“PureBite”

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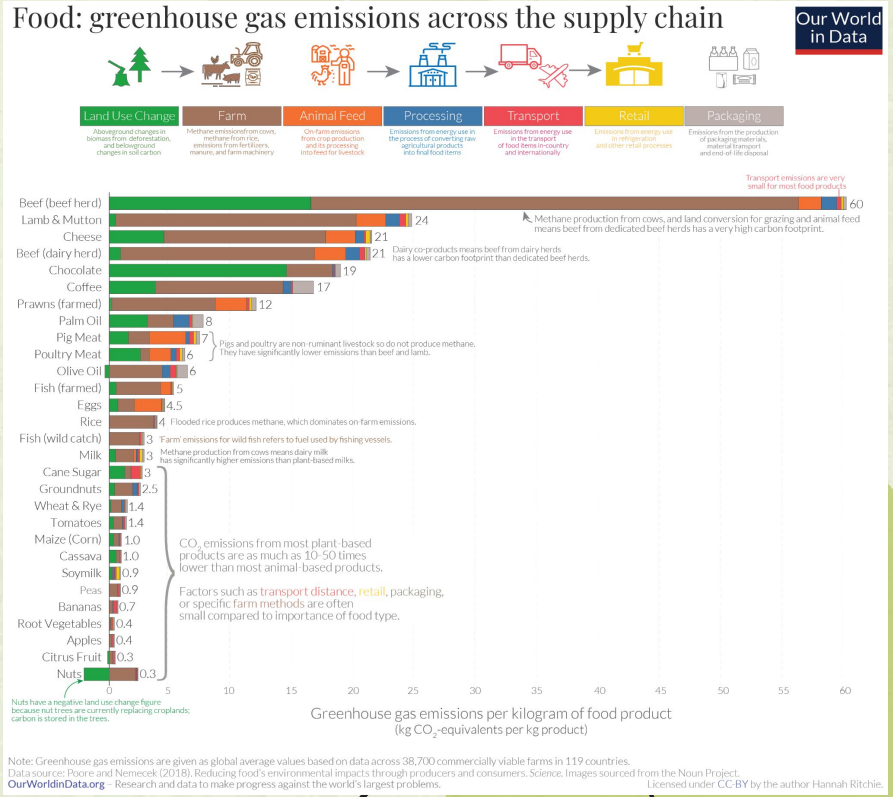
Introduction

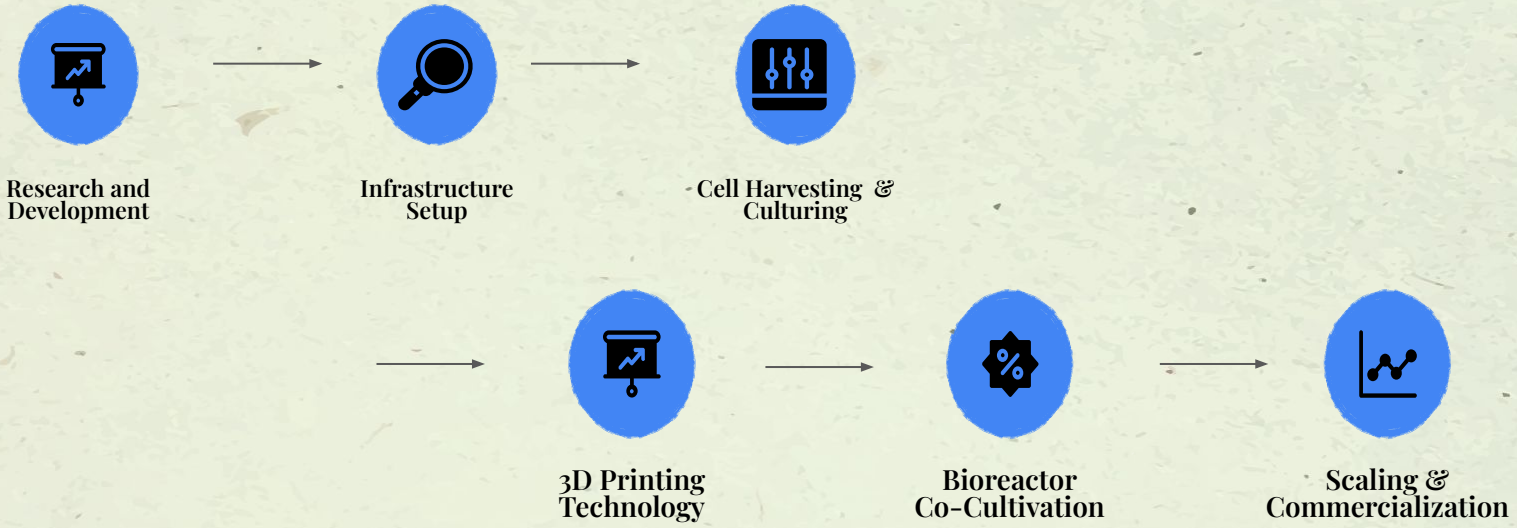
- Target : Generation Z, Environmentalists, and Animal advocate Vegans

