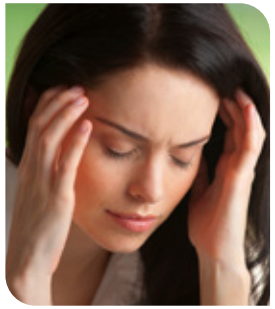
ADM®

Unlocking Nature. Enriching Life.

Probiotic Portfolio

BIOPOLIS Protexin®

An interactive guide to the available bacteria strains and mixes from ADM, their supporting research and suitable applications



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We Unlock the Power of Nature to Enrich the Quality of Life.

ADM

For more than a century, the people of Archer Daniels Midland Company (ADM) have transformed crops into products that serve the vital needs of a growing world. Today, we're one of the world's largest agricultural processors and food ingredient providers, with approximately 31,000 employees serving customers in more than 200 countries. With a global value chain that includes approximately 500 crop procurement locations, 270 ingredient manufacturing facilities, 44 innovation centres and the world's premier crop transportation network, we connect the harvest to the home, making products for food, animal feed, industrial and energy uses.

ADM Nutrition

ADM is a world-leading nutrition company with the widest range of specialty ingredients, blends, systems and experience. We move customers from concept to launch faster with sustainable, differentiated products that address their evolving needs. ADM helps our customers create consumer-preferred nutritional solutions through our on-trend and customisable portfolio of natural flavours and colours; an unmatched range of plant-based proteins; industry-leading, science-backed bioactives; as well as specialty ingredients such as hydrocolloids, lecithin, Omega-3 solutions, probiotics, polyols, texturants, soluble fibres and much more. Our talented team also provides consumer insights and intelligence; sensory expertise; culinary creativity; and full product-development services.

Two companies - one combined approach

ADM BIOPOLIS
ADM Biopolis core expertise is finding, designing and developing microorganisms for industrial and health-related purposes. To develop ground-breaking products, our Research and Development (R&D) is based on a series of harmonised, interconnected research platforms.

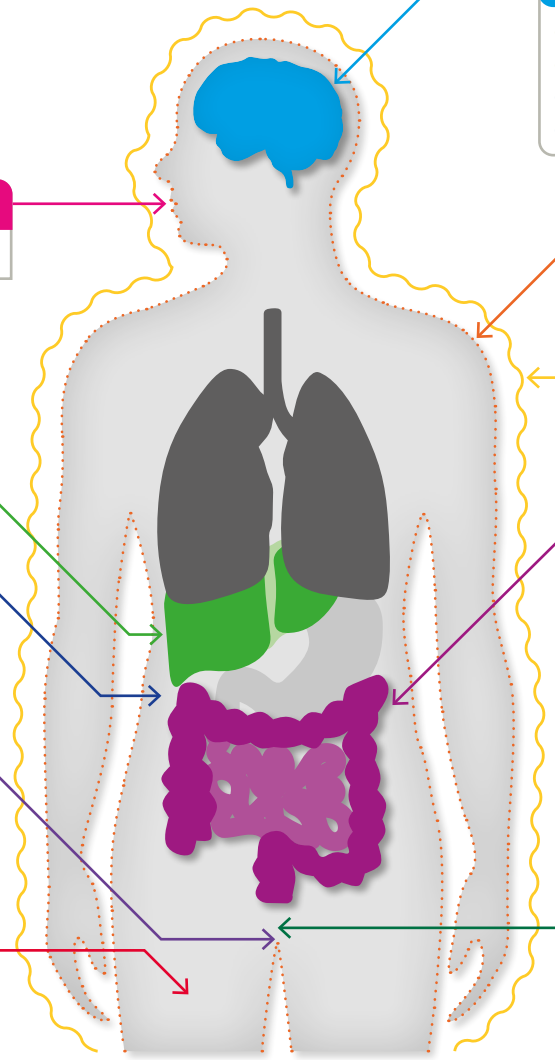
We aim to understand the complex relationship between microbiome and health. Our sequencing technology has enabled us to identify and understand this microbial diversity. There are a different number of health indications that are completely related to our microbial behaviour and to our microbiome.

We approach the development of microbiome solutions in a comprehensive way. We isolate, select, develop, and produce the right strains of bacteria to help enhance the microbiome for overall health.

ADM PROTEXIN
ADM Protexin Limited – is part of the ADM Nutrition division. Based in Somerset, UK, the company offers innovative, research-based, natural healthcare and probiotic supplements for human, pet and production-animal use with distribution in over 90 countries.

The Protexin brand includes multi-strain probiotic ranges, Bio-Kult® and Lepicol® for gut health support and more. ADM Protexin Limited works closely with leading universities, hospitals and research centres around the world, ensuring it remains at the forefront of probiotics research.

Select the indication to find out more about the strains and the research behind them



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Brain - Migraine

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BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus plantarum* PXN® 47™
- *Lactobacillus rhamnosus* PXN® 54™
- *Bacillus subtilis* PXN® 21®
- *Bifidobacterium bifidum* PXN® 23™
- *Bifidobacterium breve* PXN® 25™
- *Bifidobacterium longum* PXN® 30™
- *Lactobacillus acidophilus* PXN® 35™
- *Lactococcus lactis* ssp. *lactis* PXN® 63™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium infantis* PXN® 27™
- *Lactobacillus delbrueckii* ssp. *Bulgaricus* PXN® 39™
- *Lactobacillus helveticus* PXN® 45™
- *Lactobacillus salivarius* PXN® 57™

Beyond the Bacteria

No refrigeration needed

24 months stored at recommended temperature range

No artificial colours or flavours

Proven to survive the high acidity of stomach acid

TRIAL SUMMARY

View our infographic detailing method, results and conclusions here

RESEARCH REFERENCE

Martami F, Togha M, Seifishahpar M, et al. The effects of a multispecies probiotic supplement on inflammatory markers and episodic and chronic migraine characteristics: A randomized double-blind controlled trial. *Cephalalgia* Jan 2019.

