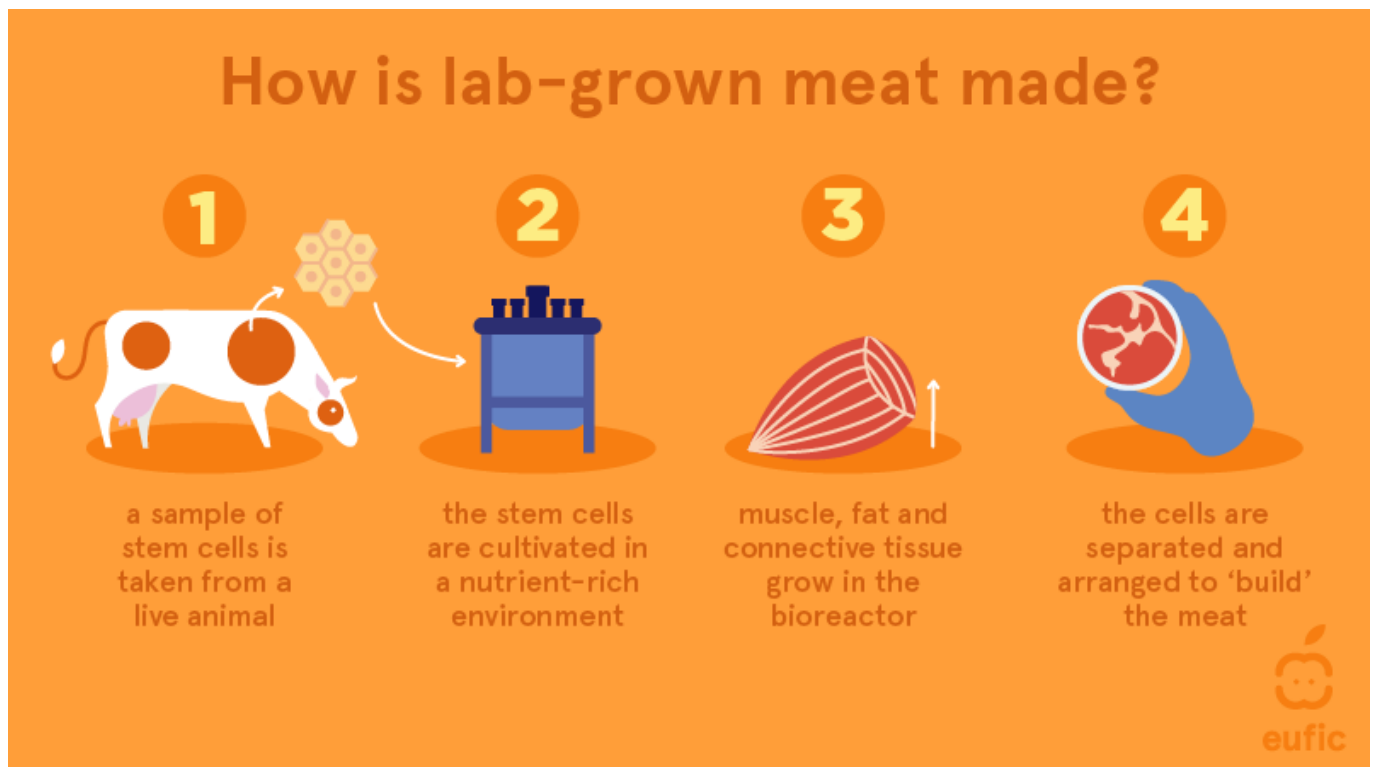




Lab grown meat: how it is made and what are the pros and cons

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There has been a lot of talk about lab-grown meat (also called cultivated or cell-based meat) in the news recently. This article explains what it is, how it's made, and the barriers that will need to be overcome if we're ever going to find it in supermarkets in Europe.



What is lab-grown meat and how is it made?

Lab-grown meat refers to meat developed from animal cell culture, and not via traditional raising and slaughter of living animals.¹ It is not an imitation of meat made with other ingredients, like

plant-based burgers that are made from plant-based proteins.

The production process can be broken down into four steps:¹

1. A sample of stem cells is taken from a live animal. Stem cells are cells that can develop into other specialised types of cells found in the body, for example, blood, liver or muscle cells.
2. The stem cells are put in large tanks called bioreactors, containing culture media that recreate a similar environment to that which the cells would find in the animal's body and provides them with the nutrients they need to multiply.
3. The culture media is changed so that stem cells can differentiate into the three main components of meat: muscle, fat, and connective tissue.
4. These cells are separated and arranged to "build" the type of meat that is being produced. This is called scaffolding. A scaffold is an edible material that supports the organisation of meat cells into the desired shape, for example, a steak, or mincemeat. The scaffold does more than just hold cells together. It also carries nutrients and helps them differentiate even further. In general, complex structures like steaks are more challenging to reproduce than burgers.

Who invented lab-grown meat?