- Beef
  - Efficient in minimizing greenhouse gas emissions as it is the largest source
  - Easier price gap reduction



Overview

Muscle and fat cells are grown separately and then combined through a stitching process to replicate the texture, taste, and appearance of conventional beef



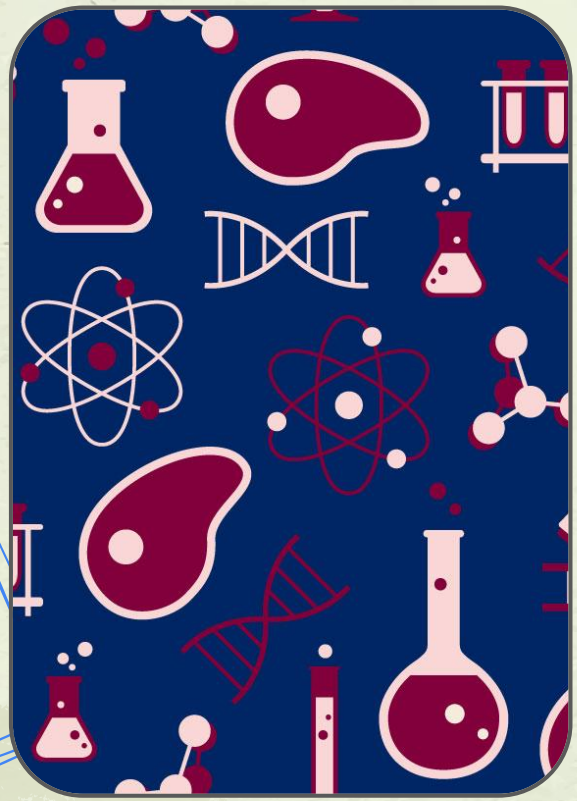
Name & Design of the Product

- “PureBite”
- Designed similar to conventional beef with marbling

Conventional beef

Lab grown meat

Tofu meat

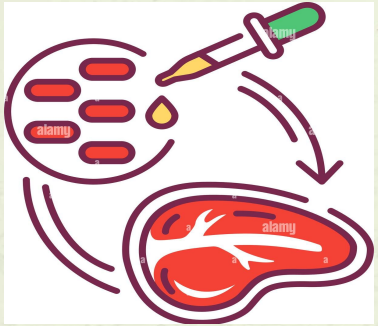


02

Biological method

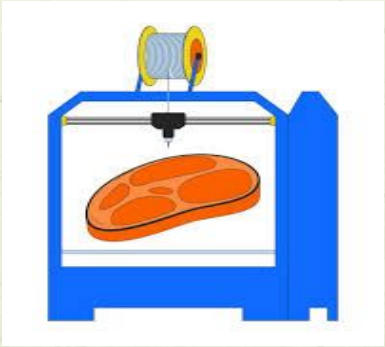
Biological steps

Cell harvesting & Culturing



- **Muscle cells**
  - Muscle satellite cells
  - Cultured on a specialized **scaffold** (alginate hydrogel)
- **Fat cells**
  - ‘Mesenchyme cells’
  - Cultured using scaffolding technique for its growth

