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New and sustainable innovations to meet the global demand for meat: Cultivated meat as a supplement to conventional livestock farming

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Abstract

The world's population is expected to reach 10 billion people by 2050. This will also increase the demand for meat products. Meat consumption has thereby a negative impact on resource depletion, greenhouse gas emissions and animal welfare. Cultivated meat (CM) is one solution to meet the global demand for meat while improving environmental sustainability and animal welfare. CM is real meat produced under laboratory conditions and represents a complement to conventional meat production. For its realisation, affordable costs per kg are required, for which process steps must be scaled up. The production of structured products, such as beef steaks, needs high-throughput technologies that are capable of producing large quantities while imitating the natural structure of conventional meat. Bio-printing technologies that place biomaterials and cells in a targeted manner to produce three-dimensional constructs are very promising for this purpose. However, the current technologies are only scalable to a limited extent or cannot sufficiently replicate the complex texture of meat. In order to combine high throughput and complexity, we are researching and developing a new bio-printing process, 3D-Bio Screen Printing. In first studies we have shown that hybrid CM products can be additively manufactured from edible scaffolds and living cells with high throughput and high resolution. In order to achieve high nutritional values and reduce costs, plant protein isolates with protein contents of $> 20\%$ can be printed into structured scaffolds. Furthermore, various biomaterials (proteins, fats and polysaccharides) can be built up additively in a multi-layer process to form steak-like texture. In addition, it was shown that meat-relevant cell types proliferate and differentiate on 3D scaffolds and thus expand the organoleptic and nutritional profile as hybrid CM products. Cultivated Meat (CM) combines various scientific fields to address the problem of environmental impact of meat. Innovative technologies are needed for CM to become part of the solution. With 3D Bio-Screen Printing, we present such a technology. As the implementation of CM requires the involvement of the agricultural sciences and agriculture, we would now like to get into an exchange to promote the realisation of CM together.

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