

Wounds, Pain and Inflammation

The emerging role of Probiotics in Healing and Recovery

Prof. Anita Frauwallner

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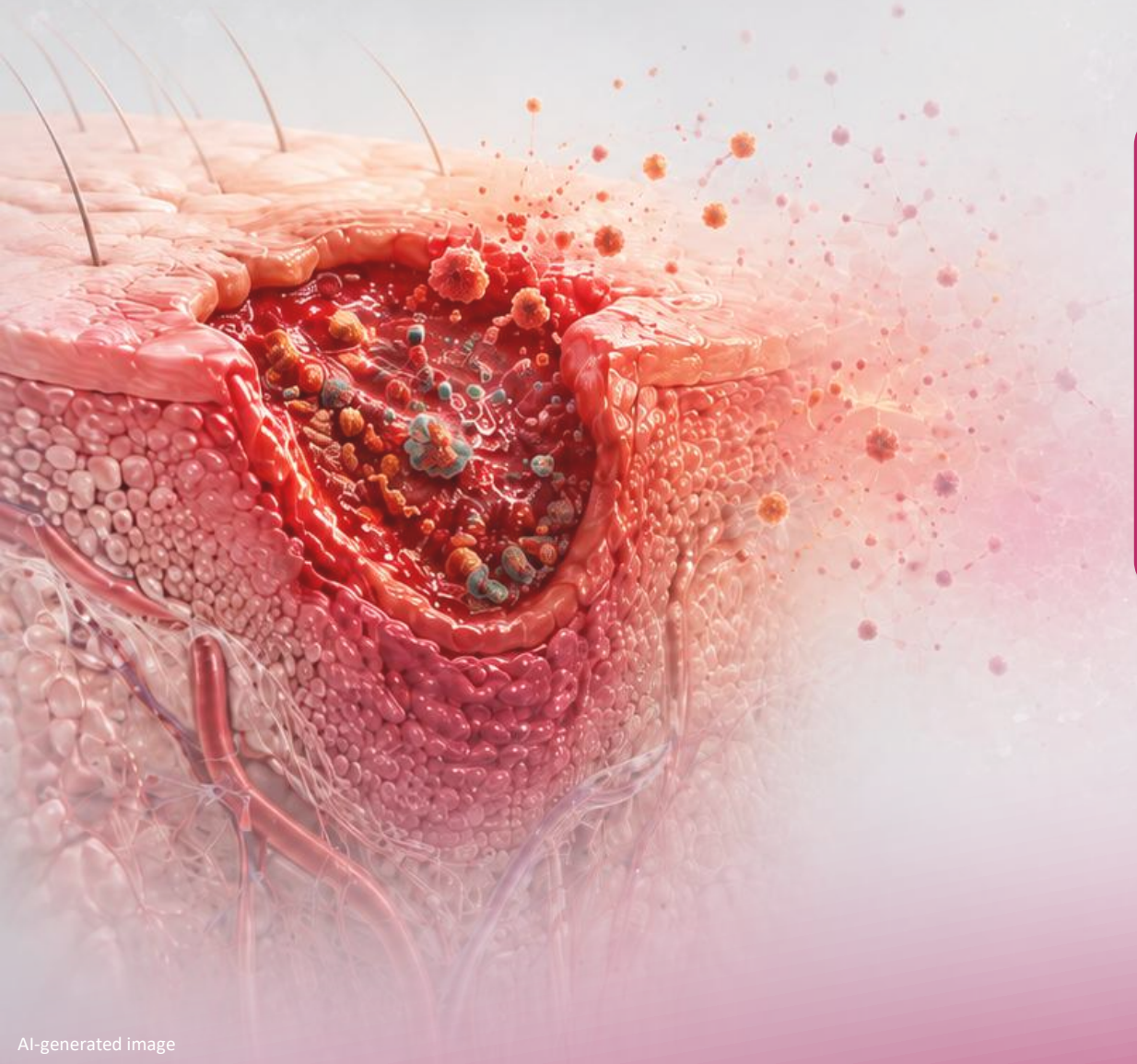

