

Complement Yourself *with* Stable & Friendly Probiotic



“ Probiotics are live bacteria that line your digestive tract, often called ‘good’ or ‘helpful’ bacteria because of their overall supportive role in helping to restore the composition of the gut microbiome—by creating an ideal environment and introducing beneficial functions like nutrient absorption, healing of digestive issues, supporting overall brain health, help fight certain allergic conditions and infections. ”

Lately, probiotics have become one of the few supplements that are popularized as a way to maintain ones health, as a whole.

LactoSpore® is a shelf-stable, clinically validated commercial probiotic preparation from Sabinsa, containing L (+) lactic acid producing microbial preparation from *Bacillus coagulans* MTCC 5856 (earlier known to be *Lactobacillus sporogenes*).

Probiotics: The Helpful Microbes with Healthful Benefits

Traditionally, people have been considering fermented milk and vegetable products (e.g. yogurt and pickles), rich sources of probiotics or 'good bacteria', as very essential part of their diet, particularly in Mediterranean and Middle Eastern regions. As a result, people were credited with relatively low prevalence of chronic and some age-related diseases. Similarly, thousands of years back, in Vedas, a large body of texts originating in ancient India, it has been well documented that use of probiotics complement healthy diet and lifestyle.

Probiotics are live microorganisms, usually bacteria found in the human gut that helps digestive processes to function properly and optimally, by exerting various protective roles. Various strains of bacteria are in use as probiotics, *Lactobacillus*, *Bifidobacterium* and yeast *Saccharomyces boulardii* are the most common. Mostly, these organisms possess different but overlapping health benefits.



**CLINICALLY
EVALUATED
AND ACCEPTED
ACROSS
THE GLOBE**

Of the 400 different bacterial species that promote a healthy digestive system by abating the growth of harmful bacterial colonies, *Bacillus coagulans* (earlier known as *Lactobacillus sporogenes*) is the largest group that produces lactic acid. This lactic acid producing species has been known to possess several potential health or nutritional benefits, ranging from improved nutritional value of food, control of intestinal infections to cognitive health and cancer support (Gilliland SE. *FEMS Microbiol Rev.* 1990;7(1-2):175-88).

Growing body of evidence has suggested that lactic acid producing bacteria inhibit the act of putrefactive microorganisms by:

- Competitive inhibition
- Generation of non-conductive acidic environment
- Production of antibiotic-like substances (bacteriocins)

In view of the pressures of modern existence, such as stress, change in the food consumption pattern, extensive travel, exposure to environmental pollutants and unexpected weather changes, the maintenance of a normal, healthy and balanced microbial population (EUBIOSIS) in the gastrointestinal (GI) tract is a difficult task. Under such adverse circumstances, the harmful bacteria may become predominant (a condition referred to as bacterial overgrowth) and create an imbalance, which may in turn impair normal gut function and lead to various health problems.

Hence, a logical approach to restoring the balance of intestinal flora would be the use of naturally occurring microorganisms. A superior and potential species among *Lactobacillus* is *B. coagulans*. This species forms spores, which on activation in the acidic environment of the stomach, can germinate and proliferate in the intestine, produce the favoured L (+) form of lactic acid and effectively prevent the growth of pathogens.

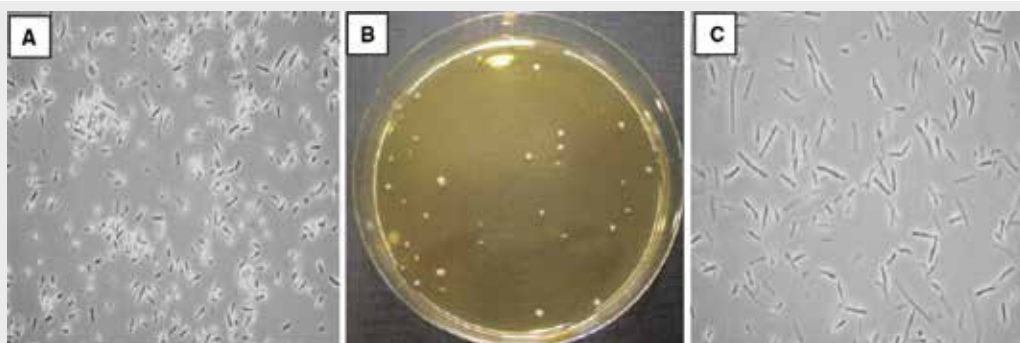
Genotypic and Phenotypic Characterization of *Bacillus coagulans* MTCC 5856

