



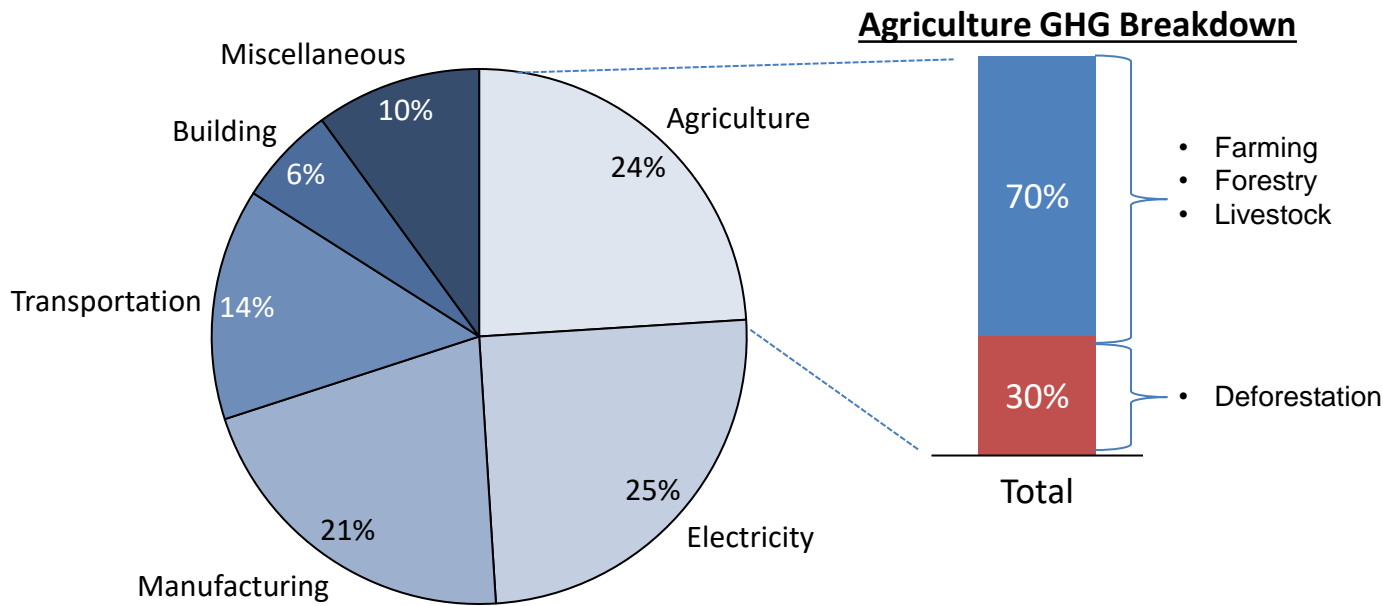
ATAL INCUBATION CENTRE
**CENTRE FOR CELLULAR
& MOLECULAR BIOLOGY**

NEAT MEATT

BIOTECH PVT. LTD

We only have one planet

Greenhouse Gas Emission Contributors %



Climate change caused damage worth ~ US\$210 B in 2020, with frequency of natural disasters driven by increase in GHG

Agricultural practices need to evolve

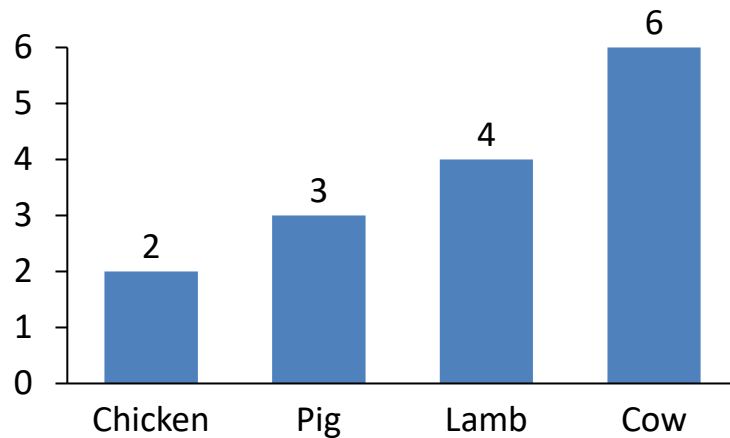
- **Agriculture** includes **forestry** and **livestock** and results in large release of Methane (CH4) which causes 28x more warming per molecule than Carbon dioxide (CO2)
- Livestock management for food is a major contributor of **Greenhouse Gas (GHG) emissions**
- **Ruminant animals** such as cow, sheep, goats, camel have compartmentalized stomachs enabling them to digest grass
- Through **enteric fermentation**, bacteria inside ruminant's stomach breaks down the cellulose, fermenting it and producing **methane**
- **Global Methane Pledge** is collective effort to reduce global methane emissions by at least 30% from 2020 by 2030, to eliminate over 0.2°C warming by 2050

