

By Tom, Hannah & Alex

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# Lab-Made Meat: The Facts



# 50 Years Hence.

We shall escape the absurdity of growing a whole chicken in order to eat the breast or wing, by growing these parts separately under a suitable medium.

Synthetic food will, of course, also be used in the future.

Winston Churchill, The Strand Magazine December 1931.

# 1<sup>st</sup> Cultured Burger.

- 5th August 2013- 5oz burger eaten in London costs \$330,000 of grant money to make ≈ \$1,120,000 per pound.



News > Science

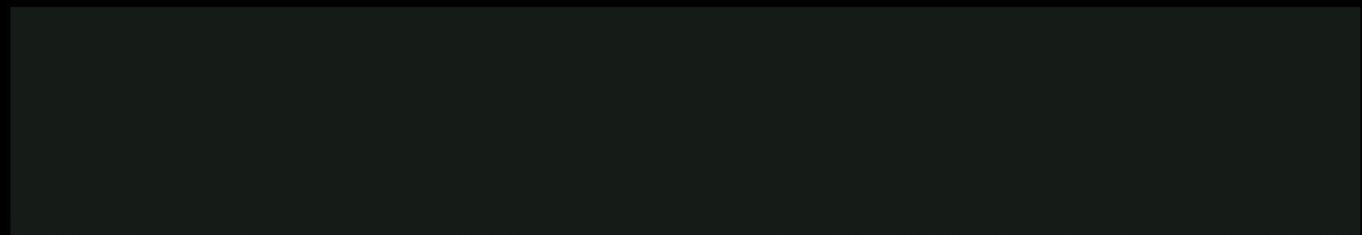
# Lab-grown 'clean' meat could be on sale by end of 2018, says producer

Cultured tissue, harvested without killing any animals, could allow scientists to grow meals' worth of products with just a handful of starter cells

