Epitope-specific antibody profiling using novel multiplex immunoassay: A new generation of biomarker for food allergy

Mayte Suarez Farinas
Icahn School of Medicine at Mount Sinai, USA

Identification of allergenic IgE epitopes is instrumental for the advancement of diagnostic and prognostic tests for food allergy. We have developed a novel Bead-Based Epitope Assay (BBEA) that quantifies epitope-specific antibody binding (ESAB) for multiple epitopes in a large number of samples. We show that this assay had impressive reliability across replicates, high reproducibility across laboratories, and is more reliable and sensitive than current peptide microarray (MIA) technology. The potential of BBEA as new tool for diagnosis, prognosis and endotype discovery in peanut and milk allergy will be illustrated in three applications that use BBEA-based IgE and IgG4 binding to sequential allergenic epitopes.

Diagnosis of oral food challenges (OFC): Despite intense resource utilization and inherent risk, OFC remain the gold standard for clinical diagnosis of food allergy. Utilizing a cohort of 185 high-risk children from the CoFAR study, we determined their utility in predicting peanut allergy.

Prediction of allergy endotypes: Using BBEA profiles from 89 milk-allergic children who tolerated different forms of milk products we used machine learning methods to distinguish them into four endotypes: reactive to baked-, fermented-, or whole-milk, and outgrown. BBEA's performance was twice that of the serum component proteins (41.9%) in training, achieving a performance in the validation set (n=21) of 86%(AUC=0.89).

Prognosis in oral immunotherapy: Although recent clinical trials have shown that the majority of patients undergoing oral immunotherapy develop desensitization only half would achieve "sustained unresponsiveness" after therapy discontinuation. Using serum from 47 subjects prior to treatment, we show that epitope-specific IgE alone was more accurate in predicting sustained unresponsiveness than standard serum component proteins (average AUC of 97% vs 80%).

This work highlights the potential of BBEA biomarker discovery to develop precision medicine approaches to diagnose allergy, predict severity endotype, and screen patients who would receive the most benefit from oral immunotherapy.

Speaker Biography

Mayte Suarez Farinas, is currently an associate professor at the center for biostatistics and the department of genetics and genomics science of the Icahn school of medicine at Mount Sinai, New York. She received a master's in mathematics from the University of Havana, Cuba and in 2003, a PhD degree in quantitative analysis from the Pontifical Catholic University of Rio de Janeiro, Brazil. In the last three years she teams up with food allergy investigators at the Icahn School of Medicine at Mount Sinai and Allergenis to develop a high-throughput assay for epitope profiling and use it to develop precision medicine algorithms to diagnosis, endotype and response to immunotherapy in patients with milk and peanut allergy. She has over 140 publications that have been cited in over 4000 articles, with an H-index of 44 and has been serving as reviewer of reputed journals and grant funding agencies.

e: mayte.suarezfarinas@mssm.edu

Notes: