



# Functional Foods- Metabolic Health

*Bifidobacterium*

Q4 | 2019

INDUSTRY PULSE



FOOD &  
NUTRITION

INDUSTRY  
INSIDER

FutureBridge

# QUARTERLY ANALYSIS

Oct 2019 - Dec 2019

**Product launches**

Product categories mainly encompass dairy products like yogurt along with segments like baby foods

**Research**

Companies are funding research studies to promote the advancement in this field

**Patent**

Players are patenting there innovative technologies to get a competitive edge in the market

## FutureBridge Insights:

- **Bifidobacteria** has emerged as **high potential probiotic strain** that is being utilized in functional food with popular **claims** like **slimming** and **improvement of gut health**
- Most of the activity is **centered around established players** who are **partnering with universities** for researching studies that can **prove the functional benefits** related to bifidobacteria
- Established players like **Danone** and **Nestlé** are dominating the market and are trying to innovate with novel alternatives like **allergen-free, dairy-free, and chemical-free**
- Players like **Evolve BioSystems** and **Chr. Hansen** have filed patents for **novel ingredients** and **technologies** to overcome the challenges like **stability** and **viability** associated with bifidobacteria

## Things to look out for:

- **Launch** of innovative products using bifidobacteria along with superfoods to provide **complete nutrition**
- New **technologies** to improve the **storage capacity** and **viability** of cells
- Players tapping into **trending claims** associated with **mental health** such as the **reduction in stress** and **depression**

## Key players :



# Why Bifidobacteria is being utilized?

Bifidobacteria is one of the most used bacterial species in probiotic products as it can treat metabolic disorders and is being incorporated in functional food products



BIFIDOBACTERIUM



## ADVANTAGES

- Improves digestion and fight metabolic diseases<sup>1</sup>
- Helps to ease Irritable Bowel Syndrome (IBS)<sup>2</sup>
- Reduce the risk of cardiovascular diseases<sup>3</sup>
- Reduces stress and depression<sup>4</sup>
- Fights obesity<sup>5</sup>
- Promote gut brain axis activity<sup>6</sup>



## LIMITATIONS

- Understanding the interactions of bacteria with specific hosts
- Low stress tolerance
- Overcoming biological barriers like digestive enzymes, acidic pH and bile
- Low calorie carbohydrate – 0.4 calories per gram (g)
- Reduced shelf life and stability
- Determination and Enumeration of the Viable Population

### RELATED PATENTS

1. *Bifidobacterium bifidum* strains for application to digestive diseases ([JP2014505065A](#))
2. Method for decreasing borborygmi by administering a *bifidobacterium* bacteria ([US8715644B2](#))
3. Bifidobacteria for treating cardiac conditions ([US20180207209A1](#))
4. Composition for relieving stress, pharmaceutical composition and food and drink composition and method for relieving stress using the composition for relieving stress ([US20190298783A1](#))
5. *Bifidobacterium longum* for treating obesity and weight management ([WO2019038449A1](#))
6. Probiotic formulations for the treatment and alleviation of metabolic and oxidative stress, inflammation and neurodegeneration ([WO2019157585A1](#))

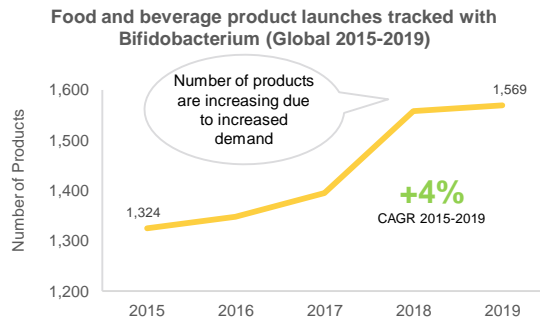
## FutureBridge Insights

- Bifidobacteria is a highly used bacterial strain in probiotics and is **emerging as a suitable alternative to meet up consumer demand for metabolic as well as beyond metabolic benefits.**
- Global **bifidobacteria products launches** shows **steady growth** over the past 5 years with the a **CAGR of 4%.**
- **Bifidobacteria** is highly used in **dairy products**, in 2019 it was most utilized in **spoonable yogurts. Danone and Chobani** launched maximum products.
- ***Bifidobacterium lactis*** is the **top strain** that is being used in **F&B products** like **infant formulas and yogurts.**

