A Three-Layer Synbiotic Strategy for Pediatric Gut and Immune Health

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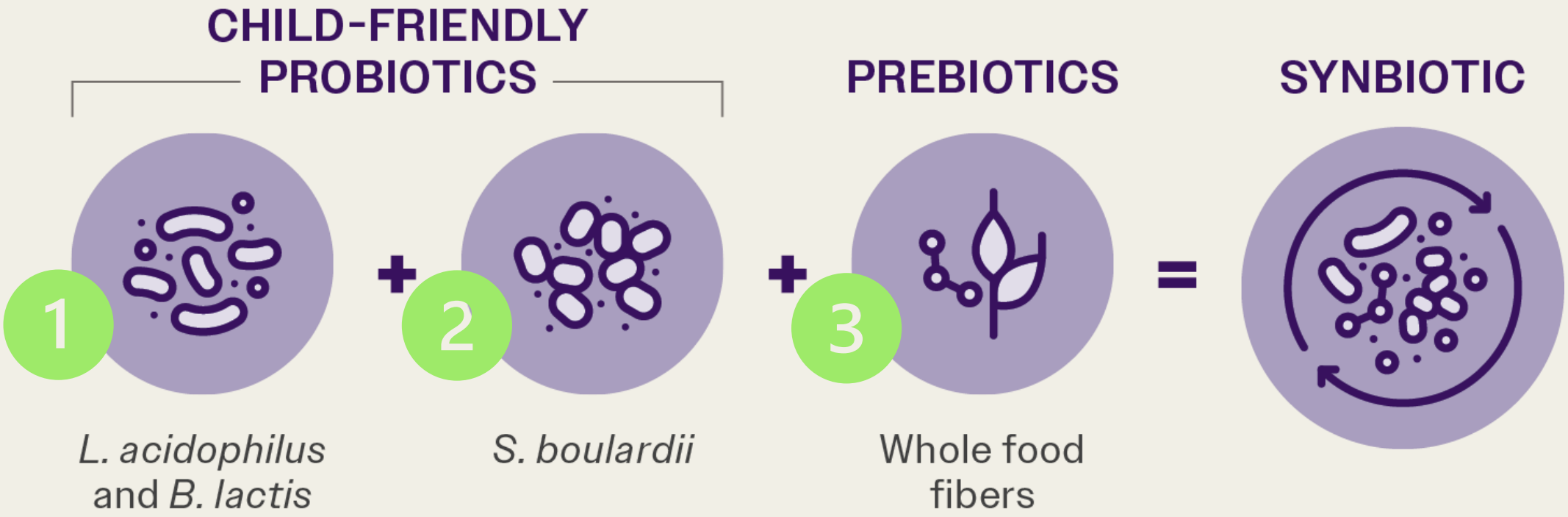
A Three-Layer Synbiotic Strategy



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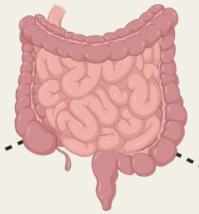
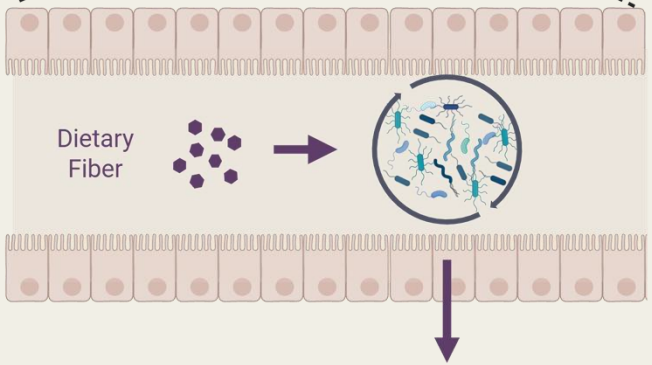
Synbiotic Mechanisms of Action

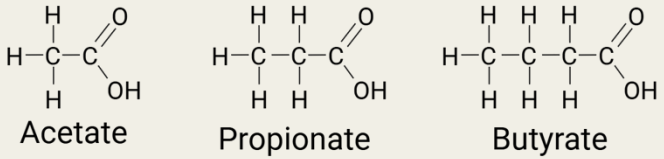
Fiber
Prebiotics
Probiotics



Gut Fermentation



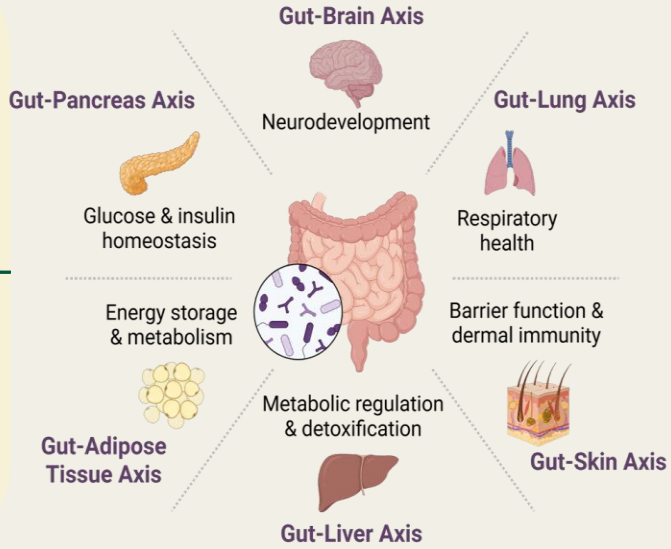
SCFA Production



Absorption & systemic circulation

Benefits

- Enhanced gut barrier integrity
- Energy for intestinal cells
- Immune tolerance
- Allergy reduction
- Skin resilience
- Airway modulation
- Metabolic regulation
- Neuroimmune balance



