WHITE PAPER

Cultured Meat Metabolomics

Cultured meats, also known as cell-based meats or lab-grown meats, are made by culturing animal cells in a bioreactor and then using them to grow muscle tissue, which can then be harvested and processed into meat products. This process can potentially offer a more sustainable and ethical alternative to traditional meat production methods. This technology is still in the early stages of development, but there has been a growing interest in cultured meats in recent years.

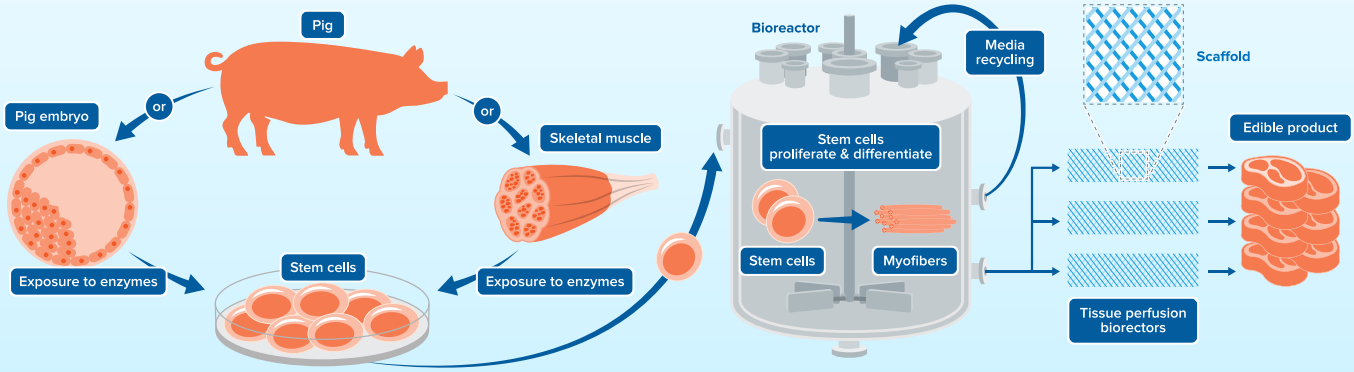
There are numerous factors that have led to the recent interest in cultured meats. These include:

- **Environmental sustainability: Cultured meats have the potential to be much more sustainable than traditional meat production, which is a significant contributor to greenhouse gas emissions, deforestation, and water pollution. Cultured meats could potentially reduce the environmental impact of meat production while still providing a source of protein.**

- **Animal welfare: There are significant concerns regarding the welfare of animals in traditional meat production, which often involves raising animals in confined spaces and subjecting them to stressful and painful conditions. Cultured meats, which are produced using animal cells without the need for slaughtering an entire animal, offer a more humane alternative.**

- **Health: Cultured meats can be produced without the use of antibiotics or growth hormones, which are commonly used in traditional meat production. Additionally, because cultured meats are produced in a controlled environment, they can be free from contaminants such as E. coli and Salmonella.**

Research into cultured meats has focused primarily on chicken and beef, as these are two of the most commonly consumed meats across the globe. However, there has also been some exploration of cultured meats from other animal species, including pork, seafood (both fish and shellfish), and “exotic” meats such as kangaroo, ostrich and alligator.



This technology has the potential to reduce the ethical concerns of animal welfare, while providing a consistent and sustainable supply of meat products without the fluctuations and uncertainties associated with traditional livestock production, the development and commercialization of cultured meat still face several challenges, including scaling of production, reduction of costs, and ensuring regulatory approval and consumer acceptance. Despite these challenges, the potential benefits of cultured meat have attracted significant investment and interest from both the private and public sectors.

When attempting to optimize the growth of cultured meats, there are numerous key variables that researchers must address:

- **Cell source: The first step in growing cultured meat is to obtain a sample of animal cells. These cells can come from a variety of sources, including muscle tissue, skin, and fat. The choice of cell source can impact the growth characteristics as well as the taste, texture, and nutritional content of the final product.**

- **Culture medium: Once the cells have been obtained, they are placed in a nutrient-rich culture medium that provides the cells with the necessary factors to grow and multiply. The composition of the culture medium can impact the growth rate as well as the quality of the cells and the nutritional content of the final product.**

- **Scaffold material: In some cases, the cells are grown on a scaffold material that provides support and structure. The choice of scaffold material and scaffold design can impact the texture and structure of the final product.**

- **Bioreactor conditions: The cells are typically grown in a bioreactor, which is a specialized vessel that provides a controlled environment for cell growth. The conditions inside the bioreactor, such as temperature, oxygen levels, and pH, will impact the growth rate and quality of the cells, as well as the efficiency in which the cells expand.**

- **Post-processing: After the cells have grown to the desired size and texture, the cultured meat must be processed to create a final product that is similar in appearance and taste to traditional meat. This can involve a variety of techniques, such as shaping, seasoning, and cooking.**

Over the past 20 years, the use of metabolomics has become increasingly popular in studying animal and plant nutrition, physiology, environment, and post-harvest storage and processing. Metabolomics is able to analyze animal and plant metabolites, including both hydrophilic and hydrophobic compounds that are low in molecular weight. These molecules include important flavor, nutrient, and functionality-associated compounds that characterize the sensory and nutritional properties of food. By analyzing the metabolome of a food, researchers can gain valuable insights into the biologically and agriculturally significant information found in the global metabolome profiles and the changes caused by various factors in food production processes. With its high-throughput capacity, metabolomics is a powerful tool for obtaining a deeper understanding of these important food-related factors.

In the context of cultured meat development, biomarkers can be used to monitor the metabolic activity of the cells and optimize culture conditions. For example, researchers utilize metabolomic analysis to track the levels of specific metabolites, such as amino acids, carbohydrates, and lipids, which are important for cell growth and development. Metabolomic analysis can also be used to assess the nutritional content and quality of cultured meat products. By analyzing the metabolites present in the final product, researchers determine the levels of specific nutrients, such as fats, proteins, organic acids, and minerals, and assess the overall nutritional value of the meat. By analyzing the correlation between sensory evaluation scores and metabolomic profiles, researchers can identify key compounds associated with eating quality, such as flavor and texture. This information can help predict the palatability of foods by using biomarker metabolites in pre- and post-harvest materials. Overall, metabolomic biomarkers are a powerful tool in the development of cultured meat, as they can provide valuable insights into the metabolic activity of cells and tissues and help optimize culture conditions for the production of high-quality, nutritious, and safe meat products.

Metabolomics provides a powerful tool to identify biomarkers of meat quality, growth efficiency, and nutritional content. Panome Bio can help you design and execute on your Next-Generation Metabolomics study.

Panome Bio™ - Biomarker Discovery with Next-Generation Metabolomics™

Panome Bio can help you profile and discover biomarkers with Next-Generation Metabolomics while saving time and resources. Our next-generation methods can take your research beyond A versus B studies and into more complex experiments such as large cohort studies and longitudinal analysis. Our technology provides you with a global and unbiased view of metabolism with quantitative accuracy while our computational methods provide a clear view of your complex metabolomics data. Contact us to start a project!

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