

EXPANDING PROBIOTIC POSSIBILITIES



DE111 provides a host of benefits for digestive and immune health, crowding out bacterial pathogens and maintaining healthy gut microbiota.

What is DE111®?

DE111 is a strain of the probiotic *Bacillus subtilis*. The *Bacillus subtilis* species of microorganism has been known for more than a century, having first been isolated and described in 1872. It is a soil-based organism and considered to be a normal inhabitant of the gut in animals and humans¹.

Supporting Digestive and Immune Health

The human body carries nearly 100 trillion bacteria in the gut ... that's more than 10 times the total number of human cells in the entire body. Probiotics are those "good" bacteria that help keep the intestines healthy and assist in digestion and nutrient absorption. Researchers are also finding evidence that certain bacteria in the gut influence the development of aspects of the immune system. In fact, about 70% of the immune system is housed in the gut.

The probiotic benefits of *Bacillus subtilis* for digestive and immune health include:

- Crowds out bacterial pathogens and maintains healthy gut flora^{2,3}
- Supports the normal immune reaction of intestinal cells^{4,5}
- Produces short-chain fatty acids to help maintain the gut barrier's function⁶
- Can germinate in the small intestine, increase and then re-sporulate⁷





QUALITY CERTIFICATIONS

- Kosher
- Halal
- Non-GMO Project Verified
- Health Canada approved (NPN 80077102)
- Non-Novel Food status, Health Canada
- GRAS Status: FDA No-Objection Letter

PRODUCT APPLICATIONS:

- Supplement Capsules, Tablets and Bulk Powder Blends
- Stick Packs
- Gummies
- Food and Beverage

INDUSTRY APPLICATIONS:

- Digestive Health
- Immune Health
- Cardiovascular Health
- Sports Nutrition
- Pets

STABILITY ADVANTAGE: SPORE FORMING PROBIOTICS

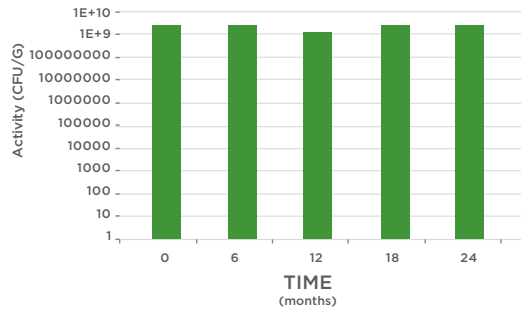
Spore forming bacteria are a diverse group of very hardy bacteria, characterized by their ability to form endospores to protect themselves in varying conditions such as high temperatures and the acidic environment of the gut.

Bacillus subtilis has the ability to form spores that protect the microbes from harsh conditions until they enter an environment ripe for germination, such as the GI tract. This means that DE111 remains viable under a wide temperature range, and doesn't require refrigeration. It also survives passage through the acidic environment of the stomach?. While all spores are hardy, different strains thrive under varying conditions, and at different rates of growth. *Bacillus subtilis* grows quickly under physiological conditions, while some other spores grow best in temperatures below that of human body.

Because DE111 remains viable under a wide temperature and pH range, the probiotic is ideal for use in supplements, foods and beverages. In stability testing, DE111 experienced virtually no loss of colony forming units (CFU) over 24 months, when stored at room temperature (25°C).

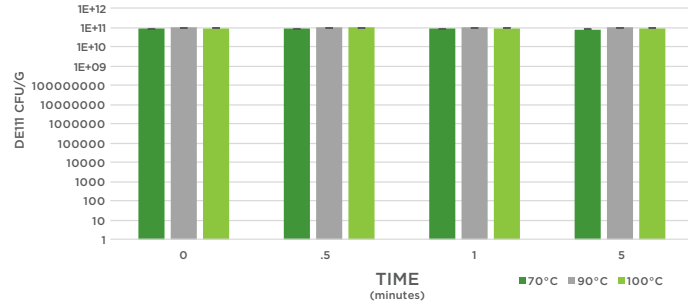
DE111 can also stand up to food and beverage processing and storage.