Commercially, probiotics have gained importance because of their therapeutic potential in the recent couple of decades. Several bacterial genera are used in probiotic preparations, viz; *Lactobacillus*, *Bifidobacterium*, *Enterococcus*, *Bacillus* and *Streptococcus*. However, accurate representation of the same, meant for both human and animal, on the labels of such dietary supplements and foods is lacking or do not contain the specified organisms or the stated numbers of organisms in most of the cases.

As per FAO/WHO expert panel, probiotic activity is more important than the source of the microorganism, as strains expressing unique and particular characteristics are believed to enable health benefits with specific functional properties.

The authenticity of the strain *Bacillus coagulans* MTCC 5856 has been established through genetic studies and phenotyping and multilocus sequence typing (MLST) have been carried out to evaluate the identity and consistency of *B. coagulans*. Biochemical profiling and 16S rRNA confirmed that the strain present is *B. coagulans*, and that its identity is consistent over at least a period of 3 years. Results from BOX-PCR fingerprints and MLST further emphasize the above results (Majeed *et al.* 2016. *World J Microbiol Biotechnol.* doi: 10.1007/s11274-016-2027-2).

Parameters, such as resistance to gastric acid, bile salt and antimicrobial activity of *B. coagulans* were also established in this study. Results showed that there was no significant difference in the viability of *B. coagulans* in the presence and absence of bile salt, thus establishing its resistance to bile salt. Further, *B. coagulans* exhibited inhibitory activity against a panel of Gram positive and Gram negative pathogens, including *Micrococcus luteus*.



Phase contrast microscopic image (x1000 magnification)
(A) *B. coagulans* MTCC 5856 powder (B) Colony grown on Glucose Yeast Extract (GYE) agar plate (C) Vegetative cells

Overall, *B. coagulans* was found to be non-mutagenic, non-cytotoxic and negative for enterotoxin genes, as evaluated through *in vitro* assays.

Hearing from FDA that the agency has no questions at this time regarding Sabinsa Corporation's conclusion that *B. coagulans* spore preparation is GRAS under the intended conditions of use underscores Sabinsa's commitment to demonstrating the safety of LactoSpore®



Dr. Muhammed Majeed
Founder, Sabinsa

Bacillus coagulans: A Conglomerate of Comprehensive Health Benefits

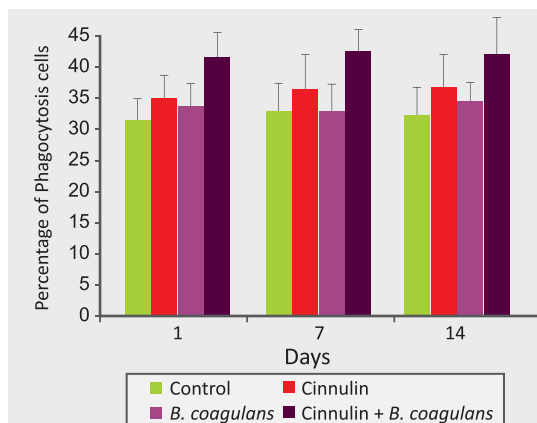
Bacillus coagulans is well-known for its key role in promoting general well-being and health, providing immune support and thereby imparting positive physiological effects on the human body. These benefits include improved bowel movement, effective management of colon cancer and related complications, support maintain healthy cholesterol, blood pressure management, improved mineral absorption, preventing growth of harmful bacteria, cognitive health support and many more.

Additionally, beneficial role of 'good bacteria' like *B.coagulans* in maintaining overall skin health is also gaining importance, as reward for keeping a healthy balance between good and bad bacteria in the body has reached the skin—beyond benefiting the digestive tract alone. Thus, connecting the dots between probiotic and beauty. Several studies have suggested that topical probiotics might be helpful in maintaining the health and appearance of the skin as well—by playing a crucial role in preventing or treating certain skin conditions.

