PROTECTION OF INTELLECTUAL PROPERTY FOR MEAT ALTERNATIVES DERIVED FROM PLANTS

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ABSTRACT

Based on a study, meat production contributes to almost 60% of greenhouse gas emissions from food production. To prioritize healthy living, people are opting for plant-based meat alternatives, which are created using advanced techniques that require significant research and development. Although plant-based meat substitutes have existed in various countries and forms for some time, their future appears promising due to growing concerns about climate change, greenhouse gas emissions, world hunger, and environmental conservation. Companies producing these substitutes need to focus on consumer demand and market trends, and innovation and Intellectual Property Rights can provide a competitive edge. To achieve success in the plant-based meat industry, companies need to safeguard their Intellectual Property Rights by submitting patent applications early, registering trademarks, developing branding strategies, and investing in research and development.

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Introduction

Advancements in technology and innovation have impacted all areas of life, including food and biotechnology. The aim of these areas is to develop sustainable solutions to cater to the increasing demand for plant-based meat options as a substitute for traditional animal-based products. Such meat substitutes imitate the taste, texture, and nutrients of animal-based meats. These substitutes are made from plant proteins that are designed to closely mimic the characteristics of traditional meat.[1]

According to the *Plant-based Meats: Intellectual Property Landscape* report, the global meat production in 2020 reached an estimated 340 million tons, which is a 500% increase compared to the early 1960s.[2] Plant-based meats (PBM) are created by extruding proteins made from various compositions to mimic the taste and texture of animal-based meats. This innovation appeals to the vegan community who seek to enjoy meat without causing harm to animals. Companies involved in the production of PBM need protection for their research and development efforts to further improve and innovate in this industry. Intellectual property (IP) protection such as patents, trademarks, designs, and trade secrets can be used to achieve this protection.

Introduction of Alternatives Driven by Historical Factors

The history of plant-based meat (PBM) dates back to ancient times. Tofu, a soy protein-based meat substitute, was first developed in China during the Hyan Dynasty in 206 BC.[3] Several popular meat substitutes have been used in many countries for centuries, including wheat gluten (seitan) in China, yuba in Japan, and tempeh in Indonesia. In the United States, the roots of PBM can be traced back to John Harvey Kellogg, who became the Director of the Battle Greek Medical Surgical Sanitarium in 1876. Kellogg believed that meat was harmful to physical strength and carried bacteria, so he served vegetarian food to patients. To provide adequate protein to the population, Kellogg conducted experiments on meat substitutes. In

[1] Mudasir Ahmed, *Plant-based meat alternatives: Compositional analysis, current development, and challenges*, 2(2), Applied Food Research, Science Direct (2022), https://doi.org/10.1016/j.afres.2022.100154.
[2] *Plant-based Meats: Intellectual Property Landscape Report*, Root Analysis (Apr. 29, 2023; 04:34PM), https://www.rootsanalysis.com/reports/plant-based-meats-intellectual-property-landscape.html.
[3] Nea Pantry, *The Fascinating History of Meat Alternatives-and Why They're Not Unnatural*, Peaceful Dumpling (Dec. 02, 2020), https://www.peacefuldumpling.com/history-of-meat-alternatives.

1896, he introduced 'Nuttose' as the first canned meat substitute product made of wheat and nut products, after several experiments. It was also known as a 'substitute for flesh food.'

The rising demand for plant-based meat substitutes, also known as PBM, can be attributed to concerns about the adverse effects of meat consumption on the environment, public health, and climate change. Over time, research and innovation have greatly improved PBM substitutes, making them more appealing to both vegans and non-vegans alike. Key players in the PBM market include Quorn, who launched their first PBM substitutes in the UK in 1985, Beyond Meat, who revolutionized the sector in 2009, and Impossible Meat and Sophie's Kitchen, who followed suit in 2011. By consuming PBM substitutes instead of meat, people can reduce their risk of health problems such as cardiovascular issues and high cholesterol, since PBM substitutes are low in saturated fats. Additionally, the production of plant-based meat (PBM) offers several environmental advantages such as decreased greenhouse gas emissions, water conservation, and lower land usage compared to conventional meat production techniques. The increasing concerns about animal welfare, food safety, health, and the environment are anticipated to drive the demand for PBM alternatives in the future.

