BIOMARKERS



TNO innovation for life

Healthcare costs are rising excessively and there is an economic and public urge to improve the system, preferably in a personalised manner. Innovations in the development of new personalised intervention therapies require better tools for early diagnosis and prognosis of disease, understanding the etiology of disease as well as prediction and monitoring of response to therapy, thus enabling personalised treatment and counselling. Molecular biomarkers are key components of such an innovation model. TNO is working with public and private partners to apply biomarkers in joint projects, to discover better biomarkers and to accelerate the development of new biomarker tests for application in biotechnological and clinical fields.

Many new molecular biomarkers have been discovered in recent years to diagnose a disease, predict disease development, monitor treatment effects and predict personalised treatment response. However, most biomarkers lack the clinical and analytical validation that allows their application in biotechnological processes and clinical care. This particularly hampers the development of novel therapies by pharmaceutical, biotechnological and nutraceutical industries that rely on biomarkers to obtain quantitative indications of efficacy and safety. The most efficient and probably only way to bridge this biomarker innovation gap is to smartly combine the expertise of public and private entities to jointly accelerate the validation and development of biomarkers.

TNO'S AMBITION IN BIOMARKER R&D

TNO wants to drive the application of molecular biomarkers in biotechnological processes and in healthcare innovations,

driving the development of novel biomarkers into validated tests. We focus on biomarkers for efficacy and safety, supporting translational and personalised healthcare. To achieve this, we combine our multidisciplinary expertise with a wide network of external public and private partners to jointly execute biomarker R&D projects. We aim to further develop these biomarker activities, thus progressing the biomarker field from innovation to application.

BIOMARKER R&D PROJECT WORKFLOW

Our philosophy is that biology should be studied on a systems level, with maximum translation to applications in biotechnology and clinical care. With this in mind, we undertake projects with private and public partners to apply available biomarkers, or discover, validate and/or develop new biomarkers.



Our biomarker R&D project work flow has distinct steps:

- > Study design
 - Translation of research question to fit-for-purpose experimental plan
- Biomarker analysis
 - Testing new pharmaceutical or nutraceutical agents in translational disease models or in human subjects
 Identifying or confirming mechanism
 - of action
- Biomarker discovery
 Interpretation of multi-parameter
 - biological networks
 - Selection and prioritisation of candidate biomarkers
- Biomarker validation
 - Fit-for-purpose biomarker assay development
 - Biomarker testing in preclinical and/ or clinical samples from biobanks and dedicated studies
 - Statistical data analysis
 - Mechanistic analysis of relationship biomarkers to disease development
- Biomarker development
 - Development of prototype biomarker test into analytical end product

BIOMARKER APPLICATIONS

We regard biomarkers as components of multi-parameter system profiles that can help to interpret the status of complex biological systems and the response of interventions thereto. To this end, biomarker changes are interpreted in relation to other parameters on the phenotypical or molecular level, focusing specifically on translational and personalised applications. We efficiently apply lessons learned across different application fields in respect of optimum research approaches and novel technologies.

- Key application fields
 - Pharmaceutical and biotechnological R&D
 - Nutrition R&D
 - Chemical R&D
 - Healthcare

- Key biomarker applications
- Understanding etiology of disease
- Identifying or confirming mechanism-of-action
- Relationship between?? therapeutic agent, molecular mechanism and pharmacological effects
- Selection of optimal therapy with best efficacy and toxicity profile
- Translational medicine
- Personalised healthcare

TNO'S BIOMARKER AREAS OF EXPERTISE

As an applied research institute, TNO participates in many public-private partnerships to accelerate the translation of new findings to applications (e.g. 290 European framework consortia as of November 2012). TNO has broad experience of biomarker research and development technologies, efficiently applying internal and external capabilities, mostly in metabolic diseases. TNO's scientists have an extensive external academic and industrial network, including innovationdriven pharmaceutical, nutraceutical, analytical and diagnostic companies, biobanks, clinicians, academic scientists and patient organisations. This ensures that a solution to a specific biomedical problem can be identified. In addition to scientific excellence, TNO scientists possess distinguished operational skills and are equipped to deliver top-level scientific evidence in a professional and efficient manner. The areas of expertise include:

- Translational preclinical disease models
- Human experimental medicine studies
- Omics and systems biology
- Biomarker analytics
- Imaging biomarkers
- Microtracer dosing
- Statistics and chemometrics
- > Translational biomarker modelling
- Comprehensive system dynamics modelling

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TNO HEALTHY LIVING

TNO initiates technological and societal innovation for healthy living and a dynamic society.

TNO

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