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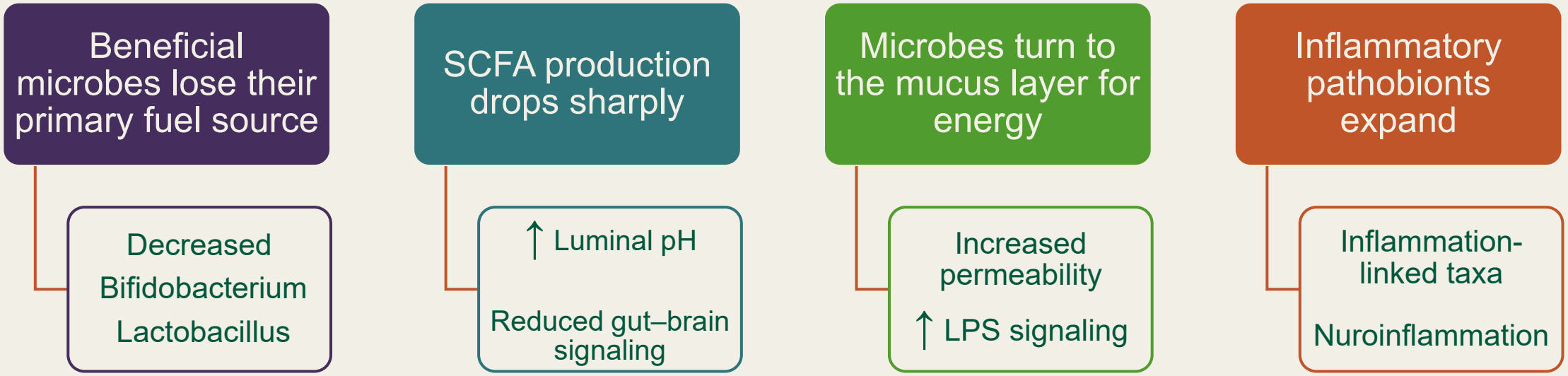
Low Fiber as a Driver of Pediatric Dysbiosis



Low-fiber diets reduce beneficial microbial metabolites while promoting barrier disruption and inflammatory signaling along the gut–brain axis.

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Building a Diverse Fiber Foundation: Key Categories

Insoluble Fiber	Adds bulk; stimulates peristalsis and stool regularity **Sources: Beetroot, Oats, Green Banana Flour**
Soluble Fiber	Forms gels; improves stool transit, slows digestion **Sources: Apple Pectin, Oats, Inulin/FOS**
Resistant Starch	feeds colonic microbes; ferments to SCFAs **Source: Green Banana Flour**
β-Glucans	Viscous gel-forming fiber that supports healthy glycemic patterns and metabolic balance **Source: Oats**
Oligosaccharides	Short-chain fibers that selectively nourish beneficial microbes and support gut and immune development **Sources*:* Chicory Root Derived Inulin/FOS**

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Building a Microbiome Friendly Fiber Foundation

95% of children do not meet daily fiber recommendations

30% of children are affected by constipation

- Different fibers feed different microbes
- Different fibers produce different metabolites
- Fiber diversity promotes microbial cross-feeding

Beetroot

Ancient Oats

Green Banana Flour

Apple Pectin

Chicory Root

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Clinically Studied Microbes in Pediatric Care

Lactobacillus acidophilus DDS-1®

- Well-characterized lactate-producing Lactobacillus species
- Supports microbial cross-feeding and metabolite production

Bifidobacterium lactis UABLA-12®

- Common member of healthy pediatric microbiomes
- Ferments prebiotic fibers and supports SCFA production

Saccharomyces boulardii

- Supports intestinal barrier integrity and immune balance
- Ecosystem stability influences gut–brain communication

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Prebiotic Oligosaccharides

Studied across age groups

- Softer, more frequent stools in infants
- Increased Bifidobacteria abundance
- Reduced atopic dermatitis risk
- SCFA-driven immune maturation

→ Rapid inulin fermentation may cause gassiness at higher doses
→ Diverse fiber blends slow and extend fermentation, improving tolerance

FOS provides a prebiotic fermentable substrate that supports probiotic function, including strains such as DDS-1 and UABLA-12, reinforcing synbiotic synergy.