Sustainable Development Goals

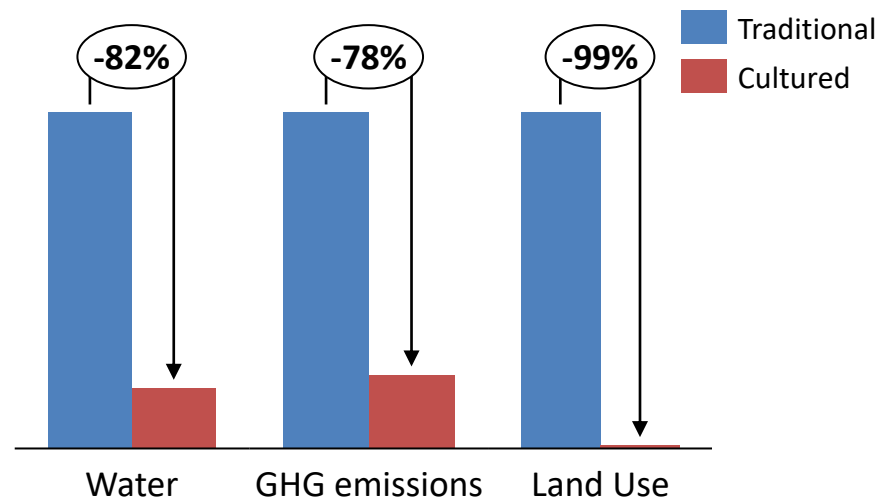


Traditional way to grow meat is inefficient and will continue to increase GHG emissions but cheaper currently..

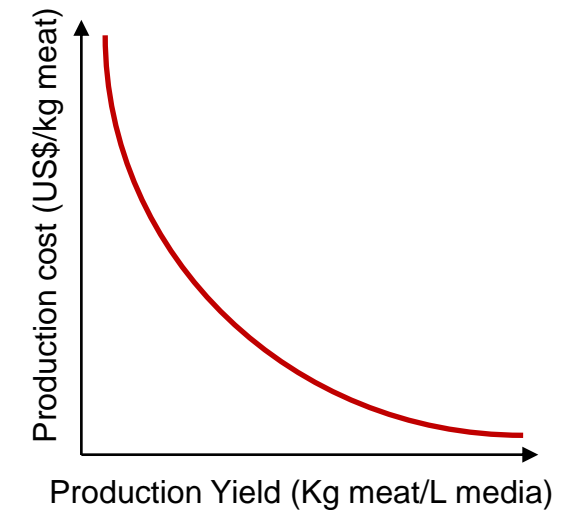
Calories of grain fed for 1 calories of product



