

From The Times

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Is in vitro meat the future?

Chicken, beef and pork that has never been a living animal could be better for people and the planet. But will it catch on?



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Here is a question that you must try to answer honestly. Would you eat meat that had been grown in a Petri dish? Let's be clear: I don't mean "mock" meat made from soya, or even the flesh of a cloned animal. I mean real, in vitro meat that has been cultured in a laboratory from, say, pig stem cells but has never formed part of a living, breathing, kicking, oinking creature. Meatro, if you like.

If the idea makes you reach instinctively for your Tesco vacuum-packed streaky bacon, perhaps you had better steel yourself and get used to it. Last month, in Norway, the first international In Vitro Meat Symposium was held, and scientists seem to agree that "victimless" meat - be it beef, pork or chicken - bought off the shelf could become a reality within the next decade.

What might propel the process along even faster was a radical move last week by People for the Ethical Treatment of Animals (Peta). The organisation, which has long promoted vegetarianism, has offered a \$1 million (£507,400) prize to "the first person to come up with a method to produce commercially viable quantities of in vitro meat at competitive prices by 2012". The rules specify that the meat in question must be chicken, with the same taste and texture as meat taken from a living bird. Peta says that the world's use and abuse of chickens is the most urgent issue to be tackled, as billions of them are slaughtered each year - 100 times more than pigs and 200 times more than cattle.

Some members of the organisation are incensed by the gesture. Ingrid Newkirk, its co-founder and president, says that it has caused "near civil war" in the Peta offices. Many purist animal rights campaigners abhor absolutely the idea of eating meat, even if no animal died to produce it, regarding it as a moral surrender.

The other view, growing in credence among both carnivores and vegetarians, is that, since human beings seem unlikely ever to kick their meat-eating habit, this may be the ideal - indeed, the only - compromise. It is a possible "third way" that would, theoretically, be kinder to both the animal kingdom and the environment. And, because the meat would not have been pumped full of steroids and antibiotics and fed on grisly reconstituted foodstuffs, it would be healthier. Harmful saturated fats could be removed and good fats, such as omega-3, introduced instead. Probable result: fewer heart attacks. And is the whole idea far-fetched? Not necessarily. Researchers have already produced small amounts of the meat in

laboratories, and have been able to get heart cells to beat in test tubes. The technology still has a long way to go, and at present the process is prohibitively costly (it would cost nearly \$1 million to turn out a 250g piece of beef). But with enough research and funding, it is not inconceivable that one day the scientists could produce a steak or a lamb chop.

The question then would be: will people eat it? A quick survey of the carnivores I know reveals an instinctive revulsion from at least 70 per cent. "It's perverted," says my colleague at the next desk. "It's a disgusting, freakish idea." Which, to a vegetarian (like me), is deeply weird. How can it possibly be more disgusting than, say, eating chickens that have ulcerated backsides from sitting for weeks in their own excrement, bodies five times their natural size, with leg abscesses the size of 50p pieces, and end their lives strung upside down with their heads hacked off?

Personally I would have nothing against eating in vitro meat in principle, because it was never a conscious animal in the first place and never had to travel hundreds of miles in an airless van, live in a cage or come within a country mile of the slaughterman's knife. If it supported an industry that would eradicate the need to keep animals in factory conditions, then I'd not only eat it, I'd buy shares in it.

Realistically, though, there is bound to be initial distrust of a relatively untested field of science with possible health implications. Words such as "Frankenfood" are likely to be bandied about. Fred Kirschenmann, of Iowa State University's Leopold Centre for Sustainable Agriculture, has said that, while he doesn't deny that the idea could work, "every time we mess around with our ecological heritage there are unintended side-effects. We have a long history of unintended consequences."

Yet it is important to be clear that in vitro tissue engineering is not the same as genetic engineering: it is imitating nature, not trying to change it. Stig W. Omholt, director of the Centre for Integrative Genetics and professor at the Norwegian University of Life Sciences, which hosted the conference in Norway, says that any health risks would need to be evaluated through experimental tests, though "we cannot foresee that this will become an issue". Nutritional experts with whom he has consulted in fact suggest the opposite - that people's health will benefit.

According to Peta and to many scientists the world over, the ways in which we now produce and consume meat are simply not sustainable. Each year, worldwide, people eat 240 billion kilos of meat. In the US alone, a million chickens are eaten every hour. In terms of CO2 equivalents, the gaseous emissions from livestock production account for about 18 per cent of the global warming effect - more than the whole transport sector. Yet, with each animal killed, a sizeable proportion of it is wasted. With cultured meat nothing is wasted: you grow only the parts you want.

New Harvest, a US organisation that supports the development of meat substitutes, highlights that food-borne diseases - most commonly caused by contaminated meats - are responsible for more than 76 million episodes of illness, 325,000 admissions to hospital and 5,000 deaths each year in America.