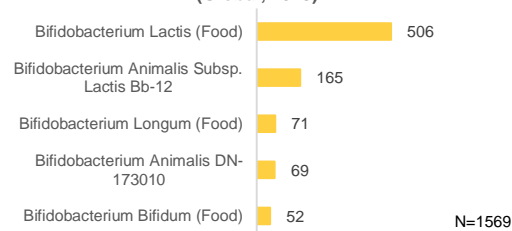
## Bifidobacteria products show steady growth in product launches over the past 5 years



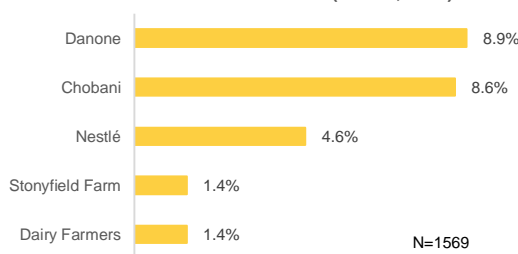
### Bifidobacteria: Product Launch



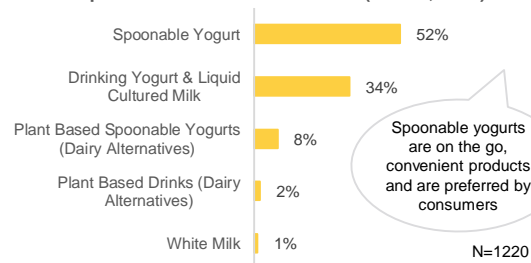
### Top 5 Bifidobacterium strains tracked in food and beverages with Bifidobacterium (Global, 2019)



### Top 5 companies launching food and beverages tracked with Bifidobacterium (Global, 2019)



### Top 5 dairy sub-categories tracked in dairy products with Bifidobacterium (Global, 2019)



Source: Mintel













## FutureBridge Insights

- The most utilized strains include *Bifidobacterium lactis* and it is being incorporated in **baby food** and **dairy**.
- Incorporation of **bifidobacteria** in **spoonable yogurt** products is increasing because it helps to **digest fiber** and **other complex carbs**. It also helps in formation of **vitamin B** and healthy **fatty acids**.
- Still the rising **challenge** is to **increasing effectiveness** of bifidobacteria in **end products**.

In Q4 2019, *Bifidobacterium lactis* is one of the most utilized strain in dairy products



### Bifidobacterium: Most utilized strains Q4 2019

| Strain                          | Company  | Category                         | Product   |
|---------------------------------|--|----------------------------------|---|
| <i>Bifidobacterium bifidum</i>  | Protein World (UK)<br>   | Meal replacements & other drinks |  Chocolate Flavor The Slender Blend Meal Replacement Shake |
| <i>Bifidobacterium longum</i>   | Shimmy Shimmy (UK)<br>   | Plant-based spoonable yogurt     |  Coconut Kefir Yoghurt Alternative                         |
| <i>Bifidobacterium animalis</i> | Danone (Switzerland)<br> | Spoonable yogurt                 |  Strawberry Yogurt   |
| <i>Bifidobacterium lactis</i>   | Nestlé (Canada)<br>      | Baby food                        |  Iron and Calcium Fortified Milk-Based Infant Formula      |
| <i>Bifidobacterium infantis</i> | The Collective (UK)<br>  | Spoonable yogurt                 |  Mango 'n' Turmeric Kefir Cultured Yogurt                  |
| <i>Bifidobacterium breve</i>    | Nutricia (Australia)<br> | Baby food                        |  Sensitive Premium Infant Formula                          |

Source: Mintel

## FutureBridge Insights

- Bifidobacteria survival in dairy products depend on factors such as the **strain of bacteria used, fermentation conditions, storage temperature, and preservation.**
- **Packaging material is one of the major criteria that impact the viability** of bifidobacteria in products like **drinkable yogurts or fermented milks.**
- The **shelf-life** of bifidobacteria is upto **5 weeks** as the **concentration of cells** reduce gradually with time.
- There is a requirement for **technologies** that can **enhance the shelf-life** of bifidobacteria in **dairy as well as other products.**

## Optimum temperature and better packaging are essential to stabilize bifidobacteria count in dairy products that impacts its effectiveness



