

PLANT-BASED AND ANIMAL CELL-BASED APPROACHES FOR PRODUCTION OF MEAT

Group 1

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Why Alternative Meats?



Plant-based Meat

Rising Meat Demand: Meat demand projected to reach 455M metric tons by 2050.

Concerns with Traditional Meat Production:

- **Environment:** Greenhouse gas emissions, land and water use.
- **Health:** Zoonotic diseases (e.g., Nipah virus, influenza), antibiotic resistance.
- **Ethics:** Billions of animals suffer from industrial farming.

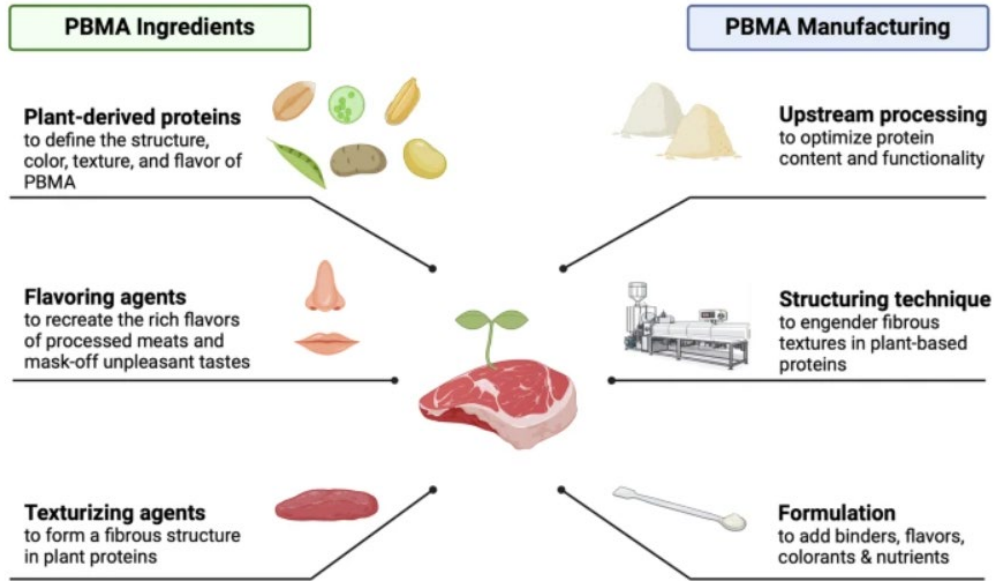
← Emerging Solutions →



Animal Cell-based Meat

(Rubio et al., 2020)

Plant-based meat analogs (PBMA)



PBMAs

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- Made mostly of legumes, soybeans, wheat, and lentils, they use **protein reforming methods** like extrusion, shear cells, and three-dimensional (3D) printing to replicate the fibrous feel of meat.
- It is considered **healthier** and **more eco-friendly**
- **Sustainable alternative** to traditional meat with less environmental waste produce

Plant-based Meat Ingredients

- PBMA's utilize the biochemical likeness between plants and animals, with proteins (20–50%), polysaccharides (2–30%), and lipids (0–5%) serving as the main raw ingredients
- **Protein** sources (prominently soy and pea), **Polysaccharide** sources (potato, wheat, cassava, pea, maize, and rice), **Fat** sources (coconut, sunflower, avocado oil)
- The components are crucial for the texture, color, flavor, and nutritional value

Challenges/Opportunities

- **Taste** - enhancing the plant-based proteins can improve flavor (important in marketing of products)
- **Nutritional profile** - addressing antinutritional factors (tannins, phenols, saponins) can enhance nutritional profile of PBMA's; lacks essential amino acids and micronutrients; highly processed foods
- **Production Cost** - the production cost of PBMA's is higher compared to traditional meats hence it is costly

Nutritional Qualities

- Compared to meat products, PBMA products have **higher dietary fiber, less calories, and less total and saturated fat**
- May **exceed salt content** due to processing and **lacks essential micronutrients** such as iron, zinc, and vitamin B12 (though fortification can be done)

(Jang & Lee, 2024)

<https://foodmeetsscience.com/2024/08/07/plant-based-meat/>



Animal cell-based meat

Overview about lab culture meat

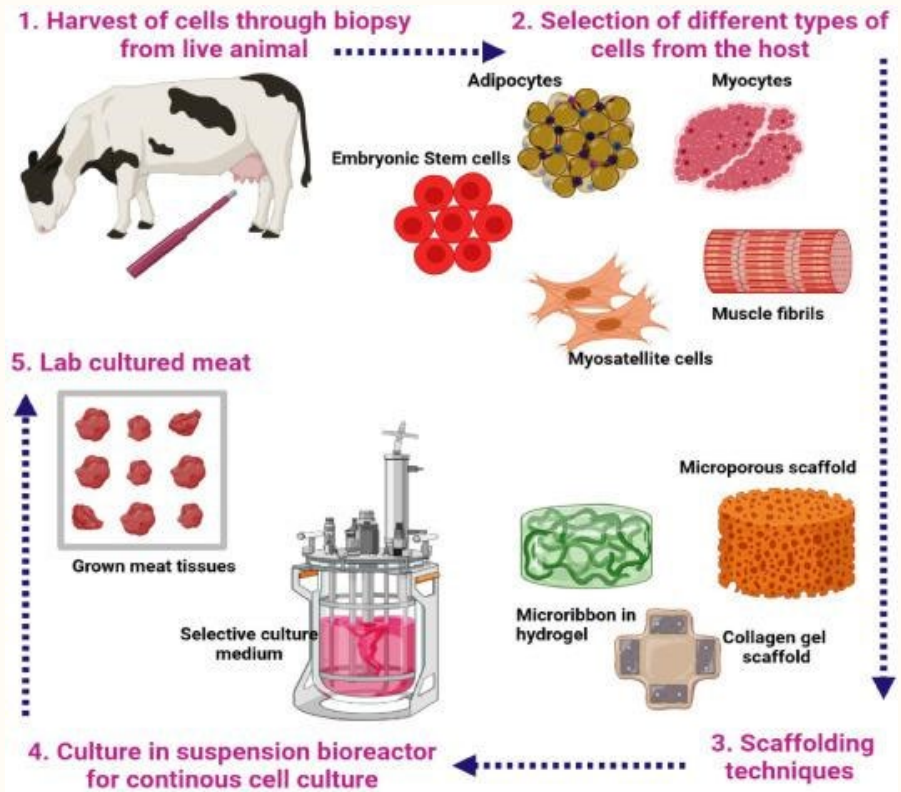
Meat produced in a laboratory setting using **animal stem cells** without the need for animal slaughter.