Traditional Meat Versus Cultured Meat



Cultured meat ~ 10x more expensive



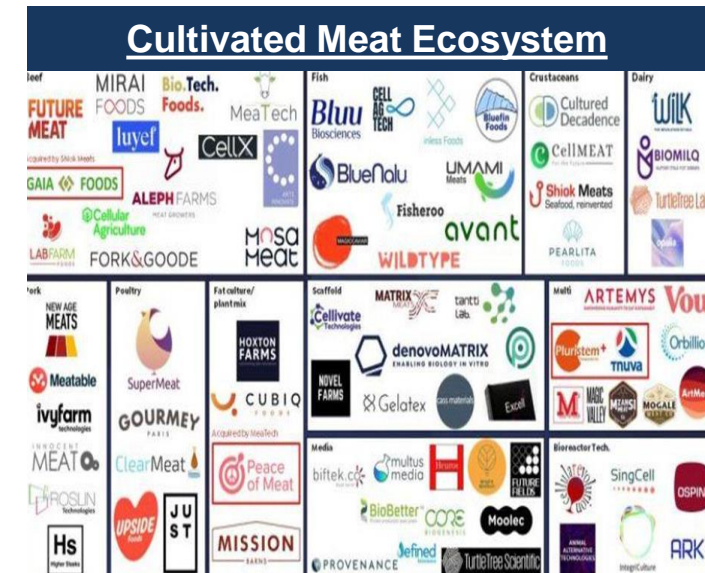
Neat Meat Focus

- Cultivated Meat is much more energy efficient, and less resource intensive s compared to standard meat culturing practices; however, the production technology is still very nascent, evolving and expensive
- Team is leveraging experience in vaccine development and using a multi-pronged approach to lower cost of goods across the value chain and develop an affordable and efficient cultivated meat production process
- Technology developed to be offered to manufacturers in other Low- and Middle-Income countries (LMICs)
- Our target is a 90% reduction to achieve price parity with traditional meat to ~ \$1.20/pound of meat

Cultivated Meat Offers Additional Benefits such as reduced Anti-Microbial resistance

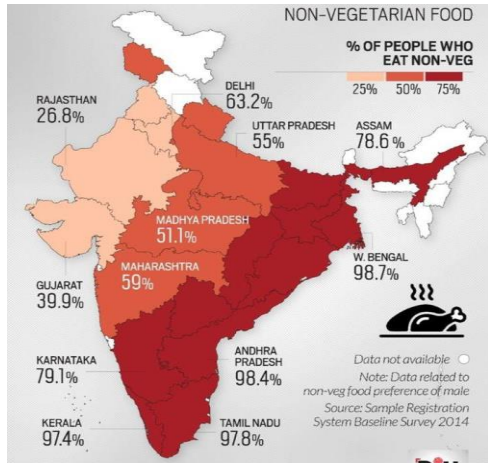
Commentary

- **No ethical concerns:** Animals are not killed or harmed in the process and cells are isolated from embryonated eggs, biopsies and then cultured in the labs
- **Sustainable and scientific approach to growing a protein source** – Reduced GHG emissions, zoonotic disease transmission and quality assured. Meat consumption has increased to 43kg per capita (2014), putting pressure on resources and contributing to GHG, with ~27% of arable land used to raise livestock. Recent spread of avian flu in Malaysia resulted in ban on poultry exports. Climate change adversely impacting crop yields and resulting in large producer such as India putting ban on wheat, rice exports
- **Antibiotic free** - Antibiotics such as streptomycin, oxytetracycline in livestock feed is used both for disease prevention and growth enhancement resulting in increasing anti-microbial resistance.
- **Unique Selling Proposition:** Novel concept, significant market opportunity, rising income levels, translates to increasing meat consumption. For e.g., India poultry market is estimated to be ~ INR 1700 Bn (2021), expected to grow ~ 10% YoY. Target a 10% of premium end of Indian poultry, addressable market size is INR 170 Bn. An ~ 25% share of health-conscious consumer ~ INR 43 Bn (INR 4200 crore)
- **Technology Monetization:** Out-license the mfr. technology to food manufacturing, consumer goods firms such as ITC, Godrej, Licious etc. in return for milestone and royalty payments. In short-term company evaluating options to out-license cell lines, media components and growth-factors which may develop during research and development

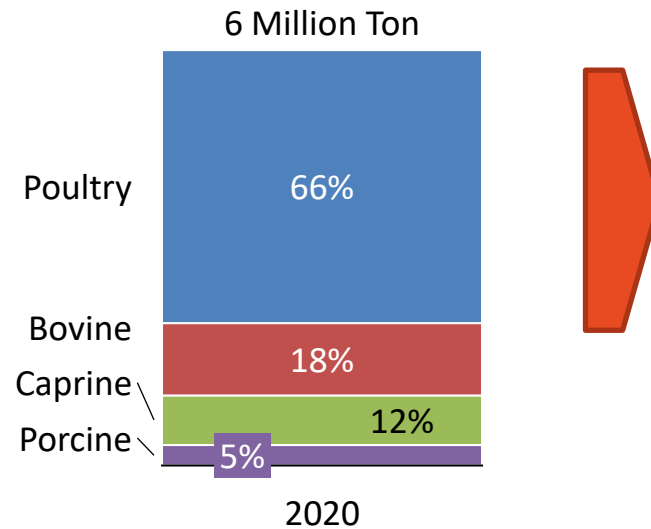


Cultured meat an approach to meet increasing domestic demand and opportunity to earn export revenues

