Toegekende projecten Chemistry of Life (CoL)

Lopende projecten

Chemoenzymatic modification of allergenic food proteins with glycans to induce oral tolerance
CHEMIE.PJT.2020.004
Utrecht University / UMC Utrecht / Nutricia Research / Enzytag

Food allergy is a serious health problem, occurring in approximately 4-8% of the children and 3-4% of the adults. At present there is no preventive or therapeutic treatment available and is advised to avoid the allergy-causing protein. However, exposure to the protein is necessary to develop oral tolerance, the situation where there is non undesired immune response against the protein. Within this project, allergenic proteins from cow's milk and peanut are linked to complex sugars and the tolerance-inducing capacity be studied. This opens up new possibilities for the prevention and treatment of food allergies.

Multimeric antibody formats targeting GPCR networks in leukemic cells (MAGNETIC) CHEMIE.PJT.2020.003
Stichting VU / Utrecht University / Argenx BV / QVQ Holding BV

Chronic lymphocytic leukemia is the most common form of blood cancer (uncontrolled growth) of specific white blood cells). The chemokine receptor protein CXCR4 is expressed on leukemia cells and plays an important role in their cell division and migration to the lymph nodes where they, through interactions with other cells, promote further cell division and become less sensitive to cell death. We investigate whether inhibiting specific CXCR4 complexes and/or switching on the immune system is most effective at knocking out CXCR4 positive tumor cells. This will lead to a new generation, CXCR4-targeted antibodies for the treatment of leukemia. G&Z central mission: By 2040, all Dutch people will live at least five years longer in good health, and are health disparities between the lowest and highest socio-economic groups decreased by 30% If you are very creative you can classify cancer as a chronic disease and then it would fit: Mission III: People with chronic diseases In 2030, the proportion of people with a chronic illness or lifelong disability who will go to desire and ability can participate in society increased by 25%. Unfortunately no direct connection to the life science technologies of the ST.

High throughput time-resolved metabolic profiling for novel insights (MOONLIGHT) CHEMIE.PJT.2020.005
Leiden University / Interscience BV / DSM Food Specialties BV / AstraZenica UK Ltd / AB Sciex Netherlands BV

To improve our knowledge of the dynamics of the building blocks of life (metabolites, enzymes and cells), we need analysis techniques that they can study quickly, under real-life conditions. We are therefore going to develop automated analysis workflows that are widely applicable. The success of this approach we want to demonstrate by, among other things, measuring the dynamics of enzymes that are used in bread baking, clinical samples and complex cell models in the search for better medicines.

ChemistryNL

Phase behaviour of biopolymer mixtures in plant-based products CHEMIE.PGT.2021.015
Eindhoven University / Unilever Innovation Centre Wageningen BV

Theoretical models for plant-based food products
The production and consumption of meat and other animal-based food products is inefficient from the perspective of the usage of natural resources, and therefore the development of alternatives based on plant materials is desired. Selecting the appropriate biopolymers (such as proteins or polysaccharides) at the right composition to make plant-based (vegan) products with appropriate texture and shelf-life is a challenging task. Due to a lack of fundamental insight, at the moment this process is largely based on trial and error, which is time intensive. Therefore, in this project Eindhoven University of Technology and Unilever will explore the development of simplified theoretical models to gain insight into the relation between composition and structure of these systems. In a subsequent step, these models will be extended to include a more realistic treatment of the biopolymers, for instance by taking into account the fact that many biopolymers are charged, that salt is present, and that the biopolymers are non-uniform in terms of their size and composition. This is expected to enable a much more efficient selection of biopolymer ingredients to achieve high quality plant-based meat analogues.

Localisation of biomacromolecules in food matrices CHEMIE.PJT.2018.008
Eindhoven University / Wageningen University / Confocal.nl / Unilever / DSM

The modern consumer wants natural and healthy food, produced in a sustainable way with a small ecological footprint. But not at the expense of taste, texture and shelf life. Realizing this dream requires insight into the relationship between ingredients, structure, and function. Locating ingredients such as proteins and carbohydrates on interfaces of small droplets and in networks of small particles is essential for this. A team of researchers from Eindhoven University of Technology, Wageningen University, Confocal.nl, Unilever and DSM will develop advanced measurement methods to enable this visualization of ingredients at very small length scales.

Monitoring and Visualizing Protein Societal Behavior in the Cell; an Integrative Approach CHEMIE.PJT.2019.002
Utrecht University / Wageningen University / FEI Electron Optics BV / Protein Metrics Inc.

In every cell of every organism there is a wide range of proteins, which work together (and other biomolecules) to function properly. The aim of this project is to further develop, bring together and integrate several advanced bio-techniques. We do this to ultimately be able to fully and dynamically map and visualize this social network of interactions, in order to understand exactly how life works in a cell.

