



Gut Health for Overall Wellbeing

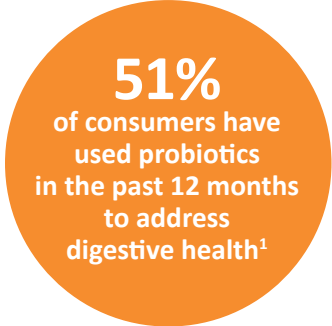
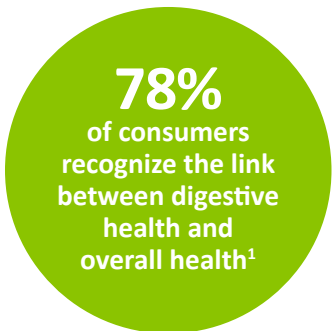
Gut health and its impact on overall wellbeing are key drivers for today's consumers.

Increasingly, pre-clinical and clinical research supports the importance of gut health in a wide variety of conditions, from digestive health to mental health and many conditions in between.

INVESTIGATING THE GUT MICROBIOME AND ITS ROLE IN OVERALL WELLBEING

ADM boasts a comprehensive, cutting-edge microbiome solutions portfolio that features proprietary probiotic strains to support overall gut health.

With ADM, you will benefit from our advanced microbiome research capabilities, from DNA sequencing to *C. elegans* testing models, to isolate efficient strains and elaborate targeted microbiome solutions.

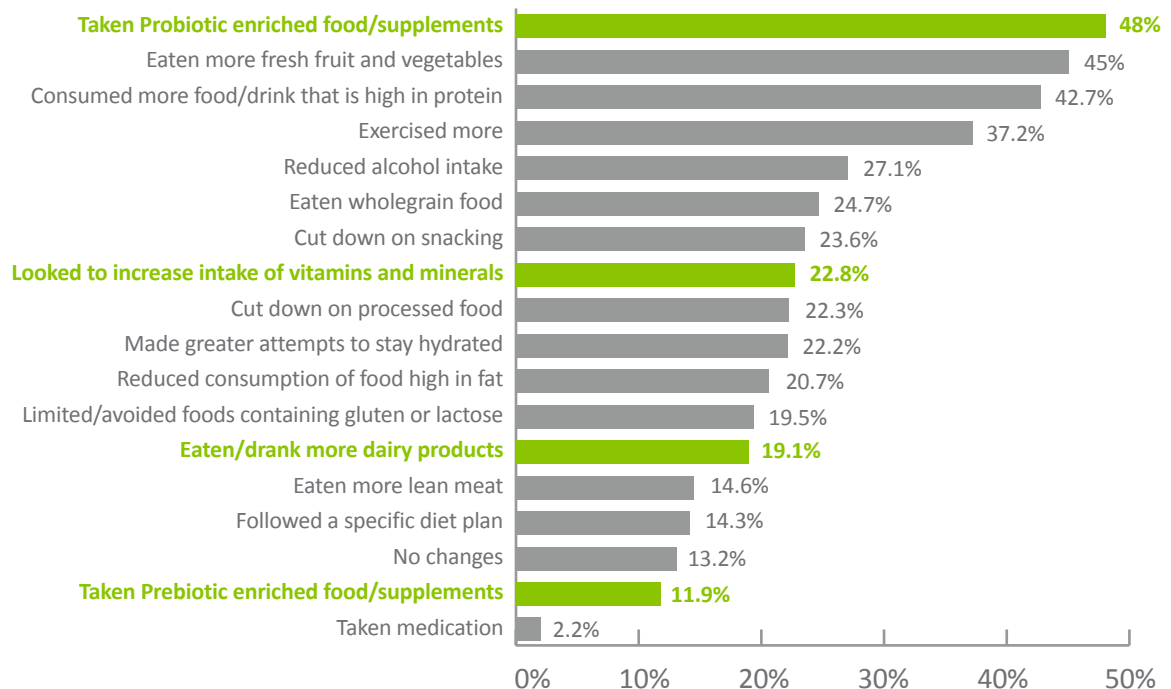




Consumer Demand for Digestive Support

More than ever, consumers are seeking digestive health support through probiotic supplementation. In fact, in 2022 almost half of consumers have turned to probiotic food or supplements to improve their digestive health.