Naghibi M, Day R, Stone S, Harper A. Probiotics for the Prophylaxis of Migraine: A Systematic Review of Randomized Placebo Controlled Trials. *Journal of Clinical Medicine* 2019; **8**; 1441

KEY FINDINGS

This is the first probiotic to show a significant benefit in migraine management in a randomised controlled trial. In this trial of 100 adults with either episodic or chronic migraine, those taking probiotics experienced substantial reductions in headache frequency, headache severity and use of migraine medications.

Brain - Parkinson's

RETURN TO INDICATIONS

BACTERIA FORMULATION

Bacillus subtilis PXN® 21®

Beyond the Bacteria

No refrigeration needed

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Proven to survive the high acidity of stomach acid

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KEY FINDINGS

Parkinson's disease is typified by the presence of intraneuronal α-synuclein aggregation and subsequent degradation of dopaminergic regions of the brain. Recently the gut microbiome has been implicated in the pathophysiology of Parkinson's disease. In this ground-breaking pre-clinical research, the probiotic strain *Bacillus subtilis* PXN® 21® is shown to inhibit α-synuclein aggregation and even clear pre-formed aggregates, in a Caenorhabditis elegans model. It is thought that *B. subtilis* PXN® 21® alters the lipid composition of the cell, favourably altering α-synuclein aggregation. Currently only symptomatic treatments are available for Parkinson's disease; therapeutic interventions that ameliorate α-synuclein aggregation represent a truly exciting breakthrough for future clinical research into disease modifying treatments for Parkinson's disease.

TRIAL SUMMARY

View our infographic detailing method, results and conclusions here

RESEARCH REFERENCE

Goya M, Xue F, Sampedro-Torres-Quevedo *et al*. *Probiotic Bacillus subtilis* Protects against α-Synuclein Aggregation in *C. elegans*. *Cell Rep* 2020; **30**(2):367-380.e7

Digestive Health - Functional Constipation

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium longum* PXN® 30™
- *Lactobacillus bulgaricus* PXN® 39™
- Fructooligosaccharide (FOS)

Beyond the Bacteria

- No refrigeration needed
- 24 months stored at recommended temperature range
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- Proven to survive the high acidity of stomach acid

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RESEARCH REFERENCE

Fateh R, Iravani S, Frootan M, Rasouli MR, Saadat S. Synbiotic preparation in men suffering from functional constipation: a randomised controlled trial. *Swiss Med Wkly* 2011;**141**:w13239.

KEY FINDINGS

Protexin probiotics achieved a significant increase in weekly bowel movements in adult men suffering with functional constipation. The participants also benefited from significant improvements in other symptoms such as stomach cramps.

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium infantis* PXN® 27™
- *Lactobacillus bulgaricus* PXN® 39™
- FOS (Fructooligosaccharide)

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KEY FINDINGS

Protexin probiotics have demonstrated a significant benefit in the management of functional constipation in children in two randomised controlled trials (total children tested = 158). In the earlier study Protexin probiotics were effective when used alone and in both trials they were effective adjuncts to other treatments.

RESEARCH REFERENCE

Khodadad A, Sabbaghian M. Role of synbiotics in the treatment of childhood constipation: a double-blind randomized placebo controlled trial. *Iran J Pediatr* 2010;**20**:387-392.

Sadeghzadeh M, Rabieefar A, Khoshnevisasl P, Mousavinasab N, Eftekhari K. The effect of probiotics on childhood constipation: a randomized controlled double blind clinical trial. *Int J Pediatr* 2014;**2014**:937212.

Digestive Health - Eradication of *Helicobacter Pylori*

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium infantis* PXN® 27™
- *Lactobacillus bulgaricus* PXN® 39™
- FOS (Fructooligosaccharide)

Beyond the Bacteria

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KEY FINDINGS

In this randomised, placebo controlled trial Protexin probiotics significantly enhanced *H. pylori* eradication rates whilst also decreasing the side effect of diarrhoea commonly associated with triple therapy. The benefits observed in *H. pylori* management exceed the average demonstrated in other similar trials.

RESEARCH REFERENCE

Khodadad A, Farahmand F, Najafi M, Shoaran M. Probiotics for the treatment of pediatric *Helicobacter pylori* infection: a randomized double blind clinical trial. *Iran J Pediatr* 2013;**23**:79–84.

BACTERIA FORMULATION

Bifidobacterium longum subsp. *infantis strain* CECT 7210

Beyond the Bacteria

24 months stored at recommended temperature range

KEY FINDINGS

In vivo and in vitro testing have shown this probiotic strain to significantly inhibit rotavirus replication and to protect cells from rotavirus infection. While in clinical testing, babies fed formula containing this same probiotic strain were found to experience fewer episodes of diarrhoea than infants fed using formula without the added probiotic.