Vandenplas et al., Br J Nutr, 2015 – Prebiotics in infant formula
Closa-Monasterolo et al., Clin Nutr, 2013 – Inulin/FOS safety & efficacy
Moro et al., Arch Dis Child, 2006 – Prebiotics & atopic dermatitis

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Prebiotic Support for Healthy Gut Function in Children

2 g/day oligofructose (Inulin derived- FOS), ages 7-9 months

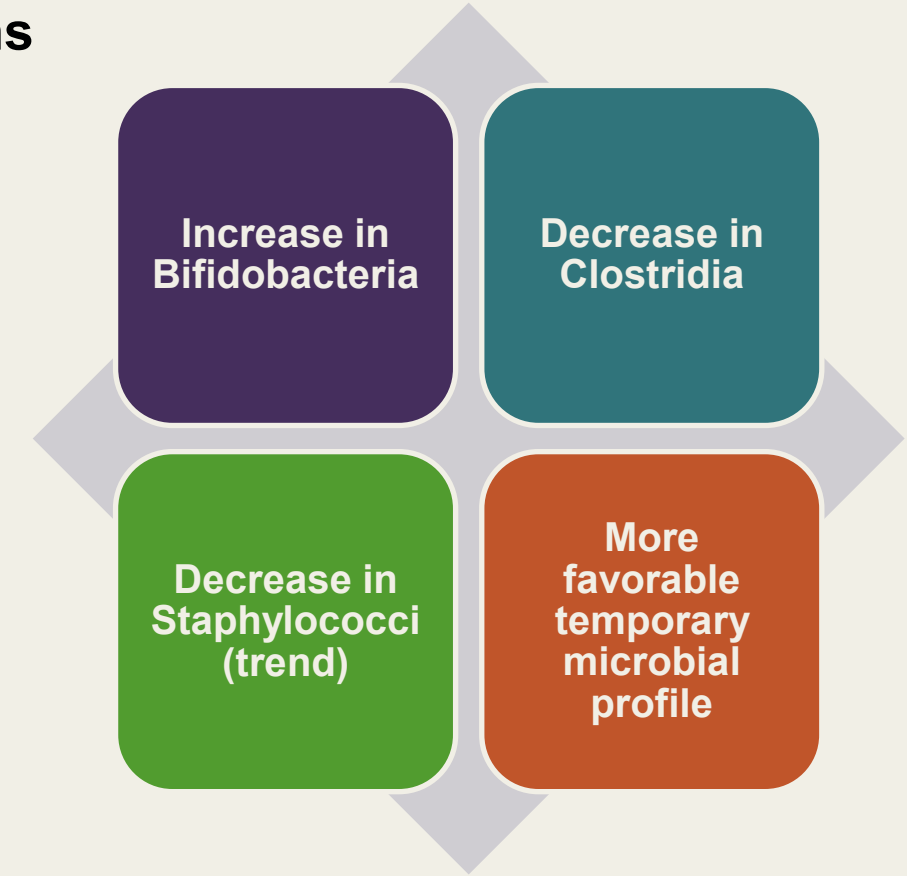
Clinical outcomes at 21 days:

- ↓ Flatulence
- ↓ Diarrhea
- ↓ Vomiting
- ↓ Fever Episodes

Randomized Controlled Trial > Int J Food Microbiol. 2007 Jan 1;113(1):108-13.
doi: 10.1016/j.ijfoodmicro.2006.07.009. Epub 2006 Sep 22.

Effect of oligofructose supplementation on gut microflora and well-being in young children attending a day care centre

Anne-Judith Waligora-Dupriet [1], Florence Campeotto, Ioannis Nicolis, Anne Bonet, Pascale Soulaines, Christophe Dupont, Marie-José Butel



Improved Stool Habits in Children

10 billion CFU/day: *L. acidophilus* DDS-1 + *B. lactis* UABLA-12

RCT (ages 4–12) with functional constipation

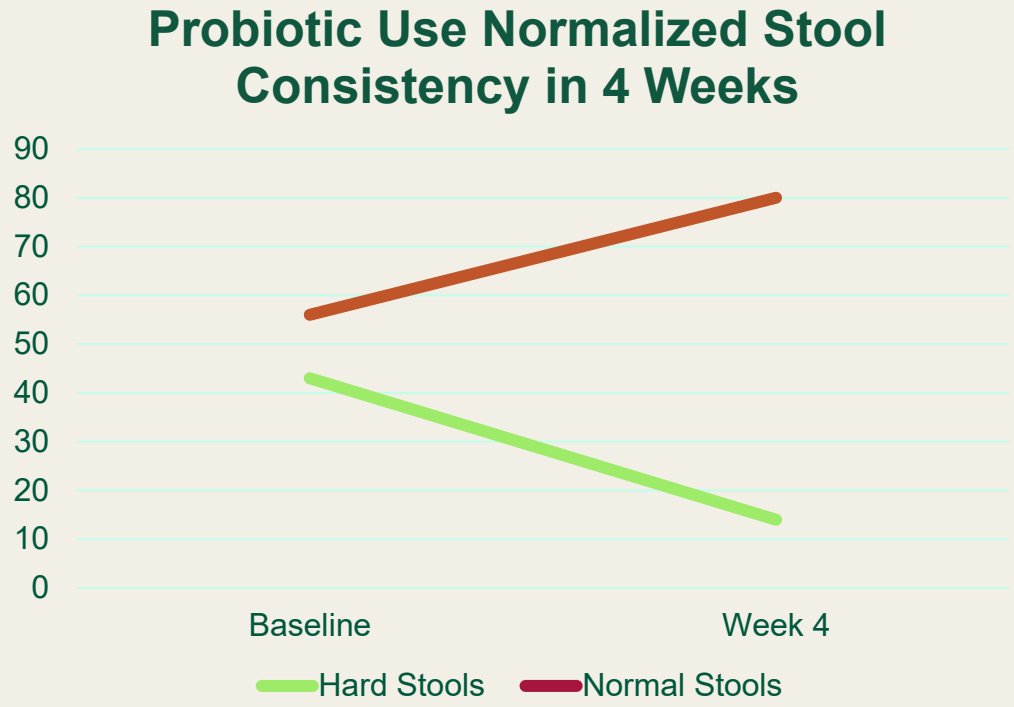
Clinical outcomes:

