FOOD & NUTRITION INDUSTRY INSIDER

TREND DEEP DIVE

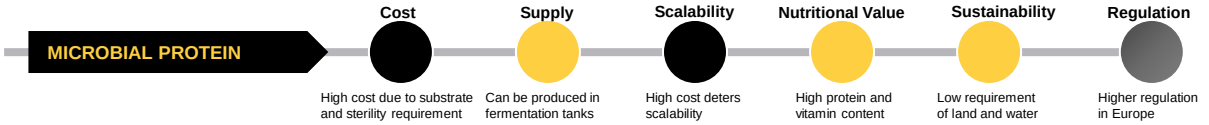
Alternative Proteins

2H 2020

FutureBridge

Microbial Protein – Technology Introduction

Microbial fermentation provides an animal protein-like final product in terms of texture, color, and nutritional properties



PATENT ANALYSIS

- **Precision fermentation** and **biomass fermentation** is active in the **European** and **North American** region with traditional fermentation dominating in the Asian region
- **Precision fermentation** and **biomass fermentation** is focused on improving the sustainability of products
- The patents published are **highest** in **2017** with focus by **universities**, **established players**, and **ingredient developers**

RESEARCH ANALYSIS

- Research is steadily **increasing** as **fermentation** provides **animal protein** like **texture** and **nutrients**
- **Higher activity** is observed in the **North** and **South American** region
- **Fermentation** is focused on **non-dairy drinkable** and **spoonable foods** for **enhancing** the **nutritional value** and **health claims** e.g. non-dairy kefir and fermented rice drink
- Research is also **increasing** on **shelf-stable functional non-dairy protein beverages** with less **sugar**

Microbial Protein

Protein (g/100g): 20- 40 g

MARKET ADOPTION

- The **highest product launches** observed in **2019**, which c**oincide** with the **rising popularity** of the **alternative proteins** industry. The product launches CAGR of **2.7%** is observed in the segment.
- **Europe** has the **highest product launches** due to the **megatrend** of **healthy eating** in the region
- Microbial protein produced through **biomass fermentation** is being commercialized as **animal feed** (fish, poultry) and the **prototype** for **human consumption** is being worked upon

PROS

- Excellent source of nutritive **proteins** and **improves digestibility** of proteins
- Microbial biomass is **independent** of **climatic** and **seasonal variations**
- Has a **high multiplication rate** and **high protein content**
- **Sustainable** due to **lower carbon footprint** and **use** of **agricultural waste**
- **Algal** sources have natural B12 and the final product isn't required to be fortified

CONS

- **GMO product** maybe **unacceptable** to some **consumers**
- **Nucleic acid content** in the biomass **lowers digestibility** and causes **skin reactions**
- Requirement of **toxicological** examination of final products
- **Scalability** is **low** due to **lower production** and **high cost**
- **Extraction process** of protein is complicated due to **presence** of **rigid cell wall**

Illustrative Player Ecosystem

Ingredient Manufacturer

Microbial protein ingredient is mainly produced by **start-ups** and also by **established companies**

Perfect Day, MYCORENA, Mushlabs, SOLAR FOODS, Fynd, Givaudan

End-product Manufacturer

Microbial protein ingredient is utilized by **start-ups** and by **established companies**

Perfect Day, Valio, LEGENDAIRY FOODS, IMPOSSIBLE, ripple, Nestlé

KEY: Start-up | Small-medium company | Established company

Microbial Protein – Start-up Player Ecosystem

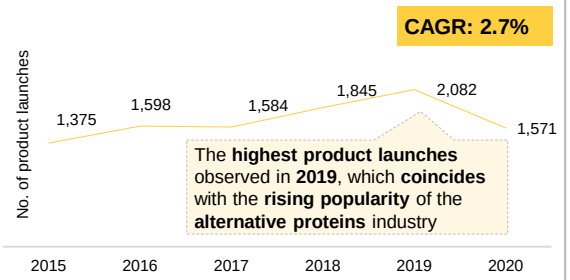
Traditional fermentation is well-known amongst consumers; biomass and precision fermentation is highly active in the North American and Europe region

Types of fermentation	Traditional	Biomass	Precision
Description	**Traditional fermentation** uses intact **micro-organisms** to produce **nutritious end-product** with upgraded **sensory properties**	**Biomass fermentation** utilizes **microbial components** to produce **nutritious end-products** i.e. substrate is provided to microbes and microbes themselves are the final products	**Precision fermentation** utilizes **microbes** to **produce specific ingredients**. The **genes** for the components maybe **spliced** into the **genome** of the microbe
Representative start-ups	MycoTechnology, prime roots, PLANETARIANS, AFINEUR, THE MEDITERRANEAN FOOD LAB	3F BIO, AIR PROTEIN, MYCORENA, SOLAR FOODS, ECOVATIVE DESIGN, Mushlabs, Fynd, MEATI FOODS, Spira, algaVia	Clara Foods, FUMI INGREDIENTS, New Culture, BOND PET FOODS, Perfect Day, LEGENDAIRY FOODS, motif FOODWORKS, String Bio SMART SCIENCE. CLEAN WORLD., GELTOR
Application	**Traditional fermentation** is utilized for applications such as **kefir beverage** and **non-dairy probiotic beverage** due to its capability of **fortification** and improving **sensory properties**	**Biomass fermentation** produces proteins extracted from **microbes** that can be utilized to produce **alternative meat** due to its **clear taste** and **nutrition**	**Precision fermentation** produces required proteins such as **casein**, **whey**, and **gelatin** to **fortify end products**