Immune Support

The biological effects of the probiotic *B. coagulans* was studied in combination with an aqueous extract of cinnamon (Cinnulin) and it was found that combination had strong synergistic effects on phagocytosis and on regulation of cholesterol and blood sugar levels.

Phagocytosis is one of the most important immunological reactions traditionally connected with effects of natural immune modulators. The combination of *B. coagulans* with Cinnulin resulted in significant stimulation of phagocytic activity, thus indicating its role in immunomodulation (Vaclav and Jana. *Am J Immunol.* 2013;9(4):103-09).



Cholesterol and Blood Sugar Management

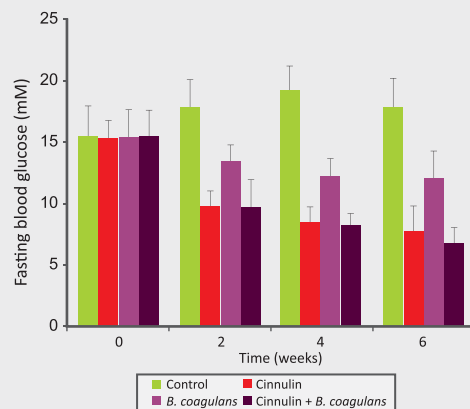
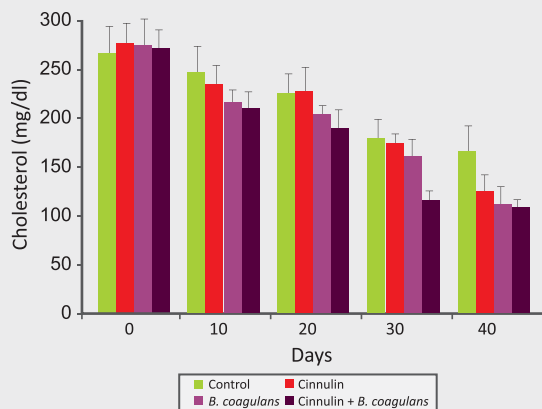
Preclinical models to establish the effect of *B. coagulans* on blood sugar and cholesterol levels showed that, while Cinnulin alone was effective only after 40 days, *B. coagulans* was already active after 10 days. The Cinnulin-*B. coagulans* combination significantly lowered cholesterol levels through all tested intervals showing a strong synergistic effect. The same synergistic combination was also found effective in the management of elevated blood sugar levels (Vaclav and Jana. *Am J Immunol.* 2013;9(4):103-09).

Advantages of LactoSpore®

Use of LactoSpore® in pharmaceutical dosage forms, such as tablets, capsules, granules or powder have the following characteristics:

1. Contain a large number of viable lactic acid producing bacteria that retain viability during preparation in pharmaceutical dosage forms and during storage before consumption
2. Survive in gastric secretions and bile of the upper digestive tract and reach the intestine safely
3. Settle in the digestive tract and produce lactic acid and other antagonistic substances to inhibit the growth of pathogenic bacteria

Bacillus coagulans: A Conglomerate of Comprehensive Health Benefits

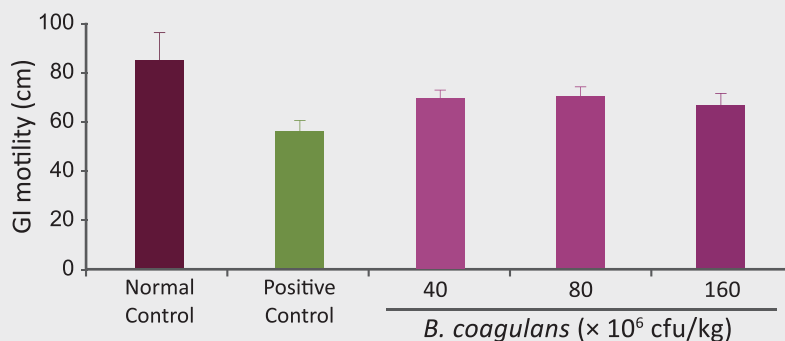


Antidiarrheal and Gastrointestinal Motility Support

The role of *B. coagulans* in improvement of GI health has primarily been established through preclinical studies. The effect of *B. coagulans* on castor oil-induced diarrhoea and GI motility has been primarily screened in an *in vivo* model. Its activity was compared to that of loperamide, a well recognized anti-diarrhoeal pharmaceutical ingredient.