RESEARCH REFERENCE

Moreno J, Chenoll E, Casinos B, *et al*. Novel probiotic *Bifidobacterium longum* subsp. *infantis* CECT 7210 strain active against rotavirus infections. *Applied Environmental Microbiology* 2011;**77**: 8775-8783

Chenoll E, Rivero M, Codoñer F, *et al*. Complete genome sequence of *Bifidobacterium longum* subsp. *infantis* strain CECT 7210, a probiotic strain active against rotavirus infections. *Genome Anouncements* 2015;**3**: e00105-15

Escribano J, Ferre´ N, Gispert-Llaurado M, *et al. Bifidobacterium longum* subsp *infantis* CECT7210 supplemented formula reduces diarrhoea in healthy infants: a randomized controlled trial. *Accepted in Pediatric Research* 2018

Chenoll E, Casinos B, E, Bataller E, *et al*. Identification of a peptide produced by *Bifidobacterium longum* CECT 7210 with antirotaviral activity. *Frontiers in Microbiology* 2016;**7**: 655. doi: 10.3389/fmicb.2016.00655

Barba-Vidal E, Castillejos L, López-Colom P, Rivero M, Moreno J, Martín-Orúe S. Evaluation of the probiotic strain *Bifidobacterium longum* subsp. *infantis* CECT 7210 capacities to improve health status and fight digestive pathogens in a piglet model. *Frontiers in Microbiology* 2017;**8**: 533. doi: 10.3389/fmicb.2017.00533

Digestive Health - Celiac Disease

RETURN TO INDICATIONS

BACTERIA FORMULATION

Bifidobacterium longum ES1

Beyond the Bacteria

24 months stored at recommended temperature range

RESEARCH REFERENCE

Olivares M, Castillejo G, Varea V, Sanz Y. Double-blind, randomized, placebo-controlled intervention trial to evaluate the effects of *Bifidobacterium longum* CECT 7347 on children with newly diagnosed celiac disease. *British Journal of Nutrition* 2014;**112**: 30-40.

de Palma G, Kamanova J, Cinova J, et al Modulation of phenotypic and functional maturation of dendritic cells by intestinal bacteria and gliadin: relevance for celiac disease. *Journal of Leukocyte Biology* 2012;**92**: 1043-1054

Medina M, de Palma G, Ribes-Koninckx C, Calabuig M, Sanz Y. *Bifidobacterium* strains suppress in vitro the pro-inflammatory milieu triggered by the large intestinal microbiota of coeliac patients. *Journal of Inflammation* 2008;**3**: 5-19

KEY FINDINGS

Both pre-clinical and clinical data illustrating the interactions between the immune system and the intestinal microbiota and how they may play a role in celiac disease.

Digestive Health - Inflammation

RETURN TO INDICATIONS

BACTERIA FORMULATION

Lactobacillus paracasei CNCM I-4034

Bifidobacterium breve CNCM I-4035

Lactobacillus rhamnosus CNCM I-4036

Beyond the Bacteria

24 months stored at recommended temperature range

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RESEARCH REFERENCE

Bermudez-Brito M, Munoz-Quezada S, Gomez-Llorente C, Romero F, Gil A. *Lactobacillus rhamnosus* and its cell-free culture supernatant differentially modulate inflammatory biomarkers in *Escherichia coli*-challenged human dendritic cells. *British Journal of Nutrition* 2014;**111**(10), 1727-1737.

KEY FINDINGS

The cell-free supernatant (CFS) of this probiotic strain (CNCM I-4036) exhibited an extraordinary ability to suppress the production of pro-inflammatory cytokines made by dendritic cells and may be used as an effective and safe alternative to live bacteria.

Digestive Health - IBS

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus plantarum* PXN® 47™
- *Lactobacillus rhamnosus* PXN® 54™
- *Bacillus subtilis* PXN® 21®
- *Bifidobacterium bifidum* PXN® 23™
- *Bifidobacterium breve* PXN® 25™
- *Bifidobacterium longum* PXN® 30™
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- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium infantis* PXN® 27™
- *Lactobacillus delbrueckii* ssp. *Bulgaricus* PXN® 39™
- *Lactobacillus helveticus* PXN® 45™
- *Lactobacillus salivarius* PXN® 57™

Beyond the Bacteria

- No refrigeration needed
- 24 months stored at recommended temperature range
- No artificial colours or flavours
- Proven to survive the high acidity of stomach acid

KEY FINDINGS

This randomised, placebo controlled trial found clinically and statistically significant improvements in abdominal pain, bloating and quality of life over a 4 month intervention period with probiotic vs placebo. This is the largest probiotic trial conducted in IBS-diarrhoea patients (400 total). It is also the largest probiotic trial in IBS as of 2019. A review of probiotics in IBS management published in 2018 included 53 studies, of these only 7 involved 200 or more patients.

TRIAL SUMMARY

View our infographic detailing method, results and conclusions here

RESEARCH REFERENCE

Ishaque SM, Khosruzzaman SM, Ahmed DS, Sah MP. A randomized placebo-controlled clinical trial of a multi-strain probiotic formulation (Bio-Kult®) in the management of diarrhea-predominant irritable bowel syndrome. *BMC Gastroenterol* 2018;**18**:71

Digestive Health - Infectious Diarrhoea

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium infantis* PXN® 27™
- *Lactobacillus bulgaricus* PXN® 39™
- FOS (Fructooligosaccharide)

Beyond the Bacteria

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KEY FINDINGS

This unique combination of probiotic strains has demonstrated reproducible efficacy in the management of infectious diarrhoea in paediatric populations. In three separate trials, including patients from 2 months up to 12 years of age, significant improvements were noted in clinical outcomes for individuals with infectious diarrhoea.

RESEARCH REFERENCE

Yala ET. The clinical efficacy of multi-strain probiotics (Protexin) in the management of acute gastroenteritis in children two months to two years old. *Pidsp* 2010;**11**:86–91.