Although purists argue that it is an abuse of animals even to use their stem cells to create meat, Newkirk says that she doesn't mind taking "uncomfortable positions" if it means fewer animals suffering in the future. The amount of grain required to feed farmed animals, which in turn feed the world's voracious appetite for meat, is causing a global food crisis, she says. About 760 million tonnes of grain are used to feed chickens, pigs and other farmed animals - more than seven times the amount used to produce biofuels. It can take up to 16lb (7.3kg) of grain to produce just 1lb of meat. Since the Earth's population is predicted to grow to nearly nine billion people by 2050 - with a commensurate rise in the quantity of

livestock needed to feed them - this cannot continue. As Bruce Friedrich, a Peta campaigner, says: "We will have to stop eating animals in the way that we do for simple self-preservation."

As the science already exists, in years to come the pressure to move towards in vitro meat may become irresistible.

The process works like this. From a living animal you take some stem cells known as myoblasts, which are pre-programmed to grow into muscle, and place them in a nutrient-rich fluid - the "growth medium". They are poured on to a sponge-like scaffold to which they can attach themselves, and stimulated to grow by using electrical impulses. The resulting sheet of meat can be pulled off, ground up, cooked and consumed as a boneless, processed meat - perhaps in a pie. Professor Omholt says that, for now, scientists are likely to concentrate on producing mincemeat on an industrial scale, rather than whole organs such as kidneys. The concept of creating the whole "animal with no brain" is not high on the agenda. But the production of ground meat for use in sausages, burgers and chicken nuggets could take a great leap forward within five to ten years, he says. And does he think that one day, as some have gloomily predicted, such meat will threaten the existence of mooing, baaing animals on farms? "I don't think we will ever see a world where [living] animals are not produced for meat," he says. "I see this as being an alternative."

By and large, the scientific community is motivated more by environmental concerns than animal welfare ones. But the mood and the timing may be right for such a compromise, as ethical halfway houses are becoming de rigueur. The idea of guilt-free - or, at least, less cruel - animal products is increasingly appealing to consumers who are waking up to the horrors of factory farming. Sales of organic foodstuffs have soared and "ethical" versions of luxury foods are catching on fast, even though they are generally more expensive. "Humane" foie gras, in which geese or ducks are not force-fed to make their livers swell to many times their natural size, is becoming popular. Waitrose's "Faux Gras" (it has banned the original type), which is made from free-range ducks and geese but blended to taste like the traditional French product, took off so unexpectedly that stocks sold out at Christmas. The Duke and Duchess of Hamilton, from one of Britain's most aristocratic families, are boycotting Selfridges because it is still selling foie gras.

Ditto farmed caviar. Waitrose stopped selling caviar amid concerns that the Caspian Sea sturgeon population was nearing extinction, but last year in 15 stores it sold sustainable caviar produced by farmed Siberian sturgeon in fish farms in Bordeaux. Demand was so high that this winter it will be offered in 60 stores.

Although the in vitro technology is not yet developed enough to synthesise blood vessels and so grow large steaks, Friedrich believes that this will happen eventually. "In vitro meat has already been created - not with the taste and texture of animal-corpse meat, but it is on its way," he says. "Eventually the technology should be such that you could grow all the parts of an animal, minus the brain. Where there's a will, there's a way." Professor Omholt knows that persuading many people to overcome their knee-jerk distaste for lab meat - or "meat without feet", as one animal organisation has referred to it - will be tricky. "It will be a challenge," he says, "but when you talk people through this, as long as they have any sort of conscience around animal welfare, they will start to agree. You can pose the question the other way round - do they want to make a less intense footprint in the world?"

Whether such meat would pass muster with carnivores, whether it would be deemed to meet kosher and halal criteria, is hard to say at the moment. But Peta's grand gesture has had the desired effect of

creating a debate about the issue. The feedback has been mixed, and some people thought it was a hoax - perhaps understandably, as Peta put out an April Fool story recently in which it claimed to have created “Newkirk Nuggets” made from cells from an upper-arm biopsy of Ingrid Newkirk, marketed as “100 per cent Human(e)”.

But, as Newkirk has said, she did so “to make the point that flesh addiction is revolting - and if I am healthier, as I am, than the average animal used for meat, and giving my flesh voluntarily, why is this revolting but eating flesh from a probably gut-infected, tumour-laden chicken or cow is not?” Nevertheless, \$1million is a lot of money for Peta to pay out. If someone, somewhere, does come up with the goods by 2012, would it definitely honour the deal? “Absolutely, yes,” says Freidrich. “It would be the best \$1 million we ever spent.”

The meaty questions

What will it look like?

In vitro processed meat, such as sausage or hamburger, could look just like the meat we eat.

How long will it take?

We may be able to make processed in vitro meat within years. Unprocessed meat may take a decade or longer.

What are the potential benefits?

Fat content can be more easily controlled, the incidence of food-borne disease reduced and, in theory, one cell could produce enough to feed the world for a year.

What are the risks?

The system could be abused, to produce genetically modified in vitro meat, which would carry the same risks as GM foods.

How will it taste?

In theory, the same as the real thing - but several technical obstacles still need to be overcome.

How much will it cost?

It may one day be cheaper than normal meat.

Source: New Harvest, a not-for-profit research organisation working to develop meat substitutes