Allergic Cascade

An allergic cascade is the sequence of chemical releases that takes place in response to an **allergen**. The end result of this chain is the release of **histamines** and other chemicals that bring on typical allergy symptoms.

Individuals must first become sensitive to an allergen before an **allergic reaction** can take place. This process involves the **immune system** mistakenly perceiving an allergen again. Links in the chain that make up an allergic cascade include:

- Proteins in the allergen, which are mistakenly recognized as threatening.
- The production of specialized antibodies to deal with this perceived threat. These antibodies attach to **mast cells**, which contain a variety of chemicals, including histamines.
- Histamines circulate in the body causing many of the symptoms associated with an allergic reaction, affecting the nose, lungs, throat, skin, and digestive tract.

The body's reaction to the allergic cascade depends on the individual and the allergen. Some symptoms appear immediately or within minutes, while others appear after several hours. Symptoms typically include **itching**, **runny nose**, **hives**, nausea, **wheezing**, and diarrhea.

Those individuals who react most severely to allergens may be at risk for **anaphylactic shock**, which is a potentially life-threatening condition involving **shortness of breath**, tightness in the chest or unconsciousness, and a sudden drop in blood pressure.

ABOUT THE ALLERGY CASCADE

- An **allergic response** is the body's overreaction to some substance it believes to be a threat.
- The substance (called an **antigen**) may be completely harmless, but the body produces specific **antibodies** to combat this "threat" regardless.
- The allergic cascade refers to the chain of events that takes place when an allergen triggers an allergic response. The cascade includes the allergic response, the cellular and chemical interactions that follow, and the symptoms that usually result.
    - The key players in an allergic cascade include:
        - ***Allergens***: Substances that the body perceives to be a threat. In response, the **immune system** overreacts by producing antibodies. Any substance that provokes an immune response is called an antigen.
        - ***IgE***: (immunoglobulin E). A specific type of antibody that attaches to mast cells and basophils. IgE antibodies are like fuses to mast cells and basophils waiting to be "lit" by a specific type of antigen.

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        - ***Mast cells and basophils -*** Types of white blood cells that contain granules of histamines and leukotrienes. They are like bombs. When IgE antibodies come in contact with an antigen, these cells release chemicals such as histamines and leukotrienes.
        - ***Histamines and leukotrienes -*** Chemicals released by mast cells into the bloodstream that directly cause allergy symptoms. They are called "chemical mediators" because they tell other cells to behave in a certain way. For instance, they tell blood vessels to dilate, which can cause symptoms ranging from nasal congestion to a drop in blood pressure and shock.
    - ***Other players include:*** a type of white blood cell called TH2 cell-also called the "allergy cell" because of its central role in allergies. A brief explanation of both TH1 and TH2 cells is as follows:
        - ***TH1 cells -*** These cells are not usually associated with the allergic cascade. Instead, these cells are used to fight infections by releasing chemicals that destroy microbes. TH1 cells are the body's normal response to a foreign invader. However, when the body does not have enough TH1 cells, it is often forced to rely more heavily on TH2 cells.
        - ***TH2 cells -*** These cells are responsible for sensitizing a person to a specific allergen and later, when the allergen is present in the body again, triggering an allergic response. When there are not enough TH1 cells, the body usually finds itself more sensitive to allergic reactions due to the increased reliance on the TH2 cells.

The tendency toward some allergies (e.g., cow's **milk**, cat **dander**) appears to be genetic. People with a tendency for allergies are said to be atopic. Scientists are working to understand why some people are more prone to **allergic reactions** than others. It also appears that some types of allergies (e.g., **poison ivy allergy**) do not have a hereditary basis.

By understanding how these cells and chemical mediators interact, scientists can target different parts of the chain. For instance, some **antihistamine** medications work by preventing histamine molecules from binding with receptors in the body. Others may alter the histamine molecules themselves.

HOW AN ALLERGIC CASCADE IS TRIGGERED

Before an allergic cascade can be put into motion, an allergic person must first have come into prior contact with an **allergen** (e.g., **pollen**, **dander**, **food** protein) and become sensitized to that allergen. This sensitizing process involves the following:

- The **immune system** encounters the allergen and misinterprets it as a threatening invader to the body. **Lymphocytes** are the specific immune system cells that actually encounter the allergen.
- The lymphocytes react to the invader by releasing a specific type of **antibody** known as **IgE** (Immunoglobulin E). The IgE antibodies contain specific information about proteins in the invading allergen – essentially a description – so that the body can remember if it ever encounters the same allergen again.
- The IgE antibodies flow through the bloodstream and eventually attach themselves to **mast cells** and basophils (volatile cells that can suddenly self-destruct and release powerful chemicals) and wait for months or years for another encounter with the allergen. Essentially the IgE operates as a fuse and the mast cells and basophils operate as bombs.