3D Printing of Tissues

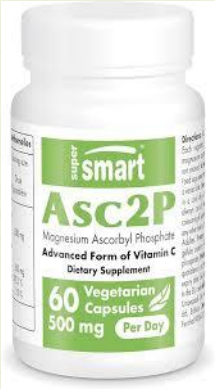


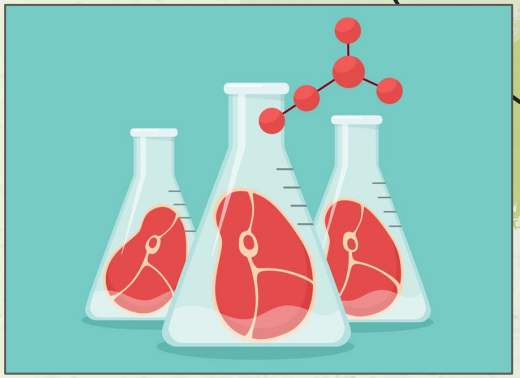
- Matured muscle and fat cells formed into define shapes using **3D bioprinting**
- Enhance taste and texture in final meat product

Bioreactor Co-Cultivation

- 3D printed tissues matured in **bioreactors** to enhance tissue
- Apply essential vitamins & targeted genetic modifications
- Replicate **Marbling texture** of traditional beef

Nutrient / Preservative





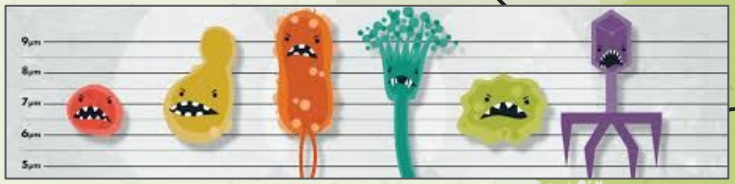
- **Nutrients**
  - Asc-2P
    - Helps cell proliferation and improve muscle cell differentiation capabilities
    - acts as an antioxidant by supporting the cellular environment and enhancing the overall growth of the cultured cells

- **Preservatives**
  - Antibiotics (Penicillin-Streptomycin)
    - Used to prevent bacterial contamination within the culture media.

Cultured Meat: Taste, Texture, and Nutritional Composition

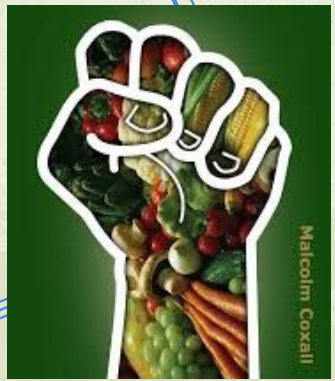
- **Nutritional Composition**
  - Protein Content
    - 26g per 100g
  - Ratio of fats:proteins
    - 1 : 2 (U.S. Prime Beef)
    - 10-13g fat
- **Taste**
  - Mimic the traditional beef
  - Impacted by the choice of cells, scaffolding materials, and cultivation methods for the desired flavor profile and nutritional values
- **Texture**
  - Combines muscle and fat cells to replicate the marbling of traditional beef.
  - match chewiness and springiness of conventional meat

Using ‘Sericin’ serum for FBS replacement’



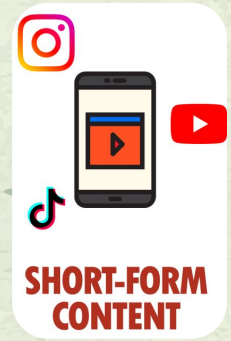
- **Reducing contamination**
  - Lower risks of contamination inherent to animal-derived products like FBS
  - Offers more consistent and controlled supplement free from animal-derived pathogens

- **Potential Drawbacks & Ethical considerations**
  - Alleviates ethical concerns linked with the use of animal serum
  - Maintains cell culture efficiency without compromising scientific integrity.



