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Serologic diagnosis of allergen sensitization

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Allergic diseases can be generally classified as respiratory allergy, food allergy, and drug allergy. The treatment stretages are quite different according to these allergic diseases. For example, pharmacotherapy and allergen specific immunotherapy is the key stretages for management of respiratory allergic diseases. But for food allergy or drug allergy, avoidance is the only treatment option. The treatment options of avoidance and allergen specific immunotherapy are only available if the culprit allergens are identified by proving the presence of allergen specific IgE (sIgE) in patients and their compatible clincial features. In vivo, skin prick test has been widely adapted for identification of allergen specific IgE. However it requires trained health professionals, and procedure facility in clinicians' office. Furthermore patients have to discontinue anti-histamines for more than 1 week to avoid false negative result of skin prick test. Serologic sIgE measurement can avoid such weak points and prescription of serologic sIgE test has been soaring world widely.

IgE antibody was first identified in late 1960s by Mr. and Mrs Ishizaka in Denver and Dr. Johansson in Uppsala, independently. In 1967, one year later after the first identification of IgE, Dr. Bennich developed radioallergosorbent test (RAST) for diagnosis of sIgE, and it has been widely used for serologic measurement of sIgE. Serologic measurement can be classified as singleflex or muliplex measurements. These measurements have their own strong and weak points. Multiplex sIgE test can simultaneously measure 40-60 allergens and provide concentrations of each allergen sIgE. These data can permit clinician "bottom-up approach" for diagnosis of allergen sensitization. However the optimization of allergen binding to solide phase may be different to each allergen, accuracy of quantitative measurement by multiplex test may be not equal to that of singleplex sIgE measurement. WHO only accredite Phadia ImmunoCAP (Thermo Scientific) for quantitative measurement of sIgE. Exact measurement of sIgE concentration may be important for diagnosis of food allergy in child. Some studies have suggested the criteria of sIgE concentration measured by ImmunoCAP for diagnosis of pediatric food allergy with 95% positive predictive values. However the values were obtained from Western pediatric food allergy patients, and its values were not yet proved in Asian countries nor by adult food allergy patients. Further more, the criteria values of sIgE may also be affected by the concentration of total IgE.

There are several advantages for singleplex sIgE measurement. But clician should make list for suspected allergen by history taking from the patients before prescribing singleplex measurement. The approach, so called as 'top-down approach", is quite different from the approach by multiplex measurement. The favorite and available food materials, dominant species of tree, weed, and mites may be quite different to each country. So the important culprit allergens are quite different to each country, and clinician should know well on the important culprit allergens in the region. The allergen panel list of multiplex measurement should also be designed reflecting the significant cultpir allergens of each country. The cost of singplex sIgE measurement is expensive compared to multiplex tests, and Korean Health Insurance program only permit 9 allergens for reimbursement of health insurance. Korean Health Insurance Review and Analysis (KHIRA) data shows that the prescription number of multiplex measurement increases rapidly compared to singleplex sIgE measurements.

Traditionally serologic sIgE measurements were done against total protein extract of causative allergy sources such as house dust mite, pollens, egg, milk, peanuts, etc. These total protein extracts are mixture of many prteins and allergens, but some of these allergens may be clinically irrelevant.

For example, some vegetable food allergens are easily destroyed by cooking and sIgE to these allergens are not clinically important. We designate the clinically relevant and important allergens in the total extract as “major allergen”. Recently as the molecular technology has been sophiscated, recombinant or native major allergens are more easily obtained, and they are now used for diagnosis of sIgE measurement. This approach is called as “Component Resolved Diagnosis”. CRD permit more accurate diagnosis of allergy and we can adat more effective treatment stretages. There are cross-reactivity among allergens from different sources which may reflect the evolution from common ancestor, sensitization pattern major allergen make us understand how the patients were sensitized to the allergens.

In conclusion, serologic measurements have several strong points to in vivo, skin test, and more clinician are rely on serologic measurements. Singleplex and multiplex sIgE measurement have their own strong and weak points, and clinician should be familial to these strong and weak points. Recently developed CRD concept permit clinican more accurate diagnosis of allergen sensitization and allow us adapting more effective treatment stretages.