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Patenting the Quest for a More Perfect Veggie Burger

"Earth & Table" Law Reporter



When a food synthesizer first appeared on *Star Trek: The Original Series*, I looked upon it with awe and wonder. Its workings were never explained; but entire meals would emerge from it magically. Swanson's frozen TV dinners were its only analogue in my childhood experience—aluminum trays compartmentalized in vaguely

Bento box proportions with a daily ration of meat, a starch, some vegetables, and possibly dessert. The food synthesizer did seem to be 23rd century stuff.[1]

In a matter of 50 years, advances in the sustainable food arts are making food duplication a 21st century reality. Deconstruction of foodstuffs is now happening at the particle level in research laboratories around the world. Food replication—through 3D printing devices and like technology—promises to create even more vexing social and legal issues of food *identity* and *authenticity*.

The holy grail of this quest is a veggie burger—one with an appealing look, taste and mouth feel that will attract and retain both vegetarian and omnivore consumers. Contorting vegetable matter into tasting, sizzling and bleeding like red meat, however, poses innumerable challenges, with concomitant patenting opportunities.

This article briefly traces the patenting history of this quest and outlines where it is currently headed. Food replication is part of our cultural DNA; the journey itself is exciting.

In the Beginning, Kellogg Patents "Protose"

The urge to replicate foodstuffs scientifically grew out of the need to feed Napoleon's standing armies in the early 1800s. Chemists thus created oleomargarine as a substitute for hard-to-provision butter. After that, scores of U.S. improvement patents were issued for various

improvements in the composition or processing of oleomargarine throughout the last century. Meanwhile, fraud disputes mounted as unscrupulous merchants passed off margarine as butter and sold it to unwitting customers.[\[2\]](#)

In the late 19th century, the impetus to develop a viable vegetable substitute for meat largely arose in Seventh Day Adventist communities. Among other things, their core beliefs and culture promoted vegetarianism. Adherents of this Protestant Christian denomination played a key role in introducing plant-based diets to a meat-centric American populace.

To make a veggie burger, you of course need a meatless patty. This prime ingredient came into patented being when a leading Seventh Day Adventist—John Kellogg (of Kellogg's fame)—invented a "vegetable substitute for meat" he named *Protose*. Issued in 1901, the [patent](#) describes the "meaty" qualities of his peanut/wheat gluten blend:

[I]t resembles potted veal or chicken. It has a distinctly meaty odor and flavor. When a bit is torn off and chewed, it shows a distinct fiber. It is of such consistency that it may be masticated like tender meat and when cooked retains its form as does meat. * * * It may be cut in slices and served cold. It may be broiled like meats of all sorts and lends itself to the various culinary manipulations in a manner altogether resembling meat.

Before patenting *Protose*, John Kellogg devised, but did not seek to patent, *Nuttose*. He described it as a "substitute for flesh food." Peanuts were its main ingredient. It became the world's first canned meat alternative in July 1896. It was touted as having "somewhat the appearance and flavor of cold roast mutton" and sold as a "health food."[\[3\]](#)

Protose joined other potted (canned) meats in kitchen pantries at the turn of the 20th century. A novel written in the 1890s by Frank Norris and set in San Francisco, *Vandover and the Brute*, describes the typical potted meats of that era:

He lay abed late in the morning, dozing between the warm sheets; he overfed himself at the table, and drank too much wine; he ate between meals, having filled his sideboard with canned patés, potted birds, and devilled meats; while upon the bamboo table stood a tin box of chocolates out of which he ate whole handfuls at a time.

Protose stopped being produced commercially some 16 years ago. Its recipe nevertheless lives on in food blog nostalgia.[\[4\]](#) The development of other veggie burger patties would unfold episodically over the 20th century.

Soybean Products Enter the Patented Meatless Burger Fray

The earliest known reference to tofu (made from soybeans) appears in Chinese literature from 965 A.D. Rather than calling it tofu (or *doufu*, its Chinese name), the literature refers to it as "mock lamb chops" or "the vice mayor's mutton."^[5] It would take almost another millennium before soybeans would become the basis for most meat alternatives in America.