CHANGES IN CONSUMER DIETS TO IMPROVE DIGESTIVE HEALTH¹



Studying Microbiome Solutions with ADM's Proprietary *Bifidobacterium longum* ES1

ADM's proprietary *Bifidobacterium longum* ES1 probiotic and postbiotic may support overall digestive health, which is demonstrated throughout its portfolio of pre-clinical and clinical evidence.

Bifidobacterium longum ES1 is a probiotic strain isolated from healthy breast-fed infants. Pre-clinical trials and human clinical trials demonstrate support for digestive health and microbiome-modulating effects of this strain.^{2,3}

The Digestive Health Support and Microbiome-Modulating Effects of *Bifidobacterium longum* ES1

1. May help support digestive health

- The strain has shown the properties of increasing the width of the villi of the intestine and the height of the enterocytes in an enteropathy animal model.⁴
- In a pre-clinical setting, it has been shown to decrease the expression of TNF- α in intestinal epithelial cells exposed to gliadins digested by *B. longum* ES1.⁵
- Has been shown to maintain stability under acidic and bile salt conditions to ensure viability during GI transit. **>50% survival at pH 2; >60% survival at 3% bile salts⁶**

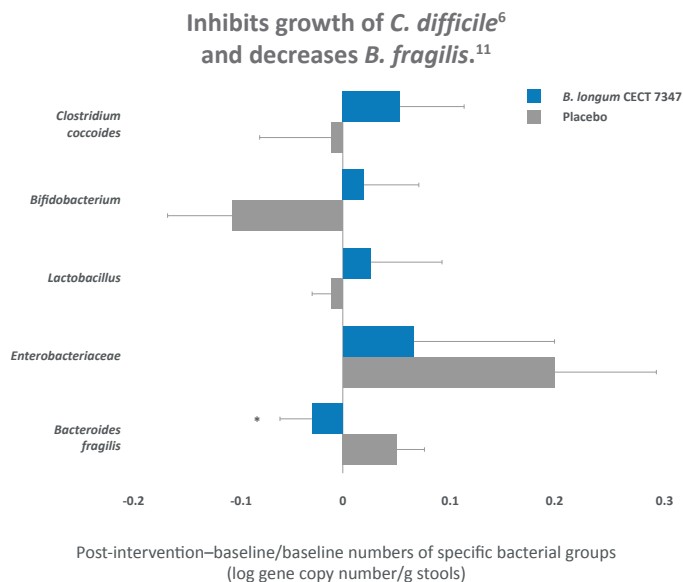
2. May support overall gut health

- In a pre-clinical model, *Bifidobacterium longum* ES1 significantly reduced levels of the pro-inflammatory agents IFN- γ and TNF- α , associated with tissue damage and inflammation.⁷
- In an *in vitro* model, *Bifidobacterium longum* ES1 reduced pro-inflammatory markers and increased the level of the anti-inflammatory cytokine IL-10.⁸
- *Bifidobacterium longum* ES1 decreased oxidative stress in *C. elegans* model, increasing its survival under this stress.⁹

Oxidative stress is intimately involved in the upregulation of inflammatory cytokines; both processes are simultaneously found in many pathological conditions.¹⁰

3. In-vitro data suggests gut microbiome modulation

- *In vitro*, the strain has been shown to inhibit the growth of pathogenic species of the digestive tract, including *Clostridium difficile* isolates.⁶
- In a clinical trial with children, administration of *Bifidobacterium longum* ES1 was associated with a significant decrease in the opportunistic pathogen *Bacteroides fragilis*.¹¹



Published Clinical Trial Evidence: Human Clinical Trials

A double-blind, randomized, placebo-controlled intervention trial to evaluate the effects of *Bifidobacterium longum* ES1 in children with newly diagnosed coeliac disease¹¹

DESIGN:

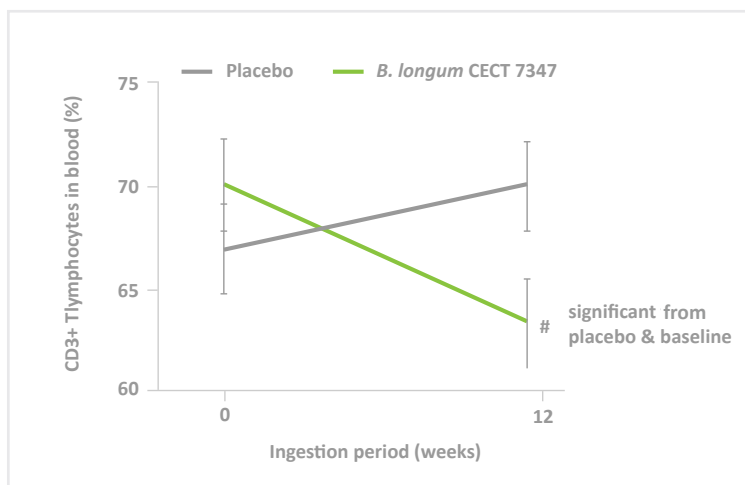
Double-blind, placebo-controlled design. 36 children newly-diagnosed with coeliac disease, a disease characterized by intestinal inflammation, intestinal dysbiosis and an altered intestinal structure.

