

# A Methodical Review on Allergens and Allergic Reactions

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## ABSTRACT

Allergic reactions can lead to a variety of symptoms, like rhinorrhoea, nasal congestion, and sneezing; eye and ear irritation, too few apparent symptoms include throat problems, cough, asthma and breathlessness and eczema. The major side effect of older antihistamines is drowsiness. Recent antihistamines normally do not cause drowsiness. Human develops hypersensitivity as a result of their immune system being overactive. Gamma globulins are created in excess during an allergic reaction. Normally, the purpose of these gamma globulins is to combat microbial infections. IgE gamma globulin functions abnormally in case of allergic onset. Various allergens (pollens, animal dander) are considered as a foreign material. IgE try to “destroy” the allergens. A series of chemical reactions take place when IgE attaches to the allergens which involves the release of histamine into the body from mast cells and results in various allergic symptoms. In this review, various allergic causes, symptoms, allergens, and treatments for allergic reactions are summarized.

**Keywords:** Allergy, Asthma, Indoor allergens, Respiratory Disorders.

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## INTRODUCTION

There are various health issues in the huge Indian population. Allergies are the most common diseases in the current world. In developed nations, allergies affect almost a quarter of the population. According to the Asthma and Allergy Foundation of America, allergies are the sixth leading cause of chronic disease in the United States. The prevalence of allergic diseases has rapidly increased in recent decades. More than a quarter of India's population is allergic to anything right now.<sup>1</sup> The public sources of allergen in are fungal spores, animal dander, pollen grains, dust mites insects, etc.<sup>2,3</sup> The common signs and symptoms of an allergic reaction include bronchial allergies, skin allergies, dermatitis, certain oral and GIT symptoms, eye hypersensitivity, and anaphylaxis.<sup>4</sup> There has been a dramatic increase in the prevalence of IgE-mediated atopic disease, according to several studies that relied only on hospitalization data from different regions of India.<sup>5</sup> It has been speculated that India possesses a large array of allergens, including inhalants, ingestants, and contactants, due to the country's climatic, botanical, and nutritional diversity. Although “molecular allergology” is a significant health danger, clinical and basic research on the topic has never been prioritized in India. As a result, appropriate diagnosis and treatment of hypersensitivity have become challenges in the

United States. ImmunoCAP and other recombinant allergen-based sophisticated diagnostic technologies are employed in the West and allergen microarray India, which still lags behind in the development of atomic prognosis, relies on Century-old SPT and the use of raw allergen extracts.<sup>6,7</sup> There are also only some dependable sources of super allergens and because of these entire reasons allergies remain a neglected issue in India and the popularity of allergies is increasing nowadays. Allergy can progress into various serious disorders mainly respiratory diseases.<sup>8</sup> Allergens are crucial in the progression of respiratory illnesses brought on by allergies. Everyone has its own immune system which is more powerful. A good immune system makes a person strong and healthy. Allergic reactions are also known as anaphylaxis or hypersensitivity reactions. It occurs when the immune body defense system reacts with allergens that do not affect most people; it can be animal dander, Pollen, fungi, chemicals, dust mites or food, etc. Allergy symptoms vary from person to person and can range from mild to life-threatening. A food allergy can induce vomiting, nausea, stomach discomfort, and diarrhea; a pollen allergy, when pollen enters the respiratory tract through the nose, can cause coughing, itching, nasal stiffness, sneezing, and wheezing. Lesions, rashes, blisters, redness, and itching are all signs of dermal sensitivity.