As it happens, the first known tofu-based patent issued in France in 1911 to Li Yu-ying, the owner of a tofu company near Paris. His patent is entitled "Cold cuts and meatlike products from soya."^[6]

Another company founded by Seventh Day Adventists, Madison Foods (located in Tennessee) would develop the first soy-based meat alternative, Soy Bean Meat, in 1922. By October 1937, Madison Foods launched our nation's earliest known meatless burger, the Soy-Burger, later renamed the Zoyburger in 1939. Thereafter, most meat substitutes would rely on a combination of soy and wheat gluten as their main ingredients.^[7]

Robert Boyer and the Invention of Bac-Os

After soy products supplanted peanut/wheat gluten blends, simulating the "chewiness" of meat became the next big veggie burger technical challenge. A leading synthetic food inventor in the mid-20th century—Robert Boyer—summarized the problem in a [patent](#) issued in 1954:

The stumbling block up to this point has been in the reproduction of the texture and appearance of natural meat, the texture of course involving a factor of "chewiness." Vegetable chops using wheat gluten as a base have a certain amount of "chewiness," but they do not duplicate the fibrous character of meat; and they fail to give that satisfaction that comes from the breakdown in the mouth during the mastication of a piece of meat.

Boyer's patent is the first to use the term *synthetic meat*. Essentially, he employed textile manufacturing techniques and adapted them to produce, elongate and spin vegetable protein fibers. Applying this textile/food technology, General Mills introduced Bac-O's (it would later be called Bac-O Bits) in December 1965. They are composed of "meatless fried bacon bits from spun soy protein fiber."^[8]

Soon thereafter, Bac-O's appeared at our family dinner table, as a condiment for an iceberg lettuce salad with French dressing. They did taste fibrous, sometimes overly so. You had to conjure up a bacon flavor through word association.

Boyer's inventive work continued well into the 1970s. His patenting efforts would include another foundational element to the ultimate veggie

burger—non-dairy cheese—as exemplified by a patent issued in 1975 entitled "Method of Making Protein Food Products Resembling Cheese."

Gardenburgers and Boca Burgers Join Morningstar Farms Grillers in the Freezer Aisle

Spawned by such influential books like Rachel Carson's *Silent Spring* (1962), Wendell Berry's essays, and John Robbins' *Diet for a New America* (1987), Americans increasingly sought out vegetarian alternatives to meat as part of a burgeoning organic food movement in the 1960s and 70s. Originally aligned with back-to-nature, "hippy" enclaves, many organic food advocates also promoted plant-based diets. The passage of the Organic Foods Production Act of 1990 would push vegetarianism out of its perceived fringe group affiliations and into the mainstream of American diets.

Entrepreneurs responded with two of the best-selling veggie burger patties in the 1980s: the *Gardenburger* (originating out of Gresham, Oregon) and the *Boca Burger* (out of Boca Raton, Florida). The original Gardenburger is composed of mushrooms, onions, brown rice, rolled oats, cheese, eggs, garlic and spices; whereas the Boca Burger is chiefly made from soy protein and wheat gluten. These meatless patties began competing with Morningstar Farms' already established veggie counterpart, the Griller, in grocery store freezer aisles. Worthington Foods (another Adventist company) owned the Morningstar Farms product line.

These companies do not appear to have staked out patent positions for their respective meatless patty compositions, although Worthington Foods did procure a number of vegetarian food processing patents in its heyday. Regardless, these companies achieved high monetary value from savvy branding and consumer awareness. Each company would be bought out by larger food conglomerates: Kellogg's acquired Worthington Foods in 1999; Kraft Foods purchased Boca Burger in 2000; and Kellogg's purchased Gardenburger assets in 2007.

Sizzling and Bleeding: The Next Generation Veggie Burger

Desiring even more exacting beef verisimilitude, food scientists are now filing patent applications in which plant-based "burger meat" mimics the sizzling, bleeding and charring of grilled hamburgers. A recent patent applicant (Beyond Meats) explains:

[N]ew vegetarian/vegan food products do not have the widely enjoyed textural and sensory characteristics of animal meat products. At the microscopic level, animal meat consists of a complex three-dimensional network of protein fibers that provides cohesion and firmness and that traps polysaccharides, fats, flavors, and moisture.

