

I'm a bad vegetarian who sometimes breaks the rules. Could lab-grown steak be the answer?



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I gave up eating meat because of the damage it does to the planet but occasionally I break my own rules. Now, a rise in "alternative proteins", some of which are derived from real animal cells, might allow me to get my meat-fix, minus the climate guilt.

In September 2018, I decided to finally go veggie. I had wanted to take the leap for a while but couldn't quite bring myself to commit, until I realised I felt slightly jealous when other people told me they were vegetarian.

The stats don't lie. Meat and dairy are responsible for 60% of farming's greenhouse gas emissions, yet provide just 18% of our calories. The livestock sector guzzles roughly one-third of all freshwater on Earth. It is simply too large.

Meat, as committed carnivores will tell you, does have health benefits. It is rich in protein and nutrients, and animals help fertilise the soil.

It is also delicious.

So, occasionally, I break my own rules. Progress not perfection, right? But there may be a solution on the horizon for people who want to eat meat with a clean conscience.



Newcastle-based 3D Bio-Tissues says it has produced the first-ever steak fillet of cultivated meat, made from pork cells, which 'replicated pork's unique flavour and texture'

The "alternative protein" sector in the UK is enjoying a growth spurt. Investment in so-called "cultivated" meat - one of the three types of "alternative proteins" - jumped from £12m in 2021 to £59m in 2022.

"Cultivated" or "cell-cultured meat" describes meat products derived from real animal cells and grown in a lab or a cultivator, a bit like in a brewery. The industry prefers these terms to "lab-grown", with its vaguely sci-fi connotations.

Plenty of food, from beer to bread, begins in a food lab, says the Good Food Institute on their website, which campaigns for more sustainable meat production, "but we don't call cornflakes 'lab-created cornflakes'".

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I sign a disclaimer so I could try meat grown in a vat

Dreaming of tucking into an almost real steak, I head off to try some of the UK's first cultivated meat, courtesy of Ivy Farm, an Oxford-based start-up with a bucolic name.

In an office adorned with tall plants, green floors and images of animals, Ivy Farm's head of cell sciences, Rowan Rimmington, talks me through their process.

It starts with a clump of fat or muscle cells from a pig; 1cm squared is enough to provide 40 million cells that can last them forever, because they teach the cells to multiply infinitely.

"We've got to make the cells immortal," says Rimmington, so you don't have to "go back to the animal".

Ivy Farm, and just a few others in the UK, "immortalise" the cells by identifying those in the original clump that would have naturally

replicated in the animal's body anyway, like when muscles break down during exercise and repair themselves, growing bulkier in the process.

It then feeds those cells a carefully-blended fluid so they can grow.

The meat is not regulated for market yet, so I have signed a disclaimer to confirm I know what I am getting myself into.

As two similar products have recently been given the greenlight by US regulators, and the real cells are identical to those grown in an animal, I felt reassured.



Ivy Farm's chief commercial and product officer Emma Lewis serves up three types of meatballs at their office in Oxford



I'm served a small meatball made from cultivated pork mince, and one made to the same recipe of onion, thyme and sage, but with real pork.

So I could compare with a plant-based alternative, I also try an award-winning plant-based meatball made from pea-protein.

The verdict?

I'm not going to lie, it feels good to sink my teeth into some juicy meat.

The cultivated meatball has an authentically crispy exterior, oozes fatty juices and chews the same way as pork. It smells like cooked meat too.

The only difference is that the normal meatball has a slightly stronger flavour, which could be due to the fact it is a little larger, so juicier.

It could also be down to real pork having more saturated fat, explains Ivy Farm's chief commercial and product officer Emma Lewis.

Bad for health, but great for flavour, it turns out. But fats are one of the many things, along with iron and amino acids, they can tailor depending on what they feed the cells.



Climate reporter Victoria Seabrook puts Ivy Farm's cultivated meatball to the test

"Unsaturated fats are more liquid, so you get more greasiness. Whereas saturated fats, they're solid, they're less healthy, but they give more of that kind of mouth-coating that you associate with meat," explains Lewis.