Lucy Pasha-Robinson | @lucypasha | Friday 2 March 2018 16:17 |  13 comments



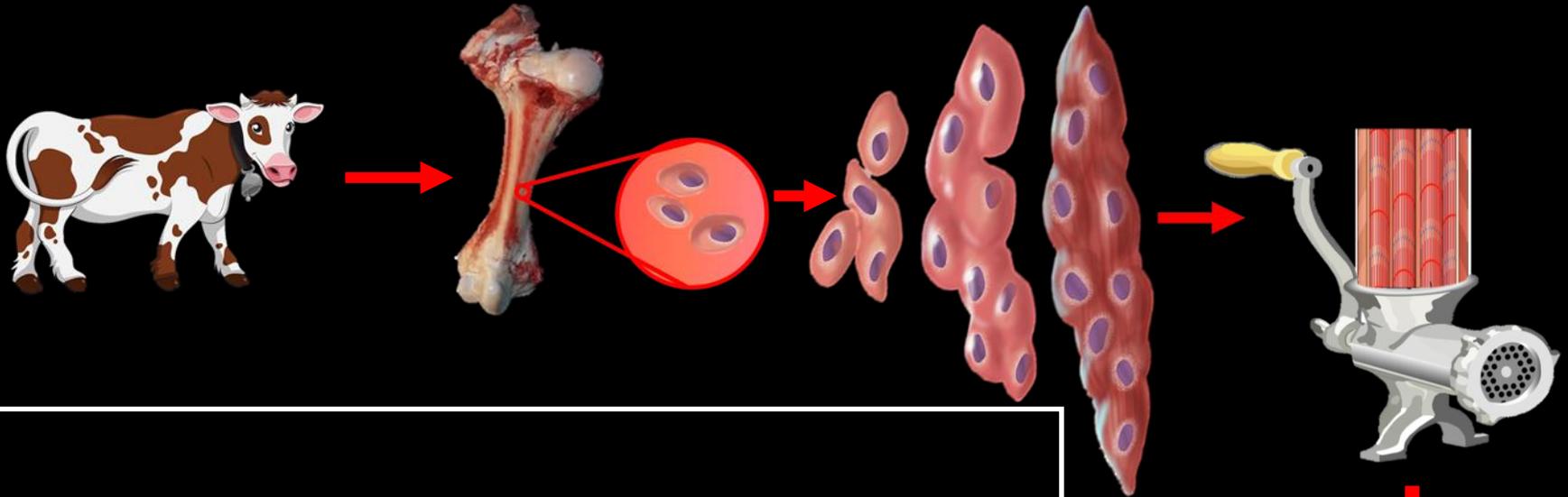
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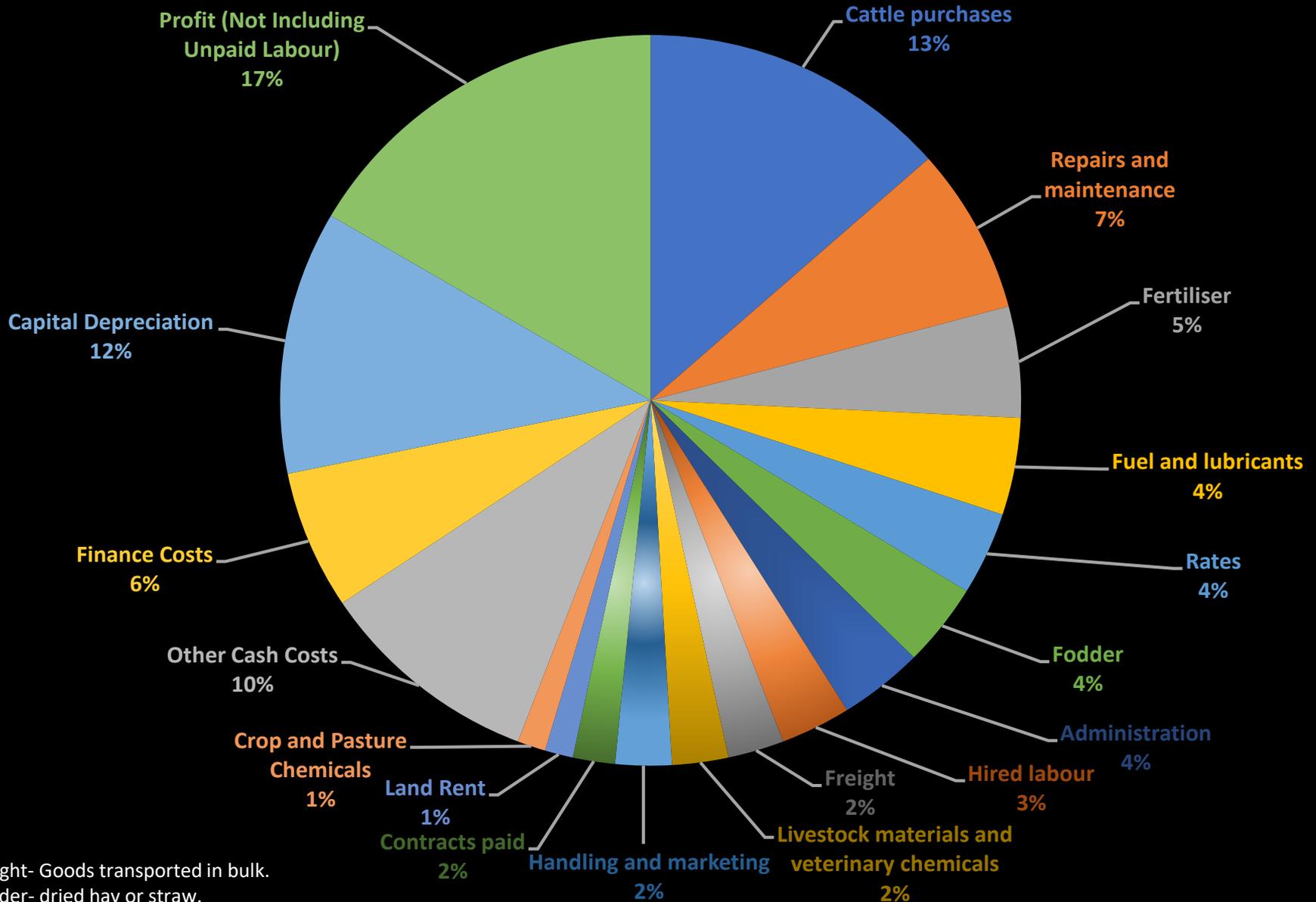


How do you 'grow' meat?



