

# Lab-Grown Meats: The Future of the Meat Industry

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## INTRODUCTION:

Few people would consider farming a technology-based field. However, with the emergence of factory farming, the meat industry has employed the use of far more technologies than ever before. This hybrid technology fuses natural cell division with human technology to create controlled and possible accelerated division. In the current industry, humans have already had an impact on cell division in livestock by feeding them growth hormones and controlling reproduction. This alteration in muscle growth will not stop but will grow and change into the future. One of these changes could very well be in vitro meat. This poses the question of where the meat industry is headed. I would like to suggest that the use of technology would push us so that we will no longer require farms to produce meat. Instead, we will have lab grown meats.

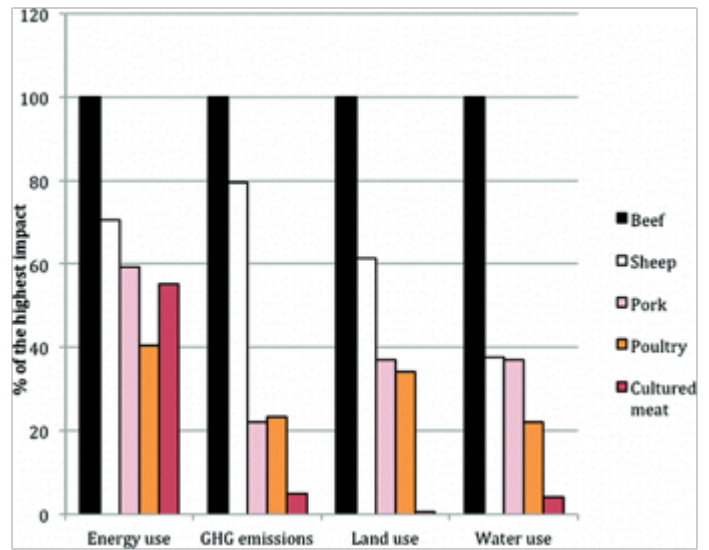
## IN-VITRO MEATS:

In-vitro meat refers to muscles grown from mature muscle stem cells called myosatellite cells (*Reviews of Physiology, Biochemistry and Pharmacology, Volume 123*, 1994). In natural division of muscle cells, the cells begin as simple mononuclear (only one nucleus) myoblasts. These myoblasts can then mature into a multinucleated (multiple nuclei) myotube, and then finally it matures into a myofiber. The myofibers are non-proliferative (Datar & Betti, 2010). This process is the basis for in-vitro meats. The muscle cells are taken from a living organism such as a cow or a pig. The cells are then stimulated with a growth serum comprising of nutrients, energy sources, and other growth factors (Edelman, 2003). These initial steps usually take place in a petri dish or on other similar substrates. Some scientists have proposed growing the muscle in a liquid medium. Once division is underway, the maturing muscle is attached to a type of skeleton that will allow it to grow in the desired direction (Edelman, 2003). Theoretically, when its growth cycle is complete, it can be seasoned, cooked, and eaten (Bartholet, 2011).

Myosatellite cells are most commonly used, although there have been attempts to use embryonic stem cells. If embryonic cells could be used, they might be more beneficial since they have more growth potential and could divide into many different types of muscles or organs (Galusky, 2014). However, there have been fewer successes than with mature myosatellite cells. Unfortunately, while mature stem cells have been more successful, they have a limited number of divisions (Galusky, 2014).

## EFFECTS OF THE CURRENT INDUSTRY:

As a result of mass population growth and agricultural expansion, the world has lost more than half of its wetlands in addition to other essential habitats (Mitsch, 2007). Livestock defecating in the fields is normal, but when farms grow to the scales we see today, then we begin to face problems such as eutrophication. Animals also tend to have heavy greenhouse gas emissions (Tuomisto & de Mattos, 2011).