In contrast, many of the available high protein vegetarian/vegan food products have looser and less complex protein structures (i.e., no protein fibers or limited sets of protein fibers that are aligned in only one direction and within a single plane) that disassemble easily during chewing, requiring an unsatisfactory, diminutive bite force and chewing time, and imparting sensations of "mealiness," "rubberiness," "sponginess," and/or "sliminess."

Without a three-dimensional matrix, the new protein food products also cannot trap moisture or flavor effectively."[\[9\]](#)

This patent application is intended to cover the Beyond Meat burgers that very recently went on sale at Whole Foods in May 2016. The company's goal is to "provide the full 360° mouth-watering, juicy, and delicious experience of beef but without so many of the health, environmental, and animal welfare downsides of traditional animal-based meat."[\[10\]](#) Unlike frozen precursors, the Beyond Burger product is intended to be displayed in a refrigerated case, preferably located next to real hamburger and other meats, in order to make comparison shopping more convenient and pointed.

One taste tester observed the following about her experience with this new-fangled veggie burger:

- The patties themselves look like raw beef—except that they are "made mainly out of pea protein, yeast extract, and coconut oil. They contain beet juice, which gives them a reddish color."
- The Beyond Burger sizzled like meat, although it didn't smell like beef. When the patty was flipped over after three minutes, it was slightly browned. It generated a lot of juice, although it didn't look like normal beef blood.
- When the reviewer bit into the Beyond Burger, she was shocked at how its texture approximated that of beef burger meat, and it was even pink in the middle. The "bits of veggie mimicked the muscles and flesh of a cow." "Overall, it was tasty and juicy, unlike most veggie burgers which can often taste closer to cardboard than beef."[\[11\]](#)

Another veggie burger innovator—a Stanford biochemistry professor Patrick Brown and his start-up company, Impossible Foods—is also staking out a multi-layered patent position for a more perfect veggie burger eating experience for carnivores.[\[12\]](#) The patent application family includes these titles: "Secretion of heme-containing polypeptides"; "Affinity agents for protein purification"; "Ground meat replicas"; and "Methods and compositions for consumables" (i.e., cheese replicas).

Impossible Food's veggie burger, the "Impossible Burger," is derived from plant molecules and compounds so that it will "bleed" like real hamburger meat:

The secret ingredient is called heme, or "plant blood," which is an organic molecule found in the protein leghemoglobin—the plant version of hemoglobin.

Heme can be extracted from the roots of nitrogen-fixing plants such as peas and beans. * * * Heme also creates flavours not unlike the ones we taste in meat when it's exposed to sugars and amino acids. So what [Professor Brown] had to do was come up with the perfect formula for his veggie patties using heme and a variety of different plant-based compounds to not only replicate the flavor of meat, but also the textures of animal fat, muscle fibre, and tissue. [\[13\]](#)

The Impossible Burger's intended market is *not* vegans or vegetarians—but rather carnivores. The company wants to attract and retain "hard-core beef lovers, the guy who's basically saying, 'You know, I'm literally on the opposite pole from a vegetarian, in no conceivable universe would I accept any substitute for meat.'" [\[14\]](#) Convincing a meat-eater that he or she is ingesting meat is the ultimate act in deluding our five senses into thinking we are eating something we are not. Sustainability of food sources may well hinge on such sensory mirages.

Impossible Foods intends to roll-out its new veggie burger this summer, first introducing it to high-end diners at select restaurants in San Francisco and New York. [\[15\]](#) An early review suggests that the Impossible Burger might live up to its hype:

The rich crust gives way to a soft, slightly tannic pink center. The taste is complex—fruitier, funkier and more barnyardy than any other plant-based veggie burger. The aroma, which accounts for about 80% of what we experience as taste, is exactly like cooked beef. But the texture is slightly off. When I roll a crumb of burger between my fingers, it goes grainy, lacking meat's melty quality. Still, there's a bona fide beefiness to the patty The burger is designed for a crisp char and sears nicely in a pan, but . . . hasn't worked as well when cooked over a grill. [\[16\]](#)

Once a "buzz" forms for the Impossible Burger, the company will seek to have grocers display it in the butcher's refrigerated case, rather than have it disappear into the "meat alternatives" section of the frozen food aisle.