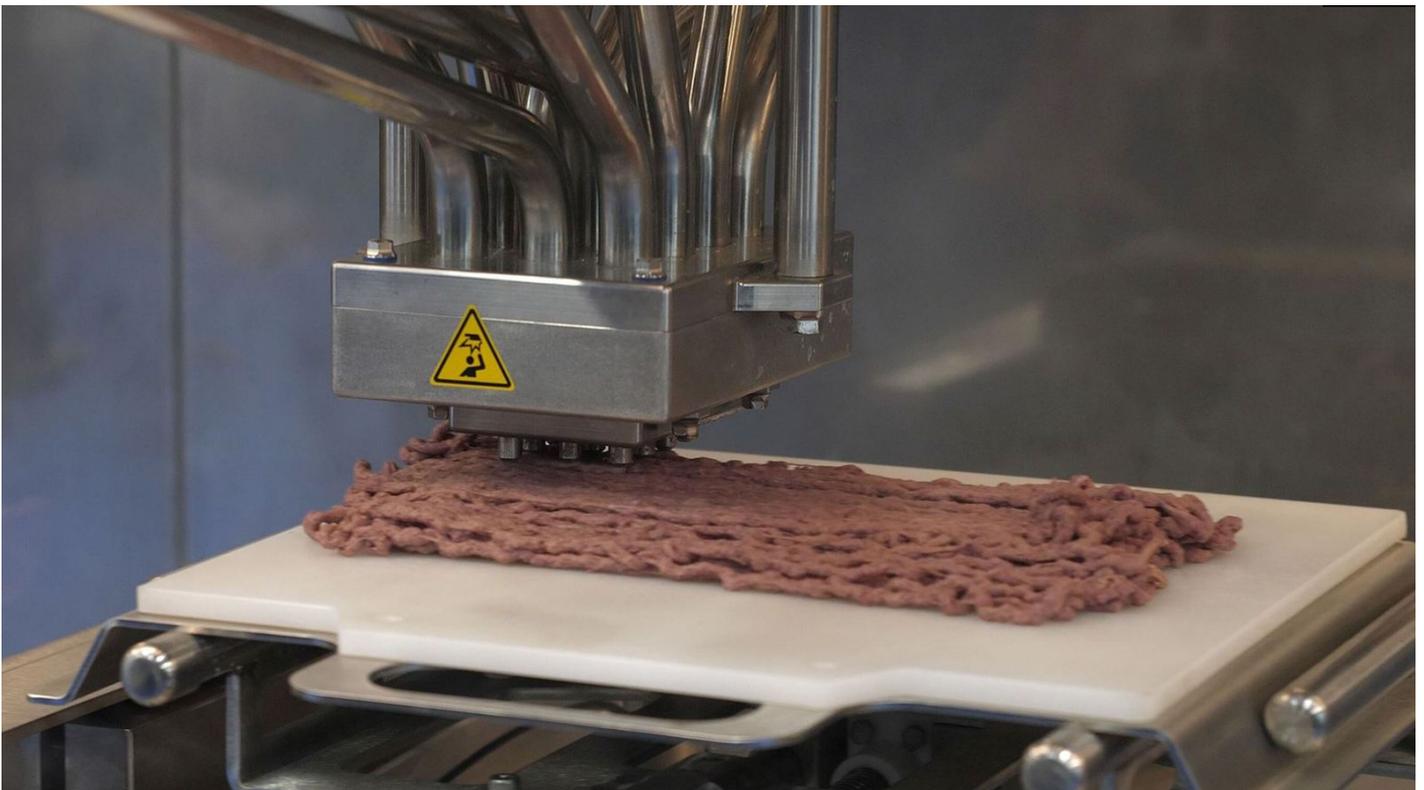
"By playing with these levels, and then playing with muscle and fat in different combinations, we can optimise not only how it tastes, but the texture and the nutrition as well."

Advocates hope cultivated meat will not replace either plant-based or real meat, but will eventually eat up about 35% of the market.

Alas, the plant-based meatball pales in comparison with the other two. Its onion and herb aroma vaguely mimics the real thing, but its pasty, soft consistency is no match for real meat.

The trouble with eating meat is it reminds you of what you are missing.

But plant-based meats could soon become closer to the real thing thanks to innovative ways of making them.