### Metabolic Health: Bifidobacteria in Dairy Products

#### Optimum pH

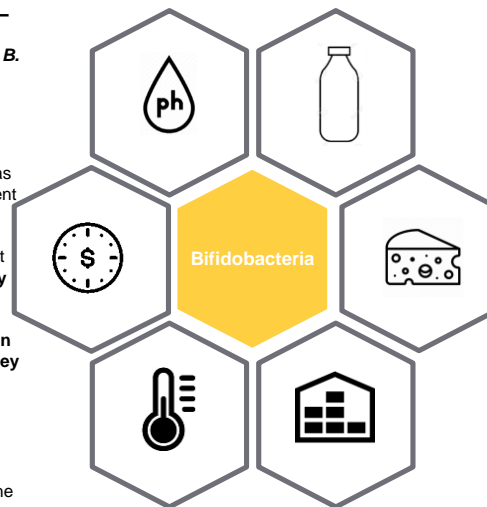
- Is **6–7**. Cells are **unable to grow** in pH 4.5–5 and below, or at pH 8–8.5 and above
- Some **species** like *B. lactis* and *B. animalis* were shown to grow even at pH 3.5

#### Viability

- Can be affected by factors such as **post-acidification**, oxygen content and presence of **antimicrobial compounds**
- To provide **therapeutic effects**, it has been **recommended** that they be **viable and ingested** in numbers **> 10<sup>6</sup>g cells/g**
- **Highest viability** was observed in yogurts supplemented with **whey protein concentrate**

#### Temperature

- Optimum **temperature** is 37–41 °C
- The **minimum** is 25–28 °C, and the **maximum** is 43–45 °C



#### Packaging

- **Material** can be **metal sheet, multi board, glass or plastic**
- **Population** of bifidobacteria is **higher** in yogurt stored in **glass bottles** than in plastic cups due to the **differences in oxygen permeability**

#### Products

- The various delivery products include **cheese, yogurt, quarks and fermented milks**
- **Functional cheese** may be **more effective** as it provides an environment that would be **conductive** to the long-term survival of bifidobacteria
- Bifidobacteria does not deteriorate the **cheese product** and **enhance the development of flavors**

#### Shelf-life

- Bifidobacteria can be **maintained** 10<sup>7</sup>g cells/g for 60 days at 12°C
- **5 weeks of refrigerated storage** there is a **three-log reduction** in **bifidobacteria** counts from an **initial concentration (10<sup>8</sup>g or 10<sup>9</sup>g)** during the 35 days of refrigerated storage

Source: Research Papers



## FutureBridge Insights

- Bifidobacteria stability can be improved by using **encapsulation technique** for the formulation of yogurt.
- The study revealed that encapsulation with LMP beads can **enhance the storage capabilities, flavor and odor in *B. breve***.
- This **processing technique** can be commercially exploited for industrial scale production
- It can also help to **enhance the yogurt quality and stability of *B. breve***.

## Researchers have identified that encapsulation with low methoxyl pectin beads (LMP) beads can improve the stability of *Bifidobacterium breve*

Title of Study: Preparation of *Bifidobacterium breve* encapsulated in low methoxyl pectin beads and its effects on yogurt quality

|             |             |           |            |
|-------------|-------------|-----------|------------|
| Data Source | Secondary   | Sci. Pub. | Patent     |
| Innovation  | Ingredients | Products  | Technology |

*Bifidobacterium breve* powder was dispensed into 0.5 mL of sterilized TPY liquid medium for 48 hours at 37°C

The 100-mL bulk cultures of *B. breve* were centrifuged, the pellets were resuspended in 5ml sterile saline, and the LMP beads were prepared. The beads were filtered and then mixed with cryoprotectant and lyophilized


The encapsulation efficiency was determined. In vitro GI tests were performed and stability test were performed by placing vacuum freeze-dried *B. breve* beads at -20°C, 4°C, and an ambient temperature (20 ± 2°C)

Yogurt fermentation, characterization of acidity, viscosity, texture were tested. Along with these an electronic nose analysis and tongue analysis were performed.

**Conclusion:** This study revealed that microencapsulation could significantly improve the viability of the encapsulated cells, and the storage effect was best at -20°C. When *B. breve* beads were added during the middle and late stages of yogurt fermentation they had little effect on the flavor and odor of yogurt. LMP appears to be ideal for encapsulating *B. breve* and can be used in yogurt fermentation.

