

# NEW Food



## Where's **the beef?**

The food industry is experiencing a significant change in consumer behaviour and attitudes, with increasing concerns about provenance. Legal expert **Laura Clewes** outlines interesting developments in the cell-cultured meat arena and highlights the potential impact these might have on the industry and the implications for intellectual property rights.

**O**NE DOMINANT food trend in 2018 has been the increasing number of consumers turning to vegetarianism or veganism. It would seem that the consumption of meat has raised many concerns, including the impact of intensive animal farming on climate change and the ethical issues surrounding the slaughter industry.

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obtained from a muscle sample taken from a living animal. These cells are then allowed to multiply in a nutrient-rich (and preferably animal-free) medium (a liquid, gel or solid designed to support the growth of cells). The cells formed are then grown on, for example, a gelatine ring, which promotes muscle fusion, creating 'strips' of muscle fibres. These are then attached to scaffolds, flooded with nutrients and mechanically stretched to increase size and protein content. The resulting tissue can then be harvested and processed into a boneless meat product.

**Making lab-grown meat affordable**

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The movement of cell-cultured meat has gained significant momentum since the unveiling of the first lab-grown hamburger, produced from bovine stem cells, in 2013. The burger – which was reported to have been made from around 20,000 muscle strands, egg powder, breadcrumbs, and other ingredients found in traditional burgers – demonstrated that it was possible to continue meat consumption without the slaughter of animals.

The process of producing cell-cultured meat requires a few 'satellite' cells, which can be

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#### **Making lab-grown meat affordable**

Whilst the breakthrough in the development of cell-cultured meat in 2013 was a huge leap forward in terms of science, the process was not yet commercially viable as the cost of producing the first cell-cultured burger was in the region of €250,000 (roughly £225,000). Clearly, the challenge facing manufacturers is how to make such a process economically viable.

Many of the costs associated with the development of the first cell-cultured burger were related to the small scale of the manufacturing process. Dr Mark Post, whose research led to the ▶

#### ABOUT THE AUTHOR



**LAURA CLEWES** is UK & European Patent Attorney at IP firm Mathys & Squire, where she works as part of the food technology team to help clients identify, protect and commercialise their food IP, whether through identifying relevant chemical compounds in new food products, analysing the food manufacturing methods, or the packaging process.

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first cell-cultured burger, believes that it would be possible to make an improved version of the burger for approximately €9, if the technology could be scaled to the level of an industrial food process.

Another cost challenge associated with the production of cell-cultured meat is the provision of an effective and low-cost nutrient-rich medium, which would allow the initial cells used to multiply. In order to create the correct environment for the cells, the medium used must contain salts, sugars and protein. Mediums made from animal blood contain all of the necessary ingredients, including the required protein content. However, the use of mediums produced from animal blood goes against the key selling point of such meat products; ie, reducing the slaughter of animals, particularly in the case of foetal bovine serum. In addition, these mediums are costly – for example, an ounce of fish serum can cost over £650 – yet these issues have failed to dampen industry buzz surrounding ‘clean meat’. Just, Inc., a start-up food manufacturing company in America, has been researching an effective animal-free nutrient medium for use in cell-cultured meat and believes that it has succeeded – though the exact components of the serum have not been disclosed.

Another company assuming the challenge of cost-effective clean meat production is Memphis Meats, which believes that cell-cultured meatballs, hotdogs, and sausages will be available on supermarket shelves in around five years’ time. In 2016, it achieved dramatic reductions in the manufacturing costs of such products, announcing the production of a ‘cultured meatball’ for around \$1,000. Clearly there remains some way to go

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of inserting DNA sequences from cows into yeast in order to instruct the yeast to produce the milk proteins (casein and whey) required in dairy products, such as milk, yoghurt, cheese and ice-cream. It appears that the food industry is welcoming this new technology with open arms, as Perfect Day has reportedly been in talks with well-known food and dairy companies interested in using the company’s recently patented products.

### **Why is this technology creating so much interest?**

Aside from the moral issues related to meat eating, there are also serious issues surrounding intensive animal farming.