Innovation: Meat Substitutes Made from Plant Sources

The use of plant-based substitutes for meat products such as burgers, bacon, sausages, nuggets, seafood, and eggs are on the rise due to their protein content and potential health benefits. These substitutes are created by using plant protein analogues and molecular reactions. The protein type and structure, such as amino acid sequencing, play a critical role in the functional properties of the substitute. To be preferred over meat, plant-based substitutes must have similar taste, texture, colour, and consistency, which can be achieved through the selection of ingredients and manufacturing process. The replacements generally consist of water, non-textured plant-based protein, textured vegetable protein, flavour enhancers, fats, binding agents, and colouring agents in specific proportions. These proportions are usually 50-80% water, 4-20% non-textured plant-based protein, 10-25% textured vegetable protein, 3-10% flavour enhancers, 0-15% fats, 0-15% binding agents, and 0-5% colouring agents.[4]

Various plant-based proteins such as soy, oil seeds, legumes, and wheat gluten can be used as substitutes for animal-based proteins. Optimal water levels not only reduce costs but also

[4] *Supra Note 1.*

enhance the juiciness of the final product. Proteins, which have a higher capacity for water-binding and protein network formation, are typically used in larger amounts. On the other hand, fillers such as starches and flour, which have lower protein levels, are used in smaller amounts. Heme, a molecule that gives meat its unique flavour and carries oxygen in the blood, is the key ingredient in the Impossible Burger. The use of legume haemoglobin, which is derived from soy plant roots, adds the distinctive red colour of meat when heated. Sustainable methods such as the Maillard reaction can also be used to add a meaty aroma and savoury flavour to plant-based meat substitutes. This reaction involves several simultaneous chemical reactions between proteins and sugars that occur during heating, resulting in the creation of new flavours, aromas, and colours. Although the reaction is complex, scientists continue to study it to understand it better.

High moisture extrusion and shear-cell processing are two commonly used techniques for replicating the meat-like taste and texture. The choice of technique depends on the type of meat product being replicated. Various strategies are employed to create structured products that mimic the texture of meat, including the use of meat analogues and PBM extenders in processed meat products. Structuring techniques can be achieved through a bottom-up or top-down strategy, where individual structural elements are either combined to form larger products or the structure is mimicked on larger length scales. These techniques not only provide a meat-like taste and texture but also have the added benefits of being energy-efficient and having a smaller carbon footprint.

Plant-Based Meat's Patent Landscape

Patents are a type of intellectual property rights that are awarded for an invention if it meets certain criteria such as being new, useful, and inventive in an industrial context. In the PBM industry, innovation and invention are crucial for success. Due to concerns about the negative impact of meat consumption on climate, sustainability, animal welfare, and personal health, younger generations are pushing for the development of new technologies that can closely mimic traditional meat. These technologies could be patented and may include factors such as the combination of molecules used to enhance flavour, key ingredients, ingredient creation processes, improvements to existing methods, product quality and attributes, shelf-life enhancements, and packaging improvements.

While patents have previously been awarded for inventions related to PBM substitutes,

synthetic meat, or fake meat, the popularity of PBM has increased significantly in recent times. John Harvey Kellogg created a meat substitute called 'Protose' in 1899 by combining peanuts and cereal, which was patented and trademarked as "Vegetable Food Compound." This was the first description to use the term 'vegetable substitutes for meat'.[5]

Robert Boyer invented a soy protein that could be eaten in 1947, using a process similar to creating textile fibres. His method was patented in 1954 under the US Patent No. 2,682,466A, and it involved making meatless, textured food using spun vegetable protein. This innovation led to the creation of a new meat substitute made from soy protein fibres that can be frozen. Boyer's patent was the first to use the term 'Synthetic Meat'. Today, Impossible Foods holds 263 global patents, 103 of which have already been granted and 239 of which are still active, reflecting the current trend toward meat alternatives.