- Stool frequency normalized more quickly
- Microbiota shifts were favorable
  - ↑ Actinobacteria
  - ↓ Proteobacteria

Front Microbiol. 2022 Aug 22:13:985308. doi: 10.3389/fmicb.2022.985308. eCollection 2022.

Impact of a probiotic chewable tablet on stool habits and microbial profile in children with functional constipation: A randomized controlled clinical trial

Dan Gan [1], Jialun Chen [1], Xin Tang [1], Luyao Xiao [2], Christopher J Martoni [3], Gregory Leyer [3], Guixia Huang [1], Wei Li [2]



When Antibiotics Disturb the Gut

Antibiotic associated diarrhea

- Broad-spectrum activity disrupts commensal taxa
- Direct epithelial effects weaken mucosal integrity

- Reduction of SCFA-producing bacteria
- Impaired bile acid + carbohydrate metabolism
- Altered motility & weakened barrier

- Osmotic/Functional-type diarrhea from malabsorption
- Infectious diarrhea (e.g., C. difficile)

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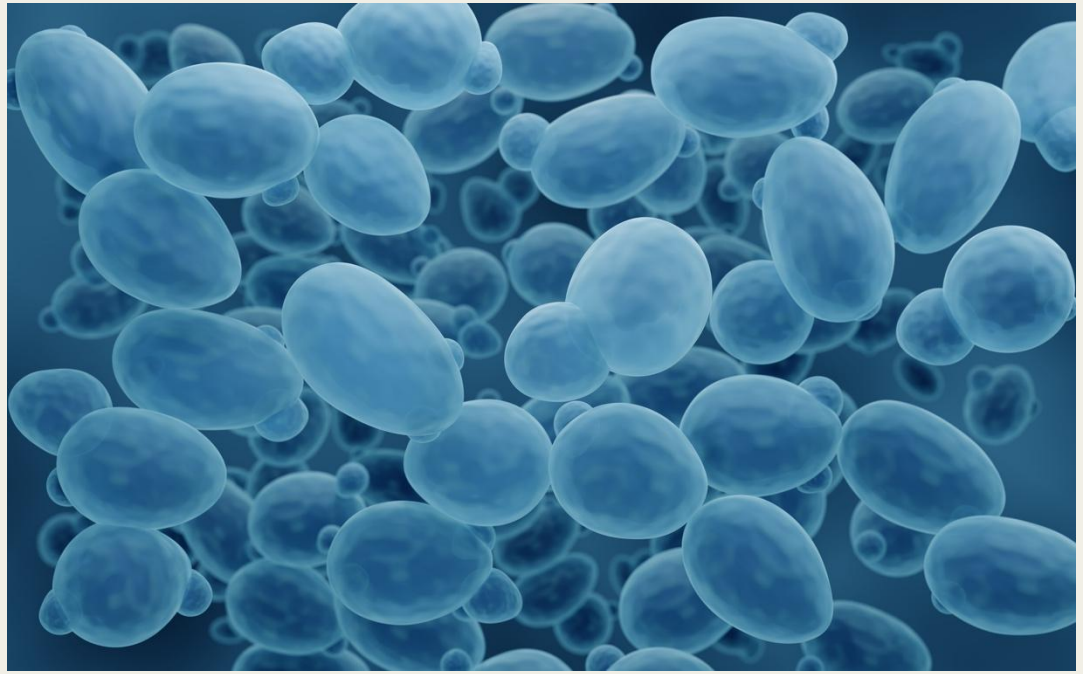
S. boulardii Prevention Antibiotic Associated Diarrhea

269 children (6 months–14 years); 250 mg BID *during* antibiotic therapy

First pediatric RCT showing significant AAD prevention with *S. Boulardii*

- 70% reduction in diarrhea incidence
- 80% reduction in antibiotic-associated diarrhea
- Protection persisted up to 2 weeks post-antibiotics
- Reduced both *C. difficile*–associated and unexplained AAD
- No adverse events reported



Clinical Trial > Aliment Pharmacol Ther. 2005 Mar 1;21(5):583-90.
doi: 10.1111/j.1365-2036.2005.02356.x.

