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# SAMPLE LANDSCAPE STUDY
# Probiotic Compositions

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# 1. INTRODUCTION

## 1.1. Probiotic Compositions

Probiotics are live bacteria and yeast that can be formulated into many different foods, drugs, and dietary nutritions. Probiotics are often called good and helpful bacteria as they help keep your gut healthy. Probiotics can be used in food supplements and some other foods, like yogurt and other dairy products.

At present, many types of bacteria are classified as probiotics but most come from two groups Lactobacillus and Bifidobacterium. Other microorganisms such as yeast Saccharomyces cerevisiae and some Escherichia coli and Bacillus species are also used as probiotics. Several well-characterized strains of Lactobacilli and Bifidobacteria are used as probiotics for human to reduce the risk of gastrointestinal (GI) infections or treat such infections. Also consumption of other probiotic composition can benefit the improvement of intestinal health by regulating the microbiota, and stimulation and development of the immune system, synthesizing and enhancing the bioavailability of nutrients, reducing symptoms of lactose intolerance, and reducing the risk of certain other diseases. Some probiotic strains can reduce intestinal transit time, improve the quality of migrating motor complexes, and temporarily increase the rate of mitosis in enterocytes. The potential effects of probiotics can only be attributed to tested strains but not to the whole group of probiotics i.e. the health benefits are strain specific and there is no universal strain that would provide all proposed benefits and not all strains of the same species are effective against particular defined health conditions.

Probiotics have shown to provide a diverse variety of health benefits to human, animal, and plants. However, viability of the microorganisms throughout the processing and storage play an important role in transferring the claimed health effects. Probiotics are also have been reported for its effects of various other diseases like antibiotic associated diarrhea, inflammatory bowel disease, lactose intolerance, irritable bowel syndrome, to improve skin conditions, urinary and vaginal health, oral health & preventing allergies and colds.

Probiotics are safe for human consumption and no reports have found on any harmfulness or production of any specific toxins by these strains. In addition, some probiotics could produce antimicrobial

For sources of information, please refer to **Appendix A**

substances like bacteriocins. Therefore, the potential health benefit will depend on the characteristic profile of the probiotics. Prospective health objects of probiotics are shown in Figure 1. Additionally, probiotics produce a variety of beneficial compounds such as antimicrobials, lactic acid, hydrogen peroxide, and a variety of bacteriocins. Probiotics have the ability to interact with the host microflora and competitive with microbial pathogens including bacterial, viral, and fungal.

The potential applications of probiotics in many non-dairy food products and agriculture have not received formal recognition and a number of uncertainties concerning technological, microbiological, and regulatory aspects exist. In recent times, there has been an increased interest in food and agricultural applications of probiotics. The agricultural applications of probiotics with regard to animal, fish, and plants production have increased gradually.

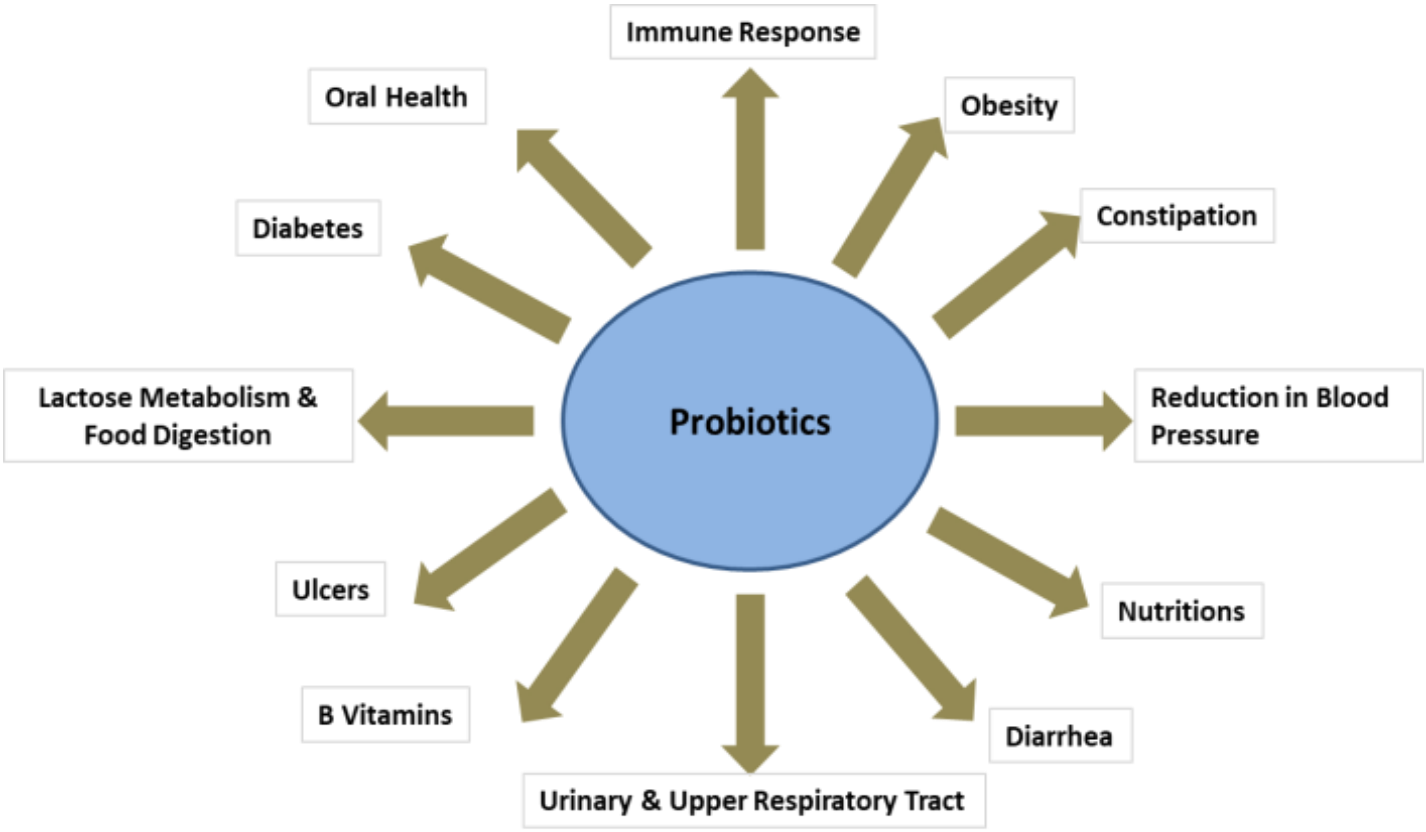



**Figure 1: Prospective applications of Probiotics**

For sources of information, please refer to **Appendix A**

## 1.2. Growth Prospects of Probiotics

The global Probiotics market size is expected to reach USD 69.4 billion by 2023, at a CAGR of 6-7% attributing to growing consumer interests towards preventive healthcare in conjunction with development of efficient probiotic strains.

The global demand for probiotics is increasing significantly due to the growing awareness among customers about their direct relation to digestive health benefits, the rise in demand for nutritious food, and increase in demand for quality animal-based products. The food & beverage segment dominated the Probiotics market on the basis of application, awareness, faith in their efficacy and safety are some of the factors driving the market of Probiotics.

