

# NewScientist

## Lab-grown meat could be 25 times worse for the climate than beef

Analysis finds the carbon footprint of cultivated meat is likely to be higher than beef if current production methods are scaled up because they are still highly energy-intensive

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Meat produced from cultured cells could be 25 times worse for the climate than regular beef unless scientists find ways to overhaul energy-intensive steps in its production.

[Lab-grown or “cultivated” meat](#) is made by growing animal stem cells around a scaffold in a nutrient-rich broth. It has been proposed as a kinder and greener alternative to traditional meat because it uses less land, feed, water and antibiotics than animal farming and removes the need to farm and slaughter livestock, which are a major source of greenhouse gases.

However, [Derrick Risner](#) at the University of California, Davis, and his colleagues found that the global warming potential of cultivated meat, defined as the carbon dioxide equivalents emitted for each kilogram of meat produced, is 4 to 25 times higher than for regular beef.

The researchers conducted a life-cycle assessment of cultivated meat that estimated the energy used in each step in current production methods. They predict that this will be similar regardless of which animal’s cells are being cultivated.

They found that the nutrient broth used to culture the animal cells has a large carbon footprint because it contains components like sugars, growth factors, salts, amino acids and vitamins that each come with energy costs.

For example, energy is required to grow crops for sugars and to run laboratories that extract growth factors from cells. Each component must also be carefully purified using energy-intensive techniques like ultrafiltration and chromatography before they can be mixed into the broth.

This “pharmaceutical-grade” level of purification is required so that there are no contaminants such as bacteria or their associated toxins in the broth, says Risner.

“Otherwise the animal cells won’t grow, because the bacteria will multiply much faster,” he says.

[Pelle Sinke](#) at CE Delft, a consulting company in the Netherlands, and his colleagues published another [life-cycle assessment of cultivated meat](#) in January that found that its carbon footprint would be lower than that of beef.

However, their analysis, which was part-funded by the Good Food Institute, a cultivated meat advocacy group based in Washington DC, modelled a hypothetical future scenario in which pharmaceutical-grade components were replaced with less pure ones termed “food-grade”. “We assumed that it will be possible to make this transition from pharma-grade to food-grade in the future,” says Sinke.

At the moment, all cultivated meat is grown in pharmaceutical-grade nutrient broths, but the Good Food Institute told *New Scientist* that “cultivated meat companies are moving towards an input supply chain that is suitable for use in food production, rather than built for pharmaceuticals”.

Risner says he is dubious about whether this will be possible because even trace levels of contamination can destroy animal cell cultures. Nevertheless, it may be possible in the future to engineer animal cells that are more resilient to contaminants, he says.

Using renewable energy to power cultivated meat factories and their supply chains could also help to reduce their carbon footprint, says Sinke.

These are issues that urgently need to be addressed before lab-grown meat is scaled up to industrial production, says Risner. “\$2 billion has already been invested in this technology, but we don’t actually know if it’s going to be better for the environment,” he says.

**Reference:**

**bioRxiv** [DOI: 10.1101/2023.04.21.537778v1](https://doi.org/10.1101/2023.04.21.537778v1)