**Authors:** Mengyang Li, Yunxiang Jin, Yawei Wang et.al.

**Universities associated with:** Heilongjiang University, China



Source : [Journal of Dairy Science](#)

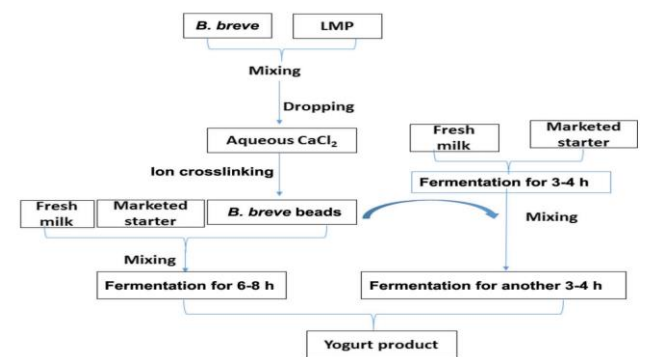


Figure 1. Schematic diagram of the preparation of yogurt containing *Bifidobacterium breve* beads. LMP (Low methoxyl pectin).



Figure 2. BC = milk fermented with commercial yogurt starter; UBFF = unencapsulated *B. breve* added to fresh milk and then fermented; UBAF = unencapsulated *B. breve* added after yogurt fermentation with commercial starter; EBFF = encapsulated *B. breve* beads added to fresh milk and then fermented; EBAF = encapsulated *B. breve* beads added after yogurt fermentation with commercial starter.



## FutureBridge Insights

- In terms of patents a lot of **different activities** were identified in order to **treat IBS, metabolic disorders, stress,** and **identifying novel strains.**
- The highest number of **patents were filed in China,** which signifies that **probiotics** is an **upcoming market** in **China** and players are planning to **launch new products** in coming years.
- The patent activity is mainly surrounded to utilize the novel strains for **treatment of stress, cardiovascular diseases and intestinal disorders.**
- The **challenge** that arise with patents is approval for **claims and clinical strains** have to be performed to **check the effect in humans.**

## The high patent activity is signifying upcoming innovations and commercialization of novel products in the coming years

### Patent Activity in bifidobacteria

- Bifidobacteria is one of the most utilized probiotic strain and has high potential in multiple food and beverage categories, **patent activity** is increasing rapidly as ingredient developers and **end-product manufacturers** look to achieve a competitive advantage in this segment.
- Players are focused on developing **new technologies or processes** for increasing the stability by overcoming biological barriers like pH, acidity, and enzymatic activity.
- Three significant patents were from Alimentary Health Limited, Polycaps Holdings Ltd., and Chr Hansen AS. The patents describe use of bifidobacteria to **treat IBS, production of moisture resistant probiotics,** and **identifications of novel strains** in bifidobacteria.

### TOP 3 PATENT PICKS FOR BIFIDOBACTERIUM...

**Patent:** A combination product for prophylaxis and treatment of irritable bowel syndrome ([WO2019145570A1](#))

**Assignee:** Alimentary Health Limited

**Description:** A combination product comprising an isolated strain of *Bifidobacterium* NCIMB 41003 and another strain which does not adversely interact with *Bifidobacterium* NCIMB 41003 improves gastrointestinal symptoms associated with IBS and improves one or more of mood, stress, anxiety, sleep quality and depression associated with IBS.

**Patent:** Moisture resistant probiotic granule and methods of producing the same ([WO2019202604A1](#))

**Assignee:** Polycaps Holdings Ltd.

**Description:** The patent describes a method to formulate a probiotic microcapsule comprising probiotic microorganisms like *bifidobacterium* and a coating layer comprising a hybrid solid dispersion that contains an edible fatty molecule evenly dispersed within a water-soluble film forming polymer and an edible mediator such as starch octenyl succinate.