Molecular aspects of biopolymers defining food texture perception and oral digestion CHEMIE.PJT.2018.001
Amsterdam University

Perhaps the largest societal challenge at this moment is to provide food for the growing world population, and do so in a sustainable way. In the western world focus has recently been on producing healthier foods to improve quality of life. A sustainable production implies fewer processing steps and being able to produce foodstuffs from less purified ingredients. Healthier and more sustainably produced foods reduced in calorie content can be developed by replacing high caloric carbohydrates such as starch with low caloric biopolymers such as soluble and insoluble plant fibres. The major challenge for food industry is to maintain sensory properties of the reformulated, healthier foods since sensory properties are key determinants for liking and repeat purchase. The focus of the proposed project is to tailor food texture by engineering structured food products using molecular and nanoscale structure of plant biopolymers. The challenge lies in the large biodiversity of natural, un-purified biopolymers with different molecular and nanostructures which consequently give rise to different ingredient functionalities. This presents a multidisciplinary challenge for building molecular understanding of how molecular and structural diversity of natural

biopolymers impact product properties. The main outcome will be a molecular and supramolecular understanding of how different biomacromolecules contribute to texture and oral 4.7
digestion. The outcome of the program will be used to build models to guide product design using complex biopolymer mixtures. This fundamental understanding will be also used in food industry to sustainably produce healthier foodstuffs with excellent texture utilising plant biopolymers.

The role of ions in the multimerization of β-galactosidase CHEMIE.PGT.2020.012
Amsterdam University / DSM

What do ions do with -galactosidase? The enzyme β-galactosidase breaks down milk sugar into smaller sugars and is therefore very interesting for for example the dairy industry. The type and concentration of ions determine whether β-galactosidase exists as a dimer, or clumped together into larger structures. It is important for the operation and purification how ions influence this agglomeration. Using advanced molecular simulations and separation techniques, the scientists of the University of Amsterdam will collaborate with DSM to find out where ions bind to β-galactosidase and how this binding takes place. Thereafter the team looks at how the binding of ions to β-galactosidase changes the shape of the enzyme, and thus the agglutination behavior.

Improving analysis of (tool) compounds for treatment of cystic fibrosis to determine mode of action
CHEMIE.PGT.2020.008
Utrecht University / AbbVie, Inc.

Since 2012, medicines are available for the first time that turn an incurable, hereditary disease (cystic fibrosis) into a treatable disease. Instead of fighting the symptoms, the faulty CFTR protein is addressed. Although evidence has now been provided that such a defective protein could be a suitable target for treatment, the first generations of drugs are still far from perfect and CF patients will have to take them for the rest of their lives. The industrial partner is therefore developing new substances that exhibit synergy with each other and that represent new chemistry. Within the existing collaboration of the participants, the mechanism of action of these substances on the defective protein is being sought. The aim of the project presented here is to improve and deepen the methods and reagents needed to investigate the mechanism of action, which will lead to a greater understanding of this mechanism. Deep molecular insight into the mechanism of action of each substance will lead to a better understanding of the CFTR protein (which is a model for a large family of so-called ABC transport proteins). It will also provide better insight into which patients will benefit from these drugs and whether there are side effects on the CFTR protein in addition to the main effect.

ChemistryNL

Afgesloten projecten

Targeting Histone Lysine Methyltransferases for Cancer Therapy CHEMIE.PJT.2015.004
Radboud University / NKI / Mercaleads BV / Chiralix

Histones are proteins that play an important role in the expression of genes. This project investigates how to inhibit enzymes that methylate lysine residues in histone proteins – so-called histone lysine methyltransferases – could eventually lead to new drugs against cancer.

Targeting membrane proteins (TAMP) CHEMIE.PJT.2015.006
Utrecht University / Genmab

Antibodies are used to specifically recognize and destroy tumor cells. In this project we will purify specific membrane proteins, which are potential markers of human tumors, and characterize. The purified proteins will be used to generate antibodies, select and characterize for diagnostic (including so-called “image-guided surgery”) and therapeutic applications.

Synthetic Biology and Genomics Platform for New-to-Nature Bioactive Peptides TKINCI.2015.0001
Leiden University / BaseClear BV / Dupont / Naturalis Biodiversity Centre / Hitexacoat / Enzypep

There is a great need for new antibiotics to fight infectious diseases. In the venom of snakes, scorpions and other animals contain peptides with strong antimicrobial activity. By a integral approach, we will identify, modify and test these peptides in order to suitable and accessible for use in the clinic.

Efficient synthesis of selective inhibitors of glutamate transporters TKINCI.2015.006.3
Groningen University / INTEGREX Research

Third generation antihistamines: Computer aided drug design of dual-action H1R/H4R antagonists.
TKINCI.2015.006.2
VU Amsterdam / Griffin Discoveries
