Lab Grown Meat Ag2030

Labrat Tech

Francesca Dobbie, Monique Andjelic, Eve Tsolakidis, Kiara Hemetsberger.

Lab Grown Beef for a better future, Mamma mia, that's a spicy lab grown beef!

Overview

This report covers a general overview of the growing industry of synthetic meat production, as well as a history of the science, pros and cons of lab grown meat and a proposal for a sustainable lab facility. All of these factors will enable significant developments towards the Ag2030 $100 billion goal.

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Timeline

A BRIEF HISTORY OF

LAB GROWN MEAT

VARIOUS BREAKTHROUGHS AND UPDATES IN THE SCIENCE OF LAB GROWN MEAT OVER THE YEARS

1998
Jon Vein achieves a patent for the production and consumption of lab grown meat tissue.

2001
Nasa begins experimenting with starter cells from turkeys.

2002
First edible lab-grown sample is produced: a fish fillet from goldfish cells

2008
PETA offers one million dollars to the first company to bring lab-grown chicken into the food indstry

2013
First lab-grown beef hamburger is produced by Dr. Mark Post at Maastricht University in the Netherlands

2015
Maastricht University held their first ever International Conference on Cultured meat

2016
Super Meats (Israeli Company) runs a crowdfunding campaign to raise money to bring lab grown poultry onto the market

2017
Finless Foods announces they expect to bring sustainable, lab grown seafood onto the market in the next two years

2018
Meatable claims they will be able to produce cultured lab grown meat from stem cells sourced from umbilical cords

2020
Singapore becomes the first country to commercially approve lab grown meat for public consumption

Results

What is AG2030?

Ag2030 is an initiative by the Australian Government through which they are setting the foundations for the agriculture sector to grow agriculture to $100 billion by 2030, ensuring Australian agricultural producers receive maximum returns for their hard work and are supported by vibrant rural and regional communities. (NYSF Ag2030, Introduction)

Current Agriculture Innovations

Australia's farmers are already some of the most efficient globally and Australia produces substantially more food than it consumes with 71% of agricultural production exported. In 2020-2021, agriculture is estimated to be $71.2 billion, which means we need to more than double the rate of value growth in order to reach the goal. (Department of Agriculture, Water and the Environment, section 6)

In comparison to other countries around the world, America's Agriculture, food, and related industries are worth roughly $1.109 trillion USD in 2019, much ahead of Australia's contributions within this sector. (U.S department of Agriculture, section 1). Despite this, this is then contrasted to a more similar country to Australia, New Zealand, who was recently estimated to be worth $12.653 billion in September of 2020, much less to that of Australia's current efforts. (New Zealand Government). These recent statistics display how Australia is on the right path to reaching the Ag2030 goal. As seen later in this report, the development of lab grown meats will significantly contribute to this $100 billion goal in Australia, and assist in being able to sustain Agriculture, Water and Environment in the country, aligning with the Government's goals.

Synthetic Meats & Ag2030

One of the greatest opportunities for industry growth is through increased access to international markets. Through the further development of lab grown meats, it will be able to be exported in and out of Australia, thus increasing jobs and cost of trade, contributing to the Ag2030 goal.

The Australian Government as of 2020 is also currently providing $1.3 billion to develop and implement a new Modern Manufacturing Strategy – including for food and beverages (Department of Agriculture, Water and the Environment, pg 10). This contribution towards

the food industry will also assist in the further development of lab grown meat, as there will be further consumption across the country.
In addition to this, the Australian Government as of 2020 is already providing $50 million for Industry Growth Centers including Food Innovation Australia Limited, to assist in implementation of the government's new Modern Manufacturing Strategy. (Department of Agriculture, Water and the Environment, pg 10).
The development of lab grown meats, will allow the consumption of ethically sound produce, and result in being able to send to a wide market across the globe due to the high demand on meat, especially in regards to the pandemic.
Lab grown meats will also allow more jobs to become available. Not just in the scientific industry, but in dealerships and taking care of the cattle across Australia. (DAWE, section 3 & 6). Furthermore, lab grown meats will also address current societal issues within the economy, in regards to spending, health benefits, the ecosystem and much more. This will all be reviewed in further detail later in this report.