It is a critical time to understand the global competitive environment of Probiotics market from a patent perspective and in-depth patent analysis of key technologies and players can help anticipate changes, detect business opportunities, mitigate risks and make strategic decisions to strengthen one's market position and maximize return on one's IP portfolio.

Some of the prominent participants in the global market of Probiotics are Danone (France), Yakult Honsha (Japan), Nestlé (Switzerland), Dow DuPont (US), and Chr. Hansen (Denmark).

For sources of information, please refer to **Appendix A**

# 2. OBJECTIVES

- To perform detailed analysis of granted patents and published applications pertaining to Probiotic compositions and to understand underlying technologies.
- In depth analysis of patents/applications, in order to categorize them and to understand focusing areas of applicants.
- Graphical representation of trends (Filing, Publication, etc.) from the mined data of relevant patents/applications.

Image Courtesy

# 2.1 SEARCH METHODOLOGY

Image Courtesy

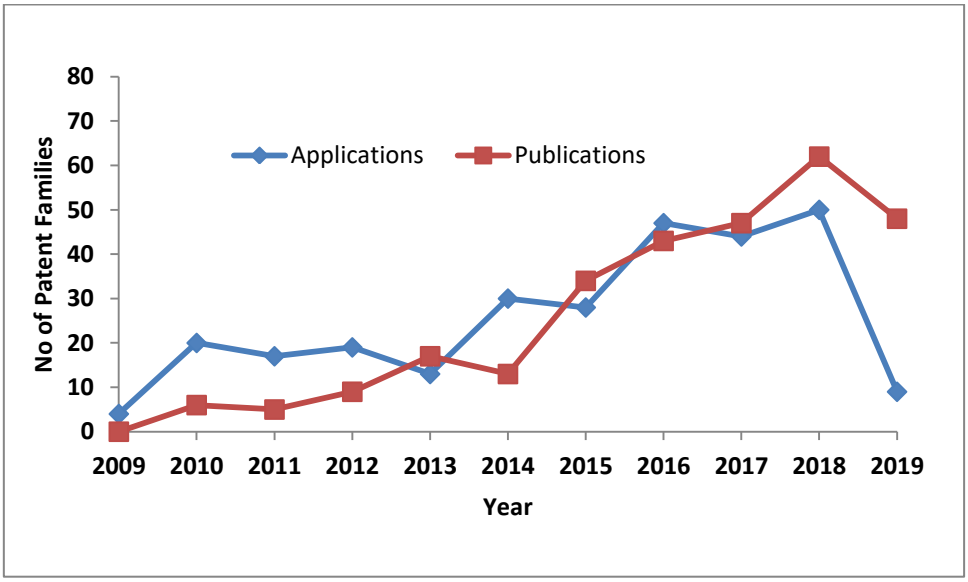
The first step is to create and define a patent set that will serve as the basis of analysis. Using renowned patent database, Derwent Innovation as our data source, we extracted data set of patents/published applications filed during the last ten years (2009-2019) by performing search in Abstract, Title, and Claims fields using keywords and International Patent Classifications.

# 3. TREND ANALSYS & GRAPHICAL REPRESENTATION

## 3.1 APPLICATION, PUBLICATION YEAR BASED TREND ANALYSIS

### 3.1.1 ANALYSIS BASED ON REPRESENTATIVE MEMBER PER INPADOC FAMILY

Below graph represents application year and publication year based trends for the patent publications pertaining to Probiotic compositions.




# Note: Attributed to non-published patent applications, there may be a higher count in the years 2018- 2019.

**INSIGHT:**

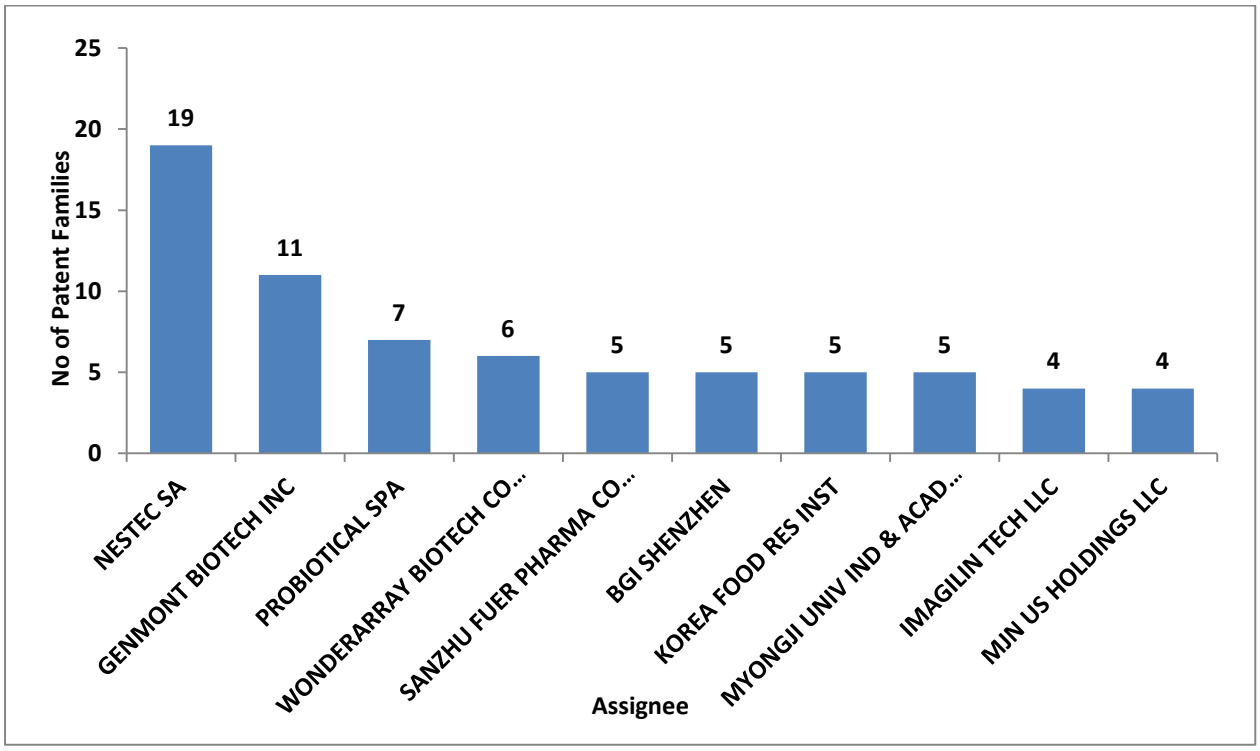
- Filing year trend provides insights for the number of patent applications filed during the period 2009-2019. As depicted in the graph, there is an overall rise in patent applications filing over the years, wherein the maximum number of patent applications (50) were filed in the year 2018.

- Publication trend provides insights for the number of patent applications published during the period 2009-2019. As indicated in the graph, there is a gradual rise in patent publication over the years, wherein the maximum number of patent applications were published in the year 2018 (62).

## 3.2 ASSIGNEE BASED TREND ANALYSIS

### 3.2.1 MAJOR ASSIGNEES (BASED ON REPRESENTATIVE MEMBER PER FAMILY)

The below graph represent major assignees in the domain.

