

From Lab to Fork

Will plant-based proteins brewed in bioreactors save the planet?

by **Andrew Standen-Raz**

To the late chef Anthony Bourdain, “Life without veal stock, pork fat, sausage, organ meat, *demi-glace*, or even stinky cheese is not a life worth living.”

Vegetarians, he wrote in *Kitchen Confidential*, “are the enemy of everything good and decent in the human spirit, an affront to all I stand for – the pure enjoyment of food.” Bourdain was no kinder toward vegans, calling them vegetarians’ “Hezbollah-like splinter-faction.”

In the ’90s, when a veggie plate meant soggy courgettes, it was easy for the red meat guys to laugh along to Denis Leary’s standup routine *No Cure for Cancer*. “Eggplant tastes like eggplant, but meat tastes like murder. And murder tastes pretty good.”

In the intervening years, ever-cheaper meat seemed worth the cognitive dissonance it required to ignore its torturous journey to the table. Almost 40 years later, with a new generation raised on recycling, electric cars and ethical consumerism, vegans may be having the last laugh: “Plant-based proteins” – vegan food for a new age – are the fastest growing food trend in the developed world since organic farming.

“We know from retailers like Spar that 80% of the veggie products are bought by meat-eaters who want variety,” confirms Felix Hnat, an environmental economist and chairman of the Vegan Society Austria (VGÖ). Plant-based familiar favorites are drawing in omnivorous “flexitarians” tempted by ice cream, fish and chips, fried chicken, scallops and even *foie gras* – all made with vegetable protein. Billionaires like Bill Gates and Richard Branson are investors in competing plant-based burgers. Celebrities help, too. The increasingly popular “Veganuary” vegan month this year attracted Jay Z and Beyonce, who lasted 22 days.

“Should the methods we invented at the start of the Industrial Revolution always be the right answer to everything?” asks Hanni Rützler, Austrian food scientist and author of the 2019 Food Report from her Future Food Studio. “We can’t go back, but we can reinvent.” The continued success of plant-based proteins, and other alternatives such as in vitro meat and insects, depends not only on how we continue to produce real meat, but whether you believe farm animals have a future at all. Rützler, who carefully sources her meat from independent farmers, views change as inevitable. “There’s a consciousness

The Austrian family business Fleischlos (“Meatless”) grows king oyster mushrooms and turns them into sausages and other products that taste like meat, but are entirely plant-based.





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Kurt Schmidinger, Austrian geophysicist & food scientist, founder of Future Food



growing that it makes sense to reconsider how to feed animals, how they should live, how to slaughter them. How we want to make our food.” As Lévi-Strauss wrote, we have to “think food,” not merely eat it.

THE POTESKIN FOOD INDUSTRY

Cheap meat has costs. It’s no secret, according to hundreds of studies, that our global food chain is challenged in ways that affect us more deeply than we may realize, with livestock farming the principal culprit. Farm animals, totaling 65 billion, do also constitute some 60% of mammals alive on the planet, who occupy almost half of the Earth’s territory, either for grazing or feed crops – land lost to human use or to other species. The Israeli Weizman Institute of

Science reports shocking losses in biodiversity: 83% of wild mammals and half of plant varieties, most in the last 50 years. The journal *Science* concludes that even the most “extensively” farmed, sustainable, low-impact organic beef uses 36 times more land and produces six times more of the greenhouse gases that contribute to global warming than plant-based protein, such as peas.

Politicians in Brussels believe the sustainability issues can be fixed. Olivier De Schutter, the co-chair of the 2018 EU Food and Farming Forum (EU3F) in Brussels, called on 200 key food experts gathered to co-create a new, sustainable Common Food

A plant-based diet is becoming increasingly popular in Austria, with numbers of vegetarians and vegans tripling since 2005 (from 2.5% of the population to over 9%), says the VGO. For Austrians under 40, the share rises to formidable 17%, with women in the lead.

Policy, to summon the spirit, if not the letter of the ’68 generation. “They asked for the impossible, we ask for strategy!”

Schutter reminded the delegates to also focus on the vast social inequalities created by our current food chain – decisions made in Europe affect the

globe. For the working group on proteins, the prospect of real change veered from cautiously hopeful (a proud Tuscan farmer of prize heritage cattle) to bleak: Saoirse McHugh of Food Sovereignty Ireland monitored the decline of wild salmon by millions each year at an Alaskan Salmon lodge. “There isn’t a future for eating fish unless you’re really rich.”

PHOTOS: PREVIOUS PAGE: FLEISCHLOS; THIS PAGE: FLEISCHLOS; NEXT PAGE: IMITHYI EDEW / EU FOOD & FARMING FORUM



The EU Food and Farming Forum took place in Brussels, May 29-30, aiming to construct a comprehensive Common Food Policy. The International Panel of Experts on Sustainable Food Systems brings together experts from different disciplines since 2015.

To Silicon Valley food scientists, it’s all about total disruption – break what can’t be fixed. Pat Brown, the vegan CEO and founder of the San Francisco-based Impossible Foods, calls cows a failed “food production technology.” Brown’s “Impossible Burger” is the most hyped plant-based product in years, a product he says was motivated by wanting to solve “the most important and urgent problem in the world” he could.

It’s a sentiment shared by Kurt Schmidinger, Austrian geophysicist, food scientist and founder of Future Food, who met Brown in 2009. “To sustainably feed 10 billion people by 2050, we urgently need alternative proteins,” says Schmidinger. He echoes Brown’s statements on the inefficiency of cows: “The meat industry is a gigantic wasting game. The average livestock animal converts 7 plant calories into 5 calories of manure, 1 calorie of slaughterhouse

waste and just 1 calorie for human consumption.”