At a dose of 160×10^6 cfu/kg body weight, *B. coagulans* showed a significant decrease in faecal weight, which was similar with loperamide treatment. Inhibition for loperamide treated group was 36%, while that of *B. coagulans* was 33%.

A similar trend was observed with respect to improvement of GI motility in a deactivated charcoal *in vivo* model. *Bacillus coagulans* at a dose of 160×10^6 cfu/kg body weight exhibited almost similar effects on the GI motility to that of a standard drug, atropine sulphate (Majeed *et al. Int J Pharm Bio Sci.* 2016;7(1): 311-16).



Even as probiotics gain unprecedented consumer acceptance, mainstream media coverage highlights confusion as to which forms are most beneficial, which is where LactoSpore[®]'s established efficacy becomes particularly compelling



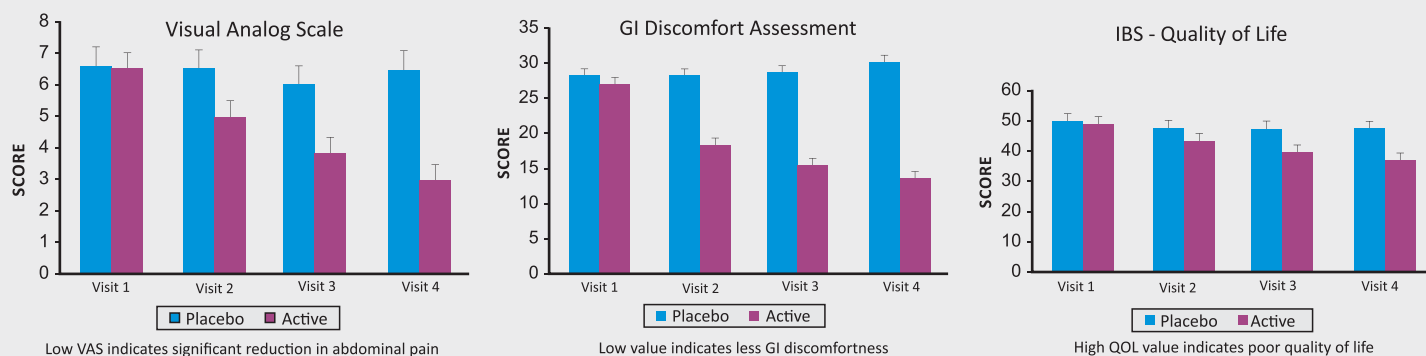
Shaheen Majeed
Marketing Director, Sabinsa

Bacillus coagulans: A Conglomerate of Comprehensive Health Benefits

Irritable Bowel Syndrome Symptoms Management

Bacillus coagulans has been clinically evaluated in a randomized, double-blind placebo-controlled study to offer relief to patients suffering from irritable bowel syndrome (IBS). *Bacillus coagulans* tablets containing 2×10^9 cfu/day were given to volunteers for 90 days. Evaluation of clinical symptoms, visual analog scale (VAS) for abdominal pain, physician's global assessment and IBS quality of life were estimated through the study.

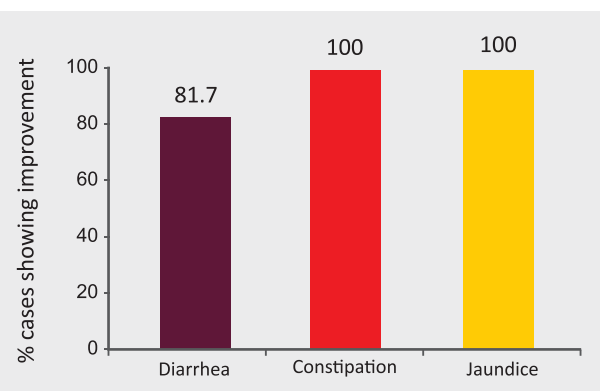
A significant decrease in the clinical symptoms like bloating, vomiting, diarrhoea, abdominal pain and stool frequency in the patient group receiving *B. coagulans* when compared to placebo group was observed. The VAS score for abdominal pain was found to be statistically significant when compared between placebo and *B. coagulans* treated groups. Disease severity also decreased, while the quality of life increased. *Bacillus coagulans* has been found both safe and effective to alleviate IBS-related symptoms (Majeed *et al. Nutr J.* 2016; doi: 10.1186/s12937-016-0140-6).