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## The Immunology of Allergic Reactions

- Immunoglobulins, a type of glycoprotein, are produced by the immune system to protect the body from bacteria and other foreign substances (IgE).
- Immunoglobulin (IgE) is overdeveloped during a hypersensitivity reaction. In first-time contact with allergens, the person becomes affected at the first introduction to an allergen, an allergic human being affected and produced allergen-specific IgE.<sup>9</sup>
- To activate mast cells, two or more IgE molecules must link to them (cross-link). Certain chemicals were produced by the charged particles, which then bound to their respective receptors on various cells, resulting in infection, inflammation, and redness.
- The primary characteristic of our defense system is to protect in opposition to contamination; but, for the duration of hypersensitivity, the defense device responds towards a material this is non-dangerous to many people.<sup>10</sup>
- T helper cells come in two varieties: Th1 and Th2. Th1 cells produce interferons and a few cytokines, which are helpful in providing defense against bacteria and other detritus.
- In the battle against parasitic worms, Th2 cells can trigger hypersensitive reactions due to their ability to overproduce IgE.<sup>11</sup>
- Th2 cells release cytokines such as interleukins (such as il-5) that boost the production of specific IgE antibodies by b cells and cause an allergic response, eosinophil activation that leads to the production of mucus, and IgE secretion.<sup>12</sup>

## Etiology of Allergy

Almost anything can trigger an Allergy (Figure 1).<sup>13</sup>

### Types of Allergens

- Vaccines and antibiotics general anesthesia and local Anaesthetics, pollen, mold, animal dander, rubber dirt, and poison ivy are well-recognized allergens. Hair dyes, detergents, and ink in tattoos also showed the presence of some allergic components.
- Bee stings.
- Small wounds, hot temperatures, exercises, pressure, or feelings can also cause allergies.
- Often, the specific allergen cannot be recognized except the person had a similar allergic response in the past.

### Signs and Symptoms of Allergic Reaction

The affected body part determines how severe the allergic response will be. Few reactions could be confined and localized, while others might have many frame systems (Figure 2). People respond differently to the same allergen in different ways.<sup>14</sup>

### Allergens

Among the most prevalent allergens are:

**Meals:** Meal hypersensitivity reactions are maximally observed in babies and regularly go away as humans become old. Some meal-hypersensitive reactions may be serious and show various

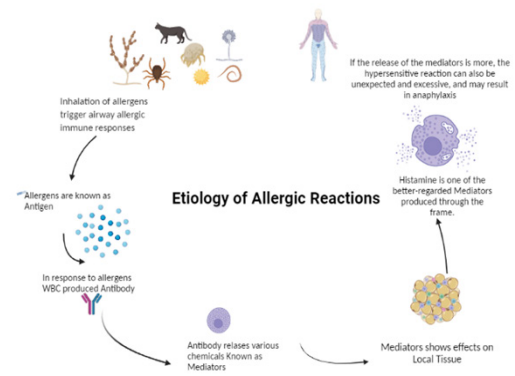


Figure 1: Etiology of Allergic Reactions

signs like itchy rash, stuffy nostrils, and diarrhea. Common allergens include milk and other dairy products; wheat; eggs; peanuts; soy; tree nuts; and shellfish.<sup>15</sup>

**Insect bites and stings:** Insect bites and stings can trigger anaphylaxis in sensitive individuals due to the venom (poison) contained within them.<sup>16</sup>

**Airborne particles:** Environmental allergens are the most prevalent form of hypersensitivity. Airborne debris such as dust mites (tiny insects that live in dust), mold spores, animal dander (dead skin, flakes of fur, and dried saliva from pets), ragweed, pollen, and bushes can trigger allergic reactions in some people.<sup>17</sup>

**Drugs:** Antibiotics used for various types of infections are the maximum common kind of drugs for developing hypersensitivity.<sup>18</sup>

**Chemicals:** Some cosmetics and detergents can develop skin reactions.<sup>19</sup>

### Arthropods

**Mites:** Among the many disorders that house dust mites contribute to, the most well-known are atopic dermatitis, allergic rhinitis, and respiratory allergies.<sup>20</sup> These allergens are categorized into 33 classes. *D. pteronyssinus* and *D. farinae* are the two most common types of dirt mites. Anaphylaxis and other symptoms have been linked to the consumption of components made with food infected with mites, even though inhalation is the most prevalent route of exposure (the pancake Syndrome). Additionally, there are storage mites *Euroglyphus maynei*, *Glycyphagus domesticus*, *Dermatophagoides microceras*, *Acarus siro*, and *Tyrophagus putrescentia*, *Lepidoglyphus destructor*, and *Blomia tropicalis*.<sup>21</sup>