Brown’s “Impossible Burger” packs almost identical good nutrients to beef, but is made with 95% less land use, 74% less water, 87% less greenhouse gas emissions, no antibiotics or hormones and zero animal cruelty. It’s the realization of the vegan’s dream of a future of hypocrisy-free, ethical eating. With over half a billion dollars in funding since last year, Impossible’s new 5,500m² factory will crank out a million pounds of plant-based meat every month.

The Impossible Burger, which struggled to get full FDA approval, is a more fundamental innovation than most. It’s designed to look, cook, smell and even bleed like real meat thanks to heme, a plant-derived blood-like molecule analogous to the hemoglobin that makes our blood red and meat pink. Top

NYC chefs are impressed that it even develops a Maillard reaction crust, the browning that produces meat’s addictive flavors.

But the process is genetic, done in a sterile lab. Brown’s biotech team chose not to extract heme from soy roots, which would take up a lot of land, but to grow it by inserting soy leghemoglobin genes into *Pichia Pastoris* yeast. It couldn’t be further from the happy “Farm to Fork” ideal of the natural, organic farm movement.

SHAKING UP PROTEINS

A more radical, sustainable protein option is in vitro meat. At the Indiebio biotech accelerator in California, white-coated millennials grow proteins in petri dishes, using AI, and brewing them in bioreactors. Finless Foods calculates they can produce one metric tonne of meat from a single fish cell.

Rützler was invited by the food scientist Mark Post to the first tasting of his *au naturel* in vitro meat in London in 2013, funded by



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Saoirse McHugh, geneticist & representative of Food Sovereignty Ireland at the EU3F



Sergey Brin of Google. With Rützler’s own preference for traditional organic farming and classical French cuisine, it’s not surprising she wasn’t entirely bowled over with the flavour. “You really have to work through the thought that the meat you’re eating will never be a piece of meat. It hasn’t got any fat.”

A proponent of urban gardening, Rützler is more circumspect about the planet-saving claims of the plant-based food industry. “There are many available simple solutions, but it is amazing that we always discuss efficiency but not selection. There’s so much more to eat out there.”

Those worst affected by our global food chain already subsist on mostly meat-free diets, and consider hunger, human rights or access to clean water before the issues that drive Silicon Valley. Will plant-based food swap one flawed mass production process for another? Eradicating livestock simply to grow single varieties of peas for pea isolate

While the substance of Fleischlos sausages is made of mushrooms, it is held together by artificial sausage casing. The burger of California-based Impossible Foods, right, promises meaty delights without the actual thing.

protein, beetroot for faking meat’s blood, coconut oil to mimic meat fat, or mushrooms to reproduce meat texture and savory flavor. Brown’s burger requires large amounts of wheat for mimicking meat’s chewiness and bite – an ingredient with a huge footprint, like many plant-based products.

Some Austrian farmers accept adaptation over bankruptcy. “The Burgenland milk producer Mona saw no future in cow milk, invested in plant milk and now is No. 2 in Europe with brands like Joya and Dream,” notes Hnat. But there has been pushback from traditional farming lobbies. “The AMA doesn’t promote plant-based milk alternatives,” adds Hnat. “The VAT for cow’s milk is 13%, the VAT for plant-based Austrian organic soy milk is 20%.” Farmers fight against the use of terms like “milk” and “sausage” for non-meat or dairy products. But competition is stiff: Austrian Hermann Neuburger’s meat company has invested over €25

million in their Fleischlos vegan product line, while an old chicken producer in Ottawa now breeds 30 million insects.

“Loblaws, the largest supermarket chain in Canada, can’t restock their shelves fast enough with insect powder,” confirms Paul Uys, a committee member of the International Panel of Experts in food Sustainability (IPES), which runs the EU3F. Big corporations also influence millennials’ eating habits. “McDonald’s could be having us eat insect burgers within two months,” notes McHugh. “In vitro will definitely happen,” predicts Uys, and will be “on the market within three to five years.”

THE FUTURE TASTES LIKE CHICKEN

Perhaps only this new generation, already thinking differently about issues like privacy, dating, health and the environment, will embrace an alternative protein future with its grandiose promises. Hnat is positive: “Plant-based alternatives can be a game-changer if they taste better, are cheaper and are easily available.”

Genetically produced salmon is already on sale. Memphis Meats, which just raised another \$17 million, harvests cultured meat from cells instead of animals, so “you can feel good about how it’s made because we strive to make it better for you ... and for the world.” Even fruit flies are being researched in the Israeli startup scene, according to Rützler. Sterile labs may be replacing earthy farms, but you no longer have to be a murderer to enjoy tasty proteins.

Despite chefs like Ferran Adria reinventing cooking at the molecular level, it’s natural to view food through a prism of history


and heritage. For all our 10,000 years of settled civilization, the best foods have brought us together in a Julia Child-level mess of smoky fats, unhealthy dairy creams and charred proteins. Codes and symbolism reflect centuries of recipes, significant moments with families, big deals and lovers. The hyper-efficiency of plant-based foods seems lifeless in comparison.

So, what did Anthony Bourdain think of the Impossible Burger? “It doesn’t fill me with joy,” he replied dryly. “As somebody who spent 30 years as a chef, of course I’m going to be resistant to the notion that

there’s any replacement for the texture and musculature and funk of real meat.”

Rützler points to the traditional Viennese café that now has fresh herbs on every table. “What will help is to focus more on quality and respect for animals,” she says, “to realize that historically we didn’t have meat so readily available; that what we pay for meat now has nothing to do with reality.

“Although I cannot think of Vienna without meat,” she adds with a laugh. “There will be a Wiener Schnitzel from now until the end of time.”

Or a genetic facsimile. 



“It all started with doubts. As animal husbandry moved to factory farming, I began to look for alternatives.”

Hermann Neuburger, founder and CEO of Fleischlos

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