03
Marketing & Advertising

Ways to enhance public perception on lab grown meat



Social media targeting generation Z

- Short form videos through instagram, youtube, tiktok
- Influencers' reviews
    - Targets generation Z who are more likely to be consumer of our product than generation Y as they consider lab grown meat more healthier, less concerned about consequences of consuming it.

Packaging

- Includes FDA & safety approval signs and explanation ensuring the safety use of cultured meat

Approaching Controversy & Ethics

- **Animal Welfare**
  - While lab based meat production eliminates the need for raising animals, there may still be ethical concerns related to the sourcing of cells from living animals.
  - Implement strict guidelines for obtaining cells from animals to ensure that the process is conducted ethically without causing harm or suffering to the animal.
- **Health and Safety**
  - Consumers may have concerns about the substances in the production process and their potential impact on human health and food safety.
  - Provide clear and transparent labeling on our products to inform consumers about the sourcing and production process.
  - Work closely with regulatory agencies to comply with food safety regulations.

Patent Restraints

- **Current Patent (US 6,835,390 B1)**

- Meat grow in bioreactor to produce greater volume

- **Our Originality**

- Utilizing 3D bioprint and scaffolding together
- Cultivated fat and muscle tissue used as a bioink to build integrated meat and co-cultivated in the bioreactor
- More natural shape and composition than current lab grown meat.

Environmental Impact & Emission Control

- **Utilize Renewable Energy**
  - Emphasize the use of solar and wind power to reduce carbon emissions during production processes.
- **Greenhouse Gas Reduction**
  - Beef has the highest amount of greenhouse gas emissions across the supply chain. By processing lab based meat, we will be able to reduce greenhouse gases such as methane.
- **Waste Management Optimization**
  - Implement effective waste management strategies to minimize organic waste generated throughout the production process.

04
Timeline & Budget

Timeline

Until 2026
Building construction, Research & Develop

Get **FDA Approval**

Start selling

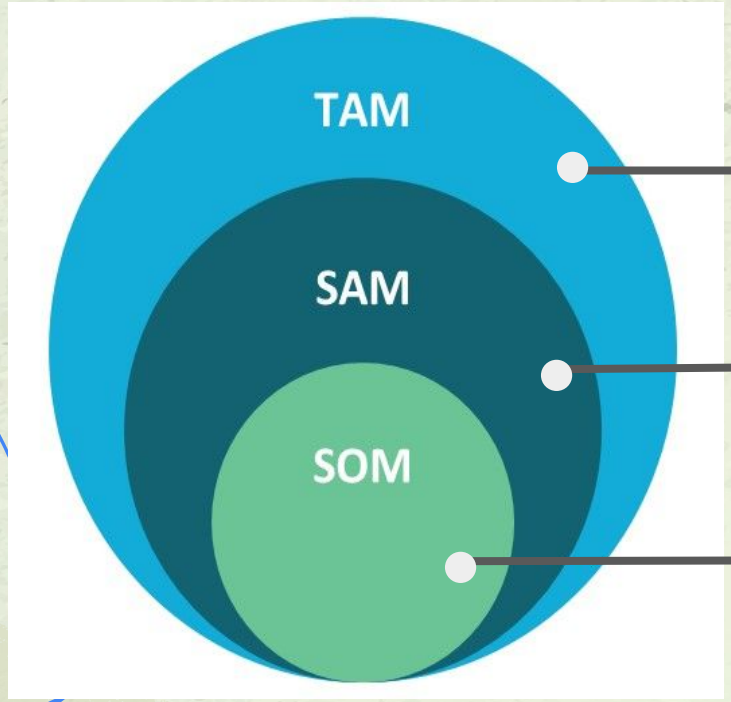
Media Marketing
to reach 5% of the market

2027
Reach 20% of cultivated meat consumption

2028
Reach Break Even

2029~
Continue get profit

Market Estimation



Total meat market
(1,481 billion)

Total soy + lab grown meat
(31.5 billion)

Estimated market share
(3.1 billion)

How will we split up the $5 billion?