Increasing Yield with same land size

Producing meat the conventional way requires tremendous amounts of land and water. 18kg of feed and 8000L are required to make 0.5 kg of beef. Farmers currently give 20 times the amount of grain needed to eliminare world hunger to their animals. Synthetic meat could end this as it requires 100 times less land and five times less water than conventional meat. (Meat & Livestock Australia)

Target Demographic

The target audience for synthetic meat is actually those who currently consume meat regularly. Many people who eat meat regularly would like to find a way around the ethical issues of the meat industry whilst still consuming meat at least occasionally. Lab grown meat is the obvious solution to this issue.
1 in 3 (meat eating) Americans reported wanting to cut down their meat intake. 29% of UK consumers say they would eat lab meat, whilst 40% of Americans say they would eat lab meat. No similar survey has been conducted on Australian populations that can be found thus far. These figures are lower for vegetarian and vegan people, however they aren't really the target audience as meat consumption is already not an issue from that population

How does it work?

Fat and muscle cells are taken from a live, healthy animal via a painless biopsy involving anesthetics. For poultry animals, cells can be taken from fertilised eggs. The cells are then filtered and isolated by experts. The individual cells are placed in a large stainless steel cultivator where they are fed the necessary nutrients for life until it divides and grows. The cells must be provided with warmth, oxygen and salts, sugars and proteins.
The cells are grown on a 'scaffold' so that the desired meat-texture can be achieved. The process altogether can take up to five weeks depending on the type and size of the meat being produced. The cells are harvested, and the harvested cells are used to create the end products using processes like 3D printing and molding which produces a more familiar meat shape. This final product is then shaped into patties, tenders, etc. and released into the market.

Machines/facilities needed for this process

- Labs with facilities specific to nurturing and growing the cells.
- Space to house the animals → these animals aren't killed or harmed at all and so much less space is needed than is regular farming.
- Correct nutrients to produce healthy meat.
- A bio-reactor or 'cultivator' → a large steel machine similar to a beer fermenting tank which provides warmth and nutrients.
- 3D printers to finalise the meat design.

Addressing possible issues

Emissions

Currently, livestock is responsible for approximately 15% of worldwide methane emissions. Switching to lab grown meat could reduce these emissions by up to 96%. If new facilities run on renewable energy, the carbon footprint would be lower for synthetic meat instead of cultivated meat. “Humans only receive around 3% of the raw materials that go into a cow” - Chris, Impossible Foods. We produce enough calories to feed 10-11 billion people. The majority of this food goes into livestock and not people.

By 2050, the Food and Agriculture Organization estimates the global demand for food will reach 455 million tonnes. By reducing emissions first through synthetic meat production as well as using renewable energy, we can reduce our carbon footprint whilst still reaching a point where we can afford to feed the world.

Despite being more energy efficient than producing actual traditional meat, in comparison to plant-based food, synthetic meat has a higher Greenhouse Gas emissions and energy use. Much is still unknown about the impact of synthetic meat on the environment

Careers

Australia's red meat industry employs approximately 189,000 people directly and a further 245,000 indirectly per year. (Queensland Government, 2021) Farmers and farm workers will lose many jobs if traditional farms are needed less across the world.

Despite the impact this will have on Australian farming jobs when switching to the Lab Grown Meat industry, there are many more employment opportunities that become available to allow equilibrium for jobs within the economy. As the area progresses commercially, more fields will open up and again, jobs will become available again.

Although more jobs will open up as the science progresses, the transition stage will still cause hardships for any workers, and a loss to the national economy.

Companies that could potentially provide jobs in the synthetic meat industry:

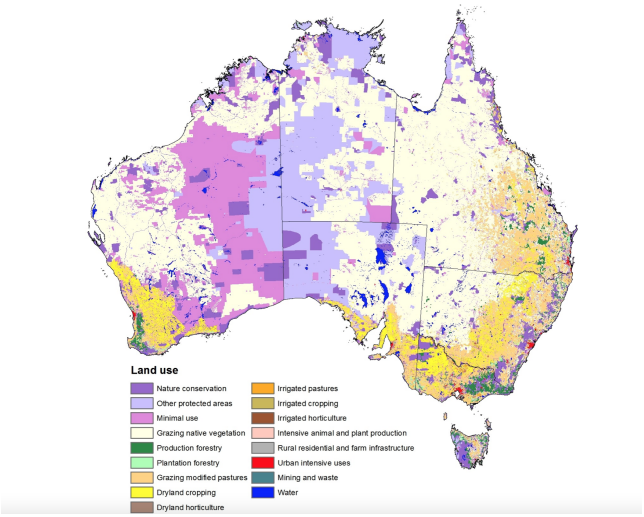
- Aleph Farms → Synthetic Biology, Cultivated meat, Cellular Agriculture, 3D Printing
- Animal Alternative Technologies → Cultivated meat, Cellular Agriculture, Artificial Intelligence, Synthetic Biology
- Ants Innovate → Cultivated meat, Cellular Agriculture
- Avant Meats → Cellular Agriculture, Cultivated meat, Seafood
- BioBQ → Cultivated meat, Cellular Agriculture

Available Space

It is estimated that around 30% of the earth's available surface is currently used for livestock farming. This is taking into account the outdoor and indoor housing of livestock, paddocks for grazing, buildings for storing food and other necessities to keep the animals alive, slaughterhouses and transport housing facilities.

By replacing this industry with a synthetic meat production industry, there will be no need for as many animals to be born and grown, which in turn means much less space used for all of the facilities mentioned above.

"We can produce the same amount of meat in factories on 1% of the land it presently takes us to do it" - Dr. Madsen Price, president of the Adam Smith Institute.



Animal Cruelty and live exports

In our current world, around 70 billion land animals are bred and killed for human consumption each year. The majority of these animals are raised in factory farms, experiencing brutal forms of abuse including severe overcrowding and unsanitary conditions.

In a direct contrast to this, the process of taking the cell from the muscle wall of the animal to produce synthetic meat is safe and not harmful for the animal at all.

It means that we can get the same (if not more) amount of meat to eat from fewer animals, and animals which are not slaughtered every day in such brutal ways.

In this process, nothing goes to waste. In a traditional slaughterhouse process, the parts of the animal that aren't commonly eaten simply go to waste. Lab grown meat has no need for any kind of waste and therefore is much more worthwhile.

Health and spread of disease

Meat consumption can lead to chronic disease due to high cholesterol and saturated fat content. When growing the meat in a lab, scientists have the ability to tweak the quantities of harmful cholesterol and fat which can help control overall population health.

Lab meat also addresses the issue of growing antibiotic resistance → factory farms administer high amounts of antibiotics to their animals to keep them alive in unsanitary and close packed living conditions. Overusing of these antibiotics can make the surviving bacteria stronger and antibiotics become ineffective. At least 70,000 people die each year from antibiotic resistant infections - this number will continue to grow if factory farming continues along the same track. It is only a matter of time before another zoonotic disease is the cause of another pandemic.

"Consumption, globalized agriculture, expansion and trade", can cause pandemics, including ones similar to the COVID-19 pandemic. (IPBES, 2021)

Lab grown meat is quite resilient against bacteria like E.Coli on its own, and has no need for antibiotics, which leads to less antibiotic resistant diseases being transferred into humans.
A sample of lab grown meat contains the same amount of protein to maintain health and proper body function as traditional meat.

"Ever since we have been keeping good records, we have seen one new human disease emerging every four months, many from animals […] and this is accelerating." - Delia Randolph

Economic advantage/disadvantage

Australia consumed on average 19.44 kg per capita of animal-made meat in 2020. (*Consumer Goods and FMCG)*
Currently it costs around $157.77 per kilogram to produce lab-grown meat. There are roughly 25.96 million Australians, therefore to cater lab grown meat for all these Australian's, it would cost $79 billion a year. However in revenue, based on a standard kilogram of meat being $23.87, Australia would gain $190 billion.

In Australia, it is not possible to buy lab-grown meat commercially, and Australia lacks the laboratories to produce our own lab-grown meat.
We are still many years off from being able to produce large quantities of cultured meat, as currently it is very expensive to produce.

Water pollution and land runoff

The keeping of livestock in Australia and worldwide takes up much land, which is then paced down by the weight of the animals and covered also in waste products. The waste products and the minerals and dirt stirred up from the trampling of the animals eventually finds its way into our rivers and lakes. This run-off can carry bacteria and viruses that can contaminate our groundwater and transmit diseases to humans.