DE111 Shelf Stability



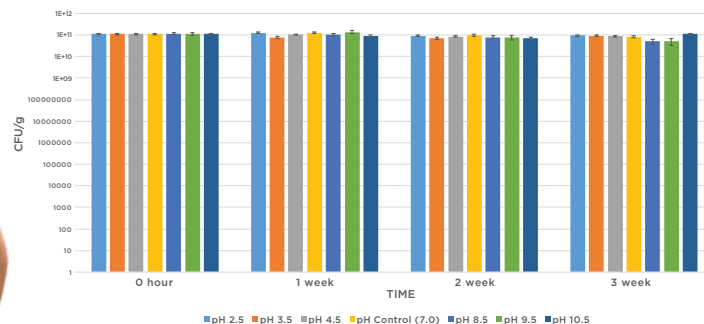
DE111 remains stable over 24 months at 25°C and 40% relative humidity.

DE111 Temperature Stability



DE111 viability is maintained under temperatures up to 100°C for up to 5 minutes.

DE111 pH Stability



DE111 viability is maintained under a wide pH range for a period of three weeks.



CLINICAL RESULTS: SAFETY AND EFFICACY

More than 30 studies have been performed to confirm the safety and efficacy of *Bacillus subtilis* DE111. A full genome sequencing confirmed the strain contained no plasmids, antibiotic resistant or deleterious genes. The genome sequence of DE111 has been uploaded to GenBank, the National Institutes of Health genetic sequence database.

Multiple human clinical studies support DE111's benefits to digestive and immune health, and Deerland is committed to continuously conducting additional studies. All studies are IRB-approved, double-blind, randomized and placebo controlled.

SUPPORTS DIGESTION

A clinical study evaluating the effect of DE111 (5 billion CFU) on digestive health demonstrated a significant influence on gut microflora. Fecal samples showed an increase in the levels of *B. subtilis* and *Bifidobacterium* (good bacteria), and a slight decrease in levels of *E. coli* (bad bacteria). DE111 was also able to maintain healthy levels of cholesterol, glucose and triglycerides, indicating that DE111 supports the normal breakdown of complex carbohydrates, sugars and fats.⁸



SUPPORTS REGULARITY

A clinical study showed a reduction of alternating constipation and diarrhea for the participants taking DE111 (1 billion CFU) when compared to participants taking the placebo. The proportion of normal stools increased from 37% to 43% in the DE111 group, while remaining the same in the placebo group. In male participants specifically, the proportion of normal stools increased from 56% to 80%. In addition, a significant difference between the DE111 and placebo groups was observed in regards to normal and non-normal stool proportions in the 30+ age group.⁹

SUPPORTS CHILDREN'S HEALTH

In a study involving 91 children aged 2 to 6, researchers found that daily consumption of the probiotic DE111 positively modulated the gut microbiome profile without changing the overall microbiome equilibrium. After 8 weeks

of daily consumption at 1 billion CFU, the researchers observed an increase in alpha-diversity at the phylum level, suggesting an expanded functional diversity of the microbiome compared to that of the children in the placebo group. Specifically, there were 9 differentially abundant taxa at the genus level found in the probiotic group, six (of the phylum *bacteroidetes*) grew in abundance while three (of the phylum *firmicutes*) were reduced. The six taxa of *bacteroidetes* that flourished are involved in immune regulation and reduction of inflammation. This modulation of the *firmicutes/bacteroidetes* ratio of the microbiome in children taking *B. subtilis* DE111 is a positive indication for healthy gut function.³

In a study involving 81 children aged 2 to 6, researchers found that daily consumption of the probiotic DE111 supported a healthy gastrointestinal tract with a reduced duration of vomiting, hard stools, and overall gastrointestinal discomfort.¹⁰