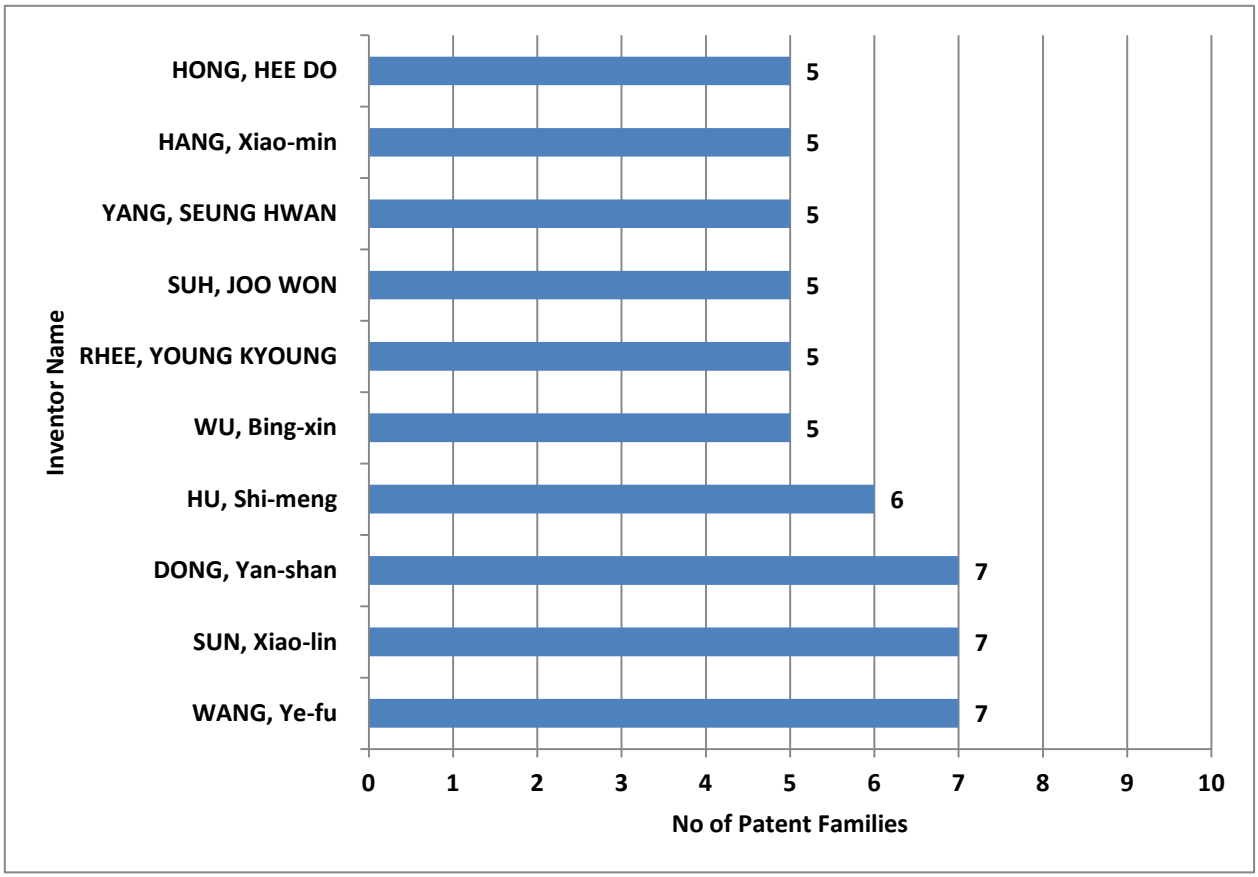



**THE TOP ASSIGNEES ARE:**

- NESTEC SA
- GENMONT BIOTECH INC
- PROBIOTICAL SPA
- WONDERARRAY BIOTECH CO LTD
- SANZHU FUER PHARMA CO LTD
- BGI SHENZHEN
- KOREA FOOD RES INST
- MYONGJI UNIV IND & ACAD COOP
- IMAGILIN TECH LLC
- MJN US HOLDINGS LLC

## 3.3 KEY INVENTORS

The below graph names the inventors with most number of innovations on their name.




**INSIGHT:**

The chart demonstrates top inventors, wherein **'WANG, YE-FU', 'SUN, XIAO-LIN' & 'DONG, YAN-SHAN'** emerged out as the leading inventors in the domain of Probiotic compositions.

## 3.4 GEOGRAPHY BASED TREND ANALYSIS

### 3.4.1 GEOGRAPHICAL DISTRIBUTION OF PATENT APPLICATION FILINGS

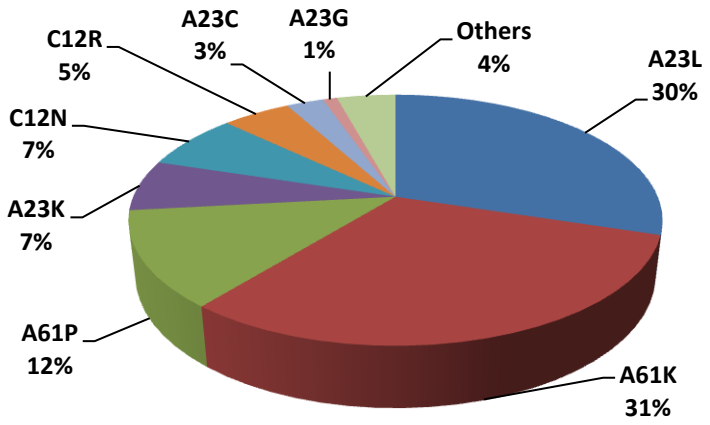
| Priority Country → Priority Year ↓ | AU | BE | BG | CA | CN | EP | ES | FI | FR | GB | IE | IN | IT | JP | KR | MX | MY | NZ | RS | TW | US | WO | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | | | | | | | | | | | | | | | | | | | | | 1 | | 1 |
| 2005 | | | | | | | | | | | | | | | | | | | | | 2 | | 2 |
| 2006 | | | | | | | | | | | | | | | | | | | | | 3 | 1 | 4 |
| 2007 | | | | | | 1 | | | 1 | | 1 | | | | | | | | | | 2 | | 5 |
| 2008 | | | | | | 4 | | 1 | | | | | | | | 1 | | | | | 5 | | 11 |
| 2009 | 1 | | | | 2 | 5 | | | 1 | | | | | | | | | | | | 6 | | 15 |
| 2010 | | | | 1 | 2 | 3 | | | | | | | 2 | 1 | 4 | | | | | 1 | 3 | 1 | 18 |
| 2011 | 1 | | | | 1 | 1 | | | | | | | 4 | | 4 | | | | | 1 | 5 | | 17 |
| 2012 | | | 1 | | 3 | 2 | | | 1 | | | | | | 3 | | | | | | 3 | | 13 |
| 2013 | | | | | 6 | 2 | 1 | | | 1 | | | | | 2 | | | | | 1 | 4 | 1 | 18 |
| 2014 | 1 | 1 | | | 9 | 2 | 1 | | 1 | | | | | | 7 | | 1 | 1 | | 2 | 6 | | 32 |
| 2015 | | | | | 9 | 2 | | | | 1 | | | | 1 | 7 | | | | 1 | | 6 | | 27 |
| 2016 | | | | | 20 | 2 | | | 1 | | | 1 | | 2 | 10 | | | | | 1 | 3 | | 40 |
| 2017 | | | | | 19 | 1 | | | | | | | | 4 | 8 | | | | | | 3 | | 35 |
| 2018 | | | | | 30 | | | | | | | | | | 7 | | | | | | 1 | | 38 |
| 2019 | | | | | 8 | | | | | | | | | | | | | | | | | | 8 |
| **Grand Total** | **3** | **1** | **1** | **1** | **109** | **25** | **2** | **1** | **5** | **2** | **1** | **1** | **6** | **8** | **52** | **1** | **1** | **1** | **1** | **6** | **53** | **3** | **284** |

**INSIGHT:**

Trend related to geographical filing demonstrates that the maximum number of filings originated from CN jurisdiction (109) followed by US (53) and KR (52) jurisdictions.