'García-Menor E, García-Marín F, Vecino-López R, *et al*. A Multicenter, Prospective, Randomized Controlled Trial to Evaluate the Additional Benefit of a Multistrain Synbiotic (Prodefen®) in the Clinical Management of Acute Viral Diarrhea in Children. *Glob Pediatr Heal* 2016;**3**:2333794X16679587.

Sobouti B, Ashraf H. Use of Probiotic for the Treatment of Acute Rotavirus Diarrhea in Children: a Randomized Single-Blind Controlled Trial. *Int J Child Adolesc Orig Artic IJCA* 2016;**2**(4):5–9.

Digestive Health - Infant Colic

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium infantis* PXN® 27™
- *Lactobacillus bulgaricus* PXN® 39™
- FOS (Fructooligosaccharide)

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KEY FINDINGS

This combination of seven probiotic strains plus the prebiotic FOS was effective at reducing unexplained crying time in infants with colic in over 80% of participants. The probiotic strains included in this consortia have been used safely in infants from birth.

TRIAL SUMMARY

View our infographic detailing method, results and conclusions here

RESEARCH REFERENCE

Kianifar H, Ahanchian H, Grover Z, *et al*. Synbiotic in the management of infantile colic: a randomised controlled trial. *J Paediatr Child Health* 2014;**50**:801-5.

BACTERIA FORMULATION

Bifidobacterium longum ES1

Lactobacillus rhamnosus BPL15

Beyond the Bacteria

24 months stored at recommended temperature range

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RESEARCH REFERENCE

Valcarce D, Genovés S, Riesco M, Herráez M, Ramón D, Robles V. Probiotic administration improves sperm motility in asthenozoospermic human donors. *Beneficial Microbes* 2017; **8**: 193-206.

KEY FINDINGS

After three weeks of daily supplementation, individuals taking these three probiotic strains showed a statistically significant improvement in rates of sperm DNA fragmentation, reduced reactive oxygen species and a large improvement in sperm motility.

BACTERIA FORMULATION

Lactobacillus paracasei CNCM I-4034

Bifidobacterium breve CNCM I-4035

Lactobacillus rhamnosus CNCM I-4036

Beyond the Bacteria

24 months stored at recommended temperature range

KEY FINDINGS

The probiotic strains included here have been shown to have a number of immunomodulatory effects. *Bifidobacterium breve* CNCM I-4035 administration resulted in a significant increase in secretory IgA levels after the 30-day intervention. Furthermore, increased levels of anti-inflammatory molecules (IL-4, IL-10, IL-10/IL-12) and decreased levels of pro-inflammatory molecules (TNF-α/IL-10) were found in the serum of volunteers taking *Lactobacillus rhamnosus* CNCM I-4036.

RESEARCH REFERENCE

Munoz-Quezada S, Chenoll E, Vieites J, *et al*. Isolation, identification and characterisation of three novel probiotic strains (*Lactobacillus paracasei* CNCM I-4034, *Bifidobacterium breve* CNCM I-4035 and *Lactobacillus rhamnosus* CNCM I-4036) from the faeces of exclusively breast-fed infants. *British Journal of Nutrition* 2013;**109**(S2), S51-S62.

Munoz-Quezada S, Bermudez-Brito M, Chenoll E, *et al*. Competitive inhibition of three novel bacteria isolated from faeces of breast milk-fed infants against selected enteropathogens. *British Journal of Nutrition* 2013;**109**(S2), S63-S69.

Plaza-Diaz J, Gomez-Llorente C, Campaña-Martin L, *et al*. Safety and immunomodulatory effects of three probiotic strains isolated from the feces of breast-fed infants in healthy adults: SETOPROB study. *PLoS One* 2013;**8**(10), e78111.

Plaza-Diaz J, Gomez-Llorente C, Abadia-Molina F, *et al*. Effects of *Lactobacillus paracasei* CNCM I-4034, *Bifidobacterium breve* CNCM I-4035 and *Lactobacillus rhamnosus* CNCM I-4036 on hepatic steatosis in Zucker rats. *PloS one* 2014;**9**(5), e98401.

Plaza-Díaz J, Fernández-Caballero J, Chueca N, *et al*. Pyrosequencing analysis reveals changes in intestinal microbiota of healthy adults who received a daily dose of immunomodulatory probiotic strains. *Nutrients* 2015;**7**(6), 3999-4015.

Liver - Non Alcoholic Fatty Liver Disease (NAFLD)

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium longum* PXN® 30™
- *Lactobacillus bulgaricus* PXN® 39™
- Fructooligosaccharide (FOS)

Beyond the Bacteria

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KEY FINDINGS

In this randomised, double blind placebo controlled trial, 52 patients with non-alcoholic fatty liver disease (NAFLD) were supplemented daily for 28 weeks with either a synbiotic or placebo. Following the intervention, statistically significant improvements were noted in multiple metrics, including ALT, AST γ-glutamyltransferase, high-sensitivity CRP, TNF-α and fibrosis (as measured by transient elastography). Overall, synbiotic supplementation in addition to lifestyle modification was found to be superior to lifestyle modification alone for the treatment of NAFLD.

RESEARCH REFERENCE

Eslamparast T, Poustchi H, Zamani F, Sharafkhah M, Malekzadeh R, Hekmatdoost A. Synbiotic supplementation in non-alcoholic fatty liver disease: a randomized, double-blind, placebo-controlled pilot study. *Am J Clin Nutr* 2014;**99**:535-42.

