

Industrial biotechnology – creating a more sustainable world with microbes and bioactives

Industrial biotechnology harnesses the power of naturally occurring microbes for industrial and manufacturing applications. In doing so, it has created a powerful toolkit of biochemical solutions that continue to reduce our dependency on fossil carbon resources. It is one of the most promising new approaches to pollution prevention and resource conservation and is being used in multiple sectors of the economy to improve almost every aspect of our daily lives.

MEET THE MICROBES

Microbes (more scientifically called “microorganisms”) were the first living creatures on Earth and are essential to life. They are living, single-celled organisms such as fungi and bacteria that naturally occur in our environment and are also the most effective producers of enzymes.

INTRODUCING ENZYMES

Enzymes are proteins that act as catalysts. When one substance needs to be transformed into another, nature uses enzymes to speed up and control this process. That is called catalysis. Enzymes occur in every living organism and without them, biological processes would occur much too slowly to sustain life.

INTRODUCING PROBIOTICS

Probiotics are live, ingestible microorganisms that are associated with benefits for humans and animals. These lactic acid bacteria beneficially affect the composition of intestinal microbiota.

INTRODUCING AMINO ACIDS

Proteins play a crucial role for biological processes and are an important building block for the human body. Proteins are large molecules that are made up of amino acids and that are split into amino acids in the gastro-intestinal tract. They are then used for building new proteins in the body. All proteins in humans and animals are built from amino acids, regardless of whether they are muscle, hair or skin proteins. Thus, amino acids are called the “building blocks of life”.

USING BIO-BASED SOLUTIONS IN COMMERCIAL APPLICATIONS

Industrial biotechnology uses microorganisms or cells to produce bio-based products in sectors as diverse as pharma, agriculture, chemicals, food, feed, fuels, detergents, paper and pulp, bioplastics and textiles. Some specific examples of the commercial applications of industrial biotechnology include:

Microbes are used to produce enzymes for various industries. Some industries also use the microbes themselves. For example, the dairy industry uses lactobacillus bacteria to produce yoghurt, and applies certain fungi in cheese-making (e.g. Penicillium roqueforti for the famous Roquefort cheese).

Enzymes have become established as critical parts of our everyday lives, working as a silent partner behind the scenes. Today, innovative enzymes are a standard technology used (i) in consumer home care applications (e.g., in laundry and dish-washing products), (ii) in food and feed production (e.g., as processing aids to prevent acrylamide formation; or in the production of food and feed additives), or (iii) in manifold industrial production processes (e.g. for biochemicals, bioenergy, biomaterials, bioplastics, biopharmaceuticals or biotextiles).

Probiotics can improve the intestinal immune system as well as boost intestinal defence against viral infections. Many consumers will be familiar with the branded probiotic supplements containing healthy lactic acid and bacteria. In livestock farming (i.e. poultry or pig production, as well as in aquaculture), similar probiotics are commonly applied as feed supplements for monogastric animals.

Probiotics promote gut health by modulating the composition of intestinal microflora, favouring favourable microbiota and repressing unfavourable microbiota. Additionally, probiotics help to reduce the need for antibiotic use in livestock, thereby reducing antibiotic use and the spread of antimicrobial resistance.

Amino acids play an essential role in the nutritional composition of feedstuffs and must be consumed regularly through feed or food intake, since they are poorly stored in the body. This is of particular importance for animal protein production, as amino acids in feed constitute protein building blocks and are important for animal growth and welfare. Not all feed rations have the proper composition of amino acids for optimal nutrition, therefore supplementation with essential amino acid is important. As feed additives, amino acids are instrumental in lowering the amount of resources needed to rear livestock such as land, feed, water and energy – that is necessary to produce healthy, nutritious food for a growing world population. They also contribute to saving thousands of acres of forest that would otherwise have to be transformed into cropland, as well as keeping millions of tons of fish in our oceans.

HORIZON EUROPE INVESTMENT IN INDUSTRIAL BIOTECHNOLOGY CAN HELP SCIENCE DELIVER SOLUTIONS FOR THE UN SUSTAINABLE DEVELOPMENT GOALS AND OTHER GLOBAL CHALLENGES.

Over the coming decade, investment in EU research and innovation will be essential to delivering solutions to a broad range of global challenges. These include the need to mitigate the impacts of climate change, provide secure and sustainable energy, develop a renewable, resource efficient circular bioeconomy, boost industrial competitiveness, growth and jobs. In addition, Europe will need to innovate to deliver on a whole host of other UN Sustainable Development Goals (SDGs), including ensuring good health and well-being, achieving food security and improved nutrition and promoting sustainable agriculture. In the context of a growing global population, industrial biotechnology, and other cutting-edge technologies, will become increasingly fundamental to meeting the UN SDGs. Ensuring an appropriate level of investment in industrial biotechnology will be critical in order to help tackle these problems and provide solutions for the future.



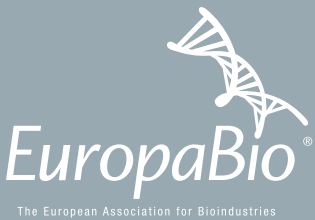
DID YOU KNOW?

- Enzymes are so powerful that one single enzyme can process up to one million molecules every second.¹
- Our love affair with enzymes began 5000 years ago, when our Bronze Age ancestors discovered that an enzyme found in cows' stomachs could turn milk into cheese.²
- Each enzyme has a specific function - it only works when it finds the right material. This makes enzymes highly efficient, and their results highly predictable.³
- Estimates vary, but it is believed 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.

¹ See [BASF 'Enzymes' webpage](#)

² See [Novozymes 'beautiful biology' webpage](#)

³ Ibid



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