6 CLEAN WATER AND SANITATION

Industrial biotechnology – Helping ensure availability of water and sanitation

The sixth UN Sustainable Development Goal – *ensure availability and sustainable management of water and sanitation for all* – aims to address the impacts of water scarcity, poor water quality and inadequate sanitation. Namely, tackling reduced food security, livelihoods and educational opportunities for poor families across the world. By 2050, at least one in four people is likely to live in a country affected by chronic or recurring shortages of fresh water.[1]

Industrial biotechnology harnesses the power of naturally occurring microbes and their components (e.g. enzymes) to treat industrial waste water, reduce water waste in agriculture and improve water efficiency in sectors from pulp and paper to textiles. Each of these applications helps ensure the availability of more, cleaner water.

SUSTAINABLE DEVELOPMENT GOALS

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USING BIO-BASED SOLUTIONS TO MINIMISE AND TREAT INDUSTRIAL WASTE WATER

Industrial processes account for approximately 16% of total global freshwater consumption.[2] At the same time, water intensive industrial processes can leave large volumes of water unpotable and unused. Industrial biotechnology has given scientists the tools to create innovative bio-based solutions that efficiently treat industrial waste water, and control effluent re-joining the water supply.

For example, in the textiles industry, enzymes are used for manufacturing processes such as denim finishing and dyeing. By being applied in the textile process, enzymes contribute to reducing the volume of water, chemicals and the related contamination of waste water. In the pulp and paper industry, innovative enzymes help to improve the industrial processes and reduce energy, water and chemical consumption.

USING BIO-BASED SOLUTIONS TO TREAT MUNICIPAL WASTE WATER

From the beginning, industrial biotechnology has integrated product improvements with pollution prevention. For example, detergents have enabled consumers to get their clothes cleaner with lower wash water temperatures while at the same time saving energy.

Today, providing clean, sustainable access to water is an increasingly pressing challenge in the face of rapidly increasing global urbanisation. Cities are expected to represent the largest share of growth in freshwater demand to 2030, meaning that innovative solutions to meet municipal water needs will be crucial. Microbes are at the heart of municipal wastewater systems. They help detect which contaminants are present and produce effective enzymes which help break them down.

USING BIO-BASED SOLUTIONS TO SEPARATE AGRICULTURAL FERTILISERS FROM WATER FOR RE-USE

Agriculture is responsible for 70% of the world's freshwater use.[3] The manufacture of food in Europe alone consumes an average of 5,000 litres per person per day.[4] Delivering innovative ways to address this thirst is vital to tackling the challenge of sustainable global water supplies. A crucial part of reusing agricultural waste water is removing any phosphorous, nitrogen and other common fertiliser residues from the water. New innovations in industrial biotechnology are moving beyond simple purification of water to explore new ways to re-use the captured phosphorous as fertiliser, and thereby contribute to a more sustainable, circular economy in agriculture.

USING MICROBES AND ENZYMES TO IMPROVE WATER QUALITY IN AQUACULTURE

Aquaculture has grown twenty-fold over the last thirty years[5], offering an alternative to traditional agriculture in satisfying our growing global appetite. Meeting the water needs of this sector is supported by innovative bio-based tools that help promote water health in farmed areas.

Microbes provide a natural, sustainable solution to the challenges of pollutants in aquaculture. Industrial biotechnology enables the use of probiotics to maintain water quality in a natural and effective way,

improving fish stock growth, survival and resistance to disease. They can also help to tackle hydrogen sulphide build-up, a particular problem in aquaculture that can lead to reduced feeding and increased fish mortality. The use of microbes provides a natural way to convert this pollutant into harmless compounds and to ensure continued water purity.

USING AMINO ACIDS AND ENZYMES IN LIVESTOCK PRODUCTION TO REDUCE NITROGEN AND PHOSPHOROUS BURDEN OF AGRICULTURE AND WATER CONSUMPTION IN ANIMAL FARMING

Amino acid supplementation in feed goes beyond reducing the quantity of water needed. It also helps to preserve the quality of water by reducing the amount of nitrates discharged into groundwater. When feed is optimally balanced with supplementary amino acids, the animals do not need to metabolise and excrete excess protein. The protein reduction leads to a lower nitrogen content in excreted manure and decreased water consumption in the animals. Reducing the crude protein content in animal feed allows a decrease in water consumption by 10% in livestock production. Similarly, the use of the enzyme "phytase" as an additive in animal feed helps the animal to digest the naturally occurring phosphate "phytate" better. This reduces the need for farmers to add mineral phosphate to the feed, and at the same time greatly reduces the phosphate excretion with manure. Thus, phytase enzymes are a major contributor to the reduction of eutrophication in surface waters.

DID YOU KNOW?

- The global population is predicted to reach nearly ten billion by 2050.[6]
- Demand for water is expected to rise by 50% by 2030.[7]
- Today roughly 30% of the world's population lack access to safe water in their homes, and 60% lack safely managed sanitation.[8]
- More than two billion people globally are living in countries experiencing excess water stress due to the high freshwater consumption.[9]
- Water is becoming an increasingly contentious resource.

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1 The United Nations 'Sustainable Development Goal 6'
2 The United Nations (2017), 'World Water Development Report 2017'
3 See The United Nations (2017), 'World Water Development Report 2017'
4 Ibid
5 See UN FAO (2012), 'State of world fisheries and aquaculture 2012'
6 See The United Nations Department of economic and social affairs webpage
7 See The United Nations (2017), 'World Water Development Report 2017'
8 See WHO/ UNICEF Joint Press Release (12 July, 2017)
9 See The United Nations Sustainable Development knowledge platform

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