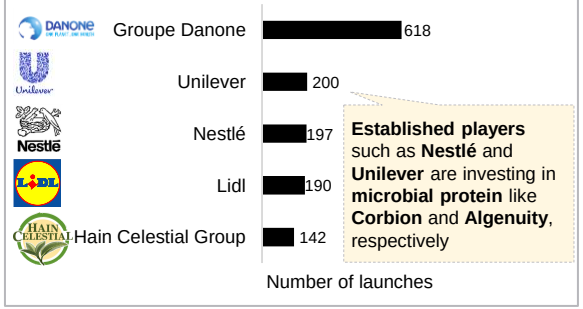
Microbial Protein – Product Formulation Snapshot (Fermentation Focus) (Jan 2015- Aug 2020)

The fermented alternative proteins products are being increasingly launched with majorly dairy substitutes being launched

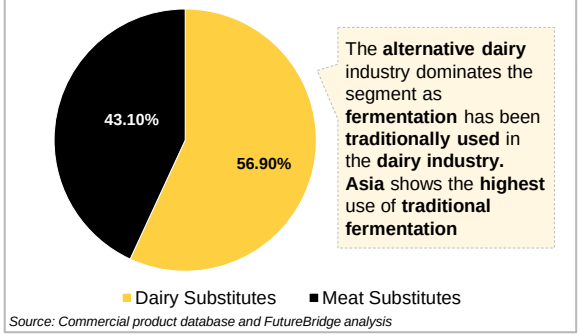
Year-wise product launch
(Global, Jan 2015- Aug 2020)



Company-wise product launch
(Global, Jan 2015- Aug 2020)

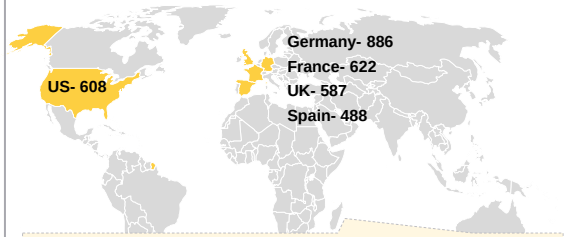


Category-wise product launch
(Global, Jan 2015- Aug 2020)



Source: Commercial product database and FutureBridge analysis

Country-wise product launch
(Global, Jan 2015- Aug 2020)



PRODUCT SPOTLIGHT

The company utilizes germinated **yellow peas** and **fermented rice** to produce a fiber-rich product

Brand: Bärta

Company: Swedish Temptations (Sweden)

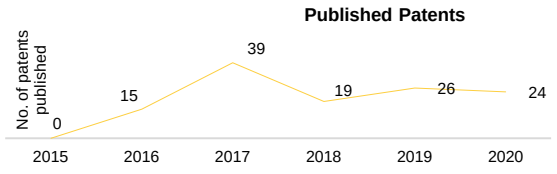
Category: Meat Substitutes

Ingredients: Yellow peas, distilled vinegar, fermented culture (rice, soya, *Rhizopus spp.* spores)), marinade (water, (water, soya beans, sea salt, *Aspergillus oryzae*), rapeseed oil, ginger, garlic, paprika, chilli, espresso

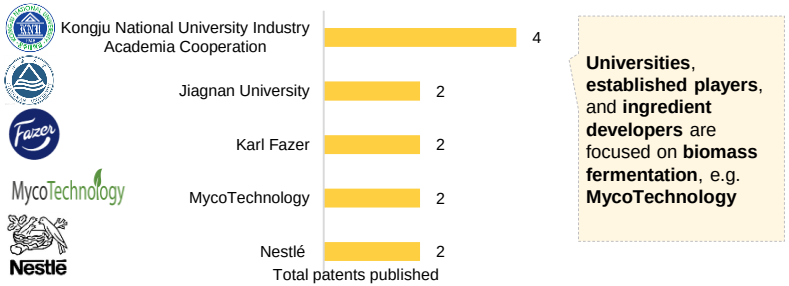
Positioning Claims: All natural product

Microbial Protein – Patent Analysis (Fermentation Focus) (Jan 2015- Aug 2020)

Precision fermentation and biomass fermentation is focused on improving the sustainability of products



The published patents **published** have increased upto **2017**, after which the industry is focused on **researching fermented alternative proteins** products



Universities, **established players**, and **ingredient developers** are focused on **biomass fermentation**, e.g. **MycoTechnology**

Europe and **North America** are highly active in the **alternative protein** segment due to the higher focus on **healthy eating**

Source: Commercial patent database and FutureBridge analysis

Insider Pick – Provides a method to ferment plant protein to replicate dairy taste, color, and texture

Patent: WO2020128361A1

Title: Method for preparing a fermented plant product

Assignee: Onyx Development

Inventors: Hubert Eudier, Jean Paul Lorand et.al.

