

Allergy investigations  
Specific IgE test

Ayanda is 4 years old. His father has brought him to see Dr Do-a-lot because he is concerned that he may be **allergic to peanuts**.

Ayanda was at a birthday party 2 weeks ago where he ate, among other brightly coloured party sweets and snacks, some **pink, candy-coated peanuts**.

Shortly afterwards his father noticed that he had developed a **mild cough**. He became **fractious**, his **lips looked swollen** and there was a **raised red rash on his chest and arms**.

By the time they reached the emergency unit he was having **difficulty breathing** and had developed a **wheeze**. He was treated with antihistamines, **nebulisation** and **adrenaline** and recovered well.

Ayanda has an **older brother, who is allergic to peanuts** so they **do not** have them at home. His **father had asthma** as a child, and his **mother suffers from persistent allergic rhinitis**.

Ayanda takes an **antihistamine** at night to help control the pruritus from which he suffers as a result of his **eczema**. It has been particularly widespread on his limbs and trunk since he stopped using the **small white tablets** that he received following his recent visit to the emergency unit. **He took a dose of antihistamine last night**. Ayanda also has a **persistently runny nose** and his father wants to know if this is due to allergies, or because he attends a crèche where he is constantly exposed to children with viral infections.

Dr Do-a-lot examines Ayanda and notes that he does indeed have **clear rhinorrhoea** as well as widespread **moderate eczema**.



She considers **allergy testing**, but decides against a skin-prick test in view of the following:

- He has had a **severe previous reaction** which may have been to peanut and there is the **risk of inducing anaphylaxis** through skin testing for peanut allergy in this case.
- The **skin is in poor condition** on the back and arms because of **eczema**.
- He has **taken an antihistamine** within the last 24 hours.

She decides to perform specific IgE tests.

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The fourth of our  
illustrated series  
remains focused on  
investigation.  
This issue concentrates  
on the specific IgE test.  
We will continue to  
explore allergy testing in  
the next issue.

Motala C, Hawarden D. Diagnostic testing in allergy. *S Afr Med J* 2009, 99: 531.  
LABSPEC Allergy Tests Request Form and Identifying Allergies Version 7, 08/07/2009.  
Potter PC. Investigation of the allergic patient: The importance of early diagnosis. *SA Journal of Continuing Medical Education* 2005, 23: 444-448.

## CAP, RAST, CAP-RAST or Specific IgE?

The radioallergosorbent test (RAST) was introduced in 1970 by Pharmacia Diagnostics AB.

In 1989 this test was replaced by the **ImmunoCAP Specific IgE Test**, also known as the ImmunoCAP, CAP RAST, CAP FEIA or Pharmacia CAP.

It is the gold standard for specific IgE determination, and is the most widely used specific IgE test in South Africa.

The test is a fluoroenzymimmunoassay, which, as the name suggests, uses fluorescent light as a marker for the presence of antibodies to the specific allergen.

This method of making antibodies detectable is sometimes referred to as a **'sandwich assay'**.

Figure 1 is a highly simplified diagram representing the immunoassay design principle; where the ingredients of the 'sandwich' are stacked one upon the other.

The antigen is attached to the surface of a high binding capacity cellulose matrix which lines the base of the 'cap'. When the serum that is being tested is added to the cap, any IgE that is specific for the antigen present on the matrix will bind to it.

The next step is to make it possible to 'see' how much specific IgE has bound. This is where the 'sandwich' part comes in.

Fluorescence-labelled anti-human immunoglobulin is added. This binds to the human IgE that is bound to the antigen, making it detectable.

The more intense the fluorescent light, the higher the concentration of antibodies.

## The 'Sandwich Assay'

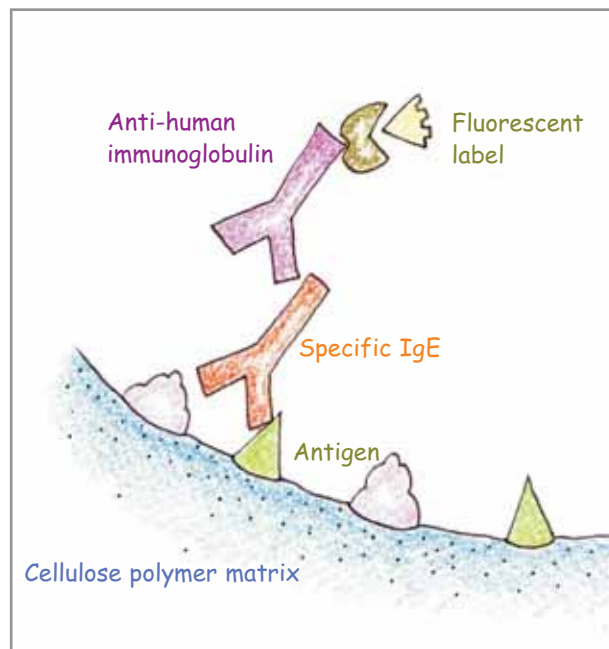


Fig. 1. Simple diagrammatic representation of the immunoassay design principle for the specific IgE test.