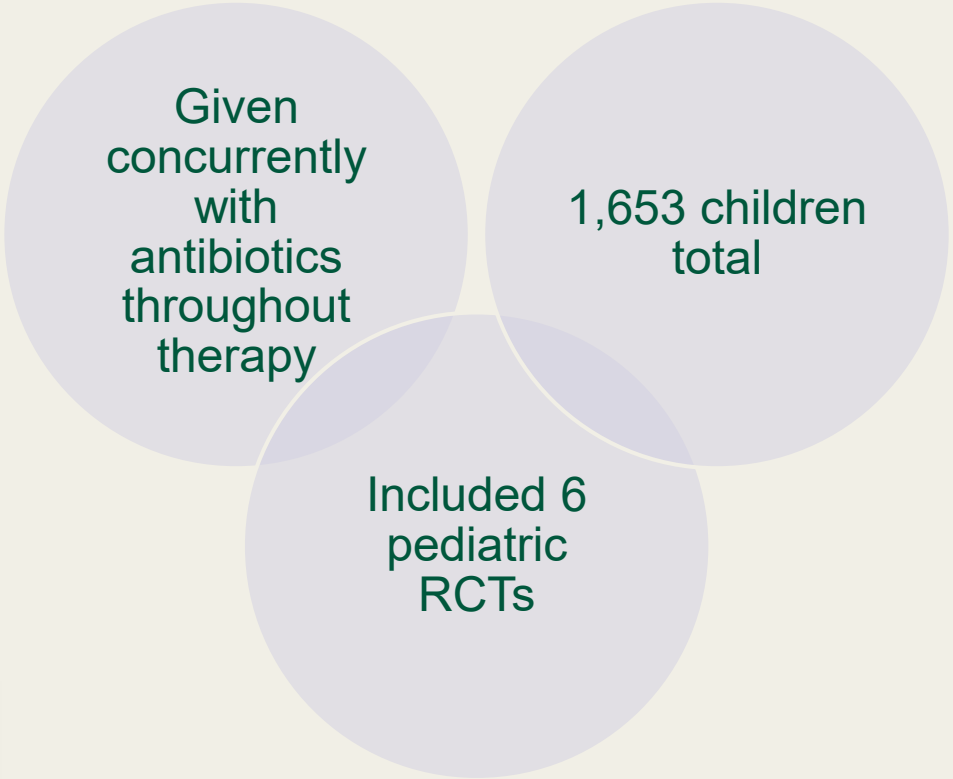
Saccharomyces boulardii in the prevention of antibiotic-associated diarrhoea in children: a randomized double-blind placebo-controlled trial

M Kotowska [1], P Albrecht, H Szajewska

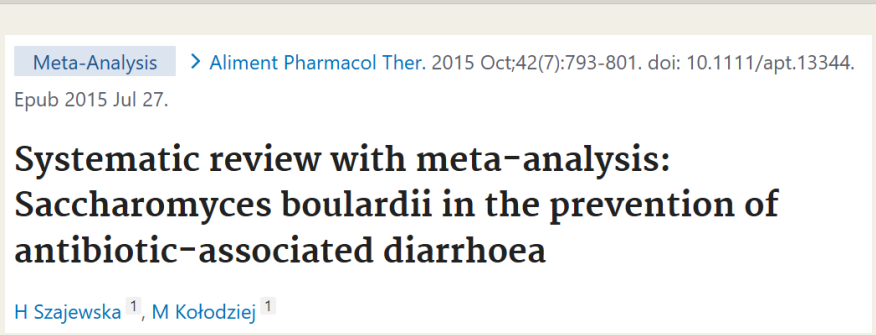
S. boulardii for Prevention of Antibiotic Associated Diarrhea

Effective across a range of doses (typically 250–1000 mg/day)

- Reduced the risk of C. difficile–associated diarrhea in children
- No serious adverse events reported in trials



In children, *S. boulardii* reduced the risk from 20.9% to 8.8%



Meta-Analysis > Aliment Pharmacol Ther. 2015 Oct;42(7):793-801. doi: 10.1111/apt.13344. Epub 2015 Jul 27.

Systematic review with meta-analysis: Saccharomyces boulardii in the prevention of antibiotic-associated diarrhoea

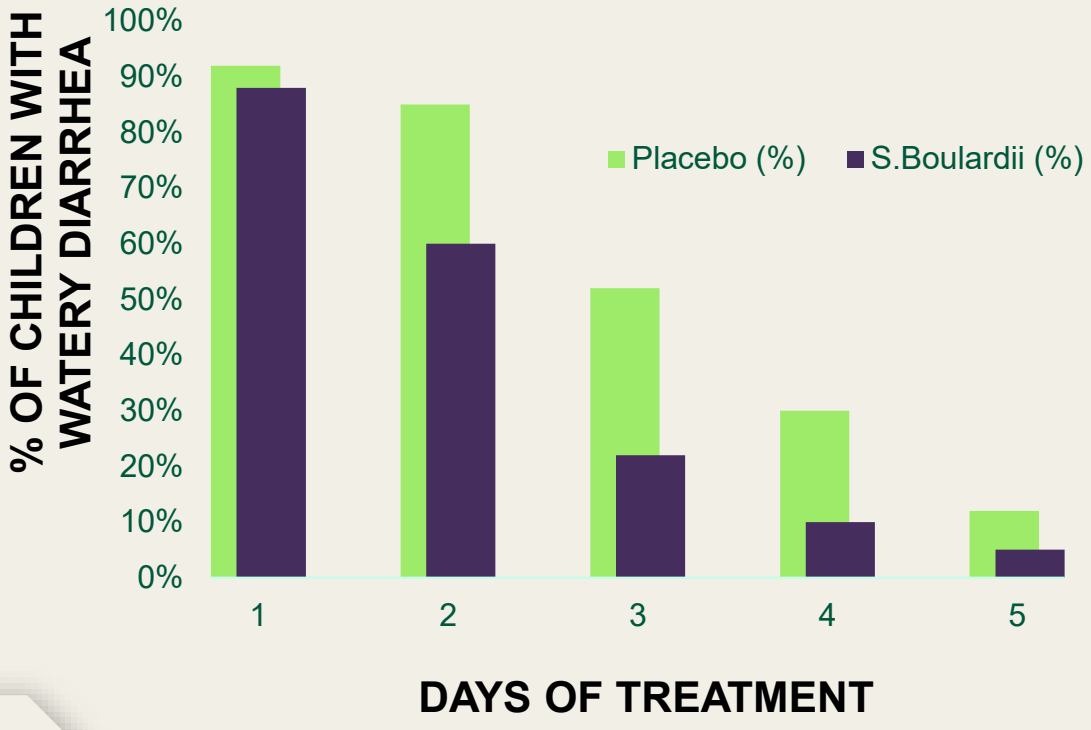
H Szajewska [1], M Kołodziej [1]