Claim: The patent describes a method to **ferment plant protein** by utilizing ***Streptococcus thermophiluset*** and ***Lactobacillus bulgaricus*** to produce **alternative dairy products**. Fermentation allows the product to have **dairy-like taste**, **color**, and **texture**. The plant proteins that can be fermented include **peanuts**, **green beans**, **white beans**, **red beans**, **mung beans**, **peas (small peas)**, **chickpeas**, **lentils**, **faba beans**, **alfalfa**, and **nutgrass** etc.

Insider Pick – Provides a method to utilize fermentation to produce a nutritious protein for a meat substitute

Patent: US20200216797A1

Title: Microbial Conversion of CO2 and Other C1 Substrates to Protein and Meat Substitute Products

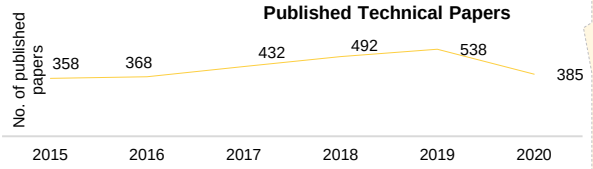
Assignee: Kiverdi

Inventors: lisa Dyson, John Reed et.al.

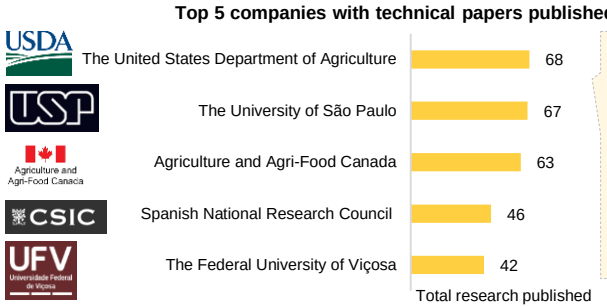
Claim: The patent provides **microorganisms** and **bioprocesses** that convert gaseous substrates, such **H_2** and **CO_2** for use in **human nutrition**, or as a nutrient for plants, fungi, or other microorganisms. The protein provides characteristics such as **bland flavor**, **light cream color**, **easy dispersibility**, **high water absorption**, and **high fat adsorption**.

Microbial Protein – Technical Paper Analysis (Fermentation Focus) (Jan 2015- Aug 2020)

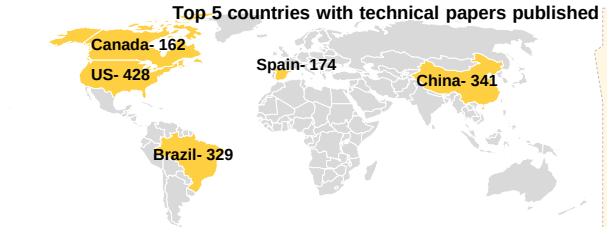
The research in the fermentation segment is increasing with a focus on improving the antioxidant activity with probiotics



The research published is steadily **increasing** as **fermentation** provides **animal protein** like **texture** and **nutrients**



Research is published by **universities** and **governmental bodies** in the **North American** and **South American** region as the use of **fermented** products is increasing



Precision fermentation and **biomass fermentation** is active in the **European** and **North American region**

Source: Commercial research database and FutureBridge analysis

Insider Pick – Study to increase probiotics and anti-oxidant activity in kefir-like fermented beverage

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

Title: Development, Characterization, and Bioactivity of Non-Dairy Kefir-Like Fermented Beverage Based on Flaxseed Oil Cake

Researchers: Łukasz Łopusiewicz, Emilia Drozłowska, et.al.

Key takeaways

- The study aims to utilize **flaxseed oil cake** as a substrate to produce a **kefir-like fermented beverage**
- **Lactic acid bacteria** and **yeast** are observed to **grow well** in the **flaxseed oil cake** without supplementation. **Fermentation** provides **high anti-oxidant activity** in the final provide

Insider Pick – Study to increase antioxidant activity in non-dairy probiotic foods

中国海洋大学 OCEAN UNIVERSITY OF CHINA

Title: Mixed fermentation of blueberry pomace with L. rhamnosus GG and L. plantarum-1: Enhance the active ingredient, antioxidant activity and health-promoting benefits

Researchers: Yehua Yana, Fang Zhang et.al.

Key takeaways:

- The study focuses on developing **non-dairy probiotic foods** and **beverages** such as **fermented blueberry pomace with probiotics**
- The use of **lactic acid bacteria increased** the **antioxidant activity** due to **increased total phenols** and **flavonoids**

North America
55 Madison Ave, Suite 400
Morristown, NJ 07960
USA
T: +1 212 835 1590

Europe
Stadsplateau 7
3521 AZ Utrecht
The Netherlands
T: +31 30 298 2108

United Kingdom
5 Chancery Lane
London EC4A 1BL
United Kingdom
T: +44 207 406 7548

Asia Pacific
Millennium Business Park
Sector 3, Building # 4, Mahape
Navi Mumbai 400 710
India
T: +91 22 6772 5700