This process of sensitizing a person to an allergen usually takes seven to ten days. However, it does not produce any allergic symptoms. People do not become aware that this process has occurred until the next

time that they encounter that allergen, which triggers an **allergic cascade**. This chain of reactions has several links, including:

- The allergen to which a person is sensitized enters the body. It may be inhaled through nasal passages, come in direct contact with the skin, be injected under the skin, or be ingested. The allergen flows through the bloodstream and encounters the IgE antibodies, which are attached to mast cells and basophils.
- The IgE antibodies recognize the invader and bind to the allergen molecule. This triggers the mast cells and basophils to which they are attached to self-destruct.
- Powerful chemicals from granules inside the mast cells and basophils are released. These include **histamines**, **leukotrienes** and other allergy stimulators.
- Allergy symptoms begin to appear. These may be *localized* (only in the area where these chemicals were first released) or *systemic* (throughout the entire body). These chemicals mainly affect the blood vessels, **mucous glands** and **bronchial tubes**.

The allergens are therefore the match that lights the fuse (IgE) that triggers the bomb (mast cells and basophils) to explode.

Sometimes one substance is similar enough to another that the immune system will mistake it for a known allergen and trigger the allergic cascade by mistake. For example, a protein in **latex** is similar to a protein found in fresh fruits, vegetables and **nuts**. People with an allergy to latex often have allergic reactions to these foods. This phenomenon is known as cross-reactivity.

SIGNS AND SYMPTOMS OF AN ALLERGIC CASCADE

As the allergic cascade progresses and **histamines**, **leukotrienes** and other chemicals are released, the body will begin to feel the symptoms normally associated with an **allergy**. The histamines are usually directly responsible for most of the symptoms themselves, though leukotrienes are known to contribute by aggravating **inflammation**.

Since these chemicals in the blood can travel freely throughout the body, symptoms can often appear in the nose, lungs, throat, skin and digestive tract. Common allergy symptoms include:

- **Itching** of the skin, eyes and nose. Caused by histamine irritation of certain nerve endings.
- **Sneezing** and **runny nose**. Due to the leakage of fluid caused by the release of histamines and other chemicals.
- **Hives.** Caused by swelling and fluid leaking out of local blood vessels.
- Nausea and vomiting.
- **Wheezing** and **coughing**. Usually involves the inflammation of cells in the breathing areas.
- Diarrhea

The most severe type of reaction to an allergic cascade is **anaphylactic shock**. This condition involves breathing difficulties, lowered blood pressure and shock as a result of blood vessel dilation. Anaphylactic shock can be life-threatening and should be treated as the first sign of a reaction. Symptoms of this more severe reaction include:

- **Shortness of breath**
- Tightness in the chest or throat
- Choking
- **Dizziness**, lightheadedness or fainting
- **Hoarseness**
- Severe itching

- Diarrhea
- Vomiting

The earliest effects of an allergic cascade may be experienced within a few minutes of exposure to an allergen. This is known as the *early phase* of an allergic reaction. This phase of the reaction is marked by the body's immediate release of **chemical mediators** upon contact with an allergen that the body has previously been sensitized to. For this reason, this early phase reaction is typically referred to as a **hypersensitive reaction**. Symptoms at this point can include the full range of allergy responses, including runny nose, itching, tissue inflammation, anaphylactic shock and hives.

In about half of all allergic reactions, the early phase reaction progresses into a *late phase* reaction, where symptoms appear (or reappear) four to six hours after exposure. Reactions at this point typically include red and swollen inflammations, though the full range of symptoms is often produced, and can include anaphylactic shock. Individuals who are susceptible to this type of reaction are often even more sensitive to subsequent exposures. This type of reaction is commonly associated with chronic allergy symptoms. While late phase **allergic reactions** usually follow early phase reactions, some late-phase reactions occur without any warning.

The tendency to develop a late phase reactions depends on the type of antigen, patient sensitivity and the concentration of the allergen.

This information can be found by going to http://allergy.healthcentersonline.com

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