**Cockroaches:** The first study on the quality of skin examination reactions to cockroach allergen dates went back to 1964. It has long been shown that cockroach allergies and bronchial allergies are strongly related. Increasing hypersensitivity responses and morbidity in children have been linked to exposure and sensitization to cockroach allergens, according to research on urban asthma in the United States of America. *Blattella germanica* and *Periplaneta americana*, also known as the German and American cockroaches, accordingly, are the two most prevalent cockroach species.<sup>22</sup>

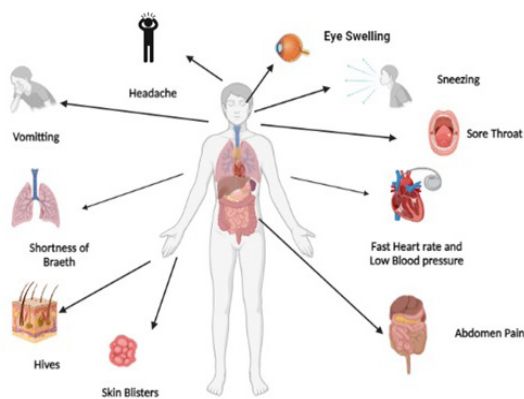


Figure 2: Sign and Symptoms of Allergic Reactions

### Mammalian Allergens

Animal allergens are found in the skin and other bodily fluids like urine, saliva, and blood. These allergens are typically made in the liver or secretory glands. Most of the proteins that cause allergic reactions in animals belong to the lipocalin family. Numerous studies have revealed how commonplace the presence of animal allergies in environment.<sup>23</sup> As a result, hypersensitive reaction to animal proteins is taken into consideration an extensive public Fitness trouble.

#### Cat (*Felis domesticus*)

Fell D 1 is a 38 kd tetrameric glycoprotein that resembles uteroglobulin in form. The most significant cat allergen causes reactions in IgE from more than 90% of cat-sensitive individuals.<sup>24</sup>

#### Dog (*Canis familiaris*)

Lipocalins make up four of six dog allergens that have been identified.<sup>25</sup> There is a huge range in CFA levels among dog breeds, but there is no indication that any breed is hypoallergenic.<sup>26</sup>

#### Rodents (*Mus musculus*, *Rattus norvegicus*)

An important occupational health concern is allergic responses to mice and rats. Scientists, doctors, technicians, and animal caretakers are the most often found.<sup>27</sup> In American city kids with comorbid bronchial bronchial allergies, mouse sensitization has also been linked to allergic rhinitis.<sup>28</sup>

### Fungi

*Cladosporium*, *Penicillium*, *Aspergillus*, and *Alternaria* were the four most common fungal genera detected in residences tested in inner-city areas. Important outdoor allergens are also produced by *Alternaria* and *Cladosporium* species, which are linked to the development of bronchial bronchial allergies and rhinitis.<sup>29</sup>

#### *Alternaria alternata*

About 5% of people will get sensitized to *Alternaria*, and it is closely linked to allergic rhinitis and hypersensitive responses. The most common allergen among those who are allergic to *Alternaria*, known as Alt a 1, has a prevalence of nearly 90%.<sup>30</sup>

#### *Cladosporium herbarum*

*C. herbarum*, like *Alternaria*, is a prevalent source of fungal inhalant allergens and can be found in both indoor and outdoor environments. While *Cladosporium* is the main allergic mold in temperate areas, *A. alternata* is the primary allergen in humid settings.<sup>31</sup>

