This is the future of meat

Moo who? (Mike Groll/AP)

Meat — despite popular movements to decrease the amount humans consume — is still a central part of diets around the world. People who live in industrial countries (like the United States) eat roughly 210 pounds of it each year. And consumption in the developing world, where people eat closer to 66 pounds each year, is climbing fast. Growth is such that by 2030 the average human is expected to consume just under 100 pounds per year, 10 percent more than today.

Our collective affinity for meat likely began out of circumstance — humans that lived inland from the coast had little choice but to hunt in order to live — and has persisted for evolutionary reasons. Meat carries nutrients like zinc and protein, promotes growth, and provides energy. It also doesn't hurt that the price of meat has fallen dramatically.

But the reality is that there are several downsides to society's growing appetite for meat. Cheap meat, for one, might leave consumers with extra cash, but it has — largely
come at the expense of animal welfare. It also isn't great for the planet, which the U.S. government recently noted. "Meat is undoubtedly an environmentally expensive food," Vaclav Smil wrote in his 2013 book "Should We Eat Meat?"

But what if there were a way to produce meat that would avail us of the need to slaughter animals? What if we could continue to order hamburgers without also feeding the livestock industry as much as a third of the world's grain production? And what if it could be done for a reasonable price?

Professor Mark Post, who is part of the faculty at Maastricht University in the Netherlands, has been asking that question for almost a decade now. Two years ago, Post's team of researchers presented their first major discovery in the form of a five-ounce hamburger patty, which was created in a lab, but still was remarkably similar to ones sold on supermarket shelves. The reception was promising: The media was abuzz, and the BBC made several food critics try it, one of whom conceded "this is meat to me, it's not falling apart."

Now, Post is working to overcome some of lab-grown meat's biggest obstacles, including its price. And he believes it's only a short matter of time before he succeeds.

"It was $350,000 when we first publicized the patty," said Post. "At this point we've already managed to cut the cost by almost 80 percent. I don't think it will be long before we hit our goal of 65 to 70 dollars per kilo."

That would drop the five-ounce burger to below $10, a number that Post hopes will eventually drop even further.

What is "lab-grown meat," anyway?

To understand how it's possible to grow a hamburger that is made of actual animal tissue — rather than a protein substitute — you need to understand a bit about how muscle tissue works.

When muscle tissue is damaged, the body repairs the injured tissue by calling on a specific type of stem cell, called a myosatellite cell. Myosatellite cells can be taken from an animal without causing it harm. They also can reproduce fairly quickly. And they tend to form muscle fibers when they do.

These characteristics, it turns out, are very useful for someone trying to replicate the process by which muscle forms naturally.
"The thing is, you can take those cells and then let them replicate as they would in the case of injury inside the body of a cow," Post said. "And you can help them form muscle tissue again."

**From the petri dish to the plate**

A team of scientists at Maastricht University has been able to create cultured meat from muscle tissue harvested from cows. This is how they did it:

1. A small sample of muscle tissue is harvested from the animal.

2. The tissue is cut into very small pieces, to separate the **muscle fibers** from cells.

   ![Diagram of muscle tissue and cells](http://www.washingtonpost.com/news/wonkblog/wp/2015/05/20/meet-t...a-10-lab-grown-hamburger-that-tastes-as-good-as-the-real-thing/)

   Individual cells are separated and placed in a culture. Cells start dividing on their own.

   ![Cells dividing](http://www.washingtonpost.com/news/wonkblog/wp/2015/05/20/meet-t...a-10-lab-grown-hamburger-that-tastes-as-good-as-the-real-thing/)
The process is hardly straightforward. Rather, it involves carefully extracting the cells, allowing them to multiply and then coercing them into differentiating. Once the cells...
have differentiated, which is a fancy term for the process in which cells change to assume different responsibilities, they combine into muscle fibers, at which point protein forms.

"The result are these little strips of tissue," Post said. "It's the same tissue grown by cells inside of the body. Except we grow them outside of it."

It takes about 20,000 of them to make the burger publicized in 2013.

100 percent prime lab-grown beef (source: Cultured Beef)

Making the meat affordable

Perhaps the single largest reason why initial publicity around Post's futuristic hamburger was met with such reluctance is that it was less affordable than most houses in the world.

"Obviously this is all still being done on a small scale, in an academic environment," Post said. "That's why it costs so much. Once we scale up it will be a different story."

Post expects to be able to produce the patties on a large enough scale to sell them for under $10 a piece in a matter of five years.
"Once we can grow the tissue in a reactor the size of an Olympic swimming pool, we should be able to achieve that sort of volume," Post said. "For perspective, half a swimming pool would allow us to feed about 20,000 people for a year."

Will people warm up to shmeat?

Irrespective of how much meat Post manages to produce, and how cheap it becomes as a result, there remains the question of whether society will ever actually warm up to the idea of eating lab grown beef.

Skepticism runs rampant enough that shmeat, which refers to the sort of synthetic meat Post had created, was a runner-up for Oxford Dictionary's word of the year in 2013. And the moniker frankenmeat has frequently been invoked.

But Post is confident that the benefits of cultured meat will eventually coerce people to give it a try.

"What people need to realize is that it will have a positive effect on many things, including animal welfare, because we would need to slaughter fewer animals, our efficiency with certain resources, and the environment," he said.

Cultured meat, according to a 2011 study, has a significantly smaller carbon footprint than regular beef, pork, and even poultry production. It also requires far less land and water than all three.
"The last thing we have to do is boost protein production beyond where we're at," Post said. "Normally, protein forms through exercise, as it is in real life with a cow. But you can also do it through electricity and other ways. We're very close to a sustainable process."

How exactly will it work? That's a bit of a secret.

"I would elaborate, but these methods are soon going to be patented!" Post said. "We actually have already done it, just not on a large scale. It's going to be really important for improving the meat's nutrition and taste."

Cultured Beef is created by painlessly harvesting muscle cells from a living cow. Scientists then feed and nurture the cells so they multiply to create muscle tissue, which is the main component of the meat we eat. It is biologically exactly the same as the meat tissue that comes from a cow. (Cultured Beef)