

Creating Food from Cells – Sustainable Future Food



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In this project, we aim to develop a cell-cultured food production system to produce edible tissues by cultivating cells—i.e., the smallest components of plants and animals. We will build a circulating cell culture system capable of amplifying animal cells using algae. These algae can be amplified through light energy as a nutrient source and can recycle the waste liquid generated in the culture process. By 2050, we aim to achieve both a sustainable food supply and global environmental conservation through the widespread use of a fully resource-circulating cultured food production system that thoroughly utilizes cellular functions. This achievement should contribute to the realization of a healthy and sustainable future food supply, as well as assist food production in outer space.

Bio-economical food production system using circular cell culture of algae and animal cells

Keywords: Circular cell culture, Cellular agriculture, Microalgae, Photosynthesis, Cultured meat, Tissue engineering

Background

Practical application of cultured meat requires sustainable culture media production and efficient reuse of the waste liquid.

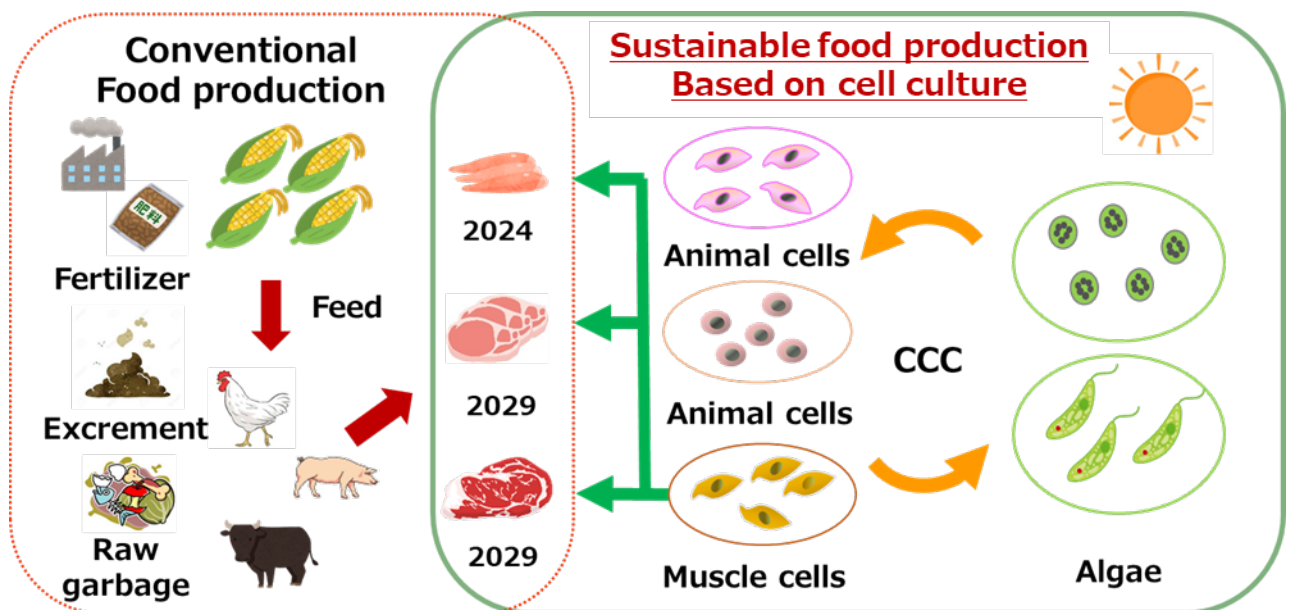
Current food production systems, which use parts of individual animals and plants such as grains and livestock, result in development of considerable environmental load and the accumulation of large amounts of waste. In recent years, cultured meat, which is produced by culturing cells of edible parts, has attracted global attention and is being actively developed. However, components of the culture medium used for cell cultivation are derived from grains and livestock, which is consequently responsible for the high cost and environmental load. In addition, it is necessary to implement measures to deal with the large amount of waste culture fluid that will be generated as the consumption of cultured meat becomes widespread in the future.

