EDUCATIONAL COMMENTARY – CLINICAL AND LABORATORY TESTING FOR ALLERGIES

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Learning Outcomes
Upon completion of this exercise, the participant will be able to:

• State the prevalence of allergies in the population.
• Describe the assays used in allergy testing.
• Determine when allergy testing is appropriate.

Allergies (immediate hypersensitivities) occur when an individual's immune system overreacts to substances that cause no immunologic reaction in most people. The substances that cause these reactions are called allergens. Common allergens include pollen, food, animal dander, house dust mites, mold, insect stings, latex, chemicals, and certain medications. These allergens enter the body through inhalation, ingestion, or absorption through the skin. On first exposure to an allergen, the susceptible individual produces immunoglobulin E (IgE) antibodies to the allergen. These IgE antibodies then attach to mast cells located in the tissues of the body. No symptoms occur at this time, but the person is then sensitized to the allergen.

Upon second exposure to the same allergen, the allergen attaches to the IgE on the mast cells, and the mast cells release their granules. The granules contain histamine and other potent mediators that cause dramatic physiologic changes, including smooth muscle contraction and blood vessel enlargement. These changes cause the symptoms of allergy.

Immune reactions to allergens produce symptoms that range from mild to very serious. Common symptoms include hives, sneezing, nasal congestion, and itching. Airway obstruction, coughing, wheezing, and tightening of the chest occur in asthma. In food allergies, symptoms may include vomiting, swelling of the lips or tongue, and difficulty breathing. The most severe reaction is called anaphylaxis. Anaphylaxis is an acute, severe, systematic, and potentially fatal allergic reaction usually occurring within minutes to two hours after contact with the allergen. The skin, respiratory tract, gastrointestinal tract, or cardiovascular system may be affected in anaphylaxis. Serious cases known as anaphylactic shock may result in decreased blood pressure and loss of consciousness and/or death. Previous history of anaphylaxis increases an individual's risk of another episode.

According to the Asthma and Allergy Foundation of America, approximately 50 million people in the United States have allergies. That computes to about 1 in every 5 Americans. Heredity plays an important role in the development of allergies. If one parent is allergic, the child has a 33% chance of
developing an allergy. If both parents have allergies, the child has about a 70% chance of being allergic. The child may not necessarily be allergic to the same substance(s) as the parent(s). Development of an allergy is also dependent upon environmental exposure - both the amount of the allergen and the duration of the exposure. While allergies are often detected in childhood, they may develop at any age.

**Allergy Testing**
In most cases, symptoms of allergies can be controlled by avoiding the environmental cause of the allergy or by using antihistamines. Allergy testing is not usually required. Only when symptoms are severe and avoidance and conventional therapies do not alleviate the symptoms should allergy testing be performed.

*Percutaneous Test*
The most commonly performed procedure for allergy testing is a qualitative test called the skin prick (percutaneous) test. Drops of diluted common allergens are placed on the skin. The skin is either pricked or scratched. In 10 to 15 minutes, the area where the allergen was applied is observed for wheal (raised area) and flare (redness). A positive skin test has a wheal at least 3 mm greater in diameter than the negative control and is surrounded by a red area. A positive skin test indicates the presence of IgE bound to mast cells that is specific for the allergen applied. Usually the patient will be tested with at least 40 common allergens. Skin testing is most useful for allergies to airborne substances. It is not as effective in determining the source of food allergies. Antihistamine therapy must be discontinued prior to skin testing. The medication will reduce the ability of the patient to produce a wheal and flare reaction.

*Intradermal Test*
The intradermal test is another procedure that may be used to test for allergies. This test is very similar to the skin prick test except that the allergen is injected into the dermal layer of the skin. Intradermal testing is usually performed to test for venom and penicillin allergies when skin prick tests are negative but the patient’s symptoms suggest this type of allergy. Patients who have experienced an anaphylactic reaction to an insect sting should not be evaluated with allergy skin tests.

*Blood Tests*
Skin testing is not feasible in some instances. If the patient has a skin condition that would make observation of a wheal and flare reaction difficult or impossible, blood tests may be performed. These tests are also less stressful for the patient. In the past, total serum IgE testing was performed. The total serum IgE assay is quantitative but does not identify the allergen(s). Because it is not specific for the offending allergen, this test is rarely performed today. Blood testing is now performed to determine the concentration of specific IgE to a battery of common allergens. The first assay for specific IgE was the radioallergosorbent test (RAST). This assay used radioisotopes to detect specific IgE. To eliminate the
danger of using radioisotopes, RAST has been converted to an enzyme-linked immunosorbent assay (ELISA) in which an enzyme replaces the radioisotope. Though the technique has changed, the test is still commonly called RAST. A RAST allows for the quantitative assay of specific IgE. It is more specific than skin testing but is not as sensitive. It is primarily used to detect airborne and food allergies. Discontinuation of antihistamine therapy prior to RAST testing is not necessary.

Immunotherapy
The most serious allergies are treated with immunotherapy (allergy shots). Skin testing or RAST testing must be performed before immunotherapy can be administered. In immunotherapy, the patient is given injections that contain the allergens to which he or she is sensitive. The patient produces immunoglobulin G (IgG) antibodies against the injected allergens. When the patient is later exposed to one or more of the allergens, the IgG antibodies produced from the immunotherapy react with the allergen(s) and prevent the allergen from attaching to the IgE on mast cells. The result is that the mast cells do not degranulate, and the allergic symptoms are avoided.

In conclusion, clinical and laboratory testing is very important in the management of patients with severe allergies. Avoiding the allergen or desensitizing against the allergen is only possible if the offending allergens have been identified.

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