#### *Aspergillus fumigatus*

*A. fumigatus* is a thermotolerant fungus that is found all over the world. Fungus *fumigatus* is the most common source of allergic bronchopulmonary aspergillosis (abpa) and allergies. Activation patterns to specific allergens vary, but both allergic bronchial allergies and abpa are defined by allergies and the presence of IgE specific to *A. fumigatus*.<sup>32</sup>

#### *Penicillium*

Typical indoor fungus called *Penicillium* species have been linked to allergic disease in persons with certain sensitivities. *P. citrinum* and *P. chrysogenum* are the two most important and well-studied species in North America. The major allergens of *P. chrysogenum* are the serine proteases pen ch 13 and pen ch 18, which have 88 and 82% IgE reactivities, respectively. High-quality reactivity to an 18 kD membrane protein was observed in 46% of penicillium-sensitized asthmatic patients, but IgE reactivity to *P. citrinum* allergens is typically lower.<sup>33</sup>

### Allergy Prognosis

Doctor do enquire about symptoms and their development for common allergies. X-rays and blood tests aren't required until really rare circumstances. In the event of significant responses, the patient may be quickly assessed within the emergency room with the aim of making a diagnosis. Choosing how serious an allergic reaction is the first step.<sup>34</sup>

- Blood pressure and pulse are checked.
- Depending on the examination requiring help to determine whether breathing support is required.
- Antihistamines (allergy medications) are sometimes kept on hand, thus an IV line is often set up just in case.

### Skin Prick Test

A pores and skin prick test (SPT) is used for allergy testing to as many as 50 specific materials at once. Pollen, mold, animal dander, and food allergies can all be detected with this simple test. Adults are typically checked on the forearm. The upper back is a suitable examination site for children. It is painless to get a skin test for a hypersensitivity reaction.<sup>35</sup> Needles (lancets) are used for this kind of testing, but they don't go all the way through the skin. No serious or long-lasting pain or bleeding is permitted. The nurse rubs alcohol over the test area, then draws tiny dots on the skin and places a drop of allergen extract next to each one. A lancet was used to puncture the skin and inject the extracts. Each new allergy requires a fresh lancet. The scratching of two additional materials into the skin allows one to check for signs of a typical skin reaction.<sup>36</sup>

- **Histamine:** A common person's skin reacts negatively to this chemical. It is possible that an allergy skin test will not show up if the person does not react to histamine.

- **Glycerin or saline:** In the general public, those materials don't cause any reaction. If a person reacts to glycerin or saline, he may have touchy skin. Approximately, a quarter-hour after the skin pricks, the nurse noticed pores and skin for signs of allergies. In case the person is allergic to one of the substances examined, they develop a raised, purple, itchy bump (wheal).

### Treatment

Various types of drugs are available for allergy treatment. They are available in various forms like as Allergic drinks, inhalers, nasal sprays, eye drops, skin lotions and injectables. A few hypersensitive reaction medicines are used as OTC drugs over-the- while others are taken via prescription most effective.

Nasal corticosteroid showers forestall and diminish signs and complexity of hypersensitivities like unfavorably susceptible rhinitis (roughage fever).<sup>37</sup> These drugs can assist with nasal stodginess, sniffing, and irritated, runny nose. Models incorporate fluticasone, mometasone, budesonide, triamcinolone and beclomethasone, fluticasone and ciclesonide. Side impacts can incorporate bad smell or taste, nasal bothering and nosebleeds.<sup>38</sup>

