

Impossible Is Possible

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To cater to increasing consumer demands for less meat and meat-free options, plant meat foods need to get more realistic, such as with the 'plant blood' by impossible foods. Henk Hoogenkamp addresses the flexitarian trend and recent developments with meat-free food.

Impossible Foods, a Californian start-up has been successful in the creation of "plant blood". This liquid makes a meat-free burger not only looking like raw ground beef, but also bleeds on the grill similarly as the all-time iconic American burger. A rapidly growing number of select US restaurants now serve these plant meat foods that originate from the world's technology hub Silicon Valley in California.

Plant meat foods are not only the opposite of the misery of industrial animal harvesting, but also to the invisible use of growth hormones, antibiotics, greenhouse gases, chemical fertilisers and clean water.

It is estimated that about one-third of the land on Earth is used to raise livestock and grow its feed in order to keep the intensive animal production output afloat. Predictions are gaining momentum that plant meat products use about 95 percent fewer resources than traditional livestock.

Industrial scale feedlot meat production is probably the world's largest environmental problem. Reducing meat consumption will free up vast amounts of land, water and alleviate the suffering of billions of animals. Ultimately, lower commodity costs of plant-origin food, including plant meat products, will contribute to a long stretch of food-price deflation when compared to the animal meat equivalent.

FLEXITARIANS GOING FORWARD

Vegetarianism appeals to surprisingly few people—just 10 percent of the global population. The true growth of meat substitutes or plant meat foods comes from flexitarians. This group consciously eliminates or reduces animal meat from their daily line-up of food and plans meatless days a few times each week.

Flexitarians are a rapid growing consumer segment aiming for transformative change, albeit often driven by psychologically inclined aspects associated with animal welfare, health and wellbeing.

Also, an important variable to consider is the reduction of red meat consumption (such as beef) and is mainly driven by young girls going through puberty.



A CHALLENGE TO REPLACE

Meat happens to be incredibly tasty and nutritious, and perhaps the only way to beat it is to develop a superior plant-based product that is at least equally good in organoleptic performance.

Beef is generally considered the worst part of the meat pyramid because of its inefficient feed-to-meat conversion and the use of huge amounts of clean water during the outgrow cycle of the animal.

Not to mention, the animals also produce high amounts of methane gas which are a large contribution to the greenhouse gases in the atmosphere.

Yet, on a worldwide basis, more than 50 percent of all beef is ground and ends up as a hamburger. This is an indication of how deeply embedded the hamburger is in many of the world's societal cultures.

OBSTACLES

The road to concoct a “veggie burger” that is juicy and flavourful with the right texture, bite and chew is quite long and not easy to navigate. Fortunately with the arrival of cellular agriculture, major development hurdles now can be successfully taken. Assembling certain compounds and ingredients from plants now allow a level playing field when comparing to the legacy animal meat formulated products.

Of course, there are major differences between animal meat and plant meat. Plants typically contain just a few percent of protein, while animal lean meat has an abundance of high quality protein as well a superior mineral content. These differences need to be brought in-line and harmonised.

Another major difference is the flavour and aroma of meat and this is especially true for beef. When beef is cooked, literally hundreds of different subtle aroma compounds come through and together create the ultimate smell and taste humans prefer, and are the reference standard for plant meat comparison.

Even when plant meat foods reach a high degree of flavour, aroma and texture equivalency, still one major component is missing from the typical attributes of the burger: “blood”. Of course, there is no real blood in raw meat but rather a combination of myoglobin and some extracellular water that creates the reddish looking meat juices.

PROGRESS



Fortunately, the rapid progress of cellular biotechnology now allows scientists to recreate meat haemoglobin—a haeme-group (iron) containing protein. When ‘infused’ with oxygen, the iron compound turns red and that is exactly what separates ‘red meat’ like beef and ‘white meat’ like chicken, turkey and, to a lesser degree, pork.

Animals are not the only ones with proteins that have a haemoglobin-like function; it appears that some legumes such as the soy plant and alfalfa have nitrogen-fixing properties that can create leghaemoglobin (a haeme protein).

Leghaemoglobin—a haemoglobin-like red pigment—is a nitrogen or oxygen carrier found in the nitrogen-fixing roots nodules of leguminous plants. It has been found that a specific sequence of soy DNA can be isolated and subsequently inserted into a yeast strain.

Yeasts are well-known to be the modern workhorses of cellular biotechnology and are increasingly used in a plethora of foods and beverages, including alcohol, craft beer, animal-free rennet for cheese making, pharmaceuticals and modification or manipulation of many types of protein. These modulated yeasts can therefore also play an important role to make ‘plant blood’ by means of fermentation.

A rather traditional step of the fermentation process is used to complete the production of the purified haeme in which most of the yeast is removed. This method of haeme technology skirts the process of genetically modified organisms (GMO), but it still remains to be seen how the natural food purists will react when they have the option in purchasing these plant meat foods.

However, it also does not deserve to be pitched as a choice for the lesser of the two evils. Moving forward with such technological advances, it is imperative to find social, economical, sustainable and ethical equipoise for meat or meat-like options.

BUILDING THE BURGER

The presence of plant haemo protein in a burger also simulates meat trimmings—including connective tissue and collagen—and animal fat, which are important variables that contribute to the typical hamburger make-up.

The development and creation of a connective tissue matrix in which the plant meat fibrous structure is encased has been attempted for many years. The same is true for the development of stable fat emulsions to simulate ground beef tallow, or pork flare fat.



Convincing consumers to give up their beloved beef burger remains a challenge. However, there is no doubt that for a large group of Millennials (born 1982-2004) and their children, the new plant meat foods are an attractive and welcome healthy choice.

THE FUTURE IS HERE

Plant-based foods that seek to make inroads into the dairy and meat categories are no longer a fad but rather a signal of evidence of the permanent shift in changing of choice of proteins at the centre of the plate, or the centre of the burger for that matter.

To be fair and balanced: there is a chance of disconnect between health and environmentally sustainable objectives. It will be of paramount importance to be transparent and find the right balance between possible conflicting goals of minimally processed 'natural' foods and cutting edge technologies that utilise cellular biology including the use of specific microorganisms.

THE IMPOSSIBLE BURGER

There is no doubt that the Impossible Burger is gradually getting closer and inching up to simulating the typical McDonald's Quarter Pounder. In its raw state, the Impossible Burger looks a bit reddish and somewhat artificially manufactured with a slightly more finely grained appearance. When cooked (fried) on a grill or skillet with a few drops of oil, it immediately begins to sizzle and some of the coconut oil emulsion oozes out.

With time, the patty starts to brown upwards from the bottom and begins releasing some of the "plant blood" juices. When the burger is flipped, a brown crust appears and has really firmed up, just like a beef patty. As the score stands now, the Impossible Burger has possibly reached a plateau of beef patty equivalency.

Cooked right and dressed with the usual condiments in a bun, the burger provides a great sensory experience and is truly indistinguishable from the 100 percent beef burger, say its creators.

In a restaurant setting it might be a different story: there is often an element of 'speed-to-plate' as well as the desire to minimise the dark crust formation when cooked at too high grill temperature. The chef's 'solution' might be to undercook the patty, but this would result in a raw-looking inside which might be unappealing for many, especially with a reddish and soft texture.

Obviously, more work needs to be done to communicate the proper cooking instructions with the operators of such restaurants as well as consumers who will purchase these products. Impossible Foods will continue to further refine the organoleptic performance and still have lots of space to grow. The day is approaching rapidly that the plant meat burger will become the product of choice for a new generation of consumers.