Cheese: The GMO food die-hard GMO opponents love, but don’t want to label

lammed by critics, Chipotle has been forced to back track on its non GMO claims. Its beef, pork and chicken are sourced from farm animals fed with GMO grain. And all of its calorie-packed sodas are sweetened with GMO sugar.

But it has yet to come clean on its most controversial GMO ingredient: all of its cheese is genetically modified. That’s right. The clotting agent used to curdle the milk into cheese is genetically engineered. So much for Chipotle’s bragging claim of transparency.

In fact, almost all the hard cheeses made in the United States, and in much of the West, use a protein that is made from genetically engineered yeast and bacteria. That includes cheese made in Vermont, which passed a mandatory GMO labeling bill in 2016—that curiously exempted its iconic Vermont cheese from carrying a GMO label. So much for the consumer’s ‘right to know.’

Critics of GMOs almost never acknowledge the fact that almost all hard cheeses are GMOs. In cheese production, coagulants called rennet are used to clot milk. The primary enzyme in rennet driving the clotting process is called chymosin, which acts on milk proteins like casein and makes milk curdle.

Traditionally, rennet is obtained from the fourth stomach lining of an unweaned calf. Calves have a higher amount of rennet in their stomachs compared to adults as they use it to digest milk, their main source of food. The rennet extracted from the stomach linings is usually a mixture of chymosin, pepsin (another enzyme) and other proteins. Rennet can only be obtained once from a single, young animal. This makes it a costly necessity during cheese production. To make billions of pounds of cheese, industrial chemistry is needed to produce large quantities of rennet. Recently harvested calf stomachs are chopped up en masse, and then chemically refined to produce rennet consisting of precise ratios of various enzymes, such as chymosin and pepsin, which are needed for consistent cheese production.

Beginning in the 1960s, the price of rennet, a byproduct of the veal industry, rose and became less stable as the animal rights movement grew. Demand for cheese also soared, and cheese-makers began looking for alternative sources of rennet from plants and microbes.

Some plants and microbes naturally produce enzymes that have coagulating properties like rennet. However, rennet from these sources tend to produce other side reactions in cheese production, leading to undesirable results in taste.

So how did biotechnology come to play a role? In 1982, Genentech earned approval from the U.S. Food and Drug Administration for the medical use of insulin produced by genetically modified microbes. It was more than a boon for medicine—it also showed that GMOs were a viable substitute for animals in the production of pure proteins. In the late 1980s, scientists figured out how to transfer a single gene from bovine cells that codes for chymosin into microbes, giving microbes the ability to produce chymosin. These genetically modified microbes are allowed to multiply and cultivated in a fermentation process while they produce and release chymosin into the culture liquid. The chymosin can then be separated and
Chymosin produced using this method is termed fermentation-produced chymosin, or FPC.

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In 1990, the FDA approved Pfizer's GMO-derived chymosin by the Food and Drug Administration for human consumption, on the basis that it was identical to the chymosin found in animal rennet, and FPC was given Generally Regarded As Safe (GRAS) status. After 28 months of review, the FDA found that FPC was substantially equivalent to rennet produced from calves, thus it needed no special labeling or indication of its source or method of production. FPC is actually more pure than calf rennet, as it does not contain other proteins from the calf stomach lining that cannot be separated from calf rennet during production. “The real advantage is that it is probably a much cheaper way of producing this substance than to grow calves,” said William Grigg, an FDA employee.

Today ninety percent of the cheese in the United States is made using FPC. In the past two decades, FPC has been considered the ideal milk-clotting enzyme. The GMO-derived enzyme has been a boon for cheese manufacturing and cheese sales. The US produced about 11-billion pounds of cheese in 2013 alone, thanks in large part to the cost-effectiveness of FPC. The technology transformed the industry, making it more efficient, more environmentally friendly and less dependent on animals. FPC has been regarded as suitable for meeting vegetarian, kosher and halal requirements. However, some vegetarians consider FPC to be derived from animals as the microbes were genetically modified using bovine genetic material. In response, scientists began synthesizing the gene needed to produce a synthetic form of FPC that does not have any genetic material from animals.

GMO concerns about FPC are few compared to those directed at genetically modified crops. Recent campaigns in Vermont, a major cheese-producing state that passed a GMO-labeling law in 2016 did not address the use of FPC to make cheese; dairy products were simply exempt. The Vermont law never took effect as it was eventually superseded by federal regulations.

FPC is especially interesting for the divisive role it plays in contemporary debates over the safety of genetic engineering, and the labeling of GMO foods. Should consumers be made aware of the fact that genetically modified microbes are in their cheese? If so, how should they be made aware? It’s not as though the cheese itself is genetically modified. Neither is the chymosin that produces the cheese. Because chymosin is a protein it contains no genetic material. Any genes found in purified FPC would be present only in trace amounts, vestiges of whatever genetically modified microbe produced the chymosin.

Cheesemakers know this line of reasoning well. Chr. Hansen, a Danish company, manufactures of some of the most popular brands of FPC in the world. The company describes its FPC as “GMO-free,” because purified FPC contains little to no trace of the genetically modified fungus, Aspergillus niger, that produces it. (But because organic food cannot even be a byproduct of GMOs, Chr. Hansen states that its GMO-free FPC is not acceptable for organic cheese production.) Similarly, Tillamook, an Oregon-based dairy company, uses FPC for all but five of its dozens of cheese varieties. Tillamook representatives recently stated on the company’s blog that “after purification, the end [FPC] rennet product does not contain any
genetically modified material, since it no longer contains DNA from the cow gene. It is considered non-GMO by U.S. food industry standards."

But there is huge hypocrisy by many anti-GMO campaigners who are quick to exempt their favorite cheeses from the dastardly GMO designation by target GMO sugar. Sugar made from GMO sugar beets is genetically indistinguishable from sugar derived from sugar beets or sugarcane that has not been genetically modified, but is labeled as GMO in many countries and demonized by activists.

Cheese is a foodie favorite, so it’s viewed differently. In other words, may be an unambiguous product of genetic engineering, but it is two steps removed from the genetically modified organism responsible for its existence. FPC is not allowed in organic cheese based on the certification rules in the United States, Europe and Canada, providing an option for consumers who wish to avoid FPC. Cheese with FPC are also considered a GMO by the Non-GMO Project.

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