Category	Amount	Description
R&D	$ 1 Billion	Development of bioinks and scaffold materials. Optimization of 3D printing technologies for tissue engineering. Studies on cell lines selection and genetic stability.
Infrastructure Setup	$ 1.5 Billion	Construction of production facilities equipped with advanced 3D printers and bioreactors. Setting up laboratory spaces for cell culture and scaffold manufacturing.
3D printing Tech and equipment	$ 1 Billion	Establishment of cell banks for muscle and fat cells. Development and production of biodegradable scaffolds tailored for different meat types.
Cell line and Scaffold Production	$ 1 Billion	Investment in state-of-the-art 3D printing machines capable of handling biological materials. Maintenance, upgrades, and scaling of printing technologies.
Scaling and Commercialization	$ 0.5 Billion	Scaling the production from pilot to commercial levels. Meeting regulatory requirements and obtaining necessary certifications for market entry.

Cost of Product per Kg

Material	**Cost ($/Kg)**
Serum (sericin)	0.266
Scaffolding (alginate hydrogel)	0.361
Amino acid	3.9
Triglyceride	1.8
Cost in Human labor	2.5
Maintenance	1.8
Distribution	0.6
Semi total	11.227
Profit	25
Total	$36.227

Estimated Market Price

- **Cost of Product:** $36.23

- **How much will we produce?**
  - 250 Million Kg per year

- **How much of this do you expect to sell?**
  - 200 Million Kg per year

Estimated Profit

- **Profit** : $25
- **Expenses** : $11.3
- **Revenues**: 3.1Billion (2027)
- **Estimate for when we will break-even point**: around 2028

References

- Hannah Ritchie (2020) - “You want to reduce the carbon footprint of your food? Focus on what you eat, not whether your food is local” Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/food-choice-vs-eating-local'
- Kadim, I. T., Mahgoub, O., Baqir, S., Faye, B., & Purchas, R. (2015). Cultured meat from muscle stem cells: A review of challenges and prospects. *Journal of Integrative Agriculture*, *14*(2), 222–233. https://doi.org/10.1016/S2095-3119(14)60881-9
- Myers, G. M., Jaros, K. A., Andersen, D. S., & Raman, D. R. (2023). Nutrient recovery in cultured meat systems: Impacts on cost and sustainability metrics. *Frontiers in Nutrition*, *10*. https://doi.org/10.3389/fnut.2023.1151801
- Pilařová, L., Balcarová, T., Pilař, L., Kvasničková Stanislavská, L., Rosak-Szyrocka, J., Pitrová, J., Moulis, P., & Kvasnička, R. (2023). Exploring Ethical, Ecological, and Health Factors Influencing the Acceptance of Cultured Meat among Generation Y and Generation Z. *Nutrients*, *15*(13), 2935. https://doi.org/10.3390/nu15132935
- Pilařová L, Kvasničková Stanislavská L, Pilař L, Balcarová T, Pitrová J. Cultured Meat on the Social Network Twitter: Clean, Future and Sustainable Meats. Foods. 2022 Sep 3;11(17):2695. doi: 10.3390/foods11172695. PMID: 36076879; PMCID: PMC9455233.
- Subbiahanadar Chelladurai, K., Selvan Christyraj, J. D., Rajagopalan, K., Yesudhason, B. V., Venkatachalam, S., Mohan, M., Chellathurai Vasantha, N., & Selvan Christyraj, J. R. S. (2021). Alternative to FBS in animal cell culture - An overview and future perspective. *Heliyon*, *7*(8), e07686. https://doi.org/10.1016/j.heliyon.2021.e07686

Thank you!