Eutrophication is also a major concern caused by excesses of animal feces, feed and crop residues finding their way into bodies of water that leads to algae growing excessively, using up all the oxygen at the expense of other light.
Clean meat avoids water pollution and land runoff.

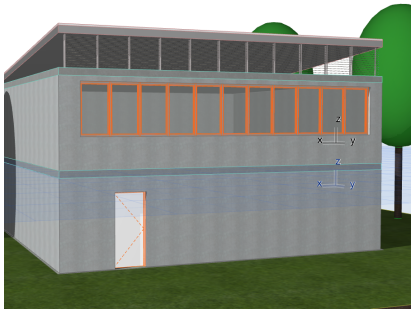
Religion

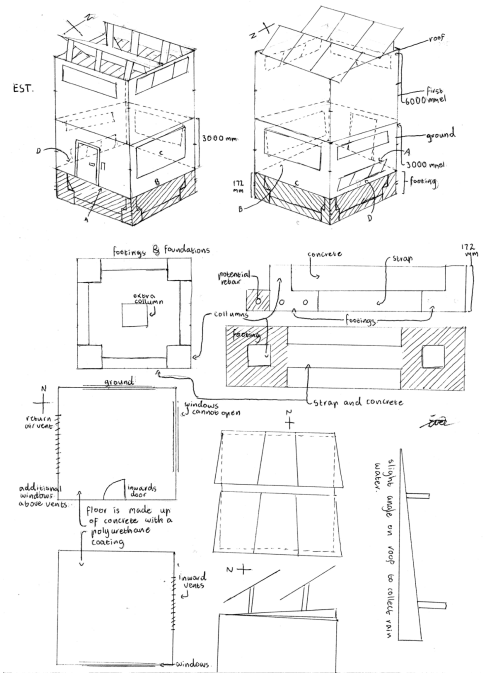
There are quite a few religions with codes on how to eat meat, such as halal and kosher, and with lab grown meat being a relatively new concept, there are many outlooks on this issue.
Lab grown meat is said to be halal if the original animal that the lab grown meat was taken from was slain halal.

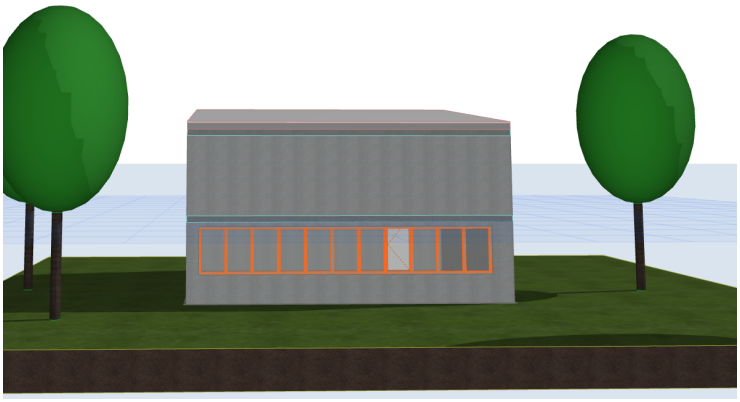
Sustainable synthetic meat laboratory

For simplicity, each lab should have two storeys, and a strong foundation.
Roof should be flat for the placement of North-angled solar panels.
From what's speculated at this moment, the labs are leaning towards being placed in tropical/hot environments, so the outer walls should be made out of the best substance to defend the inside of the building from the heat. Common insulators (materials poor at conducting heat) are stone and concrete.
Concrete is more cost effective at this moment.
Foundation needs to be strong to support both heavy concrete walls and two storeys.
Roof will be made with an outer layer of metal sheets which work best with solar panels.
Triple insulated glazing
Solar panels will be used, along with water collection to store and filter for both experiments and drinking.

-1 Footing, value at -172, 172 mm to next:
0 Ground, value at 0, 3000 mm to next:
1 First, Elevated by 3000 mm, 3000 to roof:
2 Roof, Elevated by 6000 mm.







See walls to each stretch 10 metres, and having 1 floors of 100 sq metres.

Location will be Northern Queensland where it will have sunlight that can be collected and rainwater as well.

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