Liver - Liver Enzymes in Non-Alcoholic Steato-hepatitis (NASH)

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium longum* PXN® 30™
- *Lactobacillus bulgaricus* PXN® 39™
- Fructooligosaccharide (FOS)

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KEY FINDINGS

Non-alcoholic steato-hepatitis (NASH) is a progressive form of liver injury that carries a risk of progressive fibrosis and cirrhosis. In this human clinical trial patients were randomised to receive either metformin plus placebo or metformin plus probiotics for six months. The probiotic group demonstrated a statistically significant improvement over placebo in measurements of liver health including liver enzymes and ultrasound grading of NASH severity.

RESEARCH REFERENCE

Shavakhi A, Minakari M, Firouzian H, Assali R, Hekmatdoost A, Ferns G. Effect of a Probiotic and Metformin on Liver Aminotransferases in Non-alcoholic Steatohepatitis: A Double Blind Randomized Clinical Trial. *Int J Prev Med* 2013;**4**:531–7.

Liver - Hepatic Encepalopathy

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium longum* PXN® 30™
- *Lactobacillus bulgaricus* PXN® 39™
- Fructooligosaccharide (FOS)
- Vitamin C
- Vitamin A
- Vitamin E

Beyond the Bacteria

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KEY FINDINGS

Minimal hepatic encephalopathy (MHE) is a neurocognitive dysfunction that is present in many patients with liver cirrhosis. In this human clinical trial, it is shown that this probiotic consortia can lead to significant improvement in MHE status following two weeks of supplementation. Interestingly, these effects persisted after the end of the two week supplementation period.

RESEARCH REFERENCE

Shavakhi A, Hashemi H, Tabesh E *et al*. Multistrain probiotic and lactulose in the treatment of minimal hepatic encephalopathy. *J Res Med Sci* 2014;**19**:703-8

Liver - Liver Iron Mobilisation

RETURN TO INDICATIONS

BACTERIA FORMULATION

Bifidobacterium longum ES1

Beyond the Bacteria

26 months stored at recommended temperature range

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RESEARCH REFERENCE

Laparra J, Olivares M, Sanz Y. Oral administration of *Bifidobacterium longum* CECT 7347 ameliorates gliadin-induced alterations in liver iron mobilization. *British Journal of Nutrition* 2013;**110**: 1828-1836

KEY FINDINGS

This pre-clinical trial data indicates that oral administration of *Bifidobacterium longum* ameliorates gliadin-mediated perturbations in liver iron deposition and mobilisation. This research provides an exciting insight into how this probiotic strain might be utilised to help manage certain aspects of celiac disease.

Metabolic Syndrome - Insulin Resistance in Patients with Metabolic Syndrome / Obesity

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium longum* PXN® 30™
- *Lactobacillus bulgaricus* PXN® 39™
- Fructooligosaccharide (FOS)

Beyond the Bacteria

- No refrigeration needed
- 24 months stored at recommended temperature range
- No artificial colours or flavours
- Proven to survive the high acidity of stomach acid

KEY FINDINGS

After 28 weeks of treatment with this synbiotic, fasting blood sugar and insulin resistance improved significantly compared to placebo. Participants also experienced significant reductions in triglyceride levels, total cholesterol and HDL. Overall synbiotic supplementation was found to increase the efficacy of diet and lifestyle interventions in the management of metabolic syndrome and insulin resistance.

RESEARCH REFERENCE

Eslamparast T, Zamani F, Hekmatdoost A, *et al*. Effects of synbiotic supplementation on insulin resistance in subjects with the metabolic syndrome: a randomised, double-blind, placebo-controlled pilot study. *Br J Nutr* 2014;**112**:438-45.

Metabolic Syndrome - Metabolic Health/Abdominal Fat Reduction

RETURN TO INDICATIONS

BACTERIA FORMULATION

Bifidobacterium animalis subsp. *lactis* BPL1

Beyond the Bacteria

24 months stored at recommended temperature range

KEY FINDINGS

In multiple animal models and also a human clinical trial, this probiotic strain has been shown to have the potential to affect multiple anthropometric biomarkers. In the human clinical trial both the live bacteria and a heat-treated version were shown to favourably affect metrics such as visceral fat volumes, BMI, HOMA and diastolic blood pressure. Of note, in a concurrent microbiome analysis, levels of *Akkermansia* spp. were noted to have increased significantly following the intervention.

RESEARCH REFERENCE

Chenol, E, Codoñer F, Silva, A, et al. Draft genome sequence of *Bifidobacterium animalis* subsp. *lactis* strain CECT 8145, able to improve metabolic syndrome *in vivo*. *Genome announcement* 2014;**2**(2), e00183-14.

Martorell P, Llopis S, González N, *et al*. Probiotic strain *Bifidobacterium animalis* subsp. *lactis* CECT 8145 reduces fat content and modulates lipid metabolism and antioxidant response in *Caenorhabditis elegans*. *Journal of agricultural and food chemistry* 2016;**64**(17), 3462-3472.

Caimari A, del Bas J, Boqué N, *et al*. Heat-killed *Bifidobacterium animalis* subsp. *lactis* CECT 8145 increases lean mass and ameliorates metabolic syndrome in cafeteria-fed obese rats. *Journal of Functional Foods* 2017;**38**, 251-263.

Carreras N, Martorell P, Chenoll E, Genovés S, Ramón D, Aleixandre A. Anti-obesity properties of the strain *Bifidobacterium animalis* subsp. *lactis* CECT 8145 in Zücker fatty rats. *Beneficial microbes* 2018;**1-14**.