## What can you test for using the specific IgE test?

There is a **wide variety** of specific IgE tests.

There are **mixed antigen tests** where a group of clinically relevant antigens are attached to the matrix simultaneously. These are used as screening tests.

An example is the **Paediatric Food Mix** which tests for the presence of antibodies to **foods** that most commonly cause allergic reactions, particularly in children. This test includes egg white, milk, fish, wheat, peanut and soya bean.

The **Phadiatop Inhalant Screen** tests for antibodies to **inhalants** which are commonly implicated in allergy, like house-dust mites, pollens, animal dander, moulds and cockroach.

**Screening tests for mixed allergens** are also available for groups of allergens including grasses, trees, house dust, epithelia, nuts, weeds, moulds, cereals and seafood.

If the results of screening tests are positive, it is possible to test further using the **Specific IgE Tests for Individual Allergens**. These include a wide range of foods and inhalants as well as other important allergens such as *Ascaris*, drugs, insect venoms and latex.

In addition, there are tests available for **Essential Confirmatory Components of Common Foods**. These recombinant components, if present, demonstrate a patient's risk for developing anaphylaxis if exposed to the allergen. For example, if a patient is allergic to peanut, and the test for rAra h 2 is also positive, that patient has an increased chance of developing **anaphylaxis** if exposed to peanut. **Component tests** are available for egg white, milk, wheat, peanut and hazelnut.

**Component testing** can also be used to establish **cross-reactivity between different allergens**. These are available for several foods and inhalants.



## Choosing the test: Where to start?

A judicious, history-driven approach is important when choosing specific IgE tests.

If the history leads one to highly suspect a specific allergen such as peanut, latex or drugs, then screening tests are not indicated, and the individual allergen-specific test should be requested.

If, however, the history leads one to believe that IgE-mediated allergy may be the cause of a patient's symptoms, but it is not clear what the allergen is, the screening tests as well as the total IgE may be helpful as a point of departure.

## Range for specific IgE test results

IgE level (kU/l)	Allergen specific IgE level
< 0,1	Below detectable levels
0.35 – 0.69	Low
0.70 – 3.49	Moderate
3.50 – 17.49	High
17.50 – 49.99	Very high
50 - 100	Very high
>100	Extremely high

## Interpreting results

History plays an important role in allergy diagnosis, and tests must be interpreted within the context of patients' symptoms.

Patients may have positive tests without clinically expressing their allergy.

A highly positive test will not necessarily predict the severity of a reaction.

In the same way, a low specific IgE level does not necessarily mean that a patient's symptoms will be mild.

Dr Do-a-lot decides to include the following specific IgE tests for the following reasons:

Test done on Ayanda	Reason for test
Peanut as well as the rAra h 2 component	High index of suspicion on history taking
Wheat, Egg, Milk, Soya, Fish, Potato	Children with eczema often have allergies to foods
Phadiatop Inhalant Screen	History of possible allergic rhinitis

A total IgE was not requested as it was likely to be raised in view of the strong history of allergy, and would be unlikely to alter management. It would, however be useful if all the above tests were negative, in order to assess whether or not there was any likelihood of IgE-mediated allergy.



## Ayanda's specific IgE test results (kU/l)

Peanut	55.8
rAra h 2	10.6
Wheat	Negative
Egg	10.5
Milk	Negative
Soya	5.5
Fish	Negative
Potato	Negative
Phadiatop	Negative

## Assessment

Ayanda is allergic to peanuts with a high risk of anaphylaxis if exposed to the allergen. He is also sensitive to soya and egg.

A follow-up appointment has been scheduled with both his parents for education in the management of his condition including a discussion on the role of adrenaline and Phenergan, and the need for a MedicAlert bracelet.

Ayanda is advised to avoid peanut, egg and soya. Specific IgE tests for other legumes and tree nuts have been sent to the laboratory. He has also been referred to a dietician with experience in paediatric allergy.

It is unlikely that his rhinitis is caused by any of the common inhalant allergens; however, taking his young age into consideration, it would be ideal to retest him in the next few years if his symptoms persist.