According to a study conducted by Wissen Research, the majority of the patents in the PBM industry (59.07%) are still pending, while 21.68% have already been granted.[6] The year 2021 saw the highest number of patent filings, with 128, followed by 97 filings in 2020 for plant-based meat. The PBM patent landscape is dominated by Nestle, EPC Natural Products, Impossible Foods, Cargill, and Sweet Green Field International.

Incorporating the Ochiai Germination Method, a technique for enhancing soybean's amino acid composition, DAIZ Inc, a Japanese startup established in 2017, is presently operating. The natural germination process utilized in this method enables the alteration of the nutritional value and taste of soybeans to closely resemble that of pork, chicken, fish, and beef without causing any harm to the environment through meat production. DAIZ has obtained a trademark for its plant-based meat product called 'MIRACLE MEAT' through their innovative approach. In order to verify that the product is devoid of animal ingredients and testing, DAIZ has acquired certification from The Vegan Society's Vegan Trademark, which is a recognized standard worldwide.

Protection of Trademarks in the Market for Vegan Products

Trademarks serve as a way to represent goods or services. Registering trademarks and

[5] William Shurtleff & Akiko Aoyagi, *History of Meat Alternative*, Soyinfo Center (2004), https://www.soyinfocenter.com/pdf/179/MAL.pdf.
[6] *Plant Based Meat*, Wissen Research (Jul. 27, 2022), https://www.wissenresearch.com/wp-content/uploads/2022/07/Plant-Based-Meat.png.

implementing effective brand management strategies are crucial for a company's success. Companies in the PBM market should focus on maintaining their reputation by adapting to changing customer preferences. To be eligible for trademark registration, a mark should be non-suggestive and non-descriptive. In the PBM industry, where meatless meat is the norm, choosing a distinctive tradename is essential, and caution should be exercised in the selection process. To stand out in a highly competitive food market, companies such as Beyond Meat, Impossible Foods, Moving Mountains, and others have developed distinctive names for their products. To safeguard their brand identity, Beyond Meat has obtained 108 trademarks from the US Patent and Trademark Office (USPTO). Through consistent use and quality assurance, these trademarks become associated with the unique traits of the respective products over time.

Children Cancer Aid Limited's attempt to register the trademark 'Mcvegan' in the UK has been opposed by McDonald's, claiming that it could cause confusion among customers, citing specific sections of the Trade Marks Act 1994. McDonald's advised that performing thorough trademark searches and using a unique and creative name can avoid potential problems.[7]

In 2020, the Hague's District Court ruled that Nestle had violated trademark laws by using the name 'Incredible Burger' which belonged to Impossible Foods. As a result, Nestle was ordered to stop using the name throughout Europe and faced a daily fine of 25,000 euros. Impossible Foods argued that Nestle had deliberately copied their name, visual identity, and other branding elements to deceive customers and gain an unfair advantage in the market for plant-based meat substitutes. To succeed in this industry, PBM companies must create distinctive trademarks, register them promptly, and remain vigilant against potential infringers. Consumers have the right to clear and accurate information about the products they purchase.

Conclusion

The rise in demand for plant-based meat alternatives can be attributed to their capability to imitate the taste and texture of actual meat by utilizing innovative methods and products. The plant-based meat industry is rapidly growing with new players entering the market. While both traditional and plant-based meat companies aim to meet customers' expectations, achieving exceptional taste and nutritional value requires ingenuity. Patent protection can provide a

[7] Tom Ambridge, *McDonald's International Property Company Ltd v Children Cancer Aid Limited [McVegan] (O-675-21)*, Stobbs (Jan. 04, 2022), https://www.iamstobbs.com/opinion/mcdonalds-international-property-company-ltd-v-children-cancer-aid-limited-mcvegan-o-675-21.

roadmap towards these goals. The issue of counterfeit products being sold under the label of PBM presents a significant hurdle when it comes to convincing customers of the advantages of PBM over traditional meat. To address this challenge, it is important for organizations that promote PBM products to establish regulations and policies. Additionally, it would be beneficial to incentivize researchers and entrepreneurs with rebates and awards to reduce the costs associated with Research & Development. Overall, while there are challenges, there are also opportunities to advance the PBM industry.