Overall Gastrointestinal Health Support

In a clinical study on 567 cases in 19 institutions done in Japan, a significant improvement of symptoms due to abnormalities in the intestinal flora was observed with the use of *L. sporogenes* (Clinical study compiled by the Sankyo Co. Ltd., Japan).

Condition	% cases showing improvement
Diarrhea due to chronic acute enteritis	93.7
Mal-digestion accompanied by diarrhea	85.9
Infantile diarrhea	87.9
Constipation	65.4



Antidiarrheal Support in Neonates

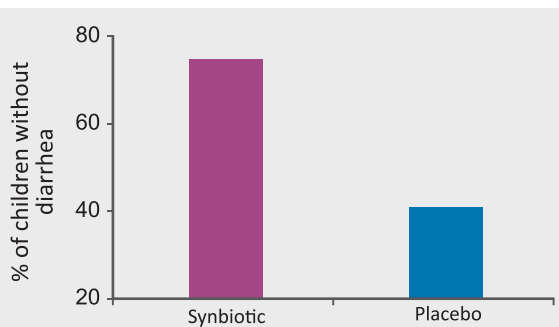
In an Indian study on 66 subjects, effect of *L. sporogenes* on 60 neonatal diarrheal cases, three suffering from constipation and three from jaundice were studied. Cases of neonatal diarrhoea responded well to *L. sporogenes* therapy. Dose administered was 15 million spores per day and resulted in a recovery period of 1.8 days (Dhongade and Anjaneyulu. *Maharashtra Med J.* 1977; 23(1):473-74).

Bacillus coagulans: A Conglomerate of Comprehensive Health Benefits

Management of Antibiotic-associated Diarrhea

Changes in the gut microflora commonly occur due to the ingestion of antibiotics. This causes a variety of biological changes in the digestive tract, including changes in immune function, inflammatory response and normal metabolism. One such change is the increased susceptibility to antibiotic-associated diarrhea (AAD) and antibiotic resistant infectious diseases. Probiotics play an important role to provide conditions that are ideal for proliferation of

beneficial microbes that are lost from the digestive tract during antibiotic treatment.



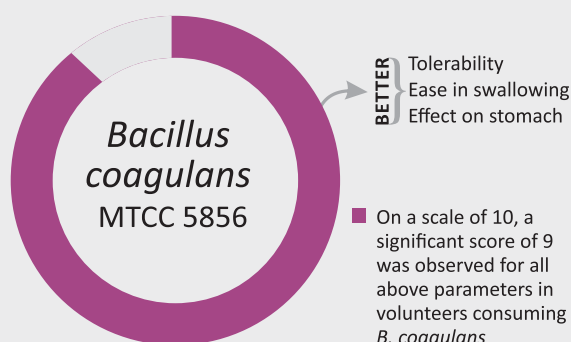
In a clinical study carried out on 120 children taking antibiotics for infections, they were given a synbiotic formulation (*L. sporogenes* with Fructooligosaccharides) or placebo for 10 days. A significant reduction in the number of days and duration of events in children with AAD was observed when treated with the synbiotic formulation (LaRosa *et al. Minerva Pediatr.* 2003;55(5):447-52).

Relief in Non-specific Vaginitis

Non-specific vaginitis is caused by a variety of pathogens, including *staphylococci*, *streptococci*, *pneumococci* and *E. coli*. Reported that, *L. sporogenes* administration to increase the vaginal acidity by the action of the lactic acid on glycogen in the vaginal epithelial tissues was adopted in a clinical trial on 44 patients. This therapy provided complete relief to 91% of the patients and partial relief to the remaining 9% (Sankholkar and Sali. A clinical study report from BJ Medical College, Pune, India).

