

Producing Food Products from Cultured Animal Tissues



There are [many questions](#) that need to be addressed before cell cultivated meat is ready for the dinner table.

- The nutritional composition and sensory characteristics of cell cultivated meat will need to undergo appropriate scientific investigation to determine the true similarities or differences when compared with conventional meat.
- A framework for the [regulatory oversight](#) of these products has been outlined, but as the technology improves, cell cultivated meat products may be developed that will, in turn, raise new questions to be answered with regulatory policy.
- The success of cell cultivated meat products will depend on consumer acceptability.

In order to [survive and grow both within and outside](#) of the body, cells need a water-based environment with a supply of nutrients and growth factors needed for various cellular processes and have metabolic waste products removed from the growth environment.

- The basic cultivating process of cell cultivated meat products will likely include cell line development, cell cultivation, and tissue cultivation.
- [Tissue structuring](#), also called tissue engineering or tissue synthesis, embeds cells within a three-dimensional scaffold, which simulates connective tissue.

[Cell line development](#), or cell line engineering, begins with extracting individual cells from a tissue biopsy of an animal.

- [Cells used for cultivation](#) of cell cultivated meat can be derived from various kinds of stem or precursor cells found in animal embryos, bone marrow, or muscle tissue.
- The [three dominant cell types](#) that influence meat flavor and texture are skeletal muscle cells, intramuscular fat cells, and connective tissue cells called fibroblasts.
- Skeletal muscle and fat cells can be incorporated into both [unstructured and structured products](#).

The [goal of cell cultivation](#) is to yield a large biomass of edible cells originating from a master cell bank of upwards of thousands of kilograms expanded from a working cell bank.

- [Scaling up of cell cultivation](#) has several technology hurdles, including lowering the cost of media, developing cell lines that can be propagated indefinitely and possess specific palatable and nutritional characteristics; establishing scalable bioprocesses, reducing the operational costs of large-scale biomanufacturing facilities, and disposal, recycling or amelioration of waste products.

The development of cell cultivated meat as a potential human food has resulted in considerable debate about how such materials would be [regulated](#) in the United States.

- Both the FDA and USDA-FSIS have entered into a [Memorandum of Understanding](#) that stipulates that the FDA will oversee cell collection and propagation up to harvesting as cell cultivated meat, at which point USDA-FSIS becomes the responsible agency.
- There is the expectation that the [USDA will require an inspection](#) system that includes sanitation, physical product inspection, HACCP verification, product testing, and records review, as well as prior label approval before a product may be distributed in interstate commerce.
- “Cultivated meat”, “clean meat”, “cultured meat”, “lab meat”, “fake meat”, “cell cultivated meat”, and “in vitro meat” are all [terms currently being used](#) to describe meat produced through cell culture technology.
- In accordance with the FDA and the USDA policies, all foods for human consumption must be evaluated for potential [biological, chemical, and physical hazards](#).

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