S. boulardii Therapeutic Outcomes in Acute Diarrhea

250 mg/day of *Saccharomyces boulardii*

Ages 3–12
Hospitalized with acute diarrhea

- ↓ Duration of diarrhea
- ↓ Watery diarrhea
- ↓ Hospital stay
- ↓ Persistent diarrhea



Clinical Trial > Acta Paediatr. 2005 Jan;94(1):44-7. doi: 10.1111/j.1651-2227.2005.tb01786.x.

Effects of Saccharomyces boulardii in children with acute diarrhoea

Z Kurugöl [1], G Koturoğlu

S. boulardii & Gut-Skin Immune Modulation

Recent preclinical evidence (2025)

↓ AD severity
Reduced scratching, behavior.

↓ NF-κB signaling
Suppressed gut–skin inflammatory pathway.

↓Allergic inflammation
Lower inflammatory cells and serum IgE.

↓ Cytokines
Reduced TNF-α and IL-1β in skin and colon.

↓Skin pathology
Less thickening and immune-cell infiltration.

↑ Colon resilience
Better antioxidant status and tissue integrity.

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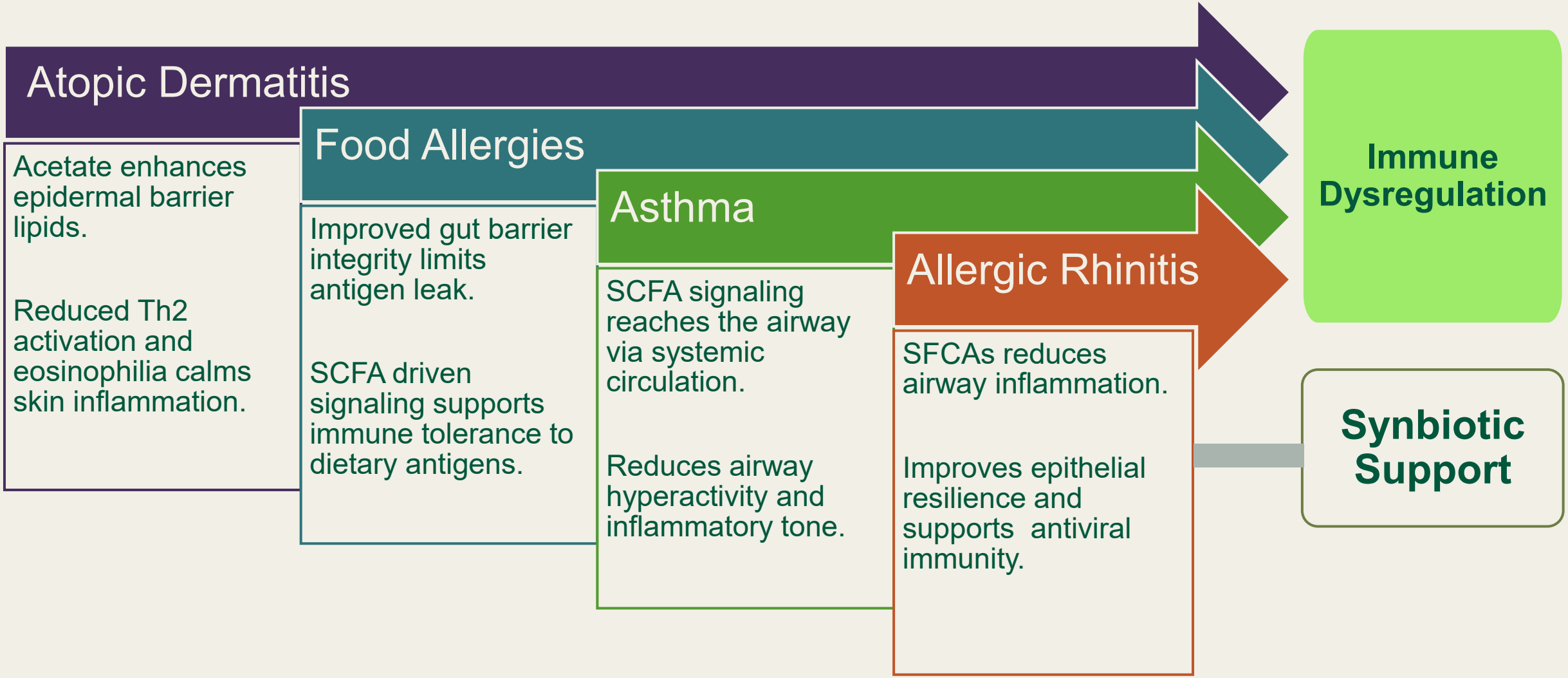
Buttar et al. S. boulardii ameliorates atopic dermatitis by modulating the NF-κB signaling in skin and colon, Arch Dermatol Res. 2025

