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Lab-grown Cultured Meat – A Long Road to Market Acceptance

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Key Points:

- The alternative protein market is growing rapidly, and could soon include cultured meat. The sector is small, however, and even in 2021 it will be dwarfed by the traditional meat market.
- The competitive impact of cultured meat on traditional pork, beef and poultry demand is expected to be minimal.
- Cultured meat developers are challenged by the need to compete head-to-head with traditional meat offerings on cost and quality. Initial consumer surveys also reflect the acceptance hurdles that must be cleared.
- Cultured meat could appear in restaurants and specialty stores in 3-5 years, and in grocery stores in 5-8 years.

Inside…

Introduction 1
Consumer Acceptance 2
Commercial Viability 3
Technological and Regulatory Hurdles 4
Conclusion 4

Introduction

The quest for technological advancements continues in food manufacturing. Alternative protein products derived from plant sources, insects and cultured meats are one of the top food trends to watch in 2018 and beyond. The effect on livestock and poultry protein demand in the U.S., however, is not expected to be significant. The future success of alternative proteins lies squarely with rising global protein demand rather than a battle for the existing market share of livestock and poultry protein.

In the short- to medium-term, rising global incomes will continue to drive consumers to a higher protein diet. Global GDP is projected to grow by $38 trillion from 2016 to 2030, generating a 46 percent (140 MT) increase in meat and poultry consumption. (*See Exhibit 1.*) Technology companies and alternative protein providers intend to disrupt this trend.

Investments made by leading food and agribusiness companies as well as prominent tech entrepreneurs are accelerating the research and development activities of meat alternatives. Cargill, Inc. and Tyson Foods represent recent agribusiness investments in alternative protein startups, along with billionaire tech entrepreneurs like Bill Gates and Richard Branson. Research and development efforts are not confined to the U.S. In 2017, a Chinese firm invested in an Israeli tech company to create laboratory-grown meat. Researchers in France and Japan are working on similar projects.

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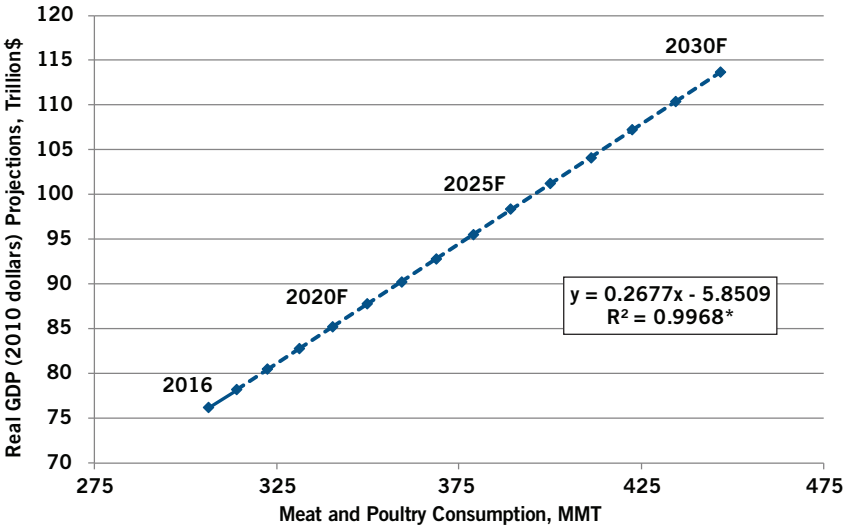
Consumer perception regarding the manufacturing process, the perceived benefits, and product positioning through marketing efforts ultimately will determine the commercial viability of alternative protein products. The alternative protein category is sure to grow over the next decade as global protein demand expands, allowing pathways for more diversified protein products. Euromonitor International projects sales of meat substitutes to rise steadily to $863 million in 2021, representing roughly 17 percent growth compared to 2017 estimates. (*See Exhibit 2.*) These figures are dwarfed in comparison to the current retail market size of $49 billion in sales for the entire meat and poultry category in the U.S.

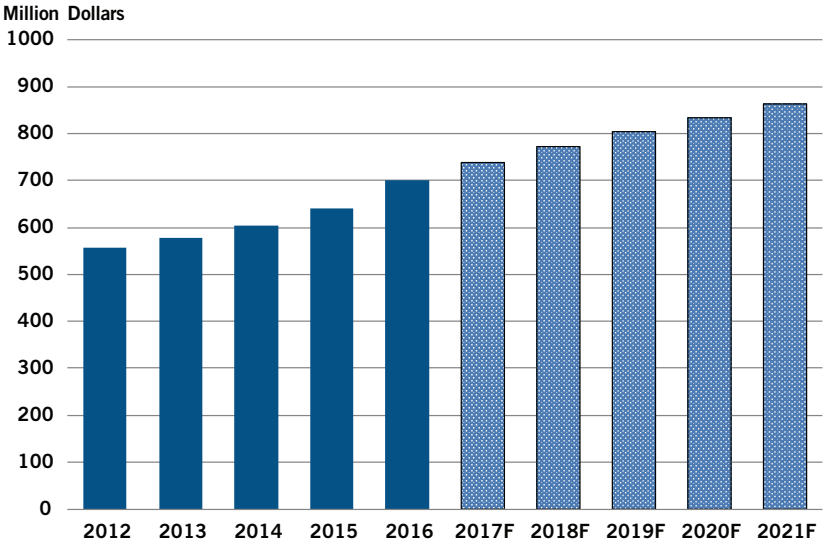
The magnitude of market penetration for meat alternatives will largely depend on the time horizon for advancements in technology that reduce price and improve quality attributes.

