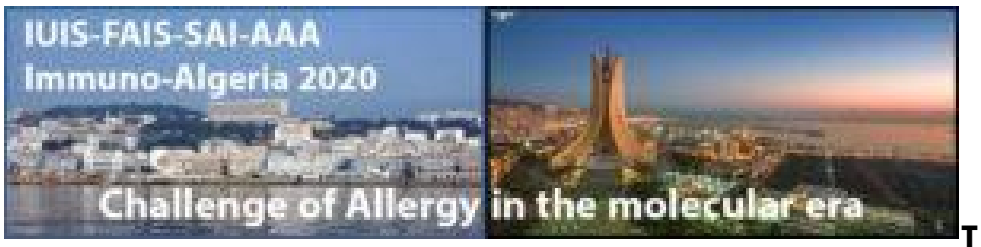
Immuno-Algeria 2020: Introduction to allergy and molecular diagnosis



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Immuno-Algeria course took place remotely between 11th May -12th June. The theme of the course was *"Challenge of Allergy in the Molecular Era"*. To ensure that all attendees had the immunological knowledge required for advanced content that was going to be discussed during the meeting, weekly immunology refresher lectures were provided during the month of May. This was followed by a 2 week long meeting focused on allergy content. This week we highlight the first lecture of the meeting given by Professor Rudolf Valenta, an expert from the University of Vienna (Austria): *Introduction to allergy and molecular diagnosis*

Immunoglobulin E (IgE)-mediated allergy is the most common immune disorder, with a prevalence as high as 30% of the global population (depending on the allergy). Though allergy symptoms can be mild and manageable, symptoms can often be severe, disabling, and life-threatening.

Professor Rudolf Valenta (University of Vienna, Austria) began his talk (first lecture of the course) discussing important advances in diagnosis and therapy that have occurred in the field of Allergy during the last couple of years. He particularly focused on the importance of the component resolved diagnosis (CRD) as a new form of modern allergy diagnosis based on the molecular aspects of allergens.

After a brief introduction about the different clinical manifestations of allergy and the concept of "*allergy march in childhood*" (*progression from sensitisation to an allergen, which may cause disease and progress to severe disease)*, Prof Valenta reported on the traditional aspects of allergy diagnosis (patient history, IgE based blood tests, skin testing, etc.) and discussed mechanisms of allergic inflammation. He then demonstrated how molecular forms of diagnosis and specific immunotherapy are currently revolutionising diagnosis and treatment of allergic patients and how allergen-specific approaches may be used for the preventive eradication of allergy.

Regarding allergens source and extract, Prof Valenta reported that the first allergen encoding cDNAs were isolated thirty years ago and this was considered as a revolution (at the time) in the characterisation of protein allergens through expression cDNA cloning. In the meantime, the structures of most of the allergens relevant for disease in humans have been solved. New insights have been gained regarding the process of sensitisation to allergens, allergen-specific secondary immune responses, and mechanisms underlying allergic inflammation.

The first demonstration that recombinant allergens can be used for *in vitro* diagnosis of allergy was published in 1991-1992. As a next step, recombinant allergens became available in a fully automated allergy test system (Immunocap) by 1999, leading to the invention of the recombinant allergen-based concept of component-resolved diagnostics (CRD) and immunotherapy (CRIT). The need to test multiple molecules

simultaneously resulted in the birth of multiallergen tests (up to 100 allergens at the same time) using microarray technology by 2002.

Prof Valenta suggested that in the future, allergy diagnosis may change and rely on this microarray testing in blood as a first step and then the clinician could complete the anamnestic step in a more precise and relevant way based on blood test results.

Finally, the lecture ended with a discussion on the advantages of molecular allergy diagnosis, in fact, every allergen tells a story: *identification of the genuinely-sensitizing allergen source, understanding clinical cross reactivity, prediction of severity, accurate prescription and monitoring of specific immunotherapy…*

In the afternoon session, Prof Valenta presented on trends to the prediction and then prevention of allergic sensitisation and allergy disease in the future. Furthermore, he showed the basis and the interest of new forms of allergen-specific immunotherapy. Knowledge of the allergen sequence and structure provides information regarding the T cell epitopes presented by MHC molecules and IgE epitopes, and allows for the design of vaccines that target different immune mechanisms: administration of allergen-derived T cell peptides, B cell epitope-containing vaccines (i.e., peptide carrier vaccines).

Reference: Valenta et al., 2018. Molecular Aspects of Allergens and Allergy. Advances in Immunology

Summary by Sawsan Feki

Recording of his talk is also available: Online Lectures