

Protein Allergens, Toxins, and Bioinformatics (PATB) and the COMPARE Database



Our Mission

The committee's mission is to advance the scientific understanding of the relevant parameters defining allergenic proteins and protein toxins in foods and feeds by: (i) encouraging the development of reliable and accurate methodologies for characterizing the allergenic potential and "toxicity" potential of novel proteins, and (ii) leveraging the power of bioinformatics approaches in accomplishing these efforts.

Chairs

Public Chairs

Prof. Ronald van Ree (Academic Medical Center, University of Amsterdam)

Dr. Antonella Cianferoni (Children's Hospital of Philadelphia)

Private Chair

Dr. Emir Islamovic (BASF)

HESI Staff

Dr. Lucilia Mouriès (lmouries@hesiglobal.org)

Carolina Morell-Pérez, MS (Protein Toxins Task Force, cmperez@hesiglobal.org)

Dr. Shermaine Mitchell-Ryan (COMPARE Allergen Database, smitchell-ryan@hesiglobal.org)

2020 Committee Highlights



Participating Organizations

2 government/regulatory agencies, 4 academic/research institutes, 6 industry, and 2 others



Publications

2 submitted



Scientific Meetings and Trainings

1 meeting and 1 workshop

- PATB and COMPARE Annual Meeting (March 2020, virtual)
- [Committee Workshop](#): From Protein Toxins to Applied Toxicological Testing (October 2020, virtual; >150 attendees)



Web Tools and Assays

1 database and 1 web resource

- COMPARE Allergen Database
- COMPASS Tool



Outreach

1 oral presentation

- [Chinese Society of Allergy 2020 Annual Meeting](#) (September 2020, virtual): Dr. Gao Zhong-Shan presented the COMPARE database as part of the Translational Allergy Session



Collaborations

1 external

- SOT Food Safety Specialty Section (partner for the organization of the workshop "From Protein Toxins to Applied Toxicological Testing")



Geographic Representation

Belgium, Denmark, China, France, Germany, Netherlands, United Kingdom, and United States

Working Groups

- **Digestibility Working Group: Food Matrix Project.** This research project aims to study the impact of food matrices on the digestibility of proteins and complements the work completed on digestibility *in vitro* models, by testing whether protocols that take matrices into account would provide a better discrimination of allergens and nonallergens than protocols focusing on purified proteins in solution. In 2020, the experimental work was concluded. The data are being analyzed and a publication is planned in 2021.
- **Protein Toxins Task Force.** The goals of the task force are to (1) investigate approaches for identifying protein toxins and (2) suggest specific guidelines to identify new protein toxins. In 2019, the task force undertook a literature review to identify current approaches being used and leading experts in the topic to design the workshop held in 2020. The workshop covered recent advances in protein toxins biology,

described the use of computational biology for protein toxins identification and characterization with *in silico* approaches, and discussed the applicability of existing tools and resources for safety assessment of novel food biotechnology products.

- **Immunogenicity.** This working group aims to examine application of an *in vitro* protocol for identifying specific T cells and antibodies from nonallergic and allergic patients to pairs of proteins from the same protein family but with different allergenicity. After some delays in the anticipated start date due to the COVID-19 pandemic, the project officially received the green light from the leading institution, Copenhagen University Hospital at Gentofte (Copenhagen, Denmark) in late 2020.
- **COMPARE Allergen Database.** Development and annual update of a database of protein allergen sequences is ongoing. The fourth version of the database was released in January 2020. Throughout the year, the team re-initiated and conducted the 10-month-long process leading to the next annual update, and completed the development of a new visualization feature in COMPASS (COMPARE Database's built-in bioinformatics tool), released in June 2020. The feature allows users to analyze FASTA sequence comparisons using a color-coded output, in addition to the existing table view. This new visual display will allow users to quickly identify regions within a query sequence that have similarities with one or more of the 2,248 allergen sequences contained within the COMPARE Database, and will also allow visualization of multiple alignments in one graphic output. Visit COMPARE at <https://comparedatabase.org> and select "Run COMPASS" to explore the new feature, and learn about other tool updates under the "Updates" tab..

Areas of Focus for 2021

- The food matrix study and rebuild study have concluded. In 2021, the Digestibility Working Group will focus on the data analysis and publications development resulting from these two large multi-year projects.
- The Protein Toxins Task Force will address learnings from the October 2020 virtual workshop, develop a workshop report/publication, and evaluate needs for next projects.
- The Immunogenicity Working Group experienced delays due to the COVID-19 pandemic (inaccessibility to laboratories and clinics during shutdowns). The project is anticipated to resume at the end of 2020 and continue into 2021.
- Annual update of the COMPARE database will continue. The fifth version of COMPARE will be released in January 2021.
- The PATB and COMPARE database programs are actively recruiting new participants who share our goal of improving the science of protein toxin and protein allergen assessment to improve human health. Limited funds are available to support new multi-sector collaborative projects aligned with HESI PATB's mission and goals. Contact PATB's Scientific Program manager, Dr. Lucilia Mouriès (lmouries@hesiglobal.org), for information.

Strategic Impact Areas

Catalysis of New Science

The PATB focus on new research generates a variety of novel data to better understand the mechanisms of allergenicity.



Enhancement of the Societal Knowledge Base on Human Biological Processes of Relevance for Protecting Human Health

The PATB develops science to better understand the mechanisms of allergenicity and allergens sensitization, a condition that affects 2–5% of the US population and other developed nations. The COMPARE Allergen Database is a free public resource that can be used by anyone with interest in allergens.



Increasing the Audiences for Collaborative Safety Science

The committee workshop "From Protein Toxins to Applied Toxicological Testing" had an impressive reach, bringing together international experts from academia, research institutes, government and regulatory agencies, and industry sectors: over 150 participants from four continents and 20 countries participated and engaged during the event. The HESI PATB Committee looks forward to continuing this interaction with the global scientific community.



Publications

Submitted

Bioinformatics approaches to assess safety of novel proteins in relation to food hypersensitivity: Perspectives from the Health and Environmental Sciences Institute workshop, 17–18 October 2018, Copenhagen, Denmark.

van Ree et al. (2020) The COMPARE database: a public resource for allergen identification, adapted for continuous improvement.



Participating Organizations

Government/Regulatory Agencies

US Environmental Protection Agency
US Food and Drug Administration

Academic/Research Institutes

Academic Medical Center, University of Amsterdam
Copenhagen University Hospital at Gentofte
University of Maryland, Joint Institute of Food Safety and Applied Nutrition
Zhejiang University, China

Industry

BASF
Bayer
Corteva Agriscience
KWS
Limagrain
Syngenta

Others

Children's Hospital of Philadelphia
European Bioinformatics Institute (EBI/EMBL)