Exhibit 1: Global Protein Consumption Projections



Source: FAO, USDA-ERS, Global AgriTrends *Projections based on 1970-2015 correlation

Exhibit 2: U.S. Meat Substitute Sales Projections



Source: Euromonitor International, *The Wall Street Journal*

Consumer Acceptance

Scientifically engineered animal protein will initially appeal to consumers who are concerned with the environmental and ethical aspects of current livestock and poultry production. Current product positioning among cultured meat marketing efforts revolve around making comparisons to traditional production systems in terms of land and water utilization, greenhouse gas emissions, input conversion and nutritional attributes. In time, the target audience for scientifically engineered ingredients could go beyond environmentally conscious consumers and appeal to a broader base of consumers concerned about ingredient consistency, efficacy, and purity.[1]

A recent consumer study indicates that two thirds of consumers are willing to try lab grown cultured meat with only one fifth indicating they would not try it. Only one third of those surveyed would be willing to consume the product regularly.

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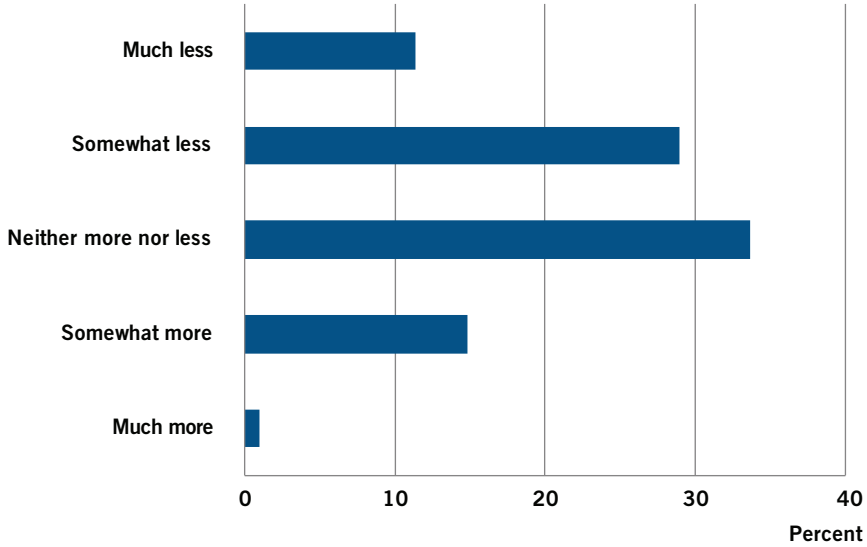
A number of potential barriers to engagement were identified. Taste/appeal of the product was the number one response (79 percent), followed by ethical concerns (24 percent) and price (20 percent).

Related to price, consumers indicate a reluctance to pay more for lab-grown cultured meat compared to traditional livestock and poultry products. (*See Exhibit 3.*)

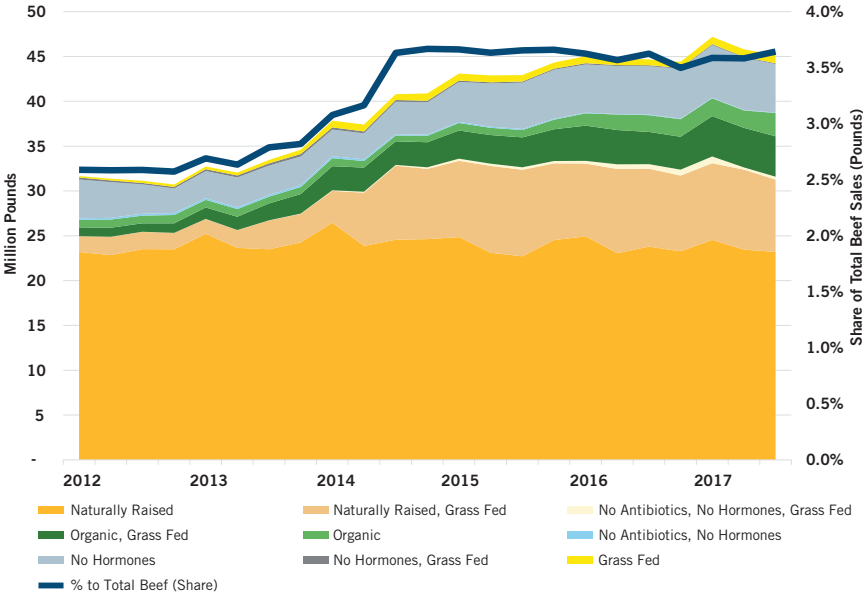
Food safety is another attribute being marketed by cultured meat companies. The laboratory environment provides less exposure to food-borne pathogens and animal disease outbreaks that can occur in traditional livestock and poultry production systems. Cultured meat could also eliminate the need for antibiotic treatment. Lab grown meat does not, however, completely eliminate the risk of biological contamination.

