

MEAT BY THE MOLECULE: CULTIVATED MEAT 101

Cultivated meat is animal meat produced by growing cells outside the bodies of animals. The resulting meat looks, tastes, and cooks just like conventional meat. By removing animals from the process, this kind of meat production is more efficient and sustainable, avoids the use of prophylactic antibiotics, and reduces the risk of foodborne illness. By supporting cultivated meat innovation, you can help alleviate the negative impacts of conventional meat production.

THE SCIENCE BEHIND CULTIVATED MEAT

Decades of experience growing animal cells in the biopharmaceutical industry provide a robust foundation of detailed knowledge about large-scale animal cell culturing. Now, just as the biomedical industry replicates cellular processes that occur in the human body to heal people, food producers can replicate the cellular processes that occur inside a living animal to produce meat.

Production begins with a small tissue biopsy from an animal. The cells from this sample are put in a closed sterile tank called a cultivator and fed nutrients in the form of a cell culture medium, a liquid solution containing salts, sugars, amino acids, and growth factors. During cultivation, the cells multiply many times over,

producing muscle, fat, and other components of meat. Additionally, some cultivated meat products are grown on scaffolds – biodegradable or edible structures made of food-grade materials – that support the development of a desirable texture. Like media ingredients, these materials are already widely used in the food industry, and their safety is well documented. [1]

Because the starter cells will be derived directly from species and breeds that are routinely farmed for meat, the final product – sometimes called clean meat, cell-based meat, cultured meat, or slaughter-free meat [2] – will be the same product as the conventional meat counterpart that consumers and regulators are familiar with, but with some benefits that are noted below.

THE CULTIVATED MEAT INDUSTRY IS DEVELOPING RAPIDLY

Innovators around the world are working to bring this new way of producing beef, poultry, pork, and seafood to market at a competitive price point. Indeed, the price of cultivated meat has dropped dramatically since the first cultivated burger was produced. Some companies estimate that their products will be available within the next few years and will be cost-competitive with conventional meat in under a decade, though these predictions assume substantial equity investments in these companies. Cultivated meat companies have held tastings of cultivated ground beef, chicken, duck, pork sausage, foie gras, fish, shrimp, and minute steak. Investors and large protein companies have invested hundreds of millions of dollars in the industry, and there are currently dozens of cultivated meat companies around the world.

WILL CULTIVATING MEAT BE SAFE?

Yes. Cell culturing requires a sterile production environment, and comprehensive procedures and tests have been established for preventing and screening for contaminants. Removing animals from the process also eliminates fecal waste that can contaminate meat with *E. coli*, salmonella, and other pathogens. Finally, just as with conventional meat and seafood products, U.S. regulators will require cultivated meat producers to implement safety plans designed to reduce the risk of contamination from biological, chemical, and physical hazards. [3]



Federal Regulatory Oversight. In March 2019, the U.S. Department of Agriculture (USDA) and the Food and Drug Administration (FDA) announced a formal agreement describing how they will share oversight of cultivated meat. The FDA will take responsibility over production up to the point of cell harvest, and the USDA will oversee post-harvest processing and labeling (except with respect to cultivated seafood products, over which the FDA will exercise exclusive oversight). Regulators are working to refine the technical details of this framework and are expected to provide explicit guidance on the use of traditional meat, poultry, and seafood terms on cultivated meat labels, [4] potentially requiring modifiers indicating the production method, such as “cultured” or “cell-based.” With this leadership at the federal level, consumers can be confident that cultivated meat will be safe, wholesome, and properly labeled.

CULTIVATED MEAT WILL HAVE MANY BENEFITS

Cultivated meat eliminates many of the externalities of conventional meat production. Cultivated meat is expected to produce lower greenhouse gas emissions than industrial animal agriculture, without the animal waste that currently contributes to extensive soil and water pollution around the world. Cultivated meat production will also be inherently more efficient. The majority of the nutrients that animals consume are used for life processes other than the growth of muscle tissue. Since cells in culture can use most of their nutrients for the creation of more cells, [5] cultivated meat production will require far fewer natural resources than conventional meat, reducing water usage, deforestation, and biodiversity loss. Furthermore, in contrast to the widespread use of prophylactic antibiotics in conventional meat

WILL CULTIVATED MEAT PRODUCERS USE FETAL BOVINE SERUM (FBS)?

No. FBS has been used as cell culture media in research, but its quality varies between batches, global supplies are extremely limited, and it is very expensive. It is therefore not a viable option for commercial-scale meat production. Some cultivated meat companies have already phased out the use of FBS, and no companies will use it beyond the research and development stage. [6]

production, antibiotics will not be used in commercial production of cultivated meat, alleviating the public health concerns raised by the increasing incidence of antibiotic resistance. [7]

Cultivated meat innovation has great potential to provide a method of food production that is more sustainable and safer than conventional animal agriculture. With the global population projected to reach about 10 billion people by 2050, cultivated meat can help satisfy the world's rapidly expanding demand for protein without exacerbating environmental degradation, antibiotic resistance, or the spread of foodborne illnesses. You can contribute to a more sustainable, healthy, and just food system by supporting publicly funded cultivated meat research and fair labeling rules.

- [1] While the fundamentals of the cultivation process are well established, public funding for further research is essential to more rapidly bring production costs down and address technical challenges related to commercial scale-up.
- [2] For a discussion of consumer attitudes toward these various terms, see Friedrich, B. (2019, September 13). Cultivated Meat: Why GFI Is Embracing New Language [Web log post]. Retrieved from <https://www.gfi.org/cultivatedmeat>
- [3] According to the formal agreement between the U.S. Department of Agriculture (USDA) and the Food and Drug Administration (FDA), the USDA's Food Safety Inspection Service (FSIS) will conduct inspections in cultivated meat processing facilities “in accordance with applicable FSIS regulations (including sanitation and physical product inspection, Hazard Analysis and Critical Control Point (HACCP) verification, product testing, and records review) to ensure that resulting products are safe, unadulterated, wholesome and properly labeled.” FDA & USDA. (2019). Formal agreement between the U.S. Department of Health and Human Services Food and Drug Administration and U.S. Department of Agriculture Office of Food Safety (p. 3). Retrieved from <https://bit.ly/2EVzaEZ>
- [4] This is especially important for consumer safety since cultivated meat will have the same effects as conventional meat on consumers with meat allergies. Clear and accurate labeling will therefore be essential.
- [5] See Specht, L. (2018). Is the future of meat animal-free? *Food Tech.*, 72(1), 17-18. Retrieved from <https://www.gfi.org/images/uploads/2018/08/LizSpechtIFTFuture.pdf>
- [6] For more information on FBS, see Friedrich, B. (2017, August 4). FBS & clean meat: The future of meat is slaughter-free [Web log post]. Retrieved from <https://www.gfi.org/the-future-of-meat-is-slaughter-free>
- [7] For a detailed discussion of cultivated meat's environmental and public health benefits, see The Good Food Institute. (2018). Growing meat sustainably: The cultivated meat revolution [Fact sheet]. Retrieved from https://www.gfi.org/files/sustainability_cultivated_meat.pdf