Redefine Meat 3D prints a plant-based 'beef flank' by building it up layer by layer

3D printed 'steak'

One of these methods is 3D printing. Israeli start-up, Redefine Meat, uses plants to recreate what they describe as the three "building blocks" of meat - fat, muscle and blood - and then compile them into a prime cut using a 3D printer.

To create fat, they blend different oils such as coconut and rapeseed. The "muscle" comes from plant-based proteins like soy, pea or chickpea. Dark red plants like beetroot and cranberry are the basis of the "blood".

I sat down for lunch at Meraki, a swish modern Greek restaurant in London's West End, where a variety of Redefine Meat ingredients are peppered through the main menu - not tucked away in a vegetarian section.

MENU		A LA CARTE	
mus Greek Style ✓ ry chickpea, toasted buckwheat seed, pita		Start the MERAKI experience with	
ides d wagyu beef meatball, yoghurt, tahini, parsley		Aubergines 'Meltzanosalata' ✓ 10 Smoked aubergine, parsley, Florina, pepper, Rhodes ladopitta	
Greek Style thy potato, poached egg, cretan butter, truffle oil		Baby Squid 16 Crispy squid, paprika, basil mayonnaise	
Artichokes ✓ okes, lemon oil, herb, burnt tomato		Fresh and Raw	
Seabass s, lemon oil, wild 'horta', roasted potato		Tuna Ceviche 16 Tuna ceviche, black truffle, crispy filo pastry	
"Trofie" asta, pumpkin delicia, butternut squash, n seed, 'graviera' cheese (option available) ✓		Seabass Carpaccio 15 Seabass, tomato, fennel, lemon	
m & Sorbet Selection shed almonds cookies (3 scoops)		Beef Carpaccio 15 Seared beef, walnut, black truffle, 'metsovone'	
		Yellowtail Sashimi 25 Yellowtail, taroma, 'kritamo', basil, caviar	
		Courgette Ceviche ✓ 12 Courgette, tomato, basil, crispy aubergine	
		Celeriac Carpaccio ✓ 14 Celeriac carpaccio, wild mushroom, truffle	
		Spread	
		Taramosalata 7 White cod roe emulsion, smoked herring caviar, bottarga	
		Meraki's Tzatziki 6 Greek yoghurt, garlic, mint, courgette	
		Hummus Greek Style ✓ 6 Crispy chickpea, toasted buckwheat seed	
		Pita Bread Basket 4	
		Salads	
		Santorini Tomatoes Salad 14 Cherry tomato, thyme, caper leaf, goat cheese	
		Mykonian Salad 13 Tomato, cucumber, 'kritamo', olive, feta	
		Crab Salad 16 Dorset crab, avocado, spring onion, lemon, chive	
		Beetroot Salad 12 Tsalafouti sheep cheese, green apple, pecan nut	
		Quinoa Salad 10	
		Octopus 18 Octopus, fava bean, onion 'stifado', oregano	
		Greek Artichokes 14 Artichoke, lemon oil, herb, 'gavros'	
		'Redefine Lamb' Keftedes ✓ 14 Plant-based 'redefine' lamb kebab, tahini, tomato	
		Main Course	
		From the sea	
		Grilled King Prawns 28 Tiger prawns, herb & tomato oil, burnt lemon	
		Butterfly Seabream 30 Seabream, tomato, olives, caper berry	
		Salt-crusted Seabass 58 Seabass, 'horta', thyme-lemon olive oil dressing (Serves two)	
		From the land	
		Charcoal-grilled Baby Chicken 25 Baby chicken, chimichurri, parsnip	
		Lamb Chops (3 pieces) 33 Grilled lamb chop, rosemary, crispy courgette, yoghurt tahini	
		Grilled Rib-eye 36 Beef rib-eye, oregano, Florina pepper chimichurri	
		Beef Fillet Kebab 31 Beef, harissa, aubergine yoghurt, tomato	
		Josper 'Redefine Beef Fillet' ✓ 35 Plant-base 'redefine' fillet, cauliflower, mushroom, chimichurri	
		Pasta	
		Beef Brisket 'Makaronaki' with black truffle 26 16-hours braised beef, short pasta, 'graviera'	
		Mushroom 'Giovuetsi' 28 Orzo pasta, portobello, wild mushroom, 'graviera', chive	
		Lobster 'Giovuetsi' 65 Lobster, orzo pasta, cherry tomato, lemon zest, basil	

Meraki in the West End has embedded Redefine meat dishes within the main menu

The steak was served sliced on a wooden chopping board - with a steak knife, for extra authenticity.

