

Cellular agriculture refers to the production of animal-sourced foods (products) from cell culture methods. Evolving as a fusion of Animal Tissue Culture and Bio-Fermentation, this Bio-Innovation has sent disruption waves across the USD1 Trillion industry. This disruption is further supported by trends of plant source protein replacement and vegan adoption by consumers. While the jury is still out on the impact of both these trend driven innovations, it's safe to say that consumers are inquisitive and willing to try the products developed from cellular agriculture as long as it provides the texture and flavour profile akin to real meat.

Being a science heavy product sector, cellular agriculture innovations are fairly technical and complex in their approach and impact. Also, being an investment heavy industry, entry barriers are higher both from cash and comprehension perspective and require thorough understanding and insights to make out the method in the madness. For the purpose of this article, the innovations can be divided into Production Innovations and Market Innovations.

### **Production Innovations**

Despite global initiatives, production costs for even the most basic products still remain far from reaching critical affordability thresholds. Due to the vast quantity of growth media necessary for manufacturing of cultured meat in industrial and large scale quantities, cell culture medium has been recognised as one of the key reasons for increased prices for creating cultured meat products. Patents on lower-cost cell culture medium formulations are predicted, as well as claims aimed towards high-efficiency cell culture medium formulations that maximise the conversion of culture medium nutrients to biomass.

Core areas of innovation and patent activity revolve around cell culture medium and additive formulations for expanding culture and yield efficiency. The core focus is on developing methods and substrates to achieve greater fold expansion of cultured cells from a low starter batch size and faster culture durations.

Traditional mammalian cell culture technology includes the use of animal-derived serum and derivatives, which corporations are trying hard to eliminate. Animal-derived serum/growth factor compositions create safety concerns and go against the ethics perspective that many Cellular Agriculture companies hold so dear. As a result, claims regarding procedures and cell culture medium formulations are likely to be made in the absence of animal-derived serum products, or in small concentrations of such products.

A considerable number of the contemporary methods and materials utilized for cell culture were created for essential exploration in cell science and regenerative medication, with human cells or cells from model species (for example rodents, non-human primates, and so on). As the industry gets its basics right, it is anticipated that the companies will focus on innovation driven culture methodologies custom made for livestock species and even of specialized meat sources to achieve better Wagyu and Angus made from cells and not culling.

Needless to mention, there will also be innovation in relation to the equipment and techniques employed for the culture of cells from different species and tissues at the required scale. We anticipate filings relating to new bioreactors providing for high scalability, providing better physical culture characteristics and weight reduction.

### **Market Innovations**

While the production innovations progress on a slow and steady pace, the market readiness for the eventual innovation operationalization needs significant readiness. Owing to the time consuming nature of the science driven innovations, market readiness and consumers have to be gradually built by industry stakeholders.

Positioning of cellular agriculture products has always been a major challenge owing to the cost factor and scale limitations. While mass substitution is a far fetched idea in the current state of the market, positioning cellular agriculture products and meats can be the biggest avenue of innovation. Niche and Gourmet positioning of cellular agriculture meat needs to be explored keeping customer empathy at the core. Consumers are more likely to pay the premium prices if the eventual preparation, pricing and placement on the palate is linked to exclusivity of cellular meats. In simpler terms, cellular meats need to be placed to compete against the grade A natural meats like Angus and Wagyu.

Furthermore, while the vegan meat/faux meat/vegetarian meat alternatives continue to gather market momentum, cellular meats have a distinct advantage in the form of cellular bio-similarity of the finished product which shares its origin with natural meats. Flavour and structural similarity is easier to achieve in cellular meat due to inherent presence of Haemoglobin and tissue structuring. These advantages need to be communicated to consumers who are so far on the fence with regards to vegetarian meats and cite the dissimilarity to be more than acceptable.

In conclusion, while the production scale and price points are evolving on a constant basis, the time is right for companies in the product sector to prepare the market readiness and consumer acceptability to facilitate rapid adoption once the price parity starts making sense in the value chain. Optimal positioning, clean label claims and distinct taste, flavour and textural superiority needs to be innovated upon keeping the consumer preference, perceptions and expectations in mind to achieve the right bite when the market is hungry.

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