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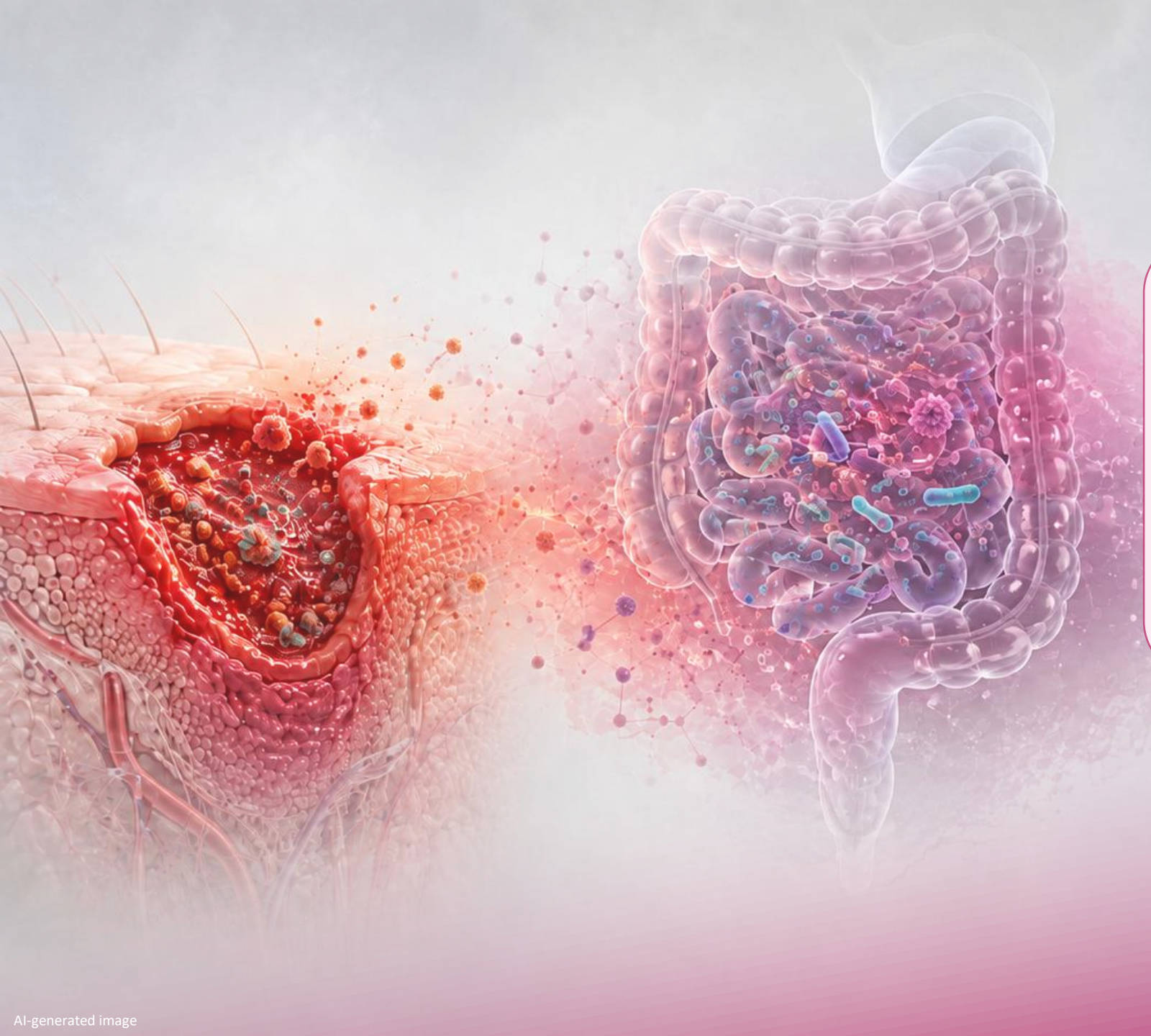
A chronic wound is **not only a local problem** — it is a visible endpoint of **microbial imbalance, impaired barrier function** and **persistent low-grade inflammation**.



Microbial dysbiosis

Leaky gut

Silent inflammation

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