Allergies have been estimated to affect more than 50 million Americans each year and are a leading cause of chronic illness in the US[1]. Worryingly, numbers appear to be rising, it has been postulated that this may be driven in part by the COVID-19 pandemic, which has caused people to lead increasingly sanitized lives. Detection of IgE antibodies in blood samples is a common approach to diagnosing allergies, with techniques such as enzyme-linked immunosorbent assay (ELISA) and lateral flow immunoassay (LFIA) being widely used due to their high specificity and sensitivity.

What is an allergy?

An allergy is defined as a hypersensitive immune reaction to a substance that, in most individuals, would be harmless. Common allergens include pollen, pet dander, latex, and various drugs (e.g., penicillin), insect venom as well as food products such as milk, peanuts, and shellfish. Depending on the nature of the allergen, symptoms may present as sneezing, watery eyes, wheezing and coughing, or a red, itchy rash. Food allergies can additionally cause swelling of the lips, tongue, or throat. While many allergic reactions are relatively mild, some can cause anaphylaxis – a systemic inflammation of the respiratory and circulatory systems, which can be fatal if not treated immediately.

What is the molecular basis of allergy?

During an allergic response, allergen-specific T helper 2 (Th2) cells drive allergen-specific B cells to produce IgE. A critical step in this process involves Th2 cell production of the interleukins IL-4 and IL-13, which induce immunoglobulin class switching to IgE and clonal expansion of B-cell populations. Upon binding to FceRi receptors on mast cells and basophils, secreted IgE stimulates the release of granules containing inflammatory molecules such as heparin, histamine, and serotonin, which act to produce the symptoms previously described.

How is allergy testing usually performed?

Skin prick testing is one of the most common allergy tests, involving little more than placing the allergen (diluted in solution) on the skin of the forearm and gently pricking the skin with a needle; the development of a red, itchy bump is indicative of an allergic reaction. Another, equally popular approach is to test a sample of patient blood for the presence of allergen-specific IgE antibodies, with ELISA and LFIA being favored for their capacity to support rapid, highly sensitive diagnosis.

Of the various ELISA formats available, direct and sandwich ELISA are widely used for allergy testing. During direct ELISA, a dilute blood sample is applied to a microplate coated with the potential allergen; any allergen-specific antibodies subsequently become plate-bound and can be detected with a labeled anti-IgE antibody. Sandwich ELISA instead uses plate-bound anti-IgE antibodies to capture IgE antibodies from the sample; these are visualized using a labeled anti-IgE antibody, enabling levels of IgE in the sample to be measured. LFIA testing involves applying the sample to a test strip; as the sample migrates along the strip, allergen-specific antibodies become trapped and are visualized with an anti-IgE secondary antibody, often conjugated to 40nm gold particles.

Read more about LFIA tests

Is allergy testing on the rise?

Allergy incidence is thought to be increasing, driven in part by the hygiene hypothesis first proposed by Strachan in 1989. This suggests that certain infectious agents provide protection against a broad spectrum of immune-related disorders, and that an increasingly sanitized approach to living has compromised these effects. Climate change is also considered to be a contributing factor, with higher temperatures extending the growing season for plants and increasing the associated pollen and allergen counts.

To address the need for tests able to quickly and accurately determine whether an individual has an allergy, efforts to develop diagnostic products have been stepped up. Notably, tests that use purified

allergen to capture secreted IgE from blood, with labeled anti-IgE secondary antibodies providing detection, represent a sustainable, cost-effective solution.

Browse anti-IgE antibodies

Jackson ImmunoResearch specializes in producing secondary antibodies for life science applications, including ELISA and LFIA. Our portfolio includes anti-IgE antibodies conjugated to HRP, biotin, Alkaline Phosphatase, and fluorescent dyes, as well as to fluorescent proteins such as R-PE, APC, and PerCP. We've also recently expanded our range of gold-conjugated secondary antibodies with the addition of 40 nm colloidal gold conjugates, which are among the most frequently used detection moieties for LFIA.

References:

- American College of Allergy, Asthma, and Immunology. Allergy Facts. https://acaai.org/allergies/allergies-101/facts-stats/
- Hay fever, hygiene, and household size, Strachan D.P., BMJ, 1989 Nov 18;299(6710):1259-60 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1838109/
- Pawankar, R., Canonica, G., Holgate, S., and Lockey, R., 2011. *World Allergy Organization (WAO) white book on allergy*. United Kingdom: WAO.

Learn more:	Do more:
Colorimetric western blotting	**Spectra Viewer**
Chemiluminescence western blotting	Antibodies for signal enhancement
Fluorescent western blotting	