- Inhaled corticosteroids reduce symptoms brought on by airborne allergens. As part of the therapy for bronchial asthma, they are often given every day. For instance, fluticasone, ciclesonide, budesonide, mometasone, flexhaler, and beclomethasone.<sup>39</sup>
- Corticosteroid eyedrops are used to deal with intense eye infection due to allergic conjunctivitis and hay fever. Examples consist of dexamethasone, fluorometholone and prednisolone specialty. Those medicines may motivate blurred imaginative and prescient. Prolonged use may increase danger of eye infections, glaucoma and cataracts.<sup>40</sup>
- Corticosteroid skin lotions, a few low-efficiency corticosteroid lotions are to be had to take as an OTC. Examples encompass hydrocortisone and triamcinolone. Side consequences can include pores and skin inflammation and discoloration. Long-term use, specifically of more potent prescription corticosteroids, thins the dermis of the skin, ensuing in clean bruising where the cream has been accomplished.<sup>41</sup> Corticosteroids are available in liquid form that may be beneficial for skin situations involving the scalp.
- Oral corticosteroids (pills and beverages) cured treat intense allergy. Examples consist of prednisone and prednisolone. Due to the fact they are able to reason many quick- and long term aspect things, oral corticosteroids are generally prescribe given for brief durations of time<sup>42</sup>.
- Antihistamines It prevents release of histamine which is the chemical release from immune system in response of allergic onset.<sup>43</sup>
- Oral antihistamines (capsules and beverages) ease signs and symptoms which encompass swelling, runny nostril, Itchy eyes, and hives (urticaria). Both loratadine and cetirizine are available as oral antihistamines over-the-counter. You need a doctor's prescription for desloratadine and levocetirizine. Fexofenadine is available both without a prescription and with one.<sup>44</sup> Dry mouth and sleepiness are possible side effects of several oral antihistamines. Chlorpheniramine, clemastine, and diphenhydramine are all examples of older antihistamines that are more prone to impair alertness and reaction speed. You shouldn't take these sedating antihistamines if you plan on driving or doing anything else that could potentially be risky.
- Antihistamine nasal sprays assist in relieving sinus congestion, scratchy or runny nose, and sneezing azelastine and olopatadine are two examples of prescription antihistamine nasal sprays. Nasal sprays may also cause the adverse effects like: Negative reactions to sour flavors include lightheadedness, drowsiness, headaches, nasal burning, nosebleeds, nausea, vomiting, a sore throat, and sneezing.
- Many drugs, including decongestants and mast cell stabilizers, are taken with antihistamine eye drops to treat allergies. The use of antihistamine eyedrops has been shown to reduce allergy symptoms. Ketotifen and pheniramine are two that are available without a prescription. The prescription drugs emedastine and olopatadine are two good examples. Purple or bloodshot eyes, watery eyes, mild stinging or burning, and a headache are some of the possible negative reactions to these drugs. The risk of eye irritation in those who wear contact lenses is increased when antihistamine eye drops are used.
- Decongestants nasal and sinus congestion can be temporarily relieved with the help of decongestants. Decongestants should be avoided during pregnancy, older grownups or excessive blood pressure.
  1. Oral decongestants (drugs and fluids) to relieve fever-related nasal and sinus congestion. Over-the-counter decongestants are plentiful. A typical agent is pseudoephedrine. Various medications that contain a decongestant like pseudoephedrine joined with different prescriptions. Oral decongestants can cause various results, counting peevishness, quick or sporadic heartbeat, unsteadiness, sleep deprivation, cerebral pains, uneasiness, quakes, and expanded blood pressure.<sup>45</sup>
  2. Nasal decongestant showers and drops alleviate nasal and sinus blockage. The drug consists of phenylephrine and oxymetazoline. (drugs and fluids) to relieve fever-related nasal and sinus congestion. Over-the-counter decongestants are plentiful.<sup>46,47</sup>
  3. Decongestant eye drops (or joined decongestant-antihistamine eye drops) can in brief as outcomes like red, bothersome eyes. Accessible over-the-counter, drugs like tetrahydrozoline and naphazoline. Results contain industrious eye redness and damage to veins in the attention whilst abused. Decongestant eye drops occasionally cause an unexpected (severe) episode of glaucoma.<sup>48</sup>

Other allergy medications, a couple of different medicines work by obstructing indication causing synthetics delivered during an unfavourably susceptible response.<sup>49</sup>