Economic Validity

# COST OF 1KG OF BEEF



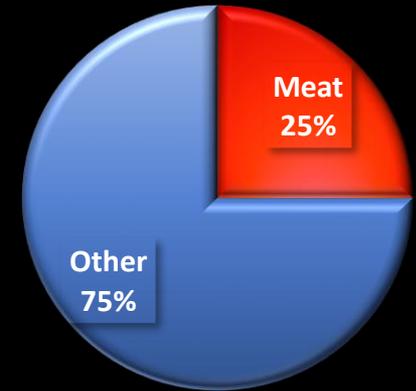
Freight- Goods transported in bulk.  
 Fodder- dried hay or straw.  
 Capital Depreciation- Decrease in value due to obsolescence, changes in the demand, etc.

[must-understand-cost-of-production.nim](http://must-understand-cost-of-production.nim)

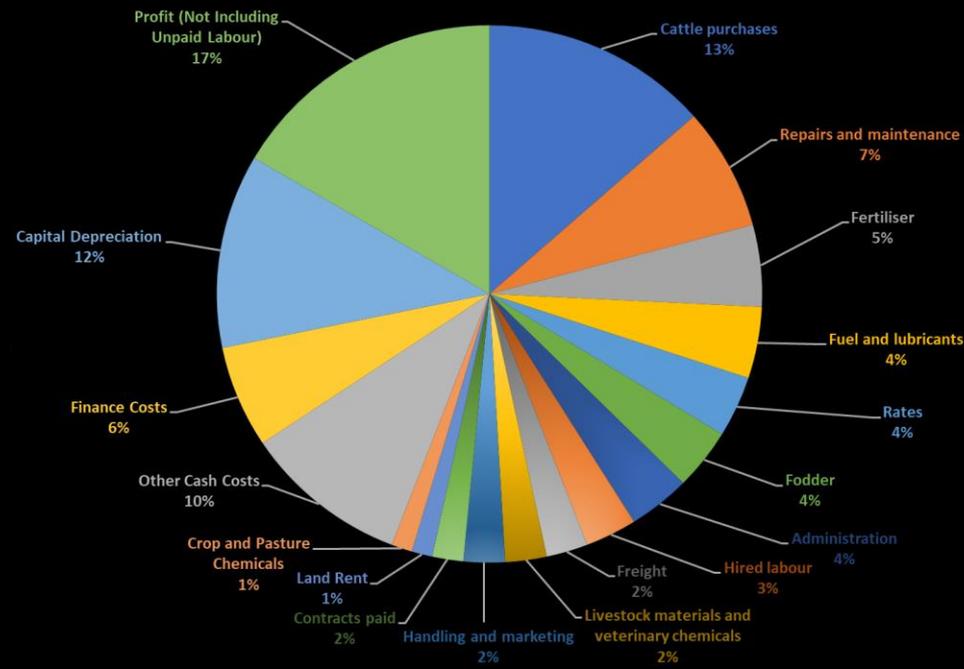
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# Lab made beef Costs

- Is not entire animal, only meat, therefore no bones and almost all serum used to create muscle, no vet bills or fodder needed.