Safety Study

A double-blind, randomized, placebo-controlled, clinical trial in humans for establishing safety of oral supplementation of *B. coagulans* MTCC 5856 was conducted. The study involved 40 healthy human volunteers, of which 20 were given 2 billion spores of *B. coagulans* once daily for 30 days and analysed for laboratory parameters (blood hematology and clinical chemistry parameters), anthropometric measures (weight, BMI, blood pressure and heart rate), adverse events, Bristol Stool Score, tolerability questionnaire and bowel habit diary. Study results showed that *B. coagulans* tablets were safe, tolerable, easy to swallow and had minimal effect on the stomach (Majeed *et al. J Clin Toxicol.* 2016. doi:10.4172/2161-0495.1000283).



Why LactoSpore® Stands Out

- Shelf-stable at room temperature
- Self-affirmed GRAS : "No comment letter from USFDA"
- In sporulated form, the culture survives and proliferate only in the GI environment
- Produces predominantly the beneficial L (+) form of lactic acid
- Clinically evaluated for its safety and efficacy
- Approved as "Natural Health Product" in Canada by the NNHPD
- Effective in relieving IBS-related pain



LOOKING FOR AN ATTRACTIVE, ALL NATURAL, SUGAR FREE FORMULATION?

LactoSpore® Bunnies Deliver 1 Billion Viable Spores Per Dose.
These Contain Vanilla Flavor and Xylitol.

PROBIOTICS: NEVER BE DEAD ON ARRIVAL



GMP Registered

From chewable bunny tablets, to gummies, capsules and tablets, your probiotic must survive and you can be sure it will with Sabinsa's LactoSpore® probiotic. Stable at room temperatures, safe and clinically tested LactoSpore efficiently supports a healthy balance of natural microflora in the gastrointestinal tract; helping the body's natural defenses to effectively combat stress and imbalances. LactoSpore being in naturally encapsulated spore form remains viable on processing and storage, advantageously producing the beneficial L(+) form of lactic acid and other healthful metabolites upon delivery.

an ingredient of Sabinsa

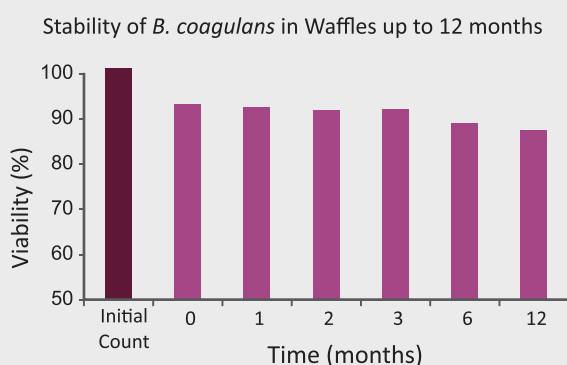


#ipreferlactospore

Viabile Probiotic in Functional Foods

Bacillus coagulans MTCC 5856 in Functional Foods

The stability of *B. coagulans* MTCC 5856 in baked muffins and waffles, hot beverages, such as coffee, frozen fudge frostings and toppings and beverages, such as apple juice and glucose syrup has been evaluated. *Bacillus coagulans* showed promising stability during processing and storage of functional foods (Majeed *et al. Int. J Food Sci. Tech.* 2016.doi:10.1111/ijfs.13044).



Bacillus coagulans was found to be stable during baking and storage at frozen conditions. Certain examples include 92% viability when used in banana muffins and 86% viability when used in waffles up to 12 months. Similar results were observed when *B. coagulans* was added to hot fudge topping and chocolate fudge frosting as well.