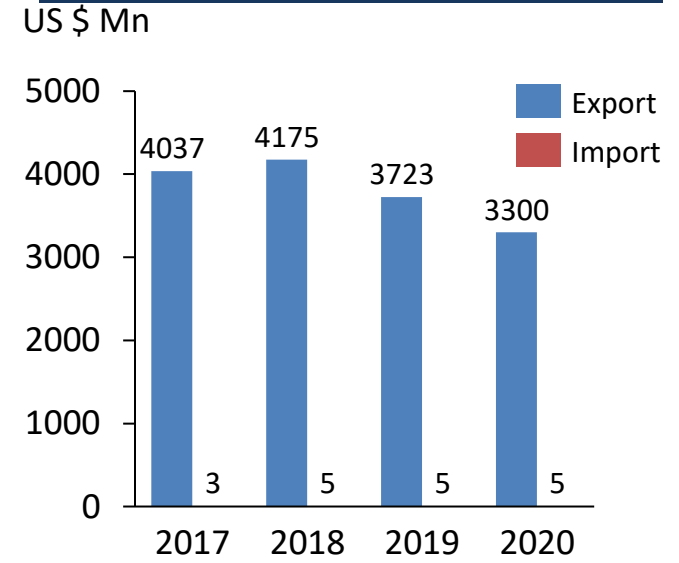
>70% Indian's Eat Non-Veg Food



India Meat Consumption (MT)



India' Meat Trade (US\$ Mn)



Commentary

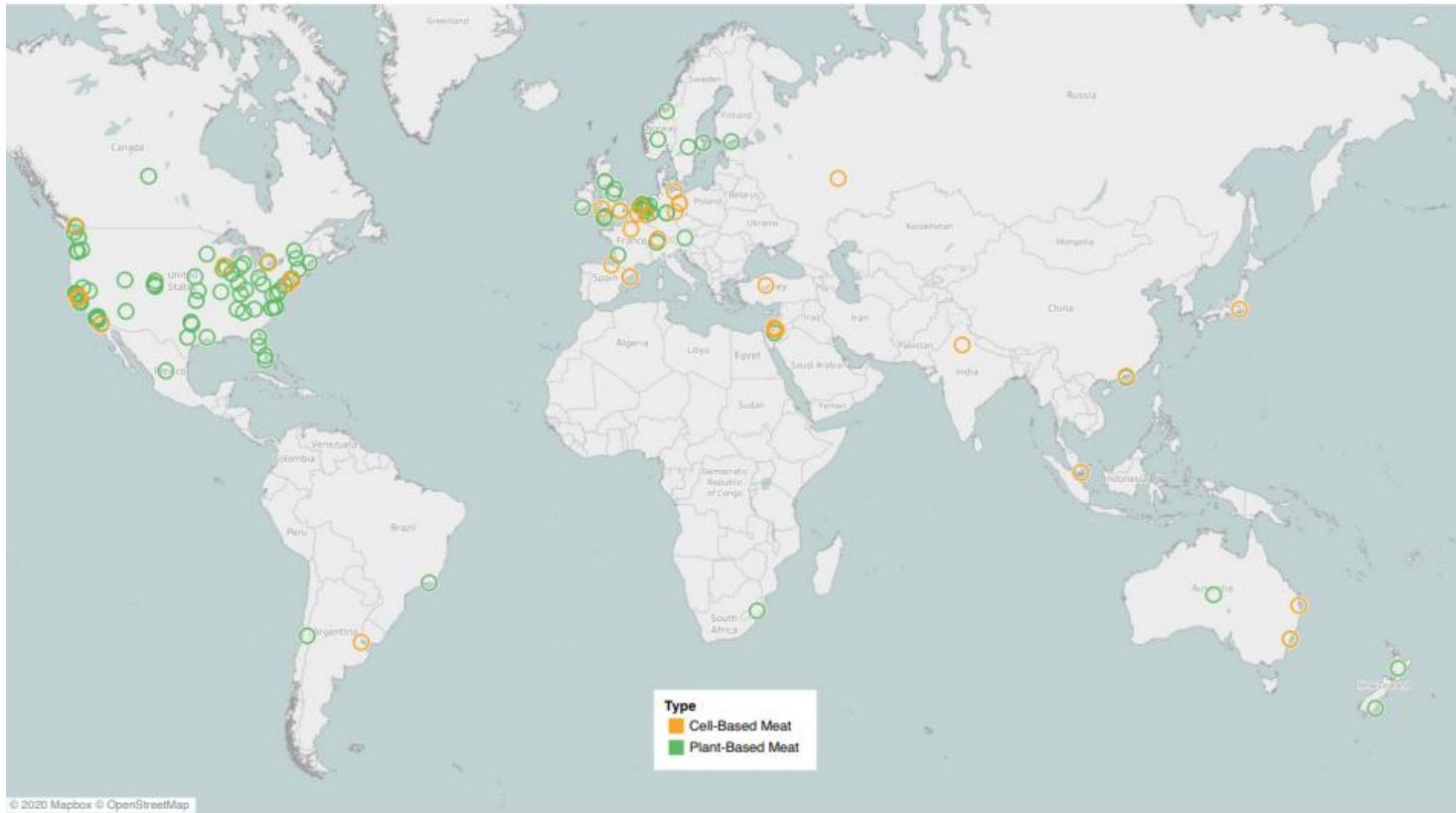
- ~ 70% of Indian's consume non-vegetarian food; with total meat consumption ~ 6 Million Tonnes in 2020 in India
- Poultry constitutes the largest component ~ 66% of overall meat consumption, followed by beef, goat, and pork
- Rising income would result in increased meat consumption and hence developing alternative protein sources as cultivated meat is important approach to meet rising demand, address sustainability challenges and mitigate climate change
- Cultivated meat can be exported to other countries in the future and increase India's overall exports
- In 2021, lab grown meat garnered US \$1.2Bn from investors. Future Meat raised US\$ 347M from Tyson and ADM. Just Eats Singapore based with chicken product on market raised US\$267M. Company to open a large-scale plant in Qatar. Upside California based producer opened US\$50M Engineering, Production, and Innovation Centre.