Pedret A, Valls R, Calderón-Pérez L, *et al*. Effects of daily consumption of the probiotic *Bifidobacterium animalis* subsp. *lactis* CECT 8145 on anthropometric adiposity biomarkers in abdominally obese subjects: a randomized controlled trial. *International Journal of Obesity* 2018;**1**.

Guerola P, Cuadros M, Vidal D, *et al*. U.S. Patent Application No. 14/905,270. 2016

Other - Cystic Fibrosis

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium infantis* PXN® 27™
- *Lactobacillus bulgaricus* PXN® 39™
- FOS (Fructooligosaccharide)

Beyond the Bacteria

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KEY FINDINGS

This blend of seven probiotic strains plus FOS has been shown to signifcantly reduce levels of faecal calprotectin (a marker of intestinal inflammation) in children diagnosed with cystic fibrosis. In a separate clinical trial, this blend was shown to reduce the number of pulmonary exacerbations compared to placebo.

RESEARCH REFERENCE

Fallahi G, Motamed F, Yousefi A, *et al*. The effect of probiotics on fecal calprotectin in patients with cystic fibrosis. *Turk J Pediatr* 2013;**55**:475-8.

Jafari S, Mehdizadeh-Hakkak A, Kianifar H, Hebrani P, Ahanchian H, Abbasnejad E. Effects of probiotics on quality of life in children with cystic fibrosis; a randomized controlled trial. *Iran J Pediatr* 2013; **23**(6):669-74

Other - Necrotising Enterocolitis

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium infantis* PXN® 27™
- *Lactobacillus bulgaricus* PXN® 39™
- FOS (Fructooligosaccharide)

Beyond the Bacteria

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KEY FINDINGS

Necrotising enterocolitis (NEC) is a serious gastrointestinal diagnosis affecting pre-term neonates. In this human clinical trial, the incidence of NEC was significantly reduced amongst neonates treated with this unique blend of probiotics and prebiotic compared to those given placebo.

RESEARCH REFERENCE

Amini E, Dalili H, Niknafs N, Shariat M, Nakhostin M, Jedari-Attari S. The Effect of Probiotics in Prevention of Necrotising Enterocolitis in Preterm Neonates in Comparison with Control Group. *Iranian Journal of Pediatrics* 2017;**27**(6).

Other - Antioxidant Status of Human Breast Milk

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus acidophilus* PXN® 35™
- *Lactobacillus casei* PXN® 37™
- *Lactobacillus bulgaricus* PXN® 39™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Bifidobacterium longum* PXN® 30™
- Fructooligosaccharide (FOS)

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RESEARCH REFERENCE

Mahdavi R, Taghipour S, Ostadrahimi A, Nikniaz L, Hezaveh SJG. A pilot study of synbiotic supplementation on breast milk mineral concentrations and growth of exclusively breast fed infants. *J Trace Elem Med Biol* 2015;**30**:25-29

KEY FINDINGS

Daily synbiotic supplementation of breastfeeding mothers was associated with a statistically significant increase in breastmilk concentration of zinc, copper, iron, magnesium and calcium. This pilot study showed that the administration of synbiotics may prevent the reduction of mineral levels in breastmilk and improve infants' growth.

Skin Health - Atopic Dermatitis in Children

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium infantis* PXN® 27™
- *Lactobacillus bulgaricus* PXN® 39™
- FOS (Fructooligosaccharide)

Beyond the Bacteria

- No refrigeration needed
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KEY FINDINGS

This randomised, double blind, placebo controlled clinical trial analysed the effect of a seven strain synbiotic on the management of atopic dermatitis in children aged 3 months to 6 years of age. Children in the synbiotic group achieved substantial and statistically significant reductions in symptoms of atopic dermatitis after only 4 weeks.

RESEARCH REFERENCE

Farid R, Ahanchian H, Jabbari F, Moghiman T. Effect of a new symbiotic mixture on atopic dermatitis in children: a randomized-controlled trial. *Iran J Pediatr* 2011;**21**:225-30.

Skin Health - Atopic Dermatitis

RETURN TO INDICATIONS

BACTERIA FORMULATION

Bifidobacterium animalis subsp. *lactis* BPL1

Bifidobacterium longum ES1

Lactobacillus casei BPL4

Beyond the Bacteria

24 months stored at recommended temperature range

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RESEARCH REFERENCE

Navarro-López V, Ramírez-Boscá A, Ramón-Vidal D, et al. Effect of Oral Administration of a Mixture of Probiotic Strains on SCORAD Index and Use of Topical Steroids in Young Patients With Moderate Atopic Dermatitis: A Randomized Clinical Trial. *JAMA dermatology* 2018;**154**(1), 37-43.

KEY FINDINGS

This randomised, placebo controlled human clinical trial demonstrated a strong and statistically significant improvement in symptoms of atopic dermatitis following 12 weeks of probiotic supplementation. Children taking the probiotics saw reductions in their overall symptoms and saw reductions in their use of topical steroid treatments relative to the placebo group.

Skin Health - Psoriasis

RETURN TO INDICATIONS

BACTERIA FORMULATION

Bifidobacterium animalis subsp. *lactis* BPL1

Bifidobacterium longum ES1

Lactobacillus rhamnosus BPL15

Beyond the Bacteria

24 months stored at recommended temperature range

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RESEARCH REFERENCE

Codoñer F, Ramírez-Bosca A, Climent E, et al. Gut microbial composition in patients with psoriasis. *Scientific reports* 2018;**8**(1), 3812.

