Can Lab Meat Fix Our Factory Farm Problem?

In 2013, a Dutch scientist made headlines by unveiling the first "lab-grown" burger produced using stem cells from a cow — which cost over $330,000 to produce.[1] Now there are dozens of start-ups working to make lab-grown and plant-based alternative meat products that are affordable, tasty and appealing to consumers. They claim that their products are more climate-friendly than the existing factory farm system and will reduce animal suffering. But some big questions need to be answered before we can say that these new technologies are the best answer for the problem of factory farms.

"IMPOSSIBLE BURGER" PHOTO CC-BY-SA © DLLU / FLICKR.COM

From the Farm to the Laboratory

These next-generation products are not the same-old protein alternatives we are used to seeing on grocery store shelves; products like tofu or veggie burgers made from grains or beans have been around for a long time. Instead, these new products are highly processed and are usually produced using one of two technologies.

The first, lab-grown meat, begins by extracting tissue from an animal and separating muscle stem cells. The cells are then induced to grow into muscle fibers. The process uses growth mediums such as fetal calf serum or chicken embryo extract, as well as various additives to help the muscle fibers look and taste like familiar meat and fish products.[2] These products are getting lots of attention but are still not commercially available. But there is big money (including from some meat companies) being invested into start-up companies working on lab meat products and an enormous amount of hype about their potential to "disrupt" the food system.

The second group uses a new generation of plant-based ingredients, many of which rely on genetically engineered soybeans, yeast or bacteria to produce specific compounds such as oils or proteins that are processed to imitate the flavor and texture of meat or dairy products. Some of these next-generation plant-based products are already on the market, and many more are in development. The GMO yeast, algae or bacteria are often raised in fermentation tanks and fed with sugar, corn or even natural gas. For example, the "Impossible Burger" transfers DNA from the roots of soybeans to a GMO yeast in order to produce a protein called heme, which is added to make the burger "bleed" like rare ground beef.[3] These products also require various additives to promote growth and help them mimic the flavor and consistency of meat.

Both types of technology are being developed by start-up companies looking to produce a variety of products familiar to consumers, everything from burgers to chicken tenders to fish to milk. They hope to appeal to a wide range of consumers, focusing on those who enjoy the flavor of meat.

Some companies are trying to market their products as "clean" meat or "cell-cultured" meat as a way to promote them as more sustainable or humane than meat produced on a farm. But the meat industry is working at the federal level and in some state legislatures to make it illegal for cell-cultured or plant-based products to use the word "meat" on their labels.

Unknown Risks

Companies developing these next-generation meat alternatives want consumers to believe that their products are safer than meat from animals raised on factory farms,

which confine thousands of animals in one place, rely on the irresponsible use of antibiotics and can carry pathogens like *Salmonella* and *E. coli*. However, such claims may be misleading. These technologies may still require antibiotics to ensure a sterile growing environment in the manufacturing environment. And growth mediums like fetal calf serum can possibly carry communicable diseases.[4]

These technologies are being developed by private companies whose processes and additives are often not transparent, meaning that the risks have not been clearly identified or studied. For example, inducing cells to proliferate makes them behave in a manner similar to cancer cells, and we do not know whether they are safe to consume.[5] We similarly do not know the risks of consuming the numerous additives and processing aids used to make these products, and whether they will induce allergic reactions. Some processing aids may not even be required to show up on food labels.[6]

It is not even clear which government agencies will regulate these novel foods. The new technologies triggered a turf war between different branches of the federal government, and a complicated deal between the U.S. Department of Agriculture and the Food and Drug Administration (FDA) gives some responsibility to both agencies.[7] One of the many questions that remain to be answered is whether companies making cell-cultured products will need to first register with federal regulators, or can just begin manufacturing.

But no matter which agency is in charge, our regulatory system is ill-equipped to ensure the safety of these next-generation meat replacement products, relying on outdated tools that predate the first wave of GMO foods.[8] The FDA, for instance, commonly relies on industry-submitted safety studies of novel food ingredients rather than conducting any independent testing. The agency has also treated the vast majority of GMO products in the market as "substantially equivalent" to non-GMO ingredients, meaning that they do not go through rigorous safety assessments or evaluations as a new type of food.

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Moreover, no federal agency monitors these products once they come to market in order to screen for potential adverse health effects. Controversy over this inadequate federal approval process has erupted following the aggressive marketing of some plant-based meat alternatives, like the Impossible Burger. Meanwhile, the FDA's failure to conduct sufficient testing to rule out possible allergic reactions has been challenged by advocacy groups.[9]

We need to fix our broken regulatory system and to engage appropriate federal agencies *before* companies make any claims about the safety of these next-generation meat alternatives or put them on the market.

Sustainable? Not Necessarily....

We know that we need to dramatically change the way we produce food, especially food animals, in order to avoid catastrophic climate change. Claims that lab-grown meat and GMO protein products are better for the climate are speculative at this point because we do not know the full impact of scaling up production in terms of energy use and other inputs.[10] Even so, the companies behind these products make bold claims that their products are essential in the fight against climate change.[11]

However, these meat alternative products are created in highly industrialized settings and require substantial amounts of energy — perhaps even more than livestock farming.[12] In fact, in one life-cycle analysis of various meat and meat alternatives (lab-grown beef, traditional chicken, plant-based meat substitutes and insects, among others), lab-grown meat scored the highest in each impact area excluding land use and ecotoxicity; it also had the highest overall impacts and the greatest contribution to climate change.[13] While more life-cycle analyses are needed to better understand the environmental impacts of next-generation meat alternatives, it is clear that it is too early to make sweeping claims that they are more sustainable than existing protein sources.

Instead of placing our bets on novel technologies that may be years from realization,[14] we need to act now to reduce our greenhouse gas emissions. This includes enacting policies to ban factory farms and to support a transition to more sustainable forms of agriculture.

Will Meat Alternatives Solve the Problem of Factory Farms?

It is true that the dominant model of raising livestock in the United States — on crowded, polluting factory farms — is environmentally unsustainable and leads to animal suffering. But would the introduction of next-generation meat alternatives actually replace factory farms?

Consumers would first need to accept these novel products. They need to be similar in taste and cost to meat, and to appeal to consumers who enjoy meat but refrain from it due to concerns about sustainability or animal suffering. But many consumers today also demand fresh, minimally processed foods with short ingredient lists.[15] Lab-grown meat and GMO protein products are neither of these.

And even if these products gain widespread acceptance, there is no guarantee that it will result in a decline in factory farms. Adding an additional source of meat-like protein will not necessarily stop the production of meat from animals in the United States. For example, the rapid rise in factory farms led to the country producing substantially more meat than it consumes domestically, and much of the excess is exported.[16]

We Already Know How to Fix Our Food System

No new-fangled product can fix our broken food system by itself. And the inputs needed to make these products, from natural gas to corn and sugar, could further entrench environmentally unsustainable practices like fracking and planting monocultures of herbicide-reliant GMO crops.[17]

Instead of taking animals off the farm, we should transition to smaller, regenerative farming systems that integrate both crops and livestock being raised in a sustainable way. Animals provide important inputs for farming like fertilizer that would otherwise come from fossil fuels.[18] And ruminants like cattle can graze on lands not suitable for crop production, with sustainable grazing creating a way to increase soil carbon sequestration.[19]

The solution to our factory farm problem is not going to come in the form of a technological fix. We need to demand policies that ban new factory farms and the expansion of existing ones, and support the transition to more sustainable and regenerative farming systems. That will take organizing and policy change at the local, state and federal level, not just finding a new kind of burger.

Endnotes

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