**COST OF 1KG OF BEEF**

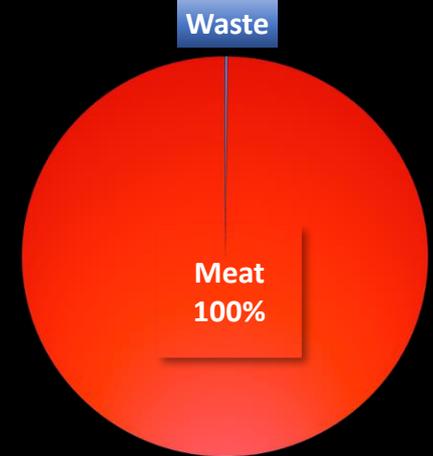


(Food for the cultured meat assumed under raw material cost)

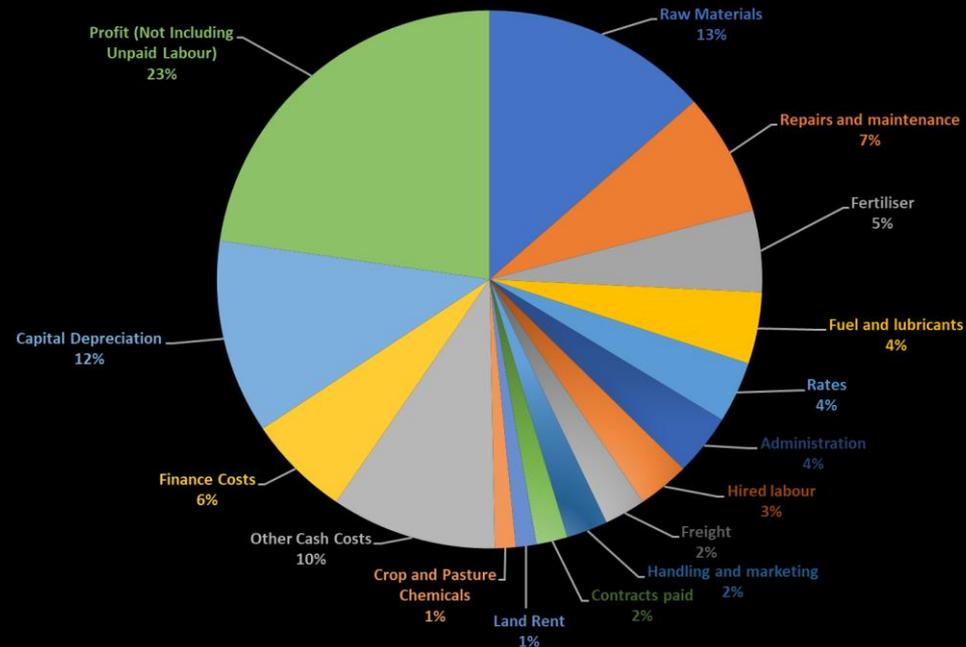
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3551074/>

