EDUCATIONAL COMMENTARY – ALLERGEN-SPECIFIC IgE TESTING

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

- explain the processes involved in allergic reactions.
- differentiate the procedures available for detecting specific IgE.
- discuss the advantages of blood testing for specific IgE.

Under some circumstances, an immune response can be detrimental to an individual’s health. One example is when an immediate hypersensitivity reaction occurs, also known as an allergic reaction. In an allergic response, the individual produces an exaggerated immune response to a substance that is not normally damaging to humans. The offending substance is called an allergen. In an allergic reaction, IgE antibodies are produced when the individual is first exposed to the allergen. The IgE produced then attaches to cells in the blood and/or tissues known as basophils and mast cells. This process is called sensitization. No allergic symptoms appear at this time. After the individual is sensitized, subsequent exposure to the same allergen results in cross-linking of IgE molecules that are attached to the basophils and mast cells. The cross-linking causes degranulation of the cells. Basophils and mast cells contain very potent vasoactive amines such as histamine, peroxidase, acid hydrolases, and heparin. Release of these substances from the cell causes physiologic changes such as smooth muscle contraction and increased vascular permeability, which result in the symptoms displayed in allergic reactions (heat, redness, swelling, and pain).

Allergies usually occur in areas of the body that have large concentrations of mast cells such as the lungs, skin, or gastrointestinal tract. The symptoms exhibited depend on where the allergen enters the body. The allergen may enter through the respiratory system and cause allergic rhinitis or asthma; through the gastrointestinal (GI) tract and cause nausea, vomiting, and diarrhea; or through skin contact and cause dry skin and itchy rashes. Immediate hypersensitivity may become systemic and affect more than one organ. This is called anaphylaxis and may be life-threatening if the individual goes into shock or has swelling of the respiratory tissues. The most common allergens that lead to anaphylaxis are peanuts, insect venom, shellfish, eggs, penicillin, sulfa drugs, or vaccines.

Differentiating allergies from bacterial or viral infections is important in determining proper therapy for the patient. A patient appearing to have recurrent respiratory infections might be treated with unnecessary antibiotics when the patient is actually suffering from allergies. In most cases, diagnosis of allergies is determined based on clinical symptoms and patient history with no confirmatory testing. Therapy includes prescription medications and/or over-the-counter drugs and avoidance of the possible allergen(s).

Skin Testing
In most cases, only individuals who do not respond to medications and individuals with severe allergic reactions undergo confirmatory testing to determine the source of their allergies. Unfortunately, it has been
shown that diagnosis based on symptoms and history alone without confirmatory testing results in a correct allergic diagnosis only 50% of the time. Skin testing is the most commonly used mode of identifying the offending allergen(s), but it is not appropriate in a patient with a rash or other skin condition that could mask the wheal and flare reaction indicating a positive result. Physicians are often hesitant to subject patients who have had anaphylactic reactions to skin testing because of the possibility of triggering a life-threatening reaction. Also, it may not be advisable to discontinue medications in patients with severe allergies. In each of these circumstances, it is more feasible to test the patient’s serum or plasma for specific IgE using either radioallergosorbent tests (RAST) or solid-phase immunoassays. These tests eliminate difficulty in reading skin reactions and the possibility of instigating an anaphylactic reaction. Reduced trauma by not subjecting the patient to large numbers of skin pricks or injections is an added advantage of blood testing.

**Blood Testing**

Blood testing for allergens began in the 1970s. A RAST is a procedure that incorporates radioisotopes to detect the amount of IgE in a patient’s serum that reacts with a panel of suspected allergens. More than 500 specific allergens are now available. The panel of allergens is chosen according to the patient’s symptoms and geographic location. Measuring the concentration of IgE to a specific antigen and using appropriate cutoff values, the clinician can determine if a patient has been sensitized to a specific allergen. Serum or plasma testing is important because it can also rule out sensitivity to specific allergens. Eliminating allergies as a diagnosis, particularly in patients with respiratory symptoms, allows the physician to direct his efforts toward bacterial or viral causes. The patient avoids ineffective immunotherapy and/or unnecessary changes to diet or environment.

Early-generation RAST did not gain the confidence of physicians because it produced too many false-negative results (low sensitivity). The newer-generation solid-phase immunoassays using monoclonal antibodies have vastly improved sensitivity, specificity, accuracy, and reproducibility. Eighty percent of the laboratories in the world that provide specific IgE testing use the solid-phase technology. Testing for specific IgE continues to be referred to as RAST even if other technologies are used to perform the testing.

Millions of Americans are affected by allergies with symptoms that range from annoying to life-threatening. The treatment of these diseases has a huge financial impact on health care running into the billions of dollars each year. The use of blood tests for IgE-specific antibodies can play an important role in the proper and timely diagnosis of patients with allergies. When the specific allergens responsible for a patient’s symptoms are determined, more effective diagnosis and management of therapy reduces health care costs.

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