Montelukast is a drug for topical use that inhibits a class of synthetics known as leukotrienes that cause symptoms. This oral medication reduces sensitivity symptoms and signs, such as runny nose, nasal obstruction, and sniffing. Results may remember upper respiratory disease for grown-ups, also, cerebral pain, ear contamination, and sore throat in kids. The FDA has cautioned that in certain individuals, leukotriene-hindering drugs might actually cause mental side effects, like touchiness, nervousness, sleep deprivation, mental trips, animosity, melancholy, and self-destructive reasoning or conduct.<sup>50</sup>

Cromolyn is a nasal spray that can be purchased without a prescription. The release of histamine and other synthetic compounds that trigger an allergic reaction is slowed. This drug is most effective when used before the onset of unwanted side effects. There are many that require three or more daily splashes. Nasal irritation or dryness could result.<sup>51</sup> Eyedrops containing mast molecular stabilizers prevent the release of chemicals like histamine that cause symptoms. These prescription medications lessen allergic reaction signs and symptoms inclusive of itchy eyes, red. These drugs do not normally cause widespread effects Ex. lodoxamide, pemirolast cromolyn, and nedocromil.<sup>52</sup>

### Immunotherapy

These injections, often known as “hypersensitivity shots,” may help alleviate hay fever symptoms and allergic bronchial allergies that are not improved by prescription medications. If oral hypersensitivity medications with no side effects aren’t recommended, injections are another option. Additionally, daily injections containing allergen extracts might be obtained for three to five years.<sup>53</sup> The goal is to prevent the immune system from reacting to allergens, reducing or eliminating the need for medicine. Immunotherapy has shown promising results for people with allergies to cat dander, dust mites, and pollen from trees, grass, and weeds.<sup>54</sup> Immunotherapy may help youngsters with rhinitis avoid developing bronchial allergies. Rarely, immunotherapy injections can cause an allergic response that is life-threatening.<sup>55</sup>

### Seasonal Allergy Treatments

Occasional hypersensitivity medications are packaged in small containers, such as liquids, tablets, nasal sprays, and eye drops. Sensitivities cannot yet be “fixed” by medicine.<sup>56</sup> So purpose of sensitivity treatment is to assist in calm side effects what occasional hypersensitivity medicine turns out best for a person who can regularly rely upon manifestations and the seriousness of those manifestations.<sup>57</sup>

### Different Types of Seasonal Allergy Treatments

- These remedies are available in many unique paperwork it really work in unique ways. Some examples include:
- Antihistamines are one of the most not unusual places where antihistamines are normally used.<sup>58</sup> They block

histamine, a chemical secreted via way of means of the body immune system. Antihistamines to be had in numerous paperwork- nasal sprays or swallow drugs. Some antihistamines can also cause drowsiness.

- Decongestants relieve nasal and sinus congestion. They act via way of means of decreasing blood vessels within side the nose. However, decongestants can from time to time result in extended blood pressure, consequently, decongestants ought to be used with warning in human beings with a few not unusual place symptoms, clinical conditions, along with excessive blood pressure.<sup>59</sup>
- Nasal steroid sprays are often used to treat allergy-related discomfort as well as for prevention. It could require a week of effort. They have also been linked to glaucoma and cataract deterioration.<sup>60</sup>
- Leukotriene blockers treat manifestations via way of means of hindering the effects of a compound that is remembered for the unfavorably inclined response.<sup>61</sup>
- Immunotherapy, often called hypersensitive reaction pictures, may also assist in times of persevering occasional hypersensitive rhinitis. The intention is to increase a person’s aversion to or strong response to allergens by reducing their affectability to express them.<sup>62</sup>

### CONCLUSION

This review concludes that the objective of treatment is to alleviate side effects and forestall an extreme response. Antihistamines for mild side effects including hives, rash, and tingling; bronchodilators like albuterol for adverse symptoms similar to asthma (moderate wheezing or hacking); Epinephrine infusion and topical, oral, or intravenous corticosteroids are used to treat hypersensitivity responses.

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