SUPPORTS CARDIOVASCULAR HEALTH

In a study involving 43 participants aged 18 to 65, researchers found that DE111 supplementation of 1 billion CFU per day resulted in significant reduction in total cholesterol and non-HDL cholesterol relative to baseline measures. The team also observed a strong trend toward reduction in LDL cholesterol, as well as improvement in endothelial function; reactive hyperemia index (RHI), an indicator of blood flow and heart health, increased by 9.14%.¹¹

SPORTS PERFORMANCE, BODY COMPOSITION AND RECOVERY

In a study involving female collegiate athletes during offseason training, researchers found that DE111 (1 billion CFU), in conjunction with a protein



drink supplement, can improve body composition and indices of athletic performance. The results of the study showed that compared to the placebo, the probiotic DE111 produced statistically significant improvements in the reduction of body fat percentage, and a strong trend indicating improved performance of the deadlift exercise.¹²

In a study involving male collegiate athletes during offseason training, researchers found that DE111 (1 billion CFU), in conjunction with adequate post-workout nutrition, can promote tissue recovery and reduce likelihood of injury. The results of the study showed that compared to the placebo, the probiotic DE111 produced a statistically significant reduction of tumor necrosis factor alpha (TNF- α).⁵

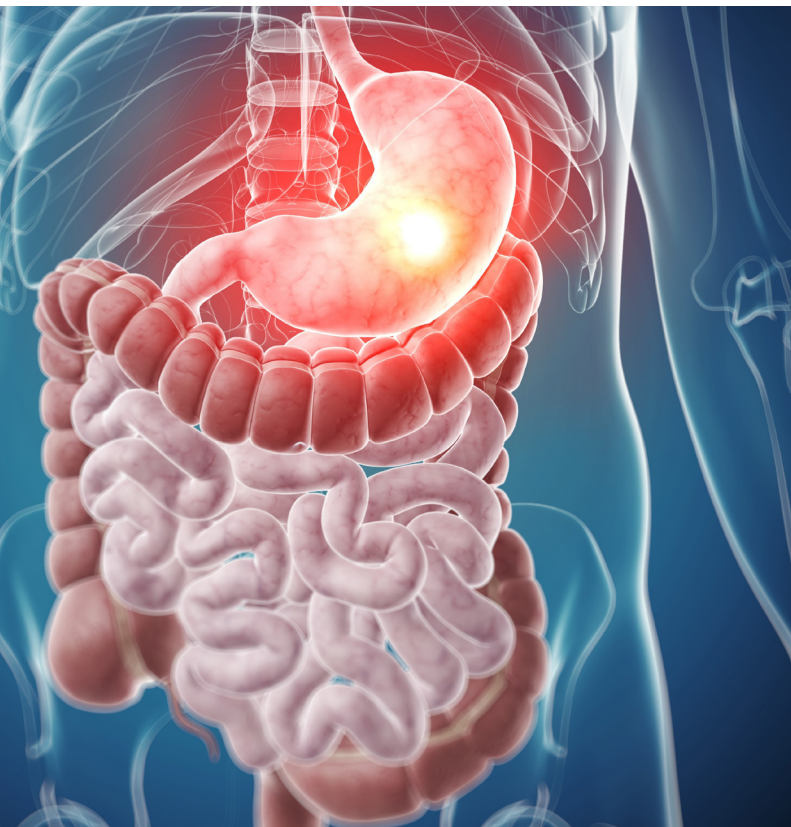
SUPPORTS IMMUNE HEALTH

In a study involving 44 participants aged 20-62, researchers observed after four weeks of daily consumption of the probiotic DE111 at 1 billion CFU, a significant decrease in the basal levels of several immune cell populations, including CD3+ T cells, cytotoxic T cells and NKT cells. Moreover, the probiotic group showed an increased capacity for immune response in cells stimulated by an induced inflammation. The results suggests that DE111 may modulate the immune system through action on both innate (rapid response) and adaptive (slow response) immune cell types.⁴



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