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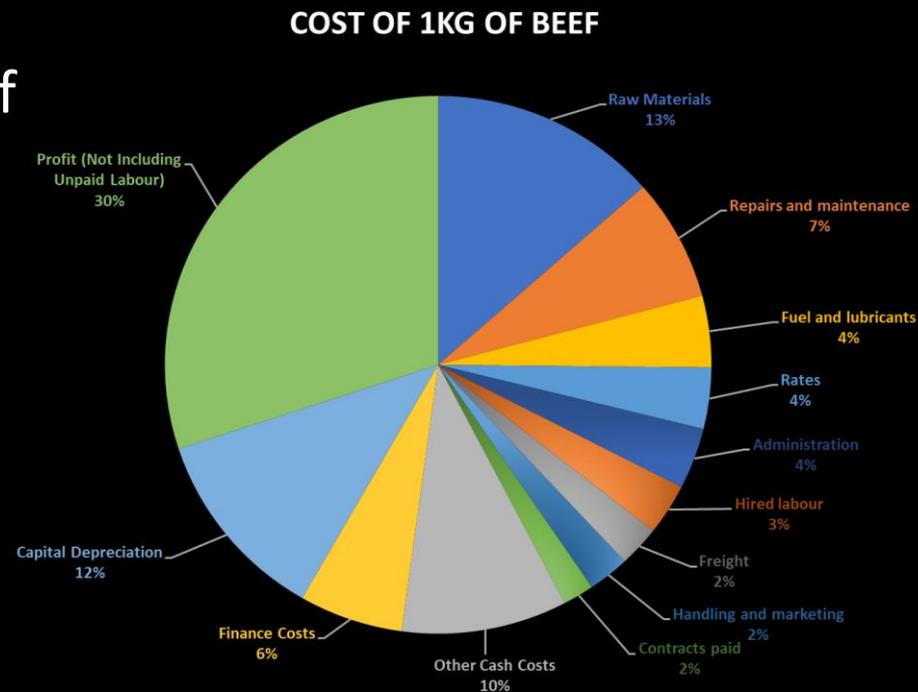
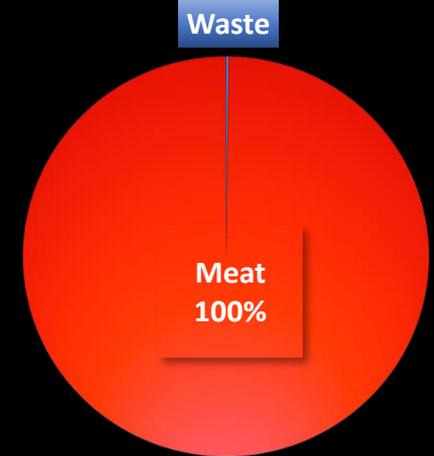


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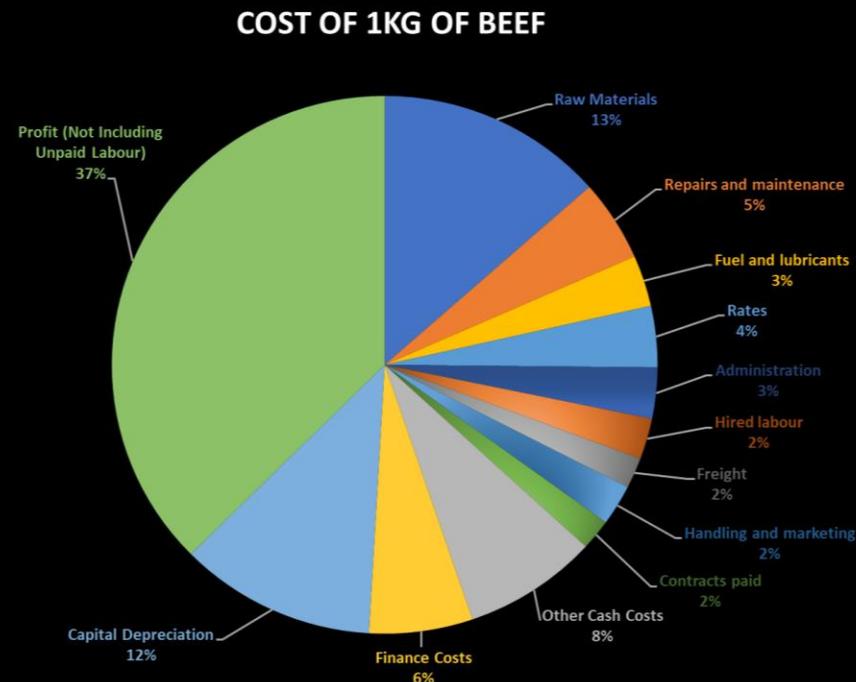
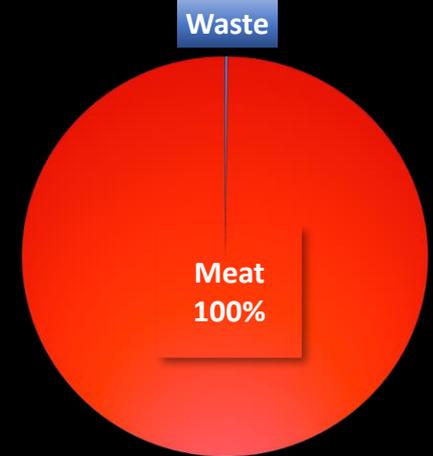