Source : 1. India Meat Consumption <https://www.indiatoday.in/diu/story/india-meat-map-people-relish-non-vegetarian-items-east-south-lead-way-1878313-2021-11-18>

2. Annual Report Ministry of Food Processing Industries India 2020-21 https://www.mofpi.gov.in/sites/default/files/mofpi_english_annual_report_final_0.pdf

Why India

Geographical distribution of plant-based and cell-based meat companies*



- For cell-based meat to achieve scale and make a difference in reducing GHG emissions, Low- and Middle-Income Countries (LMICs) need to be included
- Important for this initiative to be inclusive to have the desired impact
- Lower employee costs in LMICs is a key arbitrage cell-based meat companies would have

*Companies as per GFI company database (Aug 2020)

Early Days in Attempt to Establish Neat Meatt as an Innovative Cultured Meat Biotech Company

Vision

To be India's Leading Cultivated Meat Technology Solutions Company

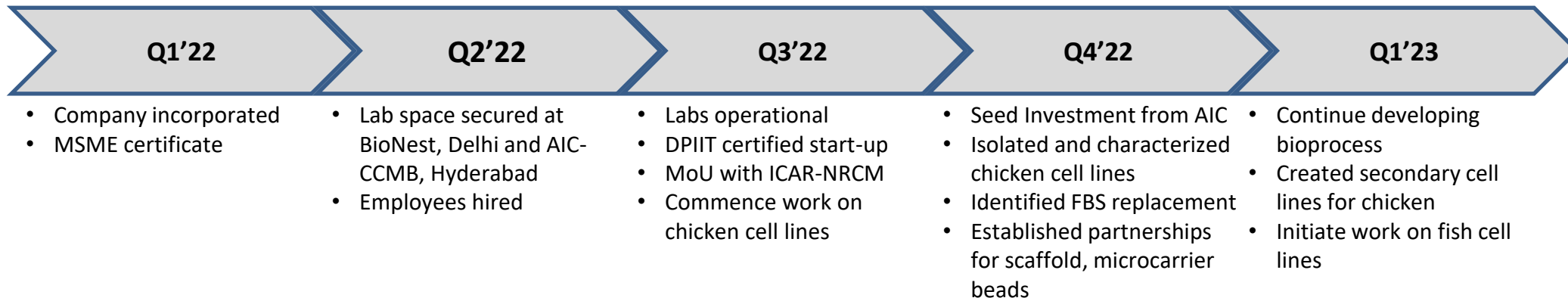
Mission

Committed to offer affordable cultivated meat technology solutions to India and other low middle income countries and contribute to planet's overall sustainability