Navarro-López V, Martínez-Andrés A, Ramírez-Boscà A, *et al* Efficacy and Safety of Oral Administration of a Mixture of Probiotic Strains in Patients with Psoriasis: a Randomized Controlled Clinical Trial Acta Derm Venereol 2019

KEY FINDINGS

This is the first study to successfully characterise the gut microbiome of individuals diagnosed with psoriasis. The microbiome of a cohort of 52 psoriatic patients was obtained using 16s rRNA massive sequencing with an average of 85,000 sequences per sample. The results of this analysis shows for the first time a specific psoriatic core intestinal microbiome that clearly differs from that present in non-psoriatic populations. This data can now be used to help create tailored microbiome therapeutics for patients living with psoriasis.

Women's Health - Recurrent Urinary Tract Infections

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus acidophilus* PXN® 35™
- *Lactobacillus plantarum* PXN® 47™
- Cranberry extract
- Vitamin A

Beyond the Bacteria

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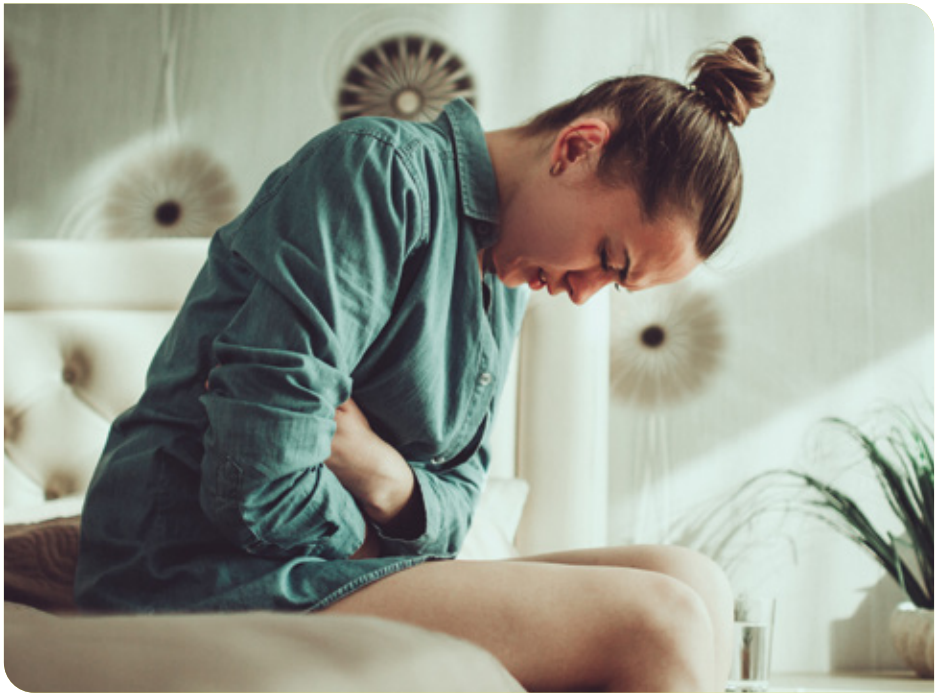
KEY FINDINGS

This randomised, double blind, placebo controlled human clinical trial is the first to find a statistically significant benefit of an oral probiotic in the prevention of recurrent urinary tract infections in adult women. Taken daily for 26 weeks, these two probiotic strains significantly reduced the number of urinary tract infections when compared to placebo. There were also statistically significant improvements in the time to first UTI, the duration of active infection and the median duration of antibiotic treatments.



TRIAL SUMMARY

View our infographic detailing method, results and conclusions here

RESEARCH REFERENCE

Koradia P, Kapadia S, Trivedi Y, Chanchu G, Harper A. Probiotic and cranberry supplementation for preventing recurrent uncomplicated urinary tract infections in premenopausal women: a controlled pilot study. *Expert Rev Anti Infect Ther* 2019; **17**: 733-740

Women's Health - Bacterial Vaginosis

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium longum* PXN® 30™
- *Lactobacillus bulgaricus* PXN® 39™
- Fructooligosaccharide (FOS)
- Vitamin C
- Vitamin A
- Vitamin E

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RESEARCH REFERENCE

Tafazzoli-harandi H, Akbari SAAA, Afrakhteh M, *et al*. Comparison of metronidazole versus a combination of metronidazole plus probiotics in the treatment of bacterial vaginosis. *J Women's Heal Issues Care* 2014;**3**:

KEY FINDINGS

The use of these unique probiotic strains as an adjunct to conventional metronidazole therapy led to a significant improvement in treatment success rates when compared to metronidazole alone. Treatment success in the group treated with metronidazole alone was 67.5% compared to a treatment success rate of 87.5% in the metronidazole plus probiotic group.

Women's Health - Vulvovaginal *Candidiasis*

RETURN TO INDICATIONS

BACTERIA FORMULATION

- *Lactobacillus casei* PXN® 37™
- *Lactobacillus rhamnosus* PXN® 54™
- *Streptococcus thermophilus* PXN® 66™
- *Bifidobacterium breve* PXN® 25™
- *Lactobacillus acidophilus* PXN® 35™
- *Bifidobacterium longum* PXN® 30™
- *Lactobacillus bulgaricus* PXN® 39™
- Fructooligosaccharide (FOS)
- Vitamin C
- Vitamin A
- Vitamin E

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RESEARCH REFERENCE

S. Nouraei, S. Amir Ali Akbari, M. Jorjani et al. Comparison between Fluconazole with Oral Protexin Combination and Fluconazole in the Treatment of Vulvovaginal Candidiasis. *ISRN Obstet Gynecol* 2012:**1–10**.