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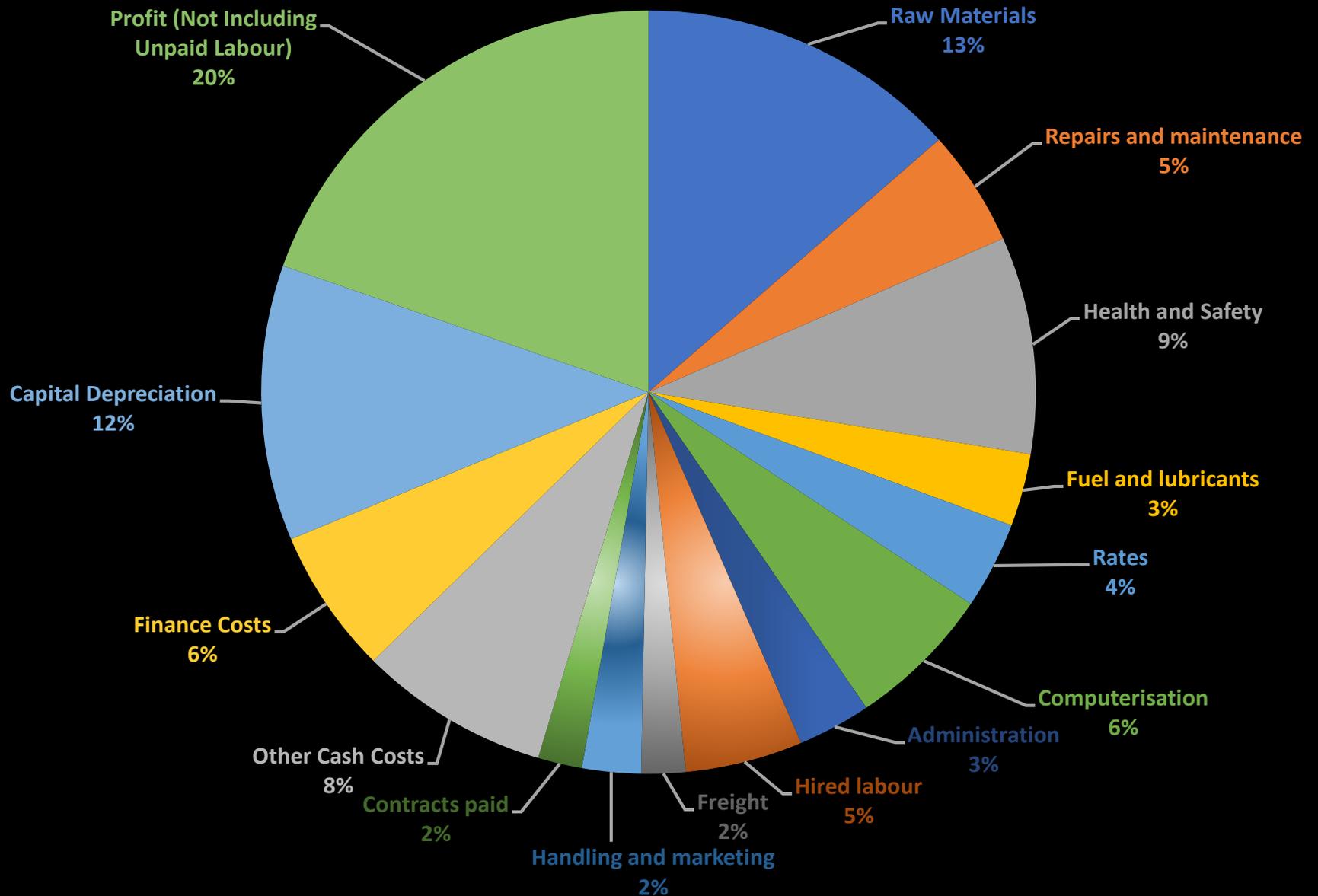
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- However, these decreased could be nullified by new costs due to a stricter hygiene regime, stricter control, computer management and staff needing training.