INTERVENTION:

Bifidobacterium longum ES1
1B CFU/day for 12 weeks.

RESULTS:

- Greater height percentile increases in the *Bifidobacterium longum* ES1 group compared to placebo group (P=0.048).
- Decreased peripheral CD3+ T lymphocytes in the *Bifidobacterium longum* ES1 group compared to placebo (P=0.004).
- **Comparison between the groups showed that the administration of *Bifidobacterium longum* ES1 reduced the numbers of the unwanted bacteria *Bacteroides fragilis* (P=0.020) and the concentration of secretory IgA in stools (P=0.011) compared to the placebo group.**



A pilot study on non-coeliac gluten sensitivity: effects of *Bifidobacterium longum* ES1 co-administered with a gluten-free diet³

DESIGN:

Non-randomized, open label study. 30 participants with symptoms attributable to non-coeliac gluten sensitivity (NCGS).

INTERVENTION:

Bifidobacterium longum ES1
1B CFU/day for 12 weeks

RESULTS:

A combination of gluten-free diet plus *Bifidobacterium longum* ES1 resulted in significant improvements* in the frequency and intensity of digestive and extra-intestinal episodes:

- **Improvements in multiple outcome measures including occasional abdominal pain and swelling compared to baseline.**

*compared to baseline

EXCITING NEW RESEARCH SHOWS THAT ES1 POSTBIOTIC MAY SUPPORT:

- Positive microbiome modulation
- Butyric acid producing bacteria
- Growth of beneficial bacteria within the gut
- Displacement of unwanted bacteria in the gut



ADM Delivers Cutting-Edge Microbiome Solutions

Through pre-clinical discovery and clinical validation, ADM has the depth and breadth of expertise to support our growing range microbiome solutions, including *Bifidobacterium longum* ES1.

CLAIMS AND CERTIFICATIONS

- EU Permitted | QPS List
- GRAS
- Non-GMO
- Organic Compliant
- Gluten Free
- Kosher

The Right Products

Composition	Concentration
<i>Bifidobacterium longum</i> ES1	50B CFU/g
<i>Bifidobacterium longum</i> ES1 Postbiotic	50B cells/g

SOURCES

- ¹ FMCG Gurus, (2022) Global Digestive Health Survey
- ² Genovés, S., et al. (2016) *Nutrafoods*. 15: 157–60
- ³ Di Pierro, F. et al. (2020) *Minerva Gastroenterol Dietol*. DOI:10.23736/S1121-421X.20.02673-2
- ⁴ Laparra, J. M., et al. (2012) *PloS one*. 7(2): e30744
- ⁵ Laparra, J.M. and Sanz, Y. (2010) *J. Cell Biochem*. 109(4): 801-7
- ⁶ Sanz, Y., et al. (2009) Patent WO 2009/080862 A1
- ⁷ Medina, M., et al. (2008). *J Inflamm*.
- ⁸ De Palma, G., et al. (2012) *J Leukoc Biol*.
- ⁹ Valcarce, D.G., et al. (2017) *Benef Microbes*. 8(2): 193-206
- ¹⁰ Biswas, S.K. (2016) *Oxidative Medicine and Cellular Longevity*. 2016: Article ID 5698931
- ¹¹ Olivares, M., et al. (2014) *Br J Nutr*. 112: 30–40

An innovative leader in the microbiome field, ADM delivers future-forward solutions fueled by science, with a complete range of solutions from prebiotics, to probiotic and postbiotic strains, all clinically documented to deliver consumer benefits.

An expansive portfolio of health & wellness ingredients including bionutrients, botanical extracts, vitamins, and more means you can deliver innovative, science-driven supplements and food and beverage formulations to meet consumers’ evolving functional nutrition needs. With our vertically integrated supply chain to protect the reliability and availability of high-quality products and our dependable customer service, you get industry-leading quality solutions to ensure your success.

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