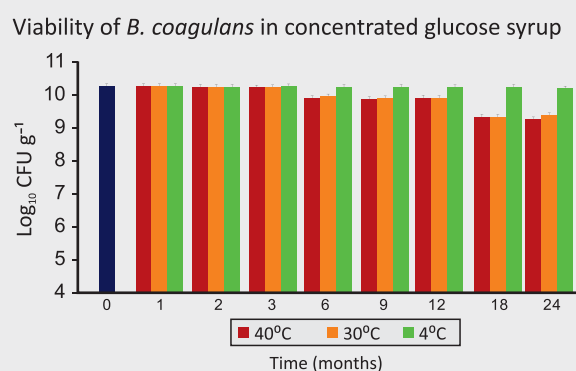
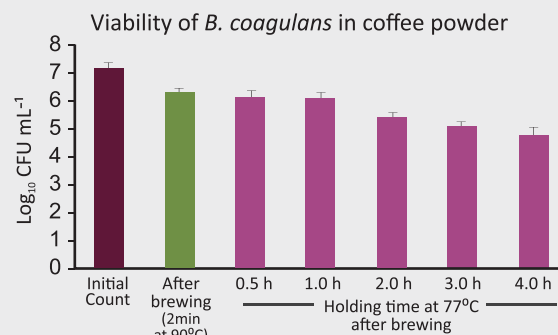


**CAN YOUR
PROBIOTIC
SURVIVE?**

Bacillus coagulans MTCC 5856 in Functional Foods

The viability of *B. coagulans* has been evaluated in coffee powder after brewing for 2 min followed by holding temperature 77 °C for 4 h. Only a 13% reduction ($0.92 \log_{10} \text{CFU mL}^{-1}$) was observed after brewing at 90 °C for 2 min from initial count.

Viability of *B. coagulans* blended with concentrated glucose syrup at 45–50 °C and stored at accelerated (40 ± 2 °C) room temperature (30 ± 2 °C) and refrigerated conditions was evaluated for up to 24 months. While at refrigerated conditions, upto 99% viability was retained, at accelerated conditions, 96% upto 12 months and 90% at 24 months was retained. A similar observation was made when *B. coagulans* was constituted in apple juice at an acidic pH of 3.5.



A
SMART CHOICE
OF ADDITIONAL
HEALTH BENEFITS,
ANYTIME!

Peanut butter and strawberry preserves were blended with *B. coagulans* at temperatures of 30–35 °C and 75 °C, respectively. The viability of *B. coagulans* in peanut butter and strawberry preserves was retained over 97% upto 12 months of storage at room temperature. *Bacillus coagulans*, thus showed promising stability during processing and storage of functional foods.

Sabinsa offers LactoSpore® of following strengths:

- 6 Billion spores/g
- 15 Billion spores/g
- 100 Billion spores/g



Pampers Your Skin Inside Out

Cosmetic Applications of *Bacillus coagulans* MTCC 5856

Beneficial role of probiotics in skin care has been determined by a few clinical trials in recent time. These studies have been able to establish a promising link between topically applied probiotics and clearer skin in acne and rosacea patients, along with reduced skin sensitivity and redness.

Bacillus coagulans MTCC 5856 has been incorporated successfully for supporting healthy skin topically in rinse off products such as soaps. *Bacillus coagulans* as a topically applied probiotic, imparts a positive effect on skin by modulating mechanisms related to the immune system and by providing therapeutic benefits for atopic diseases—by restoring residential and beneficial skin microflora (Majeed *et al.* *EuroCosmetics* 2015;10-11).

**NOT JUST
BEAUTIFUL,
BUT
HEALTHY SKIN**



A Lot of Good Reasons to be Considered

Dosage form and suggested use level

LactoSpore® can be used in the form of tablets, capsules, gummies, soft chews, granules, dry powder mixes, beverages, baked foods and functional foods.

Suggested use level: Upto 2 billion spores per day

Brand Name	LactoSpore®
Common Name	<i>Bacillus coagulans</i> (MTCC 5856)*
Description	White to off-white powder with mild characteristic odour
Shelf life	3 years
Storage Condition	Store at room temperature
Assay	
<i>Bacillus coagulans</i> viable spore count	a. Not less than 6,000 million spores per gram b. Not less than 15,000 million spores per gram c. Not less than 100 billion spores per gram
Certifications	Kosher, Halal, ISO 22000:2005, FDA Audited, NSF GMP

* LactoSpore® (*Bacillus coagulans*) has been designated with the accession number MTCC 5856