Exhibit 3: How much would you be willing to pay for lab-grown meat compared to traditional livestock/poultry products?



Source: PLoS One, 2017, Attitudes to in vitro meat: A survey of potential consumers in the U.S.

Exhibit 4: Beef Production Claims



Source: IRI/Freshlook, beefretail.org

Commercial Viability

Cultured meat developers are in a race to match price and quality to traditional meat offerings. Products currently in development are expensive and years away from widespread commercial viability.

The production cost for one lab-grown burger patty today has dramatically decreased from $325,000 estimated in 2013. Memphis Meats reports a cost of $2,400 per pound in 2017, compared to $18,000 per pound a year ago.[2] Mosa Meats expects the price of a single hamburger patty to be around $10 when production reaches scale using current technology. With further expected improvements in the production process, prices could fall far enough to compete with traditional beef.[3] Eventually, these companies envision long-term applications of the technology to represent a low-cost alternative to serve the developing world.

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The timeline for commercial viability remains the greatest unknown. The consensus projection points to an initial market introduction in the next 3 to 5 years, most likely in restaurants and specialty stores, and offered at a premium price to traditional meat offerings. Supermarket adoption is projected to take another 2 to 3 years as the technology becomes more affordable and acceptable to consumers.

For comparison, sales of beef marketed with a production claim (naturally raised, organic, grass-fed, etc.) grew dramatically over the past 10-15 years. However, consumers' willingness to pay a premium for these production claims appears to have reached a plateau of about 3.5 percent of total retail beef sales. (*See Exhibit 4.*)

Technological and Regulatory Hurdles

Two major biotechnologies have been developed that broadly involve animal cell culture/tissue engineering techniques to produce cultured meat.

The first method is referred to as the self-organizing technique. Muscle cells of a donor animal are allowed to self-replicate in a nutrient medium. This technique aims to create meat in a well-defined 3D structure, similar to the natural confirmation of meat and is more suitable for "steak" alternatives. However, the proliferation potential is limited given that new animal cells would be required from a donor animal on a regular basis.

The second method of culturing meat is referred to as the scaffold based technique. This process uses suitable stem cells where embryonic myoblasts or adult skeletal muscle satellite cells are proliferated, attached to a scaffold or a carrier and then perfused with a culture medium (nutrition for cell growth) in a suitable bioreactor.[4] This is the preferred method for producing processed ground meat products. Current research revolves around identifying different growth rates of different types of animal cells.

Technological barriers in the process remain but are being addressed by researchers at a rapid pace. Perhaps most importantly, scientists are working feverishly to improve protein content. The development of Myoglobin, the protein that gives meat its red color and iron content, is at the top of the list for researchers. Culturing fat tissue which adds taste and texture to meat products is also being explored.

Newly created cultured meat products will also need a regulatory framework before entering the market. Both the FDA and the USDA are closely monitoring developments in the cell cultured meat industry. Statements from both agencies earlier in 2017 indicated that labeling requirements for "cultured meat" have not been determined. It is unlikely that the agencies will rule on terminology that can be used to describe and market cultured meat until the technology is more fully developed. As to what kinds of terms might be used, "clean" meat is likely to get some industry pushback, while terms such as "lab-grown," "in vitro" or "cultured" meat are not very consumer friendly.[5]

Conclusion

The irony of using technological methods to promote perceived "natural" or organic elements must be noted, but it remains to be seen how these messages will be received by the consumer.[6] Food companies are under constant pressure to adapt to changing consumer tastes and preferences. The trend of manufactured food must not only appeal to the increasing interest of ideologies such as sustainability and transparency, but also traditional consumer demand attributes of convenience, price, flavor and packaging. Consumer feedback and acceptance of the technology during the development process will be critical factors in shaping the final product.

However, regardless of the specific technology that prevails in developing cultured meat, it is unlikely to have a marked effect on traditional animal protein demand at least through the next decade. ■

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[6]Wu, Leslie. "Five Trends That Will Shape Food Products in 2018." *forbes.com*, October 28, 2017.

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