## 3.5 INTERNATIONAL PATENT CLASSIFICATION BASED TREND

The below graph represents frequently assigned international patent classes.



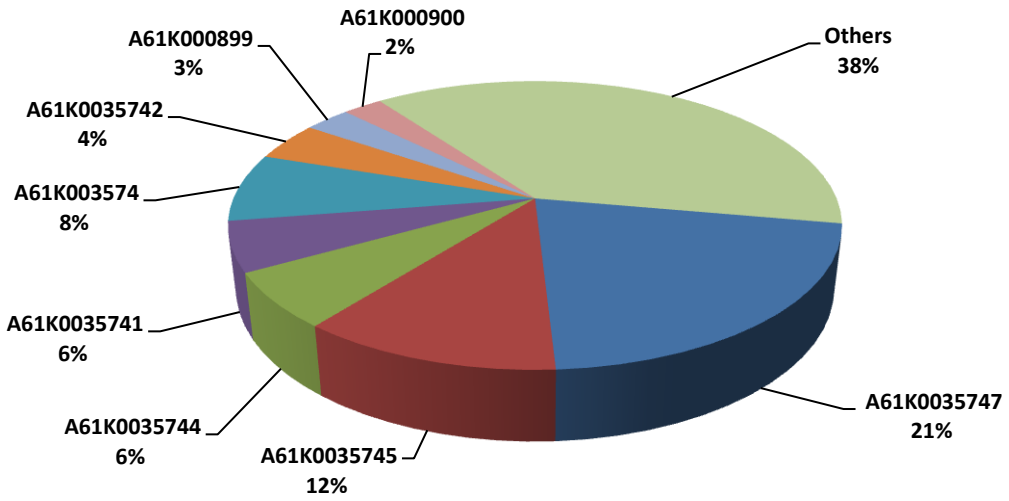

**INSIGHT:**

Majority of patent applications were assigned with IPC "**A61K**" related to "PREPARATIONS FOR MEDICAL, DENTAL, OR TOILET PURPOSES" followed by "**A23L"** related to "FOODS, FOODSTUFFS, OR NON-ALCOHOLIC BEVERAGES; THEIR PREPARATION OR TREATMENT, e.g. COOKING, MODIFICATION OF NUTRITIVE QUALITIES, PHYSICAL TREATMENT; PRESERVATION OF FOODS OR FOODSTUFFS, IN GENERAL".

### 3.5.1 INTERNATIONAL PATENT SUB-CLASSIFICATION BASED TREND

The below graph represents sub-classes pertaining to one of the top/main patent classes.

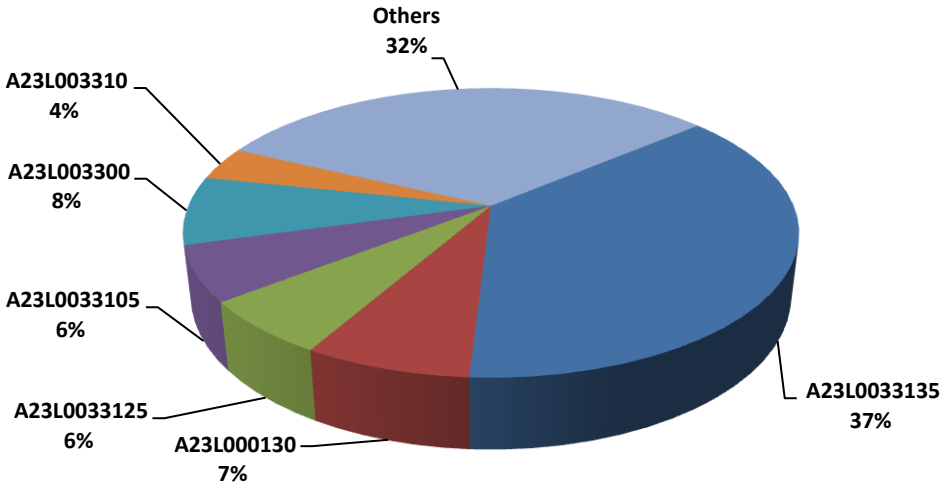
**A61K Sub-Classification**




**INSIGHT:**

"**A61K0035747**" emerged as major subclass which relates to compositions containing "**Lactobacilli, e.g. L. acidophilus or L. brevis**".