Core Values

Agility, Frugal Innovation, Integrity, Respect & Passion, and Trust

Key & Upcoming Milestones



Commercialization strategy is to out-license developed technology to Low and Middle Income Countries

Cell Based Meat Product Development Value Chain



Key Activities

- Cell Line Dev.**
 - Develop cell lines which can be out-licensed
 - Initially develop Chicken cell lines, post that other species- lamb, fish, prawns
 - Molecular Bio, cell line characterization
 - R&D research license at US\$5K per cell line with royalty of ~ 2% of product sales in case product is commercialized
 - Target June 2023**
- Culture Media**
 - Using FBS replacement to augment cell growth
 - Developing animal component free and to use only chemically defined media to culture cell
 - Important to control cost of goods
 - Assess if there is an opportunity to develop a “Halal option” for GCC and OIC countries
- Cell Growth**
 - Identified scaffolds and micro-carriers being developed and used by other companies in this field
 - Exploring collaboration opportunities with companies working in the field
- Bioprocess**
 - Process intensification and optimization techniques such as ultra-scale design
 - Identify optimum culture conditions (temp, Ph etc.)
 - Exploring novel integrated manufacturing platforms used in vaccine manfr. for use in cell-based meat
- Final Product**
 - Refine the , refine the taste, texture, flavours to address different taste palettes
 - Out-license the technology to companies working in food manufacturing and consumer goods etc.
 - Engage with Food Safety and Standards Authority of India (FSSAI) to conduct test required for approval
 - MVP target by June 2023**
 - Tech dev. By June 2024**

Collaborators



Cell Line Development

- **Isolation, culture and establishing cell lines (Sheep)-** Mesenchymal stem cells from adipose tissue (Fig 1) and skeletal muscle stem cells were extracted using collagenase I. The population doubling time was observed which showed better growth in sheep serum compared to FBS.
- **Standardization of ECM isolation** - from skeletal muscle tissue. Yield, DNA content, collagen content and protein was analysed (Fig 2).
- **Assessment of Biocompatibility of ECM-** By culturing the cells on ECM coated and collagen coated (control), well defined multinucleated myotubes were observed under microscope (Fig 3)
- **Myogenic marker analysis-** The sequence of myogenic markers were checked for Pax-7(91bp), Myo-D (128bp), Myo-G (101bp), MEF2C (115bp) and β -Actin (87bp) as housekeeping gene using RT-PCR.

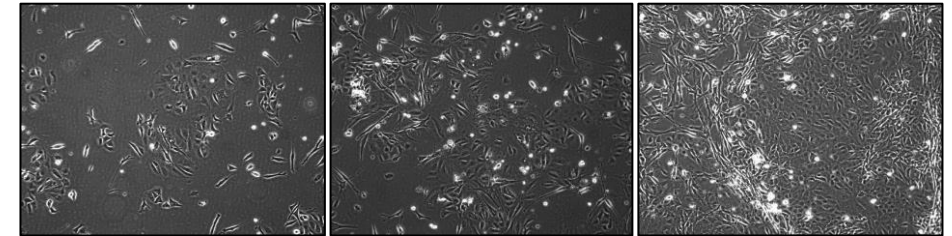


Fig 1. Mesenchymal stem cells from adipose tissue

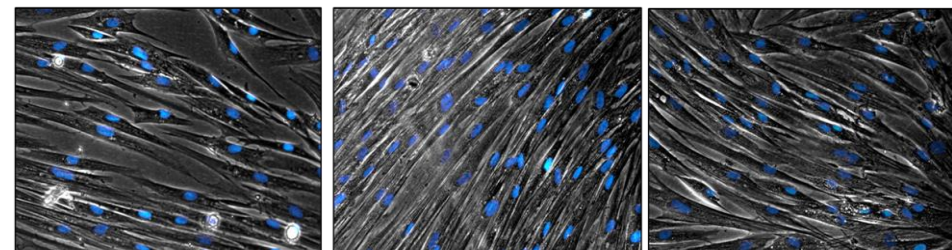


Fig 2. Differentiated multinucleated myotubes from muscle cells. d) CC; e) ECM-SDS; f) ECM-T