KEY FINDINGS

Complementary treatment with these seven probiotic strains increased the efficacy of treatment of vulvovaginal *Candidiasis* with fluconazole. Fluconazole plus probiotics resulted in 84.4% treatment success rate, compared to 60% treatment success in the fluconazole plus placebo group.

Summary

TOPIC	INDICATION	SUBJECT	FORMULATION	BACTERIA	INTERESTED
BRAIN	Migraine	Adult	14 strain mix	*Lactobacillus casei* PXN® 37™, *Lactobacillus plantarum* PXN® 47™, *Lactobacillus rhamnosus* PXN® 54™, *Bacillus subtilis* PXN® 21®, *Bifidobacterium bifidum* PXN® 23™, *Bifidobacterium breve* PXN® 25™, *Bifidobacterium longum* PXN® 30™, *Lactobacillus acidophilus* PXN® 35™, *Lactococcus lactis* ssp. *lactis* PXN® 63™, *Streptococcus thermophilus* PXN® 66™, *Bifidobacterium infantis* PXN® 27™, *Lactobacillus delbrueckii* ssp. *Bulgaricus* PXN® 39™, *Lactobacillus helveticus* PXN® 45™, *Lactobacillus salivarius* PXN® 57™.	
DIGESTIVE HEALTH	IBS	Adult	14 strain mix		
DIGESTIVE HEALTH	Constipation	Child	7 strain mix	*Lactobacillus casei* PXN® 37™, *Lactobacillus rhamnosus* PXN® 54™, *Streptococcus thermophilus* PXN® 66™, *Lactobacillus acidophilus* PXN® 35™, *Bifidobacterium breve* PXN® 25™, *Bifidobacterium infantis* PXN® 27™, *Lactobacillus delbrueckii* ssp. *Bulgaricus* PXN® 39™	
DIGESTIVE HEALTH	Eradication of *Helicobacter Pylori*	Child	7 strain mix		
DIGESTIVE HEALTH	Infant Colic	Child	7 strain mix		
DIGESTIVE HEALTH	Infectious Diarrhoea	Child	7 strain mix		
OTHER	Cystic Fibrosis	Child	7 strain mix		
OTHER	Necrotising Enterocolitis	Child	7 strain mix		
SKIN	Atopic Dermatitis in Children	Child	7 strain mix		
DIGESTIVE HEALTH	Functional Constipation	Adult	7 strain mix	*Lactobacillus casei* PXN® 37™, *Lactobacillus rhamnosus* PXN® 54™, *Streptococcus thermophilus* PXN® 66™, *Lactobacillus acidophilus* PXN® 35™, *Bifidobacterium breve* PXN® 25™, *Bifidobacterium longum* PXN® 30™, *Lactobacillus delbrueckii* ssp. *Bulgaricus* PXN® 39™	
LIVER	Non Alcoholic Fatty Liver Disease (NAFLD)	Adult	7 strain mix		
LIVER	Liver Enzymes in Non-Alcoholic Steato-Hepatitis (NASH)	Adult	7 strain mix		
LIVER	Hepatic Encepalopathy	Adult	7 strain mix		
METABOLIC SYNDROME	Insulin Resistance in Patients with Metabolic Syndrome /Obesity	Adult	7 strain mix		
OTHER	Antioxidant Status of Human Breast Milk	Adult	7 strain mix		
WOMEN'S HEALTH	Bacterial Vaginosis	Adult	7 strain mix		
WOMEN'S HEALTH	Vulvovaginal *Candidiasis*	Adult	7 strain mix		
WOMEN'S HEALTH	Recurrent Urinary Tract Infections	Adult	2 strain mix	*Lactobacillus acidophilus* PXN® 35™, *Lactobacillus plantarum* PXN® 47™	
BRAIN	Parkinson's	Worms	1 strain	*Bacillus subtilis* PXN® 21®	

CONTINUED

Summary

TOPIC	INDICATION	SUBJECT	FORMULATION	BACTERIA	INTERESTED
DIGESTIVE HEALTH	Inflammation	Adult	3 strain	*Lactobacillus paracasei* CNCM I-4034, *Bifidobacterium breve* CNCM I-4035, *Lactobacillus rhamnosus* CNCM I-4036	
IMMUNITY	Boost Immune System	Adult/Child	3 strain		
SKIN	Atopic Dematitis in Adults	Adult	3 strain	*Bifidobacterium animalis* subsp. *Lactis* BPL1, *Bifidobacterium longum* ES1, *Lactobacillus casei* BPL4	
SKIN	Psoriasis	Child	3 strain	*Bifidobacterium animalis* subsp. *Lactis* BPL1, *Bifidobacterium longum* ES1, *Lactobacillus rhamnosus* BPL15	
FERTILITY	Male Fertility	Adult	2 strain	*Bifidobacterium longum* ES1, *Lactobacillus rhamnosus* BPL15	
DIGESTIVE HEALTH	Diarrhoea/Rotavirus	Child	1 strain	*Bifidobacterium longum* subsp. *infantis strain* CECT 7210	
METABOLIC SYNDROME	Weight/Fat Reduction/Satiety	Adult	1 strain	*Bifidobacterium animalis* subsp. *Lactis* BPL1	
DIGESTIVE HEALTH	Celiac Disease	Adult/Child	1 strain	*Bifidobacterium Longum ES1*	
LIVER	Liver Iron Mobilisation	Adult	1 strain		

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