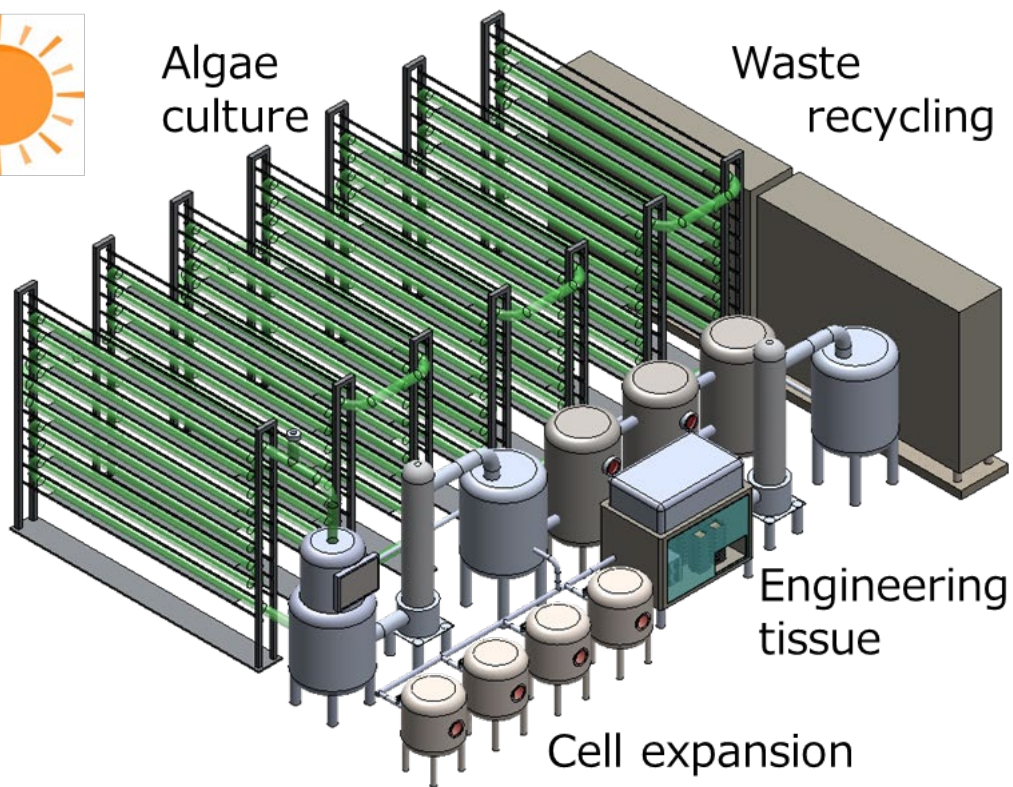
Research Contents

A high-efficiency, low-environmental-impact circular cell culture system

In this project, we aim to develop a high-efficiency, low-environmental-impact circular cell culture (CCC) system, which is based on animal cell culture using nutrients extracted from algae, and to establish a 3D tissue engineering system that produces only edible tissues from amplified animal cells.

CCC is a technology that combines cell culture engineering, catalytic chemistry, and genetic engineering to achieve cell expansion using alga-derived nutrients and culture waste recycling. The CCC system can dramatically reduce waste and environmental load when compared with conventional cultured food production technologies. The food will be fabricated with the 3D tissue engineering system originally developed in Japan. By integrating the two systems, we aim to successfully develop a bio-economical cell-based food production system.





Bio-economical cultured food production system (2030)

Targets by 2030

By 2030, we will develop the prototype of a cultured meat production system using a CCC system that has a lower environmental impact than the existing food production system, i.e., grain-fed livestock.

Cooperating Research Institutes

Tokyo Women's Medical University / Kobe University / Tokyo Institute of Technology / Waseda University / Osaka University / IntegriCulture Inc./ABLE Corp.



Moonshot Research and Development Program for agriculture, forestry and fisheries [Project Overview]