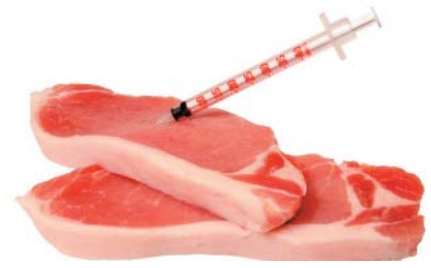


Certified Cultured Beef: Raising Beef Without the Cow?

by

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Part I—Steak?

Jeff Rodriguez was feeling nervous as he drove over to pick up his date for the evening. As a new graduate student, he hadn't had time for any social function let alone dating. Fortunately he had met Samantha, a second-year graduate student who sat next to him in the cramped graduate office. He had been planning this night for a week now and was hoping to impress her by taking her to the new steakhouse in town.

As the two were seated, the waiter explained the evening's special, "We have a special treat this evening. We are currently serving our *certified cultured beef steaks*."

Jeff, who was raised on a beef cattle ranch, thought that he had heard the waiter wrong. "Do you mean *certified angus beef steaks*?" he asked.

The waiter paused as though this was a common occurrence and said, "No sir, this is a new line of beef being offered to only the finest restaurants. It is truly the latest meat product and is supposed to be more nutritious than traditional steaks as it is biologically cultured."

Fascinated by what he was hearing but not wanting to try a new product on such an important date, both Jeff and Samantha declined the special and ordered a more traditional meat-based cuisine.

"Jeff, didn't you say you and your family raise cattle?" asked Samantha.

Still dumbfounded Jeff answered, "Yes, we've raised cattle for generations. In fact my dad works for the National Cattlemen's Beef Association, but he's never said anything about *certified cultured beef*. Even more ironic is the fact that I completed my undergraduate degree in animal science and I took a few meat science courses, but I have never heard that meat can be biologically cultured. I wonder what it tastes like."

"I don't know. I can't imagine how or why anyone would want to grow meat in a science lab. What is the purpose of *growing* beef? It can't be more nutritious than naturally raised beef from cattle, and how can they mass produce meat in a lab? Surely, they can't produce the quantity of meat that the meat packing companies can," Samantha mused.

Questions

1. Compare and contrast naturally raised beef and meat grown in a lab based on Samantha's question "What is the purpose of growing beef?"
2. What are the social, economic, and environmental effects of this type of biotechnology?
3. Is there a possibility that beef could be cultured in a scientific laboratory?
4. What current scientific methods could be used to culture meat?

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Part II—Two Methods

After dinner Jeff asked Samantha if she would like to go to a movie and was pleasantly surprised by her response, “Jeff I appreciate the offer but aren’t you curious about the process of culturing meat? It could impact your family operation substantially!”

Jeff, thinking that Samantha was reading his mind, was astonished by his luck. Not only was he enjoying the date, but Samantha was curious about his family’s cattle operation. “You truly are a researcher,” Jeff smiled. “Let’s head back to the office. I can call my friend Manny who works for the U.S. Department of Agriculture. I know he will have heard of this.”

Manny was a newcomer to the U.S. Department of Agriculture and was working under the Director of the Food Safety and Inspection Service (FSIS). He was working late that evening and was just finishing an inspection report when he received the phone call. “Food Safety and Inspection Service,” he barked into the phone.

“Manny? This is Jeff, I’m glad I caught you tonight. I just heard some interesting news and I knew you would be the man to call. What do you know about certified cultured beef?”

Manny smiled to himself, “I thought I might be hearing from you Jeff. As you know, there has been a high percentage of obesity in the United States, and the USDA has just issued a new food pyramid. There are increased concerns associated with the American diet and it is all over the press. In answer to this new area of concern, several agencies within the USDA have collaborated on funding research regarding meat production. Researchers from the University of Maryland have identified two possible methods of *in vitro* meat production.”

Jeff was looking at Samantha in disbelief, “You mean to tell me that a steak can be grown in a Petri dish?”

“Well,” said Manny, “there is a little more to it than that Jeff. The first technique is called scaffolding. Scaffolding consists of proliferating embryonic myoblasts or skeletal muscle cells called satellite cells. By introducing several environmental cues, myotubes and eventually myofibrils can be harvested, cooked, and used for ground boneless meat, which is a highly consumable product in the United States.”

Still puzzled, Jeff asked Manny, “So what you’re saying is that sheets of skeletal muscle cells can be multiplied, then ground and cooked to produce hamburger, is that it? That still doesn’t explain the offer of a certified cultured beef steak during tonight’s dinner.”

“That would include the second *in vitro* technique or the self organizing technique,” said Manny. “This technique is grounded in a goldfish-based study. Again, skeletal muscle explants were placed in a culture media for seven days. Explants have an advantage in that they contain all of the cells that make up muscle in similar proportions as the biological animal. The results were that the explants’ surface area increased by 79%. This would lead to larger meat products including your certified culture beef steak. As you know, Jeff, from our meat science class, traditional beef products contain high quantities of omega-6 fatty acids. With this new form of biotechnology, we can replace the normal omega-6 fatty acids with the healthier omega-3 fatty acids.”

Jeff was beginning to understand the ramifications to this scientific procedure. He was torn between his love for scientific advancements and the generational history of his family’s business. Samantha saw Jeff’s facial expressions turn from curiosity to pain and then back to curiosity. She was still trying to read his emotions when a look of excitement came across Jeff’s face. “Manny, you can’t mass produce meat in this manner, can

you? Muscular tissue needs more than a varied culture to grow and become edible. What about connective tissue? What about the palatability and taste of marbling? How can you get a prime steak grown under glass?”

Questions

1. What are the scientific limitations to the two types of *in vitro* cultured meat?
2. Why would scientists use embryonic myoblasts or skeletal muscle satellite cells rather than embryonic stem cells, which are undifferentiated?
3. Which technique is more economically feasible? Which is more scientifically feasible?