Synbiotic Support Across the Atopic March



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Synbiotic Outcomes Atopic Dermatitis

10 billion CFU/day (*L. acidophilus & B. Lactis)* + 100 mg inulin

8-week Synbiotic
Ages 12–36 months

33.7%
SCORAD reduction

7.7 g
Less topical corticosteroid used

- Reduced overall skin involvement
- Less itching and improved sleep
- Visibly milder lesion appearance

Randomized Controlled Trial > Am J Clin Dermatol. 2010;11(5):351-61.
doi: 10.2165/11531420-000000000-00000.

Probiotic supplement reduces atopic dermatitis in preschool children: a randomized, double-blind, placebo-controlled, clinical trial

Sergei V Gerasimov [1], Volodymyr V Vasjuta, Oksana O Myhovych, Lyudmyla I Bondarchuk

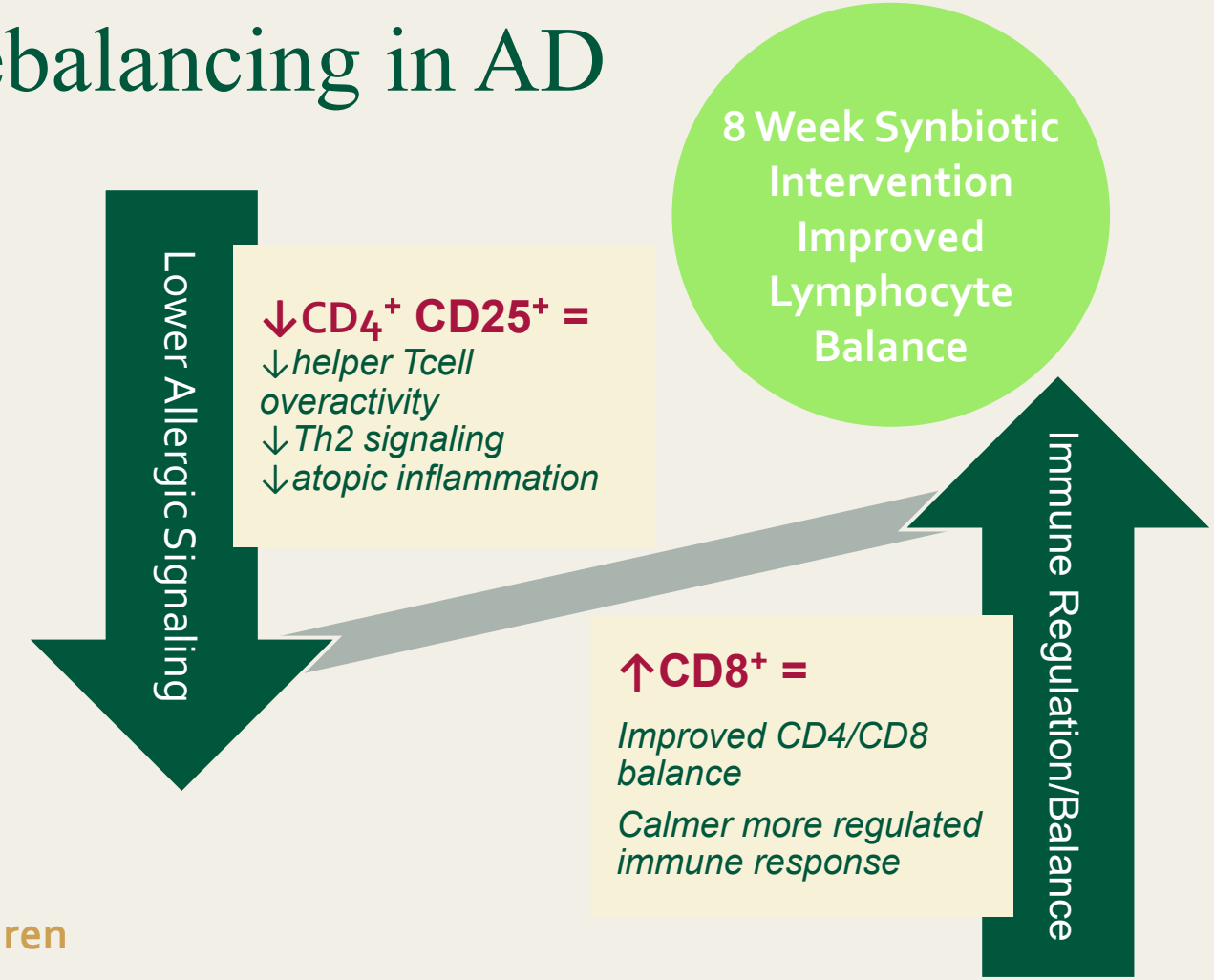
Synbiotic Driven Immune Rebalancing in AD