Intensive farming is a significant contributor to climate change. Microorganisms present in the gut of cattle emit millions of tonnes of methane (a greenhouse gas) every year. There is also the issue of space: around 27 per cent of the world’s land mass is dedicated to the beef industry, and in a world with an ever-growing population this land is becoming increasingly valuable. There is also a real possibility that the clearing of such extensive land mass for cattle grazing has caused a significant impact on biodiversity.

From a health perspective, it is believed that the controlled growth of cell-cultured meat will prevent the spread of food-borne diseases, such as mad cow disease, making the consumption of meat safer. However, while this new technology has many promising aspects, if accepted by consumers, the production and sale of such products could create a significant economic impact on the UK farming industry.

### **Will consumers accept meat products grown in a lab?**

A survey conducted in January 2018 by market research consultants Surveygoo, asked a group of over 1,000 vegans, vegetarians, pescatarians, and omnivores, whether they would be happy to eat cell-cultured meat: 29 per cent confirmed that

the production of a cultured meatball for around \$1,000. Clearly there remains some way to go before the pricing is appealing to the average consumer, yet this constitutes an impressive cost reduction, knocking more than \$250,000 off the original 2013 figure.

Current research in this field is focused on producing processed meat products. Unprocessed meat, such as steak, is far more difficult to replicate, due to the complex structure of bone, blood vessels and connective tissue it contains. Nevertheless, Dr Paul Mozdziak of North Carolina State University believes that the production of more complex unprocessed meat will eventually be possible as the technology in this field develops.

Perfect Day, a company developing animal-free products, is planning to distribute cow-free dairy products. This company has developed a method

and omnivores, whether they would be happy to eat cell-cultured meat: 29 per cent confirmed that they would. Most surprisingly, the survey found that 60 per cent of those vegans asked would be willing to eat cell-cultured meat. Based on these figures, it would seem that lab-grown meat could, at least potentially, have a viable target market.

#### **Return on investment**

The food industry has the potential to create significant revenue for manufacturers. For example, the total value of output of livestock alone in the UK in 2016 was £12,691 million. It is therefore unsurprising that companies at the forefront of these culinary developments are looking to protect their intellectual property in advance of any product launch. If any of the companies producing cell-cultured meat are able to secure

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a contract with a global food production company or franchise, such as McDonald's, which sells 75 burgers every second, the financial gain and access to potential customers would be significant. This could also lead to an industry shift toward using this technology and subsequently trigger major changes within the agricultural sector.

#### **Regulation of lab-grown meat**

Before this new product can be sold in the UK, however, it is necessary for companies to gain approval by the Food Standards Agency (FSA), most likely through the Novel Foods Regulation. A food or ingredient is defined as 'novel' if it does



A food or ingredient is defined as 'novel' if it does not have a significant history of consumption within the EU before 15 May 1997. In order to gain this approval, the Advisory Committee on Novel Foods and Processes (ACNFP), an independent panel of scientific experts, will assess evidence provided to illustrate the safety of these new food products. Such a process can be lengthy and so we await the judgement from the FSA.

Regulation of these food products doesn't seem to be clear cut in the US either. On 12 July 2018, the US Food and Drug Administration (FDA) held a one-day public meeting to gather input on potential regulatory issues surrounding the safety of cell-cultured meat products. It has been reported that the purpose of the meeting was to solicit public and stakeholder comments on potential safety issues that may need to be addressed when formulating regulations for cell-cultured meat products. The topics discussed included starter cells, culture techniques and media, manufacturing processes, and labelling. While food regulation organisations such as the FDA have extensive experience in regulating the production of meat-based products, the FDA considers that this new type of food product could provide 'unique attributes and challenges' that have not yet arisen in traditional food products.

This is not the only issue surrounding cell-cultured meat in the US. It would appear that there are two federal agencies that believe they should regulate the production of this new food product, and the US Department of Agriculture (USDA), which regulates most meat products and catfish, also believes that it should be responsible for regulation. As we go to press, we await the verdict as to which agency will be responsible for regulation, or whether a compromise to share the responsibilities can be reached.

While there remain hurdles to be overcome before these new products reach supermarket shelves, the potential benefits of this new technology are undeniable. However, despite the benefits, due to potential consumer scepticism it is unclear whether cell-cultured meat will ever be a commercial success: I guess the proof of the (steak and ale) pudding will be in the eating. 🍴

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