The first time a cultivated beef patty was introduced to the world was in August 2013. The meat was developed by a team led by Mark Post, of Maastricht University.

At the moment, there are about 60 start-ups aiming to produce and sell cultivated meat, and not just beef, but also chicken, duck, seafood, foie gras, kangaroo, and more.

What are some pros and cons of lab-grown meat?

Animal welfare is one reason for producing lab-grown meat. This production method can produce meat without the need for raising and slaughtering a large number of animals and therefore, has the potential to increase animal welfare within the food system.² However, the process currently still relies on stem cells obtained from a live animal, and the most widely used culture medium contains fetal bovine serum (FBS), which is collected from foetal blood at animal slaughterhouses, so it is not yet entirely slaughter-free.³

Some advocates of lab-based meat also consider improved **food safety** as an advantage of lab-grown meat. This is because, in the controlled lab environment, meat products will not face the traditional risk of contamination with illness-causing bacteria like E.coli or Campylobacter, which usually come from the gut of livestock. However, as with any industrial food production, microbiological or chemical contamination can still occur at different stages. Thorough safety assessments will be needed before they can be sold in Europe.⁴

More **sustainable production of protein** will be crucial in the next 30 years, considering that the world population is expected to grow to 9 billion by 2050 and sustainability is an important motivation to produce lab-grown meat. However, it is not clear yet whether mass-scale production of meat in the lab will be more environmentally sustainable than traditional animal husbandry. While less of some resources such as water, land and fertilizers, are needed compared to what is needed to grow feed crops and livestock,^{5,6} other aspects are more complicated. For example:

- While a reduction of cattle farming would decrease methane emissions that contribute to climate change, recent modelling studies have suggested that lab-based meat production could

generate problematic levels of CO2 emissions over the long term.⁷

- Producing cultivated meat requires significant energy input, which could pose a problem if fossil fuels are used to power the production process. The use of renewable energy will be key to addressing sustainability issues.⁷

Is lab grown meat suitable for vegetarians or vegans?

Lab-grown meat is an old food produced in a new way, which raises a few questions.

In the early days, vegans and vegetarians would have rejected lab-grown meat completely, because it used foetal bovine serum (FBS) as the growth medium. However since then, companies have been working to replace FBS with a growth medium that doesn't come from animals, and this was achieved for the first time in 2022.⁸ While lab-grown meat is still considered meat, those who refuse to eat meat for animal welfare reasons may choose to eat it when produced in this way.

Is lab grown meat halal/kosher?

While Jewish and Muslim religious authorities have yet to express an official opinion on this, some believe that it could eventually be considered kosher or halal.^{9,10} Others disagree. Meat that is kosher or halal must come from an animal that has been slaughtered following specific rules, that can be complicated to apply to this non-traditional production method. It remains to be seen whether these types of products will be generally accepted as kosher or halal.

Is lab-grown meat approved in the EU?

As a novel food, cultivated meat must be approved by national food safety authorities before it can be sold to consumers. The only country in the world where this has happened so far is Singapore, although the US is also making progress towards this goal. Singapore has introduced strict measures for the safety assessment of cultured meat which is currently regarded as a novel food.¹¹

In Europe, before a novel food is sold, it must be approved by the European Commission. Until now, no company or organization has applied for approval, although this is likely to happen in 2023. Then, the European Safety Authority (EFSA) will review the novel food to determine whether it's safe for humans. [This review process can last a few years.](#)

It is too soon to know whether lab-grown meat will be labelled as 'meat'. In the EU, the legal definition of meat (which was created when animals were its only possible source) is 'skeletal muscle deriving from specified animal species.' In the case of cultivated meat, however, there is no animal and no skeleton, so it's not clear if the existing definition will be sufficient to cover lab-grown meat or not. At the moment, labelling of lab-grown meat is under review in the United States where a [public consultation](#) is underway.

Will lab-grown meat replace traditional meat?

If lab-grown meat is going to replace a significant percentage of the meat that we eat, consumer acceptance will be key. Current studies indicate that people are still quite reluctant to accept cultured meat, although acceptance can be increased by the way information about the product is presented.¹² For now, people seem more likely to prefer plant-based options when considering alternative proteins.¹² However, most available consumer research on lab-based meat is based upon hypothetical situations and very few consumers have had the opportunity to taste cultivated meat so

far. There are not many studies on the sensorial properties, so we don't have much information about how the taste and texture compares to traditional meat.

It is also difficult to say whether the nutritional value of these novel products will be the same. The reason for the uncertainty is that producing lab grown meat is complex and expensive and most of the knowledge is owned by the companies who have invested in developing the technology. There are not many samples available for independent researchers, so much of the available data is so far either theoretical or based on information provided by start-ups themselves.¹³

While there are many questions still to be answered about lab-grown meat, EFSA has announced an increased focus on cell-culture derived foods, which may be a step towards paving the way to finding these products on European supermarket shelves.

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