

3 GOOD HEALTH AND WELL-BEING



Industrial biotechnology – Delivering tools to protect health and wellbeing in Europe

The third UN Sustainable Development Goal aims to ensure healthy lives and promote well-being for all at all ages.

Industrial biotechnology harnesses the power of naturally occurring microbes and their components to help improve human health and nutrition; including through a better understanding of the human microbiome, the delivery of probiotics, prebiotics and micronutrients and the development of new drug solutions.

USING BIO-BASED SOLUTIONS TO CREATE NEW TREATMENTS

Over the last two decades, biotechnology has revolutionised the way health is secured. Biologicals have become the cornerstone for new pharmaceutical treatment options. Manufacturing small molecules (e.g. pharmaceuticals or vitamins) used to require chemical technologies, whereas today, fermentation and enzymatic processes are routinely employed as efficient and resource saving manufacturing techniques.

Looking at the broader set of biotechnology tools, advances in DNA sequencing and bioanalytics have totally changed the way diagnosis and drug development is performed, spurring forward the trend towards more targeted and personalised medicine. Biotechnology is now also employed in alternative toxicology methods that can assess the safety of drugs and chemicals more quickly, and that reduce the need to run animal testing.

USING BIO-BASED SOLUTIONS TO CONTRIBUTE TO BETTER NUTRITION

While fighting hunger (SDG 2) is a prime goal for some regions of our planet, Europe is facing a different challenge. The ample availability of food and unhealthy consumption habits have led to a massive obesity and overweight problem in many of our nations – starting in early childhood and continuing through all age groups. Obesity and overweight negatively impact our well-being and are root causes of many chronic diseases that also put a financial strain on European health systems. While better education is needed to improve consumption habits, biotechnology can provide the tools we need to reformulate our food, as further exemplified below, thus contributing to better human health.

USING PROBIOTICS TO PROMOTE GUT HEALTH

The human gut is populated with a vast variety of microorganisms – the gut microbiome. In fact, more bacterial cells live in our gut than there are human cells in our entire body. Research in this field has shown the importance of the gut microbiota to human health and well-being.

If good symbionts populate the gut, they ferment dietary fibre to healthy short chain fatty acids, generate a stable pH environment and – most importantly – help the human immune system to fight off dangerous microorganisms. If pathogenic microorganisms infest the gut, they produce toxic products: diseases like cholera are extreme examples – more prevalent are subchronic and chronic illnesses (e.g. inflammatory bowel disease).

The complex interactions between the gut microbiome and the human host are currently an intensive field of research. Biotechnology can be used to produce, isolate, and deliver “probiotics” (beneficial microorganisms) to supplement or enrich food (e.g. probiotic yoghurt) and help to colonise our gut with a healthy microbiome.

USING PREBIOTICS TO PROMOTE BENEFICIAL MICROBIOTA

The consumption of dietary fibre in Western diets has greatly decreased over recent decades. Typical European dietary fibre uptake is only about 15 g/d, while the type of nutrition that has determined our evolution probably contained more than 100 g/d of fibre (still found in rural African diets). Dietary fibre consists mostly of slowly or non-digestible (low calorie) carbohydrates, on which the beneficial microorganisms (see “probiotics”) can grow. This “feed for probiotic microorganisms” is called prebiotics. Biological research enables us to understand the complex interplay between prebiotics, the gut microbiome and the human host; and biotechnology offers the tools to provide prebiotics which match the requirements of modern food processing. It can be expected that prebiotics can help to fight overweight and nutrition-based diseases. Similarly, research on the skin microbiome is helping us to understand how it can contribute to a healthy skin.

USING BIO-BASED SOLUTIONS TO IMPROVE EARLY LIFE NUTRITION AND CHILD HEALTH

Breast feeding is recognised as the best way to nurture new-borns and young infants. However, there are many reasons why a baby cannot be breast-fed at all times and instead needs to be fed formula. Industry has succeeded to enrich infant formula more and more (e. g. with omega-3 fatty acids to support brain development), but one major component of mothers' milk has so far remained elusive: human milk oligosaccharides. These are prebiotic carbohydrates that stimulate the colonisation of a baby's gut with a robust and health-protecting microbiome, and make the baby more resilient to a world full of hostile microbes¹. In the area of industrial biotechnology, new sources of human milk oligosaccharides are currently being investigated, aimed at improving early life nutrition and child health in the future².



DID YOU KNOW?

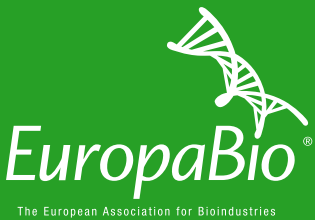
- It is estimated that between 50% and 90% of cells in the human body are microbial. The human microbiome is made up of bacteria, archaea, fungi, protists and viruses.
- In Europe it is estimated that 23% of women and 20% of men currently are obese.³
- Obesity already costs Europe in excess of 70 billion Euros a year in healthcare costs and lost productivity.⁴
- Obesity is one of the causes of other diseases such as e.g. diabetes, hypertension.

¹ See e.g. [CarboMet \(Metrology of Carbohydrates for European Bioindustries\) H2020 CSA. The essential role of carbohydrates in promoting gut microbiota function through all stages of life.](#)

² See [BASF News Releases](#)

³ Okorodudu; et al. (2010). “Diagnostic performance of body mass index to identify obesity as defined by body adiposity: a systematic review and meta-analysis”. *International Journal of Obesity* 34: 791–799. doi:10.1038/ijo.2010.5.

⁴ See [The University of Reading \(UK\), Research and Enterprise Services: European Commission Eatwell Report.](#)



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