



## **Agriculture from a bioreactor: what is possible?**

**Inhouse Farming – Feed & Food Show 2024 will be providing information about the agricultural and food systems of the future – from 12 to 15 November in Hanover, Germany**

**Just how big a role cell cultures and microorganisms might play in the agricultural system of the future is one of the core topics at this year's 'Inhouse Farming – Feed & Food Show'. The B2B platform organised by the DLG (German Agricultural Society) will be taking place from 12 to 15 November 2024 in Hanover, Germany as part of both EuroTier, the world's leading trade fair for livestock farming, and EnergyDecentral, the leading platform for decentralised energy supply. International players will be presenting their technologies and business models surrounding the production of biological components in bioreactors.**

Meat and milk without cows and housing, fish without oceans, chocolate and coffee without endless plantations – this is the idea behind cellular farming. Food, but also non-food raw materials such as leather or silk, are no longer produced from animals and plants. Instead, they are extracted in-vitro from cells or produced in precision fermentation by microorganisms that multiply under optimum conditions in a bioreactor. They have the potential to help solve the ethical and ecological challenges facing conventional farming. Just how enormous the application areas of this still discipline, which is still in its infancy, are will be the subject of presentations and live discussions at the 'Inhouse Farming – Feed & Food Show' this coming November in Hanover.

### **Precision fermentation**

In precision fermentation, protein or lipid synthesis is shifted from the animal to a microorganism. To do this, the sequence containing the blueprint for the desired protein is taken from the animal's genetic material. This is then inserted into a bacterium or a yeast, for instance. The microorganism then produces the protein in a bioreactor. This procedure has already been tested for some time and is used to supply rennet for cheese production, for example.

Conversely, approaches for also producing the proteins found in cows' milk or chickens' eggs by means of precision fermentation are new. These would enable the taste and texture of alternative foods to bear even greater similarity to those of the animal originals. The advantages of this are readily apparent: in contrast to animal farming with the associated production of feed, a bio-reactor can have a significantly smaller ecological footprint. It occupies considerably less space, consumes less water, uses no artificial fertiliser and does not output any methane. However, this advantage must go hand in hand with the provision of energy produced with zero impact on the environment. The controlled conditions render the use of antibiotics obsolete, and the risk of zoonoses is eliminated. However, proteins from precision fermentation, above all, have to overcome a major hurdle, particularly in Europe, that is primarily related to the Novel Food Regulation.

The 'Inhouse Farming – Feed & Food Show' is the ideal venue for companies in the precision fermentation sector to share experiences, develop new ideas and forge partnerships for the future of agriculture.

### **Meat without animals**

In cellular farming, on the other hand, focus is on cultivating the cells themselves. To do this, certain types of cells are taken from animals via a painless biopsy and used over numerous cell generations to produce specific cell types in specially adapted nutrient media. This procedure has already been tried and tested in the medical field for some time - in cultivating skin transplants, for instance.

In the food sector, in-vitro meat, which is also referred to as cultured meat, is attracting increasing public attention. "In the future, steak will no longer come solely from a cow grazing on a meadow," believes Nick Lin-Hi, Professor for Business and Ethics at the University of Vechta, Germany, and a member of the DLG Committee for New Feed & Food. "It will also grow in a bioreactor, and with a much lower ecological footprint." Various scientific studies back up his theory. Only recently, Dutch researchers concluded that the environmental impact of cultured beef is 92 percent lower than that of its conventional counterpart. As it also requires around 95 percent less land, it could also prove to be a starting point in the biodiversity crisis. And the fact that it consumes 78 percent less water is another weighty argument.

It therefore comes as little surprise that an increasing number of research institutes and start-ups around the world are focusing on this topic, which first came to public attention in 2013 when the first burger made from cultured meat was presented in London. Florentine Ziegowski has dedicated herself to ensuring that this development does not bypass farmers, but is driven by them. She is the co-founder of RESPECTfarms and Head of International at the non-profit

organisation CellAg Deutschland e.V. "As a model, cultured meat is not in competition with classic farming," she says. "Instead, it is a promising model for farms. And we want to help them with it." She estimates that the potential is enormous. She assumes that around five percent of farmers will choose a cellular approach over the next 15 years. "Over the past 18 months, we have analysed the feasibility of cultured meat on farms. At Inhouse Farming, I hope to be able to share some of the results and get talking to the farming community," says Zieglowski, who also brings her expertise to bear as a member of the DLG Committee for New Feed & Food.

### **Test-tube plants**

The three professors Tilo Hühn, Regine Eibl-Schindler and Dieter Eibl have impressively proved that cellular agriculture is not limited to meat, because a very special type of chocolate was created in their laboratories at Zurich University of Applied Sciences (ZHAW) back in 2015. The cocoa for it was cultivated from cocoa cells in a bioreactor. "This means that we are not dependent on weather conditions, protects natural resources such as water or soil and does away with the need for artificial fertilisers or synthetic crop protection agents," says Tilo Hühn, chairman of the DLG Committee for New Feed & Food, emphasising the benefits of his approach. The cells multiply in a large plastic bag filled with an optimally composed nutrient medium. Dried and ground into a powder, the cocoa cells are roasted after harvesting and then placed in the chocolate pot. Tilo Hühn is convinced of the result: the cell culture chocolate cannot be distinguished from other chocolates in blind tasting.

This is just the beginning for the researchers, however. Besides various spices and herbs, avocados are also on their to-do list. Light and shadow are very close together, especially where this fruit is concerned. Their high content of unsaturated fatty acids makes them particularly valuable in nutritional terms. However, the high volume of water consumed during their production and the energy required for cooling and transporting them lead to a large ecological footprint. "Part of the new present of food production stems from a tank, and the role played in this by plant cell cultures has so far been underestimated," says Tilo Hühn in conclusion.

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### **DLG. Progress and sustainability in the agriculture and food industry**

The DLG (German Agricultural Society), founded in 1885 by Max Eyth, stands for productivity and sustainability in innovation-driven improvements in agriculture and the food chain. The aim of the DLG is to promote progress through

the transfer of knowledge - especially with regard to technology and quality control. Non-profit, politically independent and with an international network, the DLG has more than 31,000 members worldwide.

As one of the leading organisations in its sector, the DLG not only organises trade fairs and events in the fields of agriculture and food technology but also tests food, agricultural technology and equipment. With its competence centers for agriculture and food, its demonstration farm where practical trials take place along with its numerous publications, the DLG continually promotes independent knowledge transfer. In addition, the DLG works on numerous national and international committees of experts to develop solutions for the challenges facing agriculture and the food industry.

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