Lowered CD4/CD8 ratios:

- ↓ Inflammation
- ↓ Th2 allergic activity
- ↓ Atopic dermatitis severity

Restoring this ratio = immune recalibration

Strongest benefits seen in high-IgE/eosinophil children



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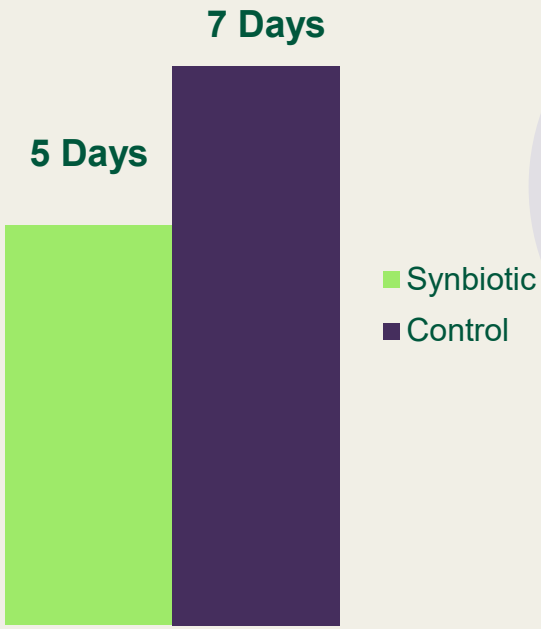
Synbiotic Outcomes Acute Respiratory Infection

5 billion CFU/day (*L. acidophilus & B. Lactis)* + 50 mg FOS



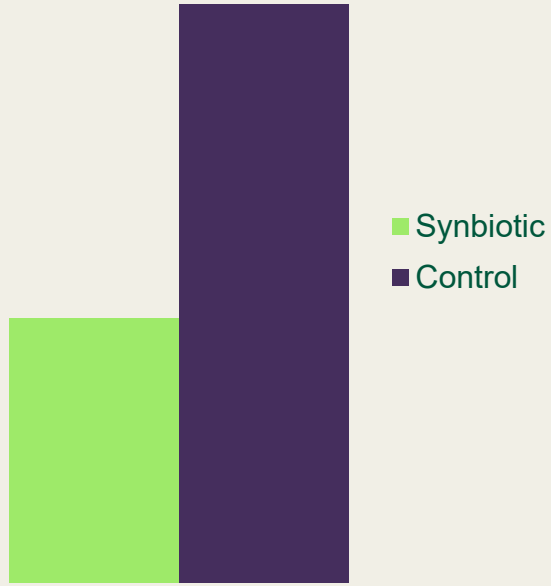
Shorter Duration with Synbiotic

2-day faster recovery

Earlier symptom improvement

>50% reduction in total symptom burden

Reduced absenteeism



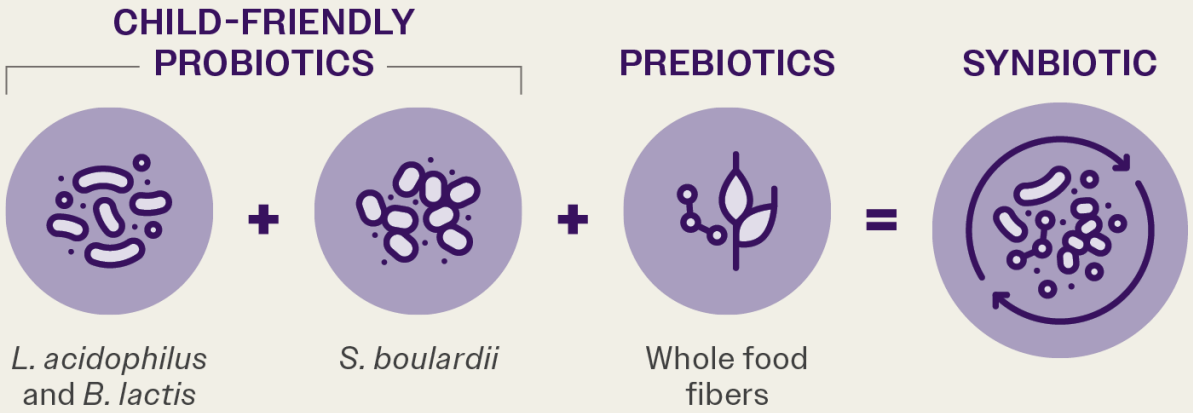
Less Symptom Severity with Synbiotic

Randomized Controlled Trial > Eur J Clin Nutr. 2016 Apr;70(4):463-9. doi: 10.1038/ejcn.2015.171. Epub 2015 Oct 14.

Role of short-term use of L. acidophilus DDS-1 and B. lactis UABLA-12 in acute respiratory infections in children: a randomized controlled trial

S V Gerasimov [1], V A Ivantsiv [2], L M Bobryk [2], O O Tsitsura [3], L P Dedyshin [1], N V Guta [2], B V Yandyo [2]

Clinically Backed Ingredients



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