen. When the same allergen exposes again

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then crosslinking of bound IgE on sensitised cells occurs and this results in the degranulation of the allergen. The active mediators like histamines, leukotrienes and prostaglandins results in the contraction and vasodilation in smooth muscles and nearby tissues.[3] In developed countries, allergic diseases are of great public health concern.[55] The organs that show localised allergic symptoms after the entry of any type of allergens are eyes, nose, throat and lungs. In lungs, inhaled allergen triggers increased production of mucus and bronchoconstriction which also leads to coughing and shortening of breath, respectively.[3]

Antigen is a molecular substance that triggers a cascade of immunological reactions to a healthy person. This develops mainly a sensitisation response that specifically synthesises the IgE antibody. Aero allergens trigger sensitisation in the respiratory system and food allergens trigger that in the digestive system.[47] These are air and food borne in nature: pollens and dust particles are air borne, and milk, animal proteins, drugs etc. are food borne. The allergic determinants in allergens are mostly proteins, allergens such as pollens are water soluble proteins or glycoproteins released from cytoplasm of pollens via diverse mechanisms.[3,34] Chemically, most allergens are proteins, having molecular weight ranges between 3 and 80 kDa. However, the chemical, structural and functional characteristics of these allergens have not been clearly identified to explain stimulating response of IgE antibody.[47]

## Pathophysiology of allergy

The immune response to allergy can be antibody-mediated or cell-mediated.[36] During an allergic immune response, the antigen presenting cell (APC) reacts with allergen and presents peptides to the T cell. The activated T cell produces IL4 resulting in the activation of B cell. Mast cell and IgE antibodies are produced from activated B cell, which leads to phase reactions such as bronchospasm, sneezing and itching in the tissues by the chemicals such as histamine, leukotrienes and prostaglandins[29,70] as shown in Fig. 1.[69] Moreover, phase reaction includes two phases i.e. early and late: the early phase reaction starts within minutes after the exposure to allergen, consecutively cytokine secretion such as TNF-$\alpha$, and IL-4 occurs hours later in late phase reaction[9] as shown in Fig. 2. Beside this, cells like eosinophils, neutrophils and macrophages are also in the body that are involved in protection from foreign particles. On the basis of the sources of allergens, allergy can be divided into categories as food allergy, chemical allergy, seasonal allergy, pet allergy, drug allergy, dust allergy and cosmetic allergy etc.[70] A variety of allergens contain activating properties for the epithelium, such as house dust mites have protease activity. In addition to proteases and oxidases, pollen extract contains associated lipid mediators or adenosine, low molecular weight molecules that have capability to induce and modulate immune cells.[26]

Manifestations of allergy cover a broad area of phenotypes, by combining with almost every organ of the body and producing a wide range of possible symptoms.[2] Allergies of ear, nose and throat significantly affect the daily life of adults as well as children. Diseases such as allergic rhinitis, otitis media, otitis externa and mould allergy have serious consequences such as retarded growth and development in academics among children in developing countries.[54] The most common childhood infection, otitis media, leads to mortality of over 50,000 children under five years of age.[51,54] Inflammation, irritation and ultimately infection in ear, nose and throat is directly due to an increase in air pollutants in the environment.[22]

## Allergic rhinitis

The inflammation of nasal mucosa by the immune response mediated by immunoglobulin (IgE) antibodies results in allergic rhinitis.[16] The term allergic rhinitis simply explains the clinical areas in which allergy is the specific cause of rhinitis that gives rise to inflammation of nasal mucous membranes. When itching, sneezing, increased secretion and blockage like hypersensitivity symptoms are mediated by an IgE antibody then the term IgE-mediated allergic rhinitis is used.[36] This is the most frequent allergic disease and also common of all chronic conditions in children.[23] This is due to a seasonal or perennial response to allergens.[82] Medically, the symptoms included are sneezing, rhinorrhoea, nasal obstruction and nasal membrane, pharynx, or soft palate itching. Ocular symptoms are also sometimes associated with bronchial asthma.[8,16] In allergic rhinitis, the provocation of allergen leads to an inflammatory response in both upper and lower airways, which supports the fact that asthma exists simultaneously with rhinitis. This is proven by the fact that the upper (nose, nasal cavity, paranasal sinuses, pharynx and larynx) and lower (trachea, bronchial tubes, bronchioles and lungs) respiratory tracts are interrelated physiologically, functionally and immunologically. This represents a combined inflammatory disease of allergic rhinitis and asthma.[72]

## Classification of allergic rhinitis

Traditionally, allergic rhinitis is classified into the two classes, namely seasonal and perennial. The former occurs during a specific season at a particular time of year and the later describes the symptoms to allergens that persist throughout the year.[41,42,72] The pollen from trees, grasses and weeds are the causes of seasonal allergic rhinitis while indoor allergens like dust mites,[79] cockroaches,[71] mites,[47,61] moulds spores[79] or animal dander[52] refer to perennial allergic rhinitis.[41] The best example of seasonal allergic rhinitis is pollens[20] induced allergic rhinitis in temperate climates but this may be perennial allergic rhinitis in warmer climates.[42] To avoid this confusion, a new classification is suggested according to the duration and severity of symptoms. It may be intermittent or persistent in duration and mild, moderate and severe in severity.[7,73] When the duration of inflammation is less than six weeks and when it persists throughout the year then it is said to be intermittent and persistent allergic rhinitis, respectively. Symptoms of mild allergic rhinitis include normal body performance and are usually intermittent, whereas the moderate or severe condition significantly affects the normal day-to-day living activity and is considered to be troublesome. The classification on the basis of duration and severity of symptoms helps in the management of individual patients,[73] as shown in Fig. 3.

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