I was surprised how well it recreated the texture of meat - something which I find eludes most plant-based products. It looked fibrous, it tore in the same way too, and, like steak, it took a few chews to break it down.

One kilogram of their 3D-printed beef used 98% less water, 96% less land and emits 91% fewer greenhouse gases.

But unfortunately it tasted only a little like steak: salty and savoury, but no rich, beefy hit. Back to the drawing board - or should I say laboratory?





but then I tried the lamb, and I was amazed.

As I bit into the sizzling piece of "meat", I was transported back to the roast lamb my mum cooked when I was young, and the sandwiches we would make with the leftovers.

This kofte-style lamb had almost the same distinctive, earthy, fatty flavour of the real thing.

To ensure I could accurately judge it, I tried the real lamb kofte too - all in the name of journalism, of course.

Eating the real meat made me realise that Redefine Meat's lamb was not quite on par. It tasted virtually the same, just a touch milder, but perhaps that'll please those who find lamb too punchy.

Climate Activism: Increasingly effective, or increasingly a

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When the two come together...

Another innovation brewing in the sector is the blend of cultivated meat with plant-based meat.

Hoxton Farms, based in London's tech heart around Old Street, makes "real animal fat, without the animals". Unlike Ivy Farm, they are only growing fat which they plan to sell as an ingredient to plant-based meat companies.

"To make something that creates traditional meat, you can get quite a long way with plant protein - things like soy and pea - and they give you the texture and the bulk that you get from muscle," said co-founder Ed Steele over the phone.

"But what these products are really missing is... the mouth feel - the way that meat sizzles in the pan is because of the fat that's in the meat."





Says Emily Urde from sustainable meat group C...

Media images of "a piece of steak shoved into a petri dish" also don't help, he adds.

Then again, one third (34%) of UK consumers would try cultivated meat, according to a survey by the Food Standards Agency (FSA).

But before reaching our plates the products have to pass regulation under the Novel Foods Act.

That process is so lengthy, says Ivy Farm, that consumers wouldn't be able to buy its meatballs until at least 2026 - so it is considering launching in the US first. The FSA is currently reviewing the regulatory process.

Two similar products - chicken made in tanks by Upside Foods and by Good Meat - have been cleared as safe to eat in the US, although haven't yet been approved for sale.

If consumers are happy to tuck in, the global cultivated meat market could reach £16-20bn by 2030, according to research by McKinsey.

A spokesperson for the UK environment department said the government's food strategy includes a "commitment to keep the UK at the forefront of the alternative protein sector by supporting new research and innovation".

Last week government-funded UK Research and Innovation (UKRI) pledged £12m for cell-cultured food. But the industry needs some £120m of public money to get going, according to an independent report commissioned by the government.

Cost is another major obstacle for the industry, with the fluid "medium" that feeds the cells particularly pricey. The single meatball I scoffed at Ivy Farm cost £16 to produce.

A study published in December found that even with "phenomenal improvements in technology", one kilogram of cell-cultured meat would still cost £50. Beef steak costs around £16.45 at the moment.

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Time for change

Professor Tom MacMillan from the Royal Agricultural University in Cirencester, who is studying the impact of lab-grown meat in farming, said it "massively matters whether these products come in effectively competing with steaks and so on, or whether they come in competing with mince and nuggets".

The impact would be bigger at the cheaper end, because it will make it less viable to farm a real animal only for the premium cuts, he said.

But there doesn't need to be a silver bullet for reducing our real meat consumption, according to Linus Pardoe from GFI.

"We're going to need lots of changes all throughout the food system to make sure that people are getting healthy and balanced diets that are more friendly for our planet," he says.

As a bad vegetarian, I've been dreaming of the next guilt-free, cell cultured meatball I can get my hands on.

Perhaps that makes me a good vegetarian after all?

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