(Figure 1: Environmental effects of livestock. This figure shows the resources used by each type of livestock (Tuomisto & de Mattos, 2011).

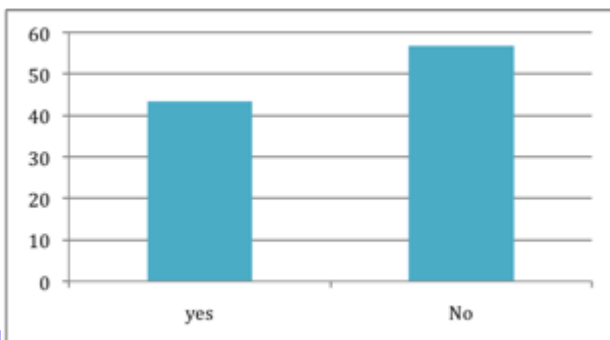
### NEGATIVE IMPLICATIONS OF IN-VITRO MEATS

The fear of ingesting something harmful or feeding a potential toxin to loved ones will surely act against the initial success of lab-grown meats. Stem cell research itself is a young and growing field. Any potential negative effects would be difficult to predict in such a new field (N Sachan, 2012).

Despite the emergence of nanotechnologies and new bio technologies, there is a tendency for consumers to show low support for anything they considered to be excessive or unnatural (N Sachan, 2012). In recent small-scale surveys, civilian taste-testers said that the laboratory meat tasted bland and that they would not buy it if it were available in stores (Fox, 2014)

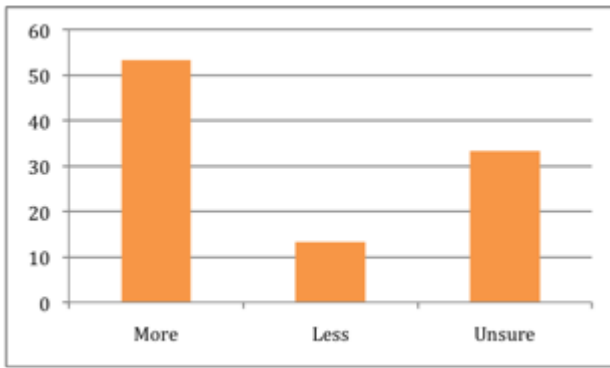
Public Survey:

Q1: *Would you eat lab-grown meats?*



(Figure 2: Original Research Public Survey. I conducted my own survey to estimate the popularity of lab grown meats amongst college students)

Q2: *Do you think lab-grown meat is more or less ethical than the current industry?*



(Figure 3: Original Research public Survey)

Q3: Do you think vegetarians would eat it? Why or why not?

Major doubts were voiced about the processes of obtaining cell samples from the animals. Other participants suggested that those who avoided meat for ethical reasons would be open to this new option. Many participants seemed averse to the entire prospect of eating food out of a lab (Solarik, 2014)

### POSITIVE IMPLICATIONS OF IN-VITRO MEATS

If in-vitro meats were to become a success, this would entail a renovation of the meat industry. The industry would not require huge sums of land for massive populations of livestock. This reduction of land use would significantly decrease the rate of deforestation (Tuomisto, 2011)

Animal populations would also most likely decrease, as we would not have as great a need for large animal populations. With population decreases, animal-related pollution such as eutrophication and methane emission (mentioned above) would potentially drop (Tuomisto & de Mattos, 2011).

Possibly the most appealing implication of in-vitro meats is that the ethical dilemma about animal wellbeing versus the need to feed a population would be put to an end (Eisnitz, 2009).

The current meat industry uses a surplus of resources that could potentially be used to feed the hungry and the poor in our own country and abroad. Land lost to farms previously could be converted into new habitat or new housing for a growing population

### CONCLUSION

Overall, the acceleration of human intervention into biology is inevitable. We have already found ways to monitor both population and individual growth of animals. With in-vitro meats, we would encounter new dilemmas as well as new solutions.

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