**A23L Sub-Classification**



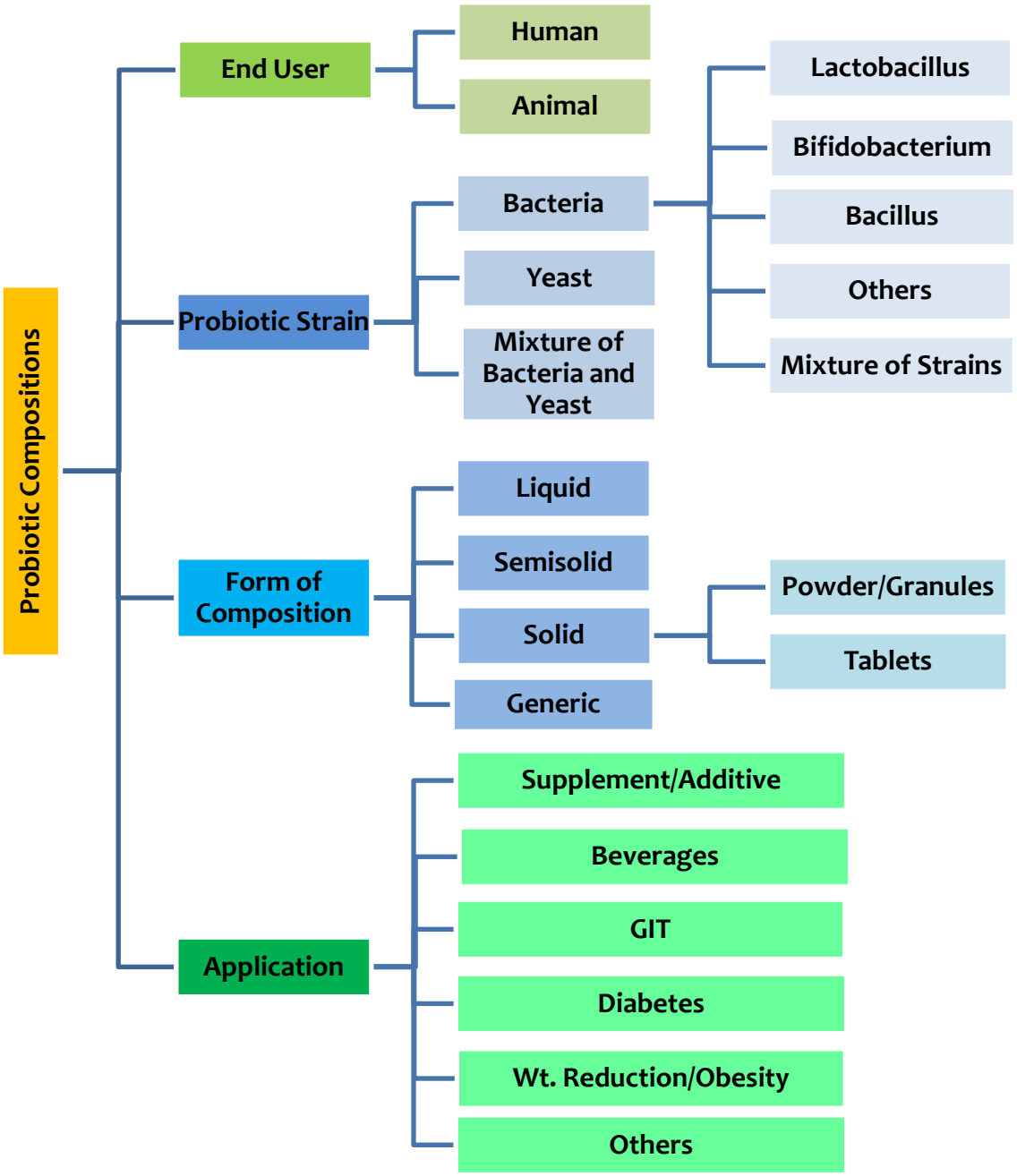

**INSIGHT:**

"**A23L0033135**"-emerged as major subclass which relates to "**Bacteria or derivatives thereof, e.g. probiotics**".

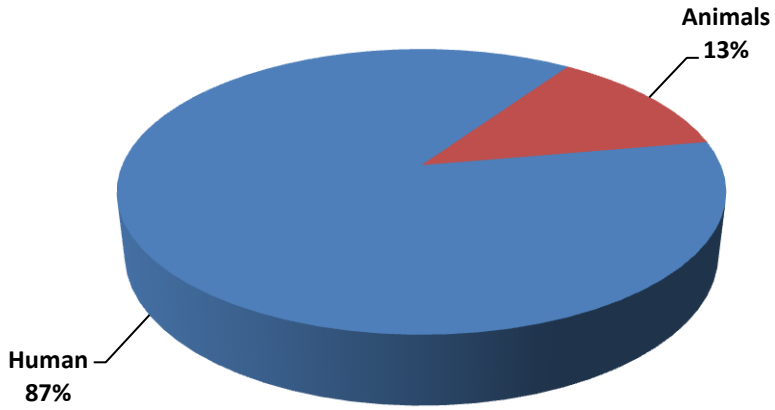
# 4. KEY TECHNOLOGICAL TRENDS

## 4.1 TAXONOMY DEVELOPED FOR BUCKETING OF RELEVANT PATENT DOCUMENTS

A set of 283 patent families were analyzed in depth to identify the focus areas of the patents related to Probiotic Compositions.



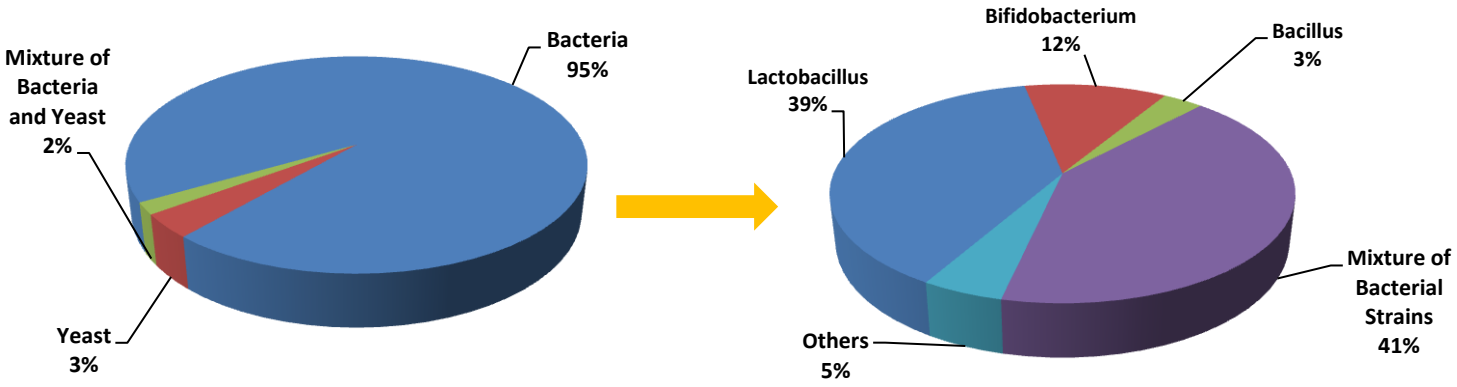
## 4.2 DISTRIBUTION OF PATENTS/APPLICATIONS PERTAINING TO END USER




**INSIGHT:**

As evident from the graph, maximum number of patents/applications (87%) focused on Probiotic compositions for human use.

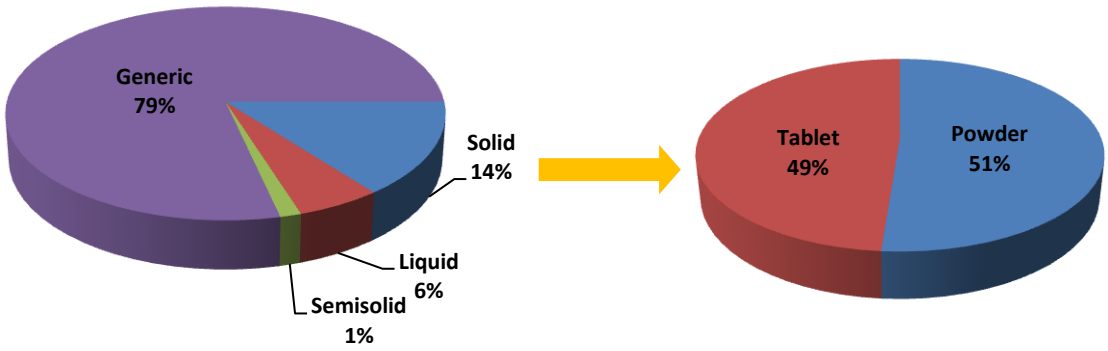
## 4.3 DISTRIBUTION OF PATENTS/APPLICATIONS PERTAINING TO SOURCE OF PROBIOTIC STRAIN IN THE PROBIOTIC COMPOSITIONS




**INSIGHT:**

As evident from the graphs, 95% of patent filings disclosed Probiotic compositions formulated with bacteria wherein majority of the patent applications disclose use of mixture of bacterial strains (45%) followed by Lactobacillus strains (39%).