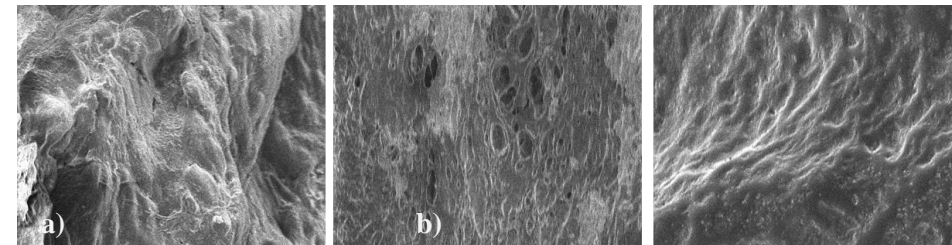


Fig 3. SEM images a) Native muscle b) ECM-SDS c) ECM-Trypsin

Abbreviations used: ECM- Extracellular matrix; CC- control; SDS- Sodium dodecyl sulphate; T- trypsin; bp- base pair; SEM- Scanning electron microscope

Work Done so Far

- Isolated and characterized Non-GMO chicken cell lines for myocytes and adipocytes
- Secondary cell lines created for chicken myocytes cell lines and to start offering R&D license for the cell lines to broader cultivated meat community
- Replaced Fetal bovine serum with chicken serum
- Developed an innovative and novel method to extract chicken serum
- Evaluating potential to file an IP on chicken serum purification process
- Chicken serum available in India and global market for US\$500 per liter, potential to supply at 50% lower price point
- Initiated work on fish cell lines
- Established partnerships with various companies working in cultivated meat development value chain
- Neat Meatt sees itself as an end-to-end cultivated meat technology development company and would out-license the entire technology to companies looking to set up a cultivated meat production plant

Discussion

- Team has extensive experience in **vaccine research, development and manufacturing**. To utilize the same business principles to develop **affordable, manufacturing process for cultivated meat**
- Leverage “**Economies of Scale**” to develop a production process ~ **90% cheaper than currently developed process and target price of US\$ 1.2/pound of cell-based meat**
- **Identified key cost-drivers to ensure product affordability; working to keep supply chain costs at a minimum**
- Received seed investment from **Start Up India Seed Fund for INR 30 Lakhs**
- Looking to raise **US\$200K** to accelerate technology development
- In next 12 months to focus on bioprocess and developing a minimum viable product

Milestones

- Operationalize cell licensing by **Q1' 2023**
- Minimum viable product developed by **Q2' 2023**
- Fully validated technology ready by **Q2' 2024**

Team



Dr. Sandeep Sharma (Co-Founder) Ph.D (Biochemistry), PG Diploma in Patent Law (NALSAR). Bioprocess engineer with ~ 20 years of expertise in Mfg. & R&D gained at Premas Biotech, Hilleman Labs, Panacea Biotec, Serum Institute of India. 8 patents, granted in US

Role- Chief Executive Officer, Operations, Bioprocess.



Mr. Santhosh Kacham (Project Manager) M Tech (Biotechnology). worked on stem cells, especially limbal stem cells, human Umbilical Cord Mesenchymal stem Cells (hUC-MSCs) and muscle satellite cells for the past 10 years.

Role: Project Mgr. R&D, Cell Line Dev.



Dr. Shushruta Bhunia (Research Scientist) Ph.D. (Molecular & Human Genetics)- Experience in molecular biology, cancer genetics, immunology & human genetics. ~4 years experience in analytical development of bacterial vaccines. Authored 8 papers

Role: Molecular Biology & Genetics



Ms. Ravina Lade (Research associate) M.Sc. (Biotechnology) - Experience in Molecular Biology Techniques and Advanced Analytical techniques. ~ 2 years experience in R&D dept. Authored 2 research articles.

Strategic Advisors



Dr. Girish Patil (Principal Scientist) ICAR-NRC Ph.D. (Animal Sciences)- Expert in Meat, cell sciences



Dr. Ajit Pal Singh (MBBS, MD) Head of Biologics, Pharmaniaga, Malaysia. 20 years + exp. In clinical trials & licensure strategy



Mr. Sourabh Sobti Co-Founder (M.Sc., Biochemical Engr. UCL) Ex VP-Strategy at Hilleman Labs Experienced in Vaccine Business Dev, Licensing, procurement, LMIC supply
Role: Strategy

Appendix