

Development of a scalable, food-grade, animal-free growth media for cultivated meat



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Priority Topic Area: Food, Health and Well-being

1 – Aims: This project aims to develop a serum-free cell culture medium for cultivated meat using food grade inputs

Cultivated Meat: It's real meat, but it's made without harming animals.

Benefits [1]:

- **Environment:** Produces fewer greenhouse gases, uses less land and water.
- **Health:** Reduces antibiotic use and risk of zoonotic disease

Challenge: The growth media (food for cells) is costly and not food-safe.

Solution: Shift to a cheaper, safe, and effective culture medium using food-based ingredients.

In summary, cultivated meat offers a sustainable and ethical alternative to traditional meat production. But we need to reduce media costs to make the price comparable to conventional meat...

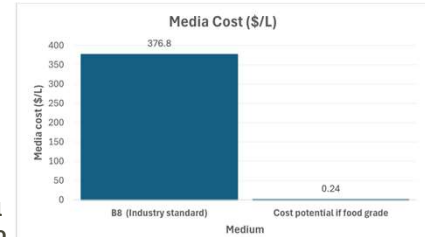
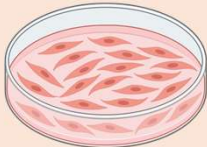
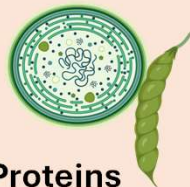


Figure 1: Comparison of culture media cost using pharmaceutical grade ingredients vs the cost potential if using food grade inputs [2]

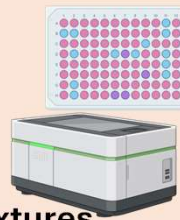
2 – Methodology: Cells, Proteins and Mixtures



Cells



Proteins



Mixtures

The methodology for this project is structured around three main studies...

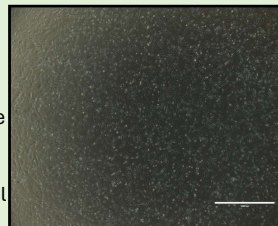
- 1. Cells:** Validation of a cell line suitable for cultivated meat that can be cultured to high cell numbers and then differentiate into mature muscle. Through cell growth and differentiation assays.
- 2. Proteins:** Processing and testing of food proteins as a like for like replacement of serum and other pharmaceutical ingredients
- 3. Mixtures:** Using high throughput screening methods and statistical models to find the optimal formulations of ingredients to go in the culture media

3 – Outputs

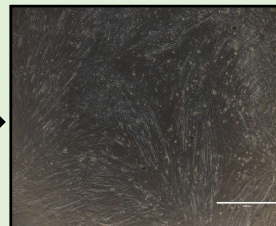
1. Cells

The cells used act as muscle stem cells.

- I observed how they grew then transformed into mature muscle tissue.
- This validation confirms that these cells have the essential qualities needed for cultivated meat production.



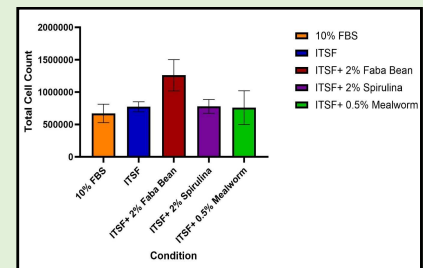
Small, rounded, random orientation



Elongated, fibrous, organised

2. Proteins

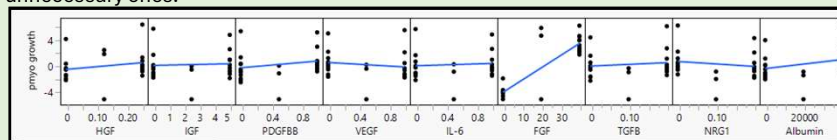
I discovered ways to add food protein powders to cell growth media. Specifically, I found that **spirulina** and **faba bean** protein effectively support cell growth in serum-free media.



3. Mixtures

Using a method called **Design of Experiments**, I identified the most critical factors for cell growth.

Then, I created a cell culture media that includes only those essential factors, leaving out any unnecessary ones.



4 – Reducing bottlenecks to revolutionise our food system

By using the sustainable growth media ingredients and formulations developed here the cultivated meat industry can achieve the **cost-effectiveness** and **scale** necessary to make it a more sustainable protein choice for the world.

5 – Next steps

With two years left on this project I aim to ...

- Discover more protein ingredients like the spirulina and faba bean
- Continually improve mixtures and optimize performance
- Test the developed formulations ability to scale



References/Acknowledgements

- [1] The Good Food Institute: The science of cultivated meat
 [2] The Good Food Institute: Analyzing cell culture medium costs
 I'd like to thank my supervision team Petra Hanga, Gary Lye and Mike Sulu as well as my collaborators Paul Cameron, Georgie Hurst and Zara Dodhia