Production process

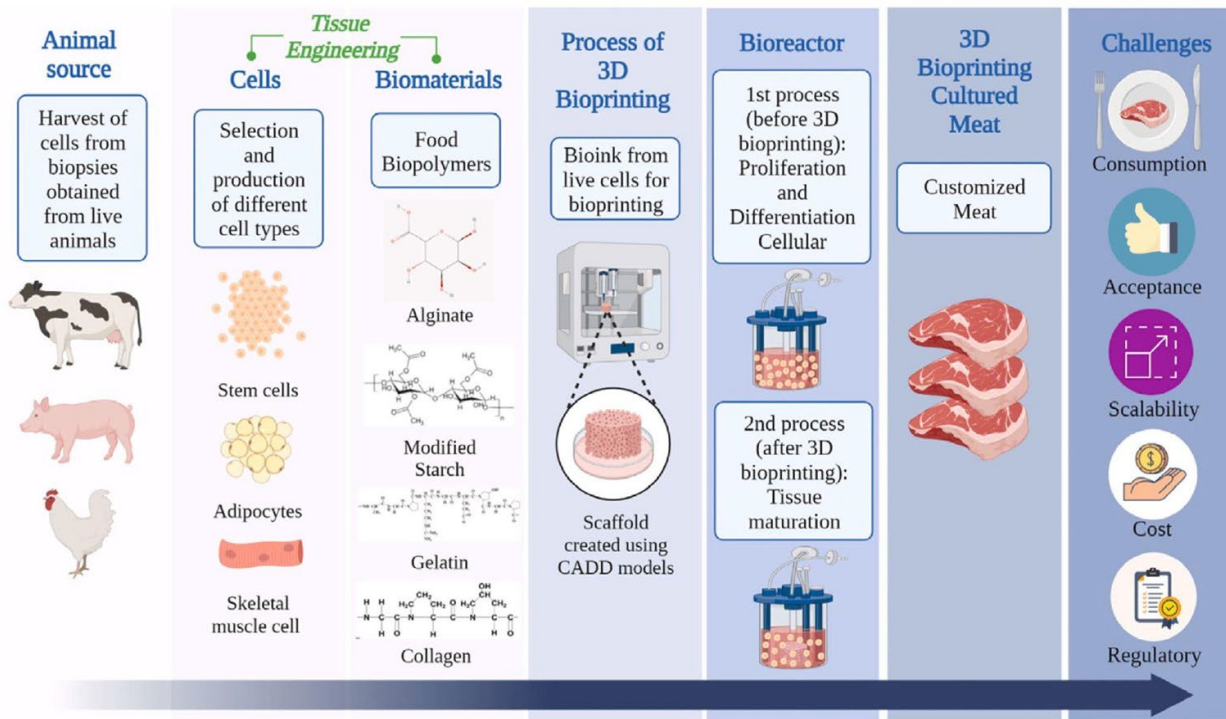
1. Choose cell types
2. Cultured in certain culture medium
3. Tissue engineering-scaffolding
4. Bioreactor-scale up
5. Stimulation-promote protein production
6. Culture meat harvest

Advantages

- **Environmental Benefits:** Culture meat production reduced land use, lower greenhouse gas emissions compared to traditional livestock farming.
- **Animal Welfare:** This method eliminates the need for animal slaughter, promoting ethical treatment of animals.
- **Food Safety:** Cultured meat is produced in sterile conditions, minimizing contamination risks and pathogen exposure.



Animal cell-based meat



Current and Future Challenges

The limitation of production:

Achieving the same taste and texture as traditional meat remains a significant barrier, particularly in **large-scale** production.

The cost of production:

The **high production costs** currently limit commercial viability and market acceptance.

The regulation of culture meat:

Clear and comprehensive **guidelines and standards** are needed to address safety.

Consumer acceptance and perception:

Public perception of lab-grown meat can be skeptical; **education and marketing efforts** are needed to increase acceptance.

Conclusion

How They Work Together:

- Plant-based Meat: Sustainable and widely available.
- Animal Cell-based Meat: Real meat taste and texture.
- Combined, they can provide better solutions for consumers.

Call To Action:

- Collaboration between researchers, companies, and governments.
- Make these technologies more affordable and accessible.
- Support sustainable and ethical innovations for a better future.



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Thank You