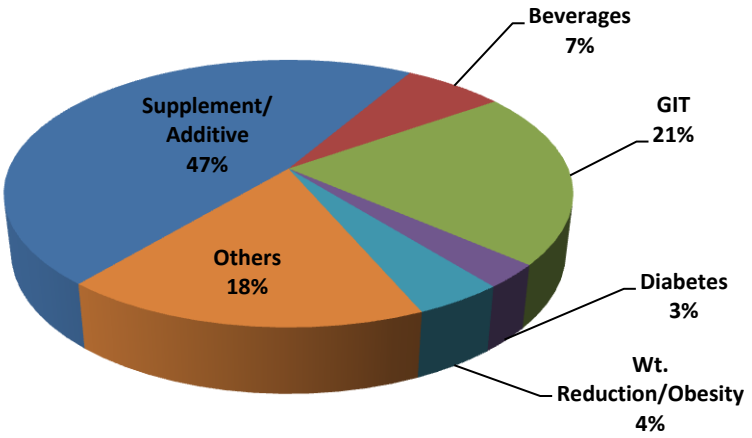
## 4.4 DISTRIBUTION OF PATENTS/APPLICATIONS BASED ON FORM OF PROBIOTIC COMPOSITIONS




**INSIGHT:**

As evident from the graph, 79% of patent filings disclosed Probiotic compositions that can be formulated into any dosage form while 14% of patent filings disclosed solid probiotic compositions wherein powders and tablet compositions represented almost equal share.

## 4.5 DISTRIBUTION OF PATENTS/APPLICATIONS BASED ON APPLICATION AREA OF PROBIOTIC COMPOSITIONS




**INSIGHT:**

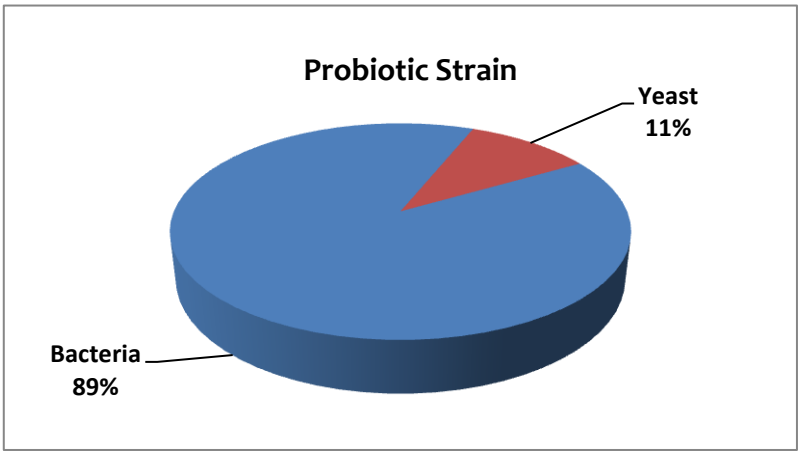
As evident from the graph, 47% of patent filings disclose the use of Probiotic composiitons as food supplement/additive for human or animals while 21% of patent filings disclose use of probiotic compositions for improving gastrointestinal tract (GIT) health.

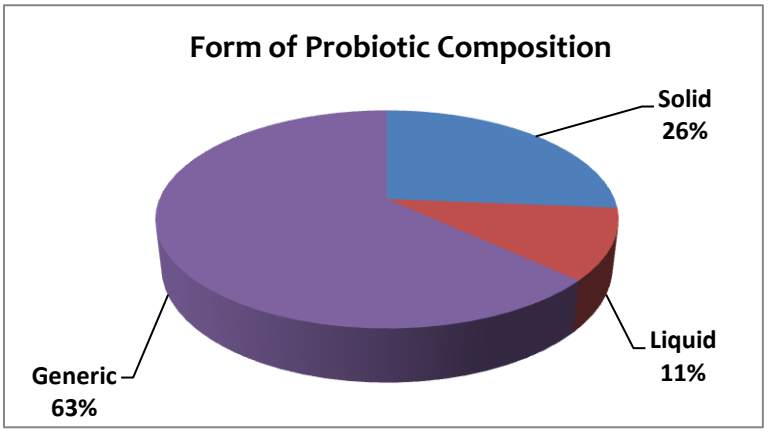
# 5. Patent Portfolio Analysis

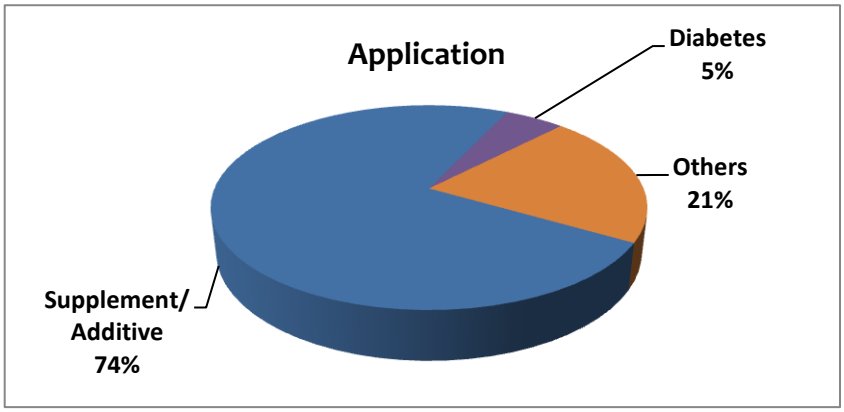
## 5.1 Patent Portfolio Analysis – NESTEC SA

**Company Profile**

Nestec SA is part of Nestle, a Swiss multinational food and beverage company. Nestle is the largest food company in the world and its products include baby food, medical food, bottled water, breakfast cereals, coffee and tea, confectionery, dairy products, ice cream, frozen food, pet foods, and snacks.