(Food for the cultured meat assumed under raw material cost)

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# PREDICTED COST BREAKDOWN FOR CULTURED MEAT



# New Method- Different Costs?

- Myoblast culturing usually takes place in an animal based serum
- This is very costly, being roughly 90% of the raw material costs.
- There is research into Serum-free media reduce operating costs and process variability while lessening the potential source of infectious agents.
- Using plant based serums, made from ground-up mushrooms or blue-green algae are also being researched, but may be more expensive than the animal based.
- 10x price of beef March 2015  
\$36.00 per pound



# Health, Prospects and Concerns

# Reduced risk of disease

No requirement for growth hormones which according to the EU's Scientific Committee for Veterinary Measures, can have "developmental, neurobiological, and carcinogenic effects."

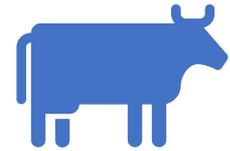
No residues of pesticides (applied to the animals to control insects), tranquillizers, or de-wormers.

Currently most production using fetal calf serum contains antibiotics and anti-fungal agents (Jones, 2010) however it is anticipated that once the process is upscaled into large mass-production facilities this would not be necessary due to strict quality controls.

Eating conventional meat can lead to food-borne pathogens such listeria, E. coli or Campylobacter infections (among others). These contribute to millions of episodes of illness each year (CDC, 2012). These diseases have been associated with the intensity of livestock farming and other anthropogenic developments in the bio-industry.

# Similarities to red meat grown traditionally

- Cardiovascular disease, diabetes and cancer have been associated with red meat consumption. 120g red meat per day significantly raised the relative risk of colorectal cancer in a study by Larsson and Wolk, 2006.
- The specific nutrients causing these issues are not known, therefore it would be difficult to avoid specific health issues being prevalent even in modified lab meat. (Post, 2012).
- First burger in consumed in London in, 2013, was composed only of muscle fibres – no connective tissue, fat or blood vessels. If in vitro meats were produced using this technology, they could lack nutrients that are essential for good health.
- This, according to Post, means that the range of nutrients in cultured beef would be different than in conventional meat. Work is being done to improve that and once these components have been successfully combined cultured meat could be healthier than its traditional counterpart.



# Potential for customised protein sources

By manipulating the culture medium, poly-unsaturated fatty acid composition could potentially be increased, while the fat content can be adjusted further with supplementations after production. By editing the biochemical composition of the meat it can be tailored to specific dietary requirements or simply create a healthier source of protein.

For example replacing saturated fatty acids with omega-3 fatty acids could lead to meat that lowers the risk of heart disease, rather than raise it.

These techniques are not inherent to the production of cultured meat however. Although currently motivated by social/environmental factors there is no guarantee future producers will share these priorities.

Balance between mimicry and modification.

Environmental Impact

# Environmental Impacts

## Land

### **Agriculturally produced meat**

- High feed requirements for animals
- Feedcrops dominate land space, causing environmental repercussions

### **Cultured Meat**

- Potentially significant reduction in land use
- Potential for vertical farming
- Issues with growth serum production



# Environmental Impacts

## Greenhouse Gases, Energy and Water Use

### **Agriculturally produced meat**

- Large volume of greenhouse gas emissions
- High water consumption for meat production

### **Cultured Meat**

- Reduced emissions and energy use (depending on meat)
- Reduced water use



# Environmental Impacts

## Potential problems

- Potential impact of waste culture disposal
- Performs less well compared to other meat substitutes in environmental impact comparison study
- Possible innovation



# Environmental Impacts

## Verdict

- Land use and emissions reduced compared to current methods
- Energy use can be reduced
- Overall, cultured meat would be an environmentally viable option for the future of the meat industry if energy requirements could be reduced and a substitute serum could be produced



Video-

<https://www.bbc.co.uk/news/science-environment-23576143>

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