**Patent:** Probiotic Bifidobacterium adolescentis strains ([US10022408B2](#))

**Assignee:** Chr. Hansen AS

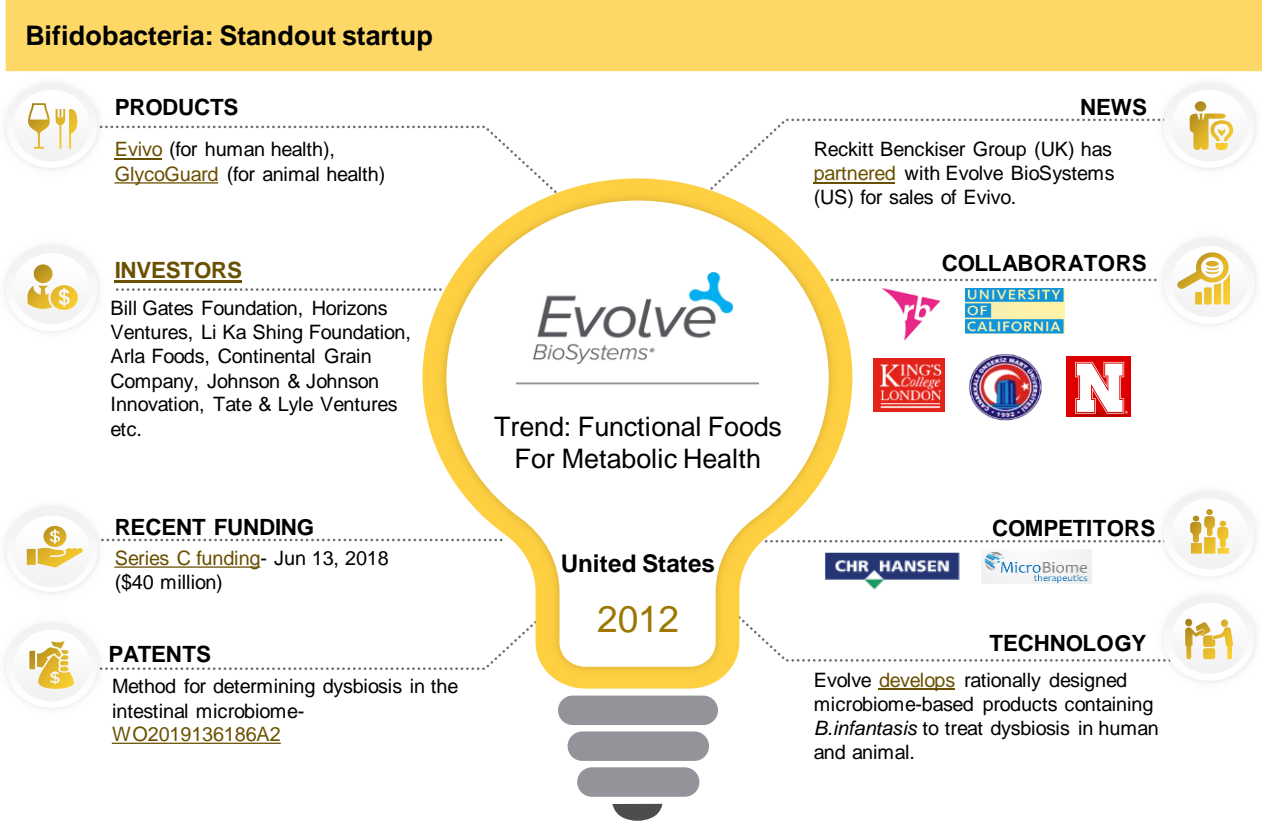
**Description:** The present invention relates to novel isolated strains of *Bifidobacterium adolescentis* which are capable of prevention, alleviation of symptoms, and treatment of diseases or conditions with an underlying impaired intestinal barrier function and pro-inflammatory activation of the mucosa or treatment of intestinal inflammatory conditions such as IBD and IBS, liver diseases, metabolic disorders, obesity, cardiovascular atherosclerosis, mood disorder, a cognitive chronic fatigue syndrome, and anxiety.



## FutureBridge Insights

- Evolve BioSystems has **partnered** with multiple **universities** to **prove** the **efficacy** of its **probiotic strain** that can be **utilized** in **infant probiotic products**.
- The company has a **commercialized** product called **Evivo** which is **specific to infants**, it works in **synergy** with **human breast milk**. It is **clinically proven** to **reduce gut pH**, **inhibit** the growth of **pathogenic bacteria**.
- Evivo is **designed for hospitals** owing to its **liquid format** but it is also available in **single-use powder format** for consumers.

## Evolve BioSystems is an innovative startup that utilizes bifidobacteria to improve gut health and digestion



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