Why Bother?

An existential question hovers over these vegetable-into-meat processing machinations. Why bother? South Indian cuisine, for example, already offers an elegant array of vegan and vegetarian food with a satisfying

range of textures and mouth appeal that can be made without industrial processing from readily available, cheap ingredients. See Julie Sahni's *Classic Indian Vegetarian and Grain Cooking* (1985) or Maya Kaimal's *Curried Favors: Family Recipes from South India* (1996).

The answer may be peculiarly American. With no established national culinary traditions, we eat whatever suits our fancy. With our secular faith in scientific progress, manipulating foodstuffs and turning them into something else altogether with extrusion dies, spinnerets and chemical baths is our *natural* penchant.

Faux foods, however, also push emotional hot buttons tied to food purity and sanctity. For research scientists, a desire to invent sustainable foods runs smack into a consumer psyche infused with latent, negative emotional responses—intuitively based on the omnivore's dilemma of making sure new foods are safe to ingest.

Clever marketers have spoofed those primal concerns. Chiffon margarine did so with its comic tagline: *It's Not Nice to Fool Mother Nature*. In this popular 1970s advertising campaign, a Hollywood actress portrays Mother Nature. When given some Chiffon margarine to taste, she enjoys it and refers to it as "my delicious butter." When informed that Chiffon margarine had even fooled her, she responds with classic moral outrage, accompanied by a flash of lightning and peal of thunder.^[17]

As in Star Trek fiction, we nevertheless boldly go where no palate has gone before in order to explore strange new culinary worlds.

[1] The more common reference in the Star Trek series is the term *food replicator*. That name would first be used in *Star Trek: The Next Generation*. It was described as a 24th century advancement over the former *food synthesizer*. See [https://en.wikipedia.org/wiki/Replicator_\(Star_Trek\)](https://en.wikipedia.org/wiki/Replicator_(Star_Trek)).

[2] See P. Swanson, "We Are What We Eat: The Origins and Current Legal Status of 'Natural' and 'Organic' Food Labels," *Gastronomica*, available online at <http://www.gastronomica.org/we-are-what-we-eat/>.

[3] W. Shurtleff and A. Aoyagi, "History of Meat Alternatives: 965 CE to 2014" (2014), at 6 (available online at <http://www.soyinfocenter.com/pdf/179/MAL.pdf>.)

[4] "History Days Monday: Protose," available online at <http://www.fourpoundsflour.com/history-dish-mondays-protose/>

[5] See n. 3, at 5.

[6] *Id.* at 7.

[7] *Id.*

[8] *Id.* at 8.

[9] T. Geistlinger, "Plant Based Meat Structured Protein Products," U.S. Patent Application No. 14/687,803 (filed April 15, 2015).

[10] See <http://beyondmeat.com/products/view/beyond-burger#>.

[11] L. Garfield, "I tried the Bill Gates-backed vegetarian burger that 'bleeds' and sizzles like beef," *Tech Insider* (May 26, 2016), available online at <http://www.techinsider.io/review-of-beyond-meat-veggie-burger-that-bleeds-2016-5>. All of the bullet points are adapted from this article.

[12] See PCT/US2014/055227 ("Secretion of heme-containing polypeptides"); US 14/385,586 ("Affinity agents for protein purification,"); PCT/US2015/023679 ("Ground meat replicas."); and US 14/152,531 ("Methods and compositions for consumables").

[13] "This new veggie burger bleeds like meat." *Science Alert* (October 9, 2014), available online at <http://www.sciencealert.com/news/20140910-26310.html>

[14] *Id.*

[15] K. Soller, "The Impossible Burger is Ready for Its (Meatless) Close-Up," *Wall Street Journal* (June 14, 2016), available online at <http://www.wsj.com/articles/the-impossible-burger-is-ready-for-its-meatless-close-up-1465912323>

[16] *Id.*

[17] See <http://www.thisdayinquotes.com/2010/06/its-not-nice-to-fool-mother-nature.html>.