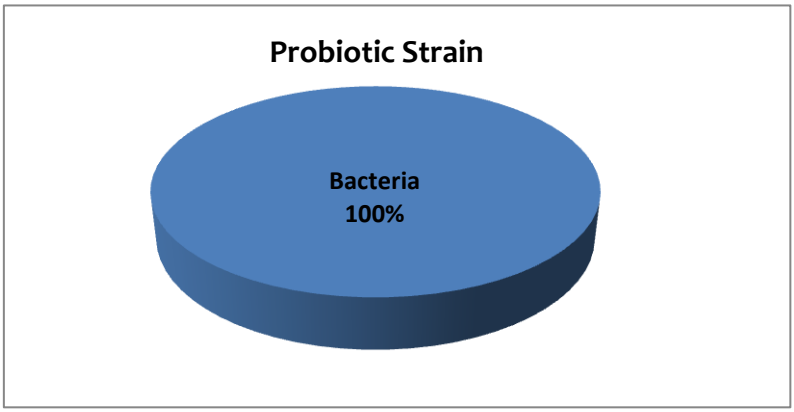
## 5.1.1 Key Patents – NESTEC SA

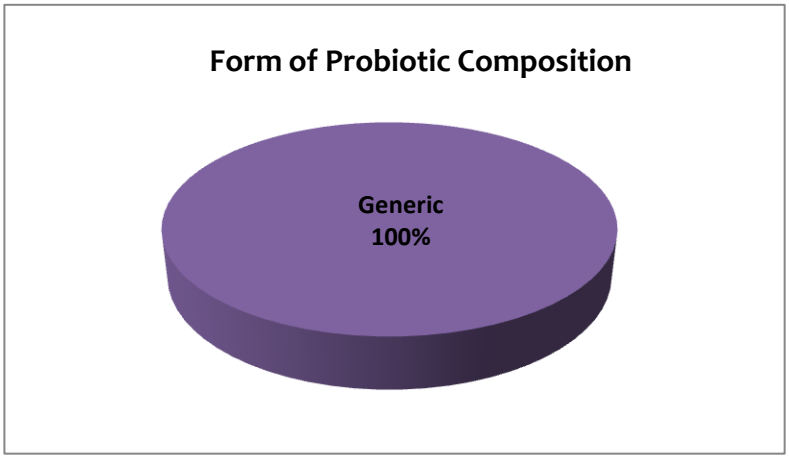
| Patent No. | Key Features |
|---|---|
| US9801915B2 | The patent document relates to a probiotic composition comprising the probiotic strain Lactobacillus johnsonii CNCM I-1225 in combination with a polyphenol that can be used as food supplements or additives in food products for human or pets. The probiotic composition can be used for treatment or prevention of a cognitive and/or neurodegenerative disorder particularly for Alzheimer's disease. |
| US9439449B2 | The patent document relates to a nutritional composition comprising Bifidobacterium strains or probiotic is provided for reducing the symptoms of allergies originating from food allergens in young children or infants. The composition comprises the Bifidobacterium longum strain NCC 2705 (CNCM-I2618) and can be used as an infant formula, an infant cereal, liquid composition for children comprising cereals, and a baby food. |

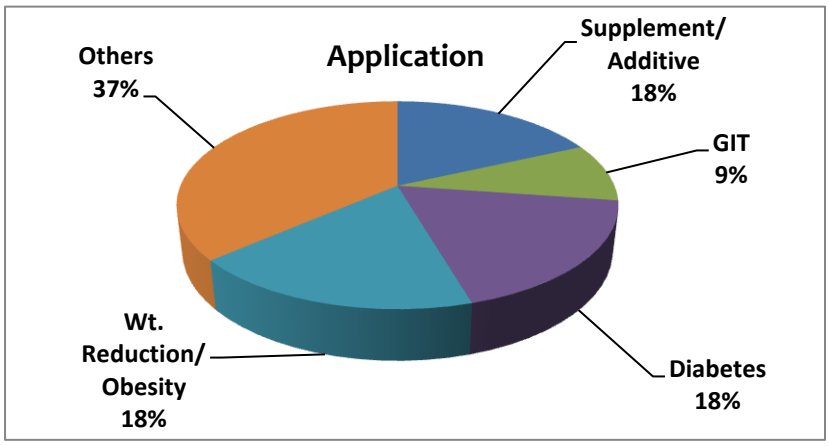
For sources of information, please refer to **Appendix A**

**Company Profile**

GenMont Biotech is a Taiwan based leading brand of functional probiotics devoted to human health care. The Company's major products are applied primarily to enhance human immunity against dust allergy and digestive system health care, including lactobacillus paracasei, lactobacillus rhamnosus, lactobacillus casei, lactobacillus plantarum, lactobacillus fermentum, lactobacillus salivarius, lactobacillus acidophilus.



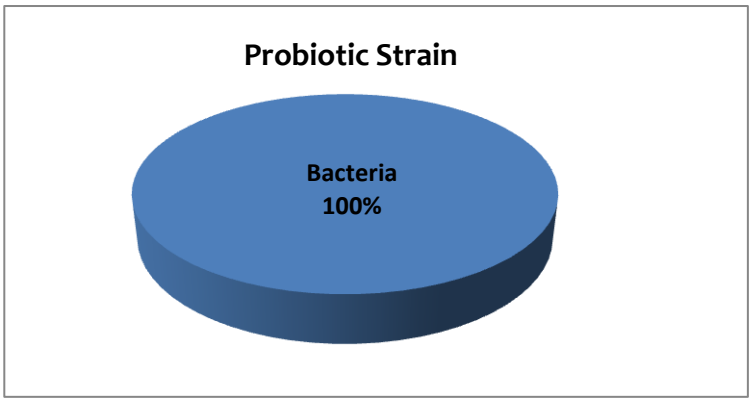



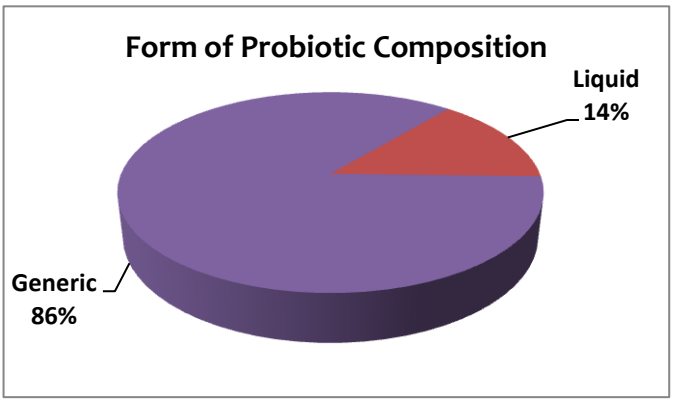
## 5.2.1 Key Patents – Genmont Biotech Inc.

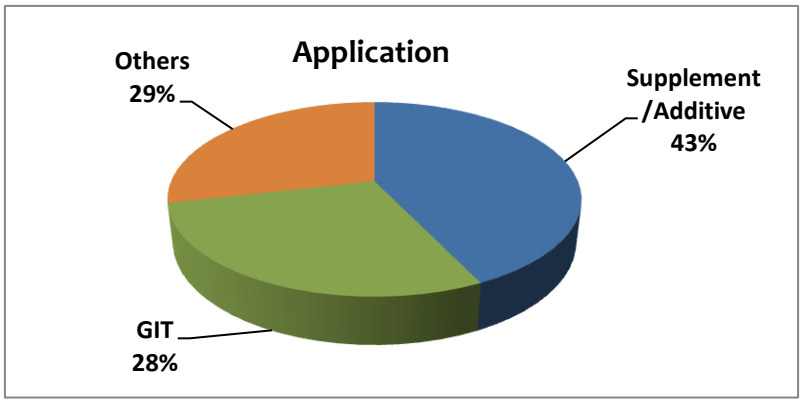
| Patent No. | Key Features |
|---|---|
| US9301984B2 | The patent document relates to probiotic composition comprising Lactobacillus reuteri GMNL-263 with the deposition numbers of BCRC 910452 and CCTCC M 209263 used for controlling body weight in humans. The composition is a pharmaceutical composition, food or their combinations and cab be formulated as solution, suspension, emulsion, powder, tablet, pill, syrup, lozenge, troche, chewing gum, slurry, capsule. |
| CN104651245B | The patent document relates to novel probiotic composition comprising Lactobacillus paracasei (GMNL-33) and Lactobacillus casei (GMNL-277) and at least one, and a pharmaceutically acceptable carrier. The composition can be used for treating piconovirus in both human and animals. The composition can be formulated as solution, suspension, emulsion, powder, tablet, pill, syrup, lozenge, troche, chewing gum, slurry, and capsule. |

## 5.3 Patent Portfolio Analysis – Probitical SPA

Probiotical SPA is a leader in the production of direct inoculum lactic acid bacteria for dairy industry. The research and development activities mainly focuses on strain isolation, characterization and production of probiotic strains for the prevention and treatment of different diseases; design and implementation of specific probiotics and synbiotics finished products for many therapeutic areas, supported by clinical studies.




For sources of information, please refer to **Appendix A**

## 5.2.1 Key Patents – Probiotical SPA

| Patent No. | Key Features |
|---|---|
| US10286017B2 | The patent document relates to a food composition or supplement product comprising probiotic bacterial mixture. The said bacterial mixture comprising bacterial strain belonging to the species Bifidobacterium breve, and a bacterial strain belonging to the species Bifidobacterium longum or Bifidobacterium longum subsp. longum the bacterial mixture having an antimicrobial activity against the pathogens E. coli, Salmonella enteriditis, Clostridium difficile and Campylobacter jejunii. The composition containing the same mixture used for feeding of infants. |
| US9931363B2 | The patent document relates to a nutritional or neutraceutical composition comprising probiotic bacteria for the treatment of pathologies associated with alterations of the immune system. In particular, the present invention relates to the use of selected probiotic bacteria used for the treatment of allergies, such as atopic dermatitis. The probiotic bacteria used in the composition is Lactobacillus salivarius LS01 deposited as DSM 22775. |

# 6. Analysis of Key Granted Patents/Patent Applications Assigned to Other Companies & Educational Institutes

## 6.1 Granted Patents/Patent Applications – Wonder Array Biotech Co Ltd

| Patent No. | Key Features |
|---|---|
| CN105725185A | The patent application relates to a probiotic composition with a blood pressure reduction function. The composition is mainly prepared from lactobacillus, bifidobacterium mixture in combination with chinese traditional chinese medicine which can directly acts on the root cause of diabetes. The probiotics including lactobacillus and bifidobacterium can effectively reduce blood sugar level and improve blood sugar content. The probiotic composition can be formulated into a powder, tablet, capsule, granule, powder, jellies, beverages, dairy products, baked snack product yoghurt or any one of. |
| CN105707898A | The patent application relates to a probiotic composition comprising probiotic powder, aloe extract powder, rhubarb extract and its preparation method. The probiotic powder is made from the mixture of probiotic bacteria of Bifidobacterium, Lactobacillus acidophilus, and Bacillus coagulans in a mass ratio 1: 1: 1 ratio. The probiotic composition of the invention used in the manufacture of detoxification bowels food or health-care product and can be formulated into powders, tablets, capsules, granules, granules, jellies, beverages, dairy products, yoghurt or baked snack products. |

## 6.2 Granted Patents/Patent Applications – Other Universities & Companies

| Patent No. | Key Features |
|---|---|
| CN105616705A<br>Sanzhu Fuer Pharma Co Ltd | The patent application relates to a probiotic fermentation blood replenishing composition and a preparation method thereof. The probiotic composition comprising a mixture of lactobacillus and bifidobacteria and is selected from the Lactobacillus acidophilus, Lactobacillus delbrueckii, Lactobacillus plantarum, Lactobacillus crispatus, Lactobacillus helveticus, Lactobacillus salivarius, Lactobacillus format, Lactobacillus johnsonii Vice Lactobacillus casei, Lactobacillus fermentum, Lactobacillus casei and Lactobacillus rhamnosus and the bifedo bacterium selected from Bifidobacterium bifidum, Bifidobacterium breve, Bifidobacterium longum, Bifidobacterium animalis, youth Bifidobacterium infantis and Bifidobacterium. The composition of the invention can be used in blood and the regulation of intestinal flora functional food, health food, pharmaceutical product. |
| CN106967756A<br>BGI Shenzhen | The patent application relates to a probiotic fungi composition for treatment and prevention of obesity and related diseases. The thick-wall fungus probiotics used in the composition is an inert Eubacterium (Eubacterium siraeum). The composition is used for one or more purposes of preventing and/or treating obesity, reducing blood fat and for preventing cardiovascular diseases and diabetes. |
| KR101467362B1<br>Korea Food Research Institute | The patent document relates to food composition comprising for immunity enhancement including a jujube fermentation made using a probiotic strain lactobacillus curvatus K031101 KCCM 11311P. The probiotic composition used to improve the immunity in animals. |

# 7. Appendix

## 7.1 Appendix A: Sources


- Probiotics, their health benefits and applications for developing healthier foods: a review
- Recent Application of Probiotics in Food and Agricultural Science
- Functional foods: a survey of health claims, pros and cons, and current legislation
- Probiotics that modify disease risk
- Probiotics and their fermented food products are beneficial for health
- Health-beneficial effects of probiotics: Its mode of action
- Demonstration of safety of probiotics -- a review
- Probiotics: a role in the treatment of intestinal infection and inflammation?
- Application of probiotics in food products—challenges and new approaches
- Probiotics and microbiota composition
- https://www.grandviewresearch.com/industry-analysis/probiotics-market
- https://www.gminsights.com/industry-analysis/probiotics-market
- https://www.marketsandmarkets.com/Market-Reports/probiotic-market-advanced-technologies-and-global-market-69.html
- https://www.webmd.com/digestive-disorders/what-are-probiotics#1
- https://www.prnewswire.com/news-releases/global-probiotics-industry-300781537.html
- https://www.fortunebusinessinsights.com/industry-reports/probiotics-market-100083
- https://www.nestle.in/nhw/nutrition-basics/foods/probiotics
- https://en.genmont.com.tw/probiotics-prebiotics.htm
- https://www.probiotical.com/index.php?lingua=en

## 7.2 Appendix B: IPC Definitions

| IPC | Definition |
|---|---|
| **A61K** | PREPARATIONS FOR MEDICAL, DENTAL, OR TOILET PURPOSES |
| **A61K 35/747** | Lactobacilli, e.g. L. acidophilus or L. brevis |
| **A61K 35/744** | Lactic acid bacteria, e.g. enterococci, pediococci, lactococci, streptococci or leuconostocs |
| **A61K 35/74** | Bacteria |
| **A61K 35/745** | Bifidobacteria |
| **A61K 35/741** | Probiotics |
| **A23L** | FOODS, FOODSTUFFS, OR NON-ALCOHOLIC BEVERAGES; THEIR PREPARATION OR TREATMENT, e.g. COOKING, MODIFICATION OF NUTRITIVE QUALITIES, PHYSICAL TREATMENT; PRESERVATION OF FOODS OR FOODSTUFFS, IN GENERAL |
| **A23L 33/135** | Bacteria or derivatives thereof, e.g. probiotics |
| **A23L 33/00** | Modifying nutritive qualities of foods; Dietetic products; Preparation or treatment thereof |
| **A23L 33/125** | containing carbohydrate syrups; containing sugars; containing sugar alcohols; containing starch hydrolysates |
| **A23L 33/105** | Plant extracts, their artificial duplicates or their derivatives |
| **A61P** | SPECIFIC THERAPEUTIC ACTIVITY OF CHEMICAL COMPOUNDS OR MEDICINAL PREPARATIONS |
| **A23K** | FEEDING-STUFFS SPECIALLY ADAPTED FOR ANIMALS; METHODS SPECIALLY ADAPTED FOR PRODUCTION THEREOF |
| **C12N** | MICROORGANISMS OR ENZYMES; COMPOSITIONS THEREOF; PROPAGATING, PRESERVING, OR MAINTAINING MICROORGANISMS; MUTATION OR GENETIC ENGINEERING; CULTURE MEDIA |

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