Systems approaches to support immune health-promoting strategies

We believe that evidence-based product development in the immune health space is crucial. But what is optimal immune health and how do you assess immune-supporting effects of specific ingredients? What knowledge is already available and how do we make optimal use of this to support the development of new evidence-based immune health promoting products?

To improve our immune health, we need to gain a better insight into the collective response of the constitutive parts of the immune system. Many components interact at many different levels of the immune system whether at the molecular, intracellular, organ or organismal scale. Moreover, it is important to understand how and to what extend extrinsic factors play a role in the processes of the immune system and immune-interacting organ systems. For this, we need to consider the involved intrinsic and extrinsic factors as one system, one network, and learn to understand the structure and dynamics of this network throughout the various life stages and how we can safely intervene in this network.

Scientific underpinning of relevant targets/processes and read-outs (biomarkers) based on already available knowledge/data on immune health is key to select ingredients, optimize (pre-)clinical study strategies and identify new therapeutic purposes. To this end, TNO has developed advanced literature and network mapping intelligence to identify new opportunities for immune health promoting products. Data workflows have been developed based on TNO's integrated expertise in data science, mathematics, metabolic health, microbiology and immune health.

Approach of TNO's Immune Health modelling tools:
BIOINFORMATICS TOOLS TO SUPPORT IMMUNE HEALTH-PROMOTING STRATEGIES
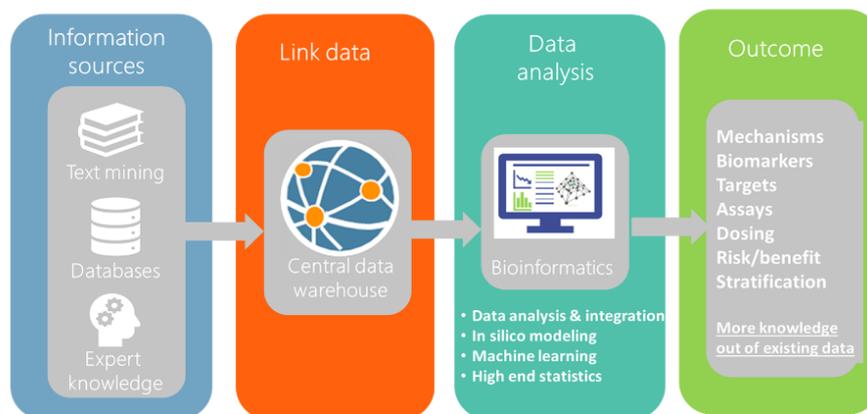
Our workflows contain different modules with which we support (new) product and intervention development for and with partners:
- Beneficial ingredient identification (for food and/or pharmaceutical application)
- Beneficial effect identification
  - Re-purposing ingredient portfolio
  - R&D target identification
- Study design optimization (biomarker discovery, assay identification, dosing optimization, etc.)
- Quick screen for adverse/beneficial immune effects of product and interventions (risk and benefit assessment)

In a recent demo case, aimed at identifying key processes in windows of opportunity for immune health intervention in early life phases, causal early life immune networks were generated based on biological data from >40 databases by applying text mining, Artificial Intelligence, bioinformatics, and systems immunology. This enabled the prediction and prioritization of key candidate biomarkers to assess the benefit and safety of early life immune interventions to improve lifelong immune health.
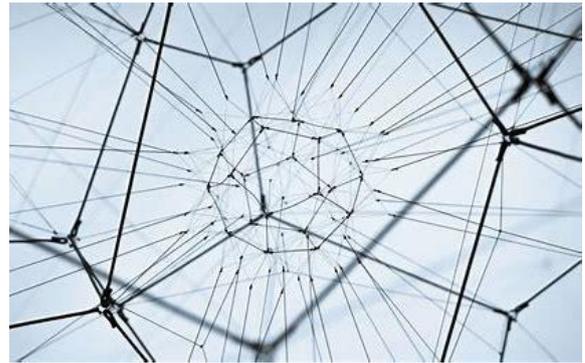
Interested in our services or collaboration?

TNO is offering its Immune Health modeling expertise in tailored contract services. Moreover, we are setting up further public-private-partnership initiatives to strengthen and further optimize our workflows in line with industries' disease specific challenges for which we are inviting partners to co-create with us.

Our team is happy to discuss how we can support you to address your specific needs tailored to your product development pipeline. Please contact Bas Kremer

Key references:

- van Bilsen et al. Front Immunol 2020. https://doi.org/10.3389/fimmu.2020.00644
- Meijerink et al Front Immunol 2019. https://dx.doi.org/10.3389/fimmu.2019.00231
- Meijerink et al Front Immunol 2019. https://doi.org/10.3389/fimmu.2019.02672