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BBQs and (meat-free) burgers

With research and development at the heart of new food product development, food companies are turning to IP to protect their investments

BBQ season is well and truly upon us (cue the British summer rain). One food that epitomizes summer is a grilled burger, perhaps slightly overdone at the edges, stacked in a soft bun and topped with crisp lettuce and juicy tomato, perhaps with a squirt of your favourite sauce. However, greenhouse gas emissions, global resource constraints, food miles, antibiotics resistance and animal welfare are just some of the factors that are starting to play on our minds and alter how we view the foods we eat. Newspapers tell us to avoid meat and dairy products to reduce our environmental impact, not to mention our cholesterol, and we are increasingly aware of the challenges of feeding a growing world population. So what about our beloved BBQs?

Several companies are a step ahead of the game and have been developing foods with a lower 'carbon footprint' for some time now. Impossible Food, Moving Mountains and Beyond Meat are just a few of the businesses involved in research and development of meat alternatives.

Impossible Food took a scientific look at what makes meat so delicious, using tools such as gas chromatography and mass spectrometry to identify the volatiles released when meat is cooked and give it its unmistakable aroma and flavour.

They found that the key ingredient in making meat taste "meaty", is an iron-containing compound, heme. An almost identical molecule, leghaemoglobin, is contained in some plants, and it has the same rich flavour and colour as animal heme. They worked up a way to genetically engineer yeast to produce this heme-containing protein in a lab, which can then be added to a meat substitute to make it "taste delicious". Impossible Food has gained patent protection not only for the engineered yeast, but also for compositions comprising heme as a food additive, and its use as a flavouring and meat substitute.

Other meat-free alternatives include Moving Mountains' zero-cholesterol vegetable burger, containing mushrooms, beetroot and pea proteins. These meat-free burgers evolved after the structure of beef fibers and muscle strands was analysed, resulting in burgers which reportedly have the texture of ground mince. Beyond Meat is another player in the burger market, making burgers with a meat-like texture. Beyond Meat's products are made using state-of-the-art protein extrusion technology, in which plant-based proteins, fats and minerals are forced through an extrusion dye, under shear and heat. This produces aligned fibers, similar to the muscular striations found in meat, while retaining a meat-like moisture level. Beyond Meat's patents include claims directed toward their process of obtaining meat-like food products.

So while taste is important, texture is also key to convincing meat-eaters to make the swap. Extrusion of plant-based proteins provides one way of achieving a texture more akin to meat. However, companies such as Memphis Meats, Just Inc and Integriculture, have developed alternative methods using cell-based meat. This meat substitute starts off by seeding a handful of cells on a scaffold, which is then cultured in a bioreactor that includes the right balance of nutrients needed to develop the growing cells into muscle fibres. Mechanical tension is applied to the scaffold, aligning the fibers and resulting in an end product that has the texture which might be expected of a juicy steak. This technique makes use of existing technologies, such as 3D printing, and scaffolds including electrospun starch fiber mats and porous biodegradable scaffolds. In this rapidly developing space, patents are emerging thick and fast, not only directed to the cell-culture method itself but also encompassing the specialised cellular input and resulting food products.

It's not just burgers that are getting the meat-free treatment. BBQ enthusiasts will be pleased to learn that sausages are also available from Beyond Meat, and, courtesy of BlueNalu's cellular aquaculture technology and New Wave Foods, it shouldn't be too long before you will be able to put a lab-grown shrimp (or fillet of fish) on your BBQ.

So that's the "meat" sorted, but what about the toppings? In this environmentally-conscious era, vegetables also come under scrutiny. Essential burger toppings, lettuce and tomatoes, are space-intensive crops, and often require special care in order to survive dark winter months. Step up lab-based crops and vertical farming systems such as those developed by Intelligent Growth Solutions, PlantLab, and Priva. Pioneering light engineering technology helps to reduce the space needed for crops and advance the vertical farming field. Supermarkets such as Ocado and M&S are even investing in vertical farming in a bid to focus on sustainability.

And if you require a bit of sauce on your burger, then a vertically-farmed, higher yielding tomato crop might be the way forward for ketchup production. But if mayonnaise is what you're looking for, then going "eggless" is the next step. Eggs are a particularly spectacular food stuff which facilitate an array of chemical transformations. They can be enjoyed alone, boiled with bread soldiers, fried or poached, or made into fluffy cakes, chewy meringues and soft breads, not to mention a tasty sauce to accompany a BBQ. Producing a consumer-acceptable alternative to real eggs is not easy, but some companies including Just Inc, Clara Foods and Spero think they might have cracked it. These (non-)eggy offerings are made from algae, soy or proteins derived from pumpkin seeds or mung beans. However, patented egg substitutes date back decades, generating a wealth of prior art available for Examiners to cite, which can provide a hurdle to protecting innovation in the "eggless field".

The food industry is demonstrating an interest in meeting the concerns of an increasingly conscientious consumer society. With research and development at the heart of new food product development, food companies are turning to IP to protect their investments. It looks likely that veggie-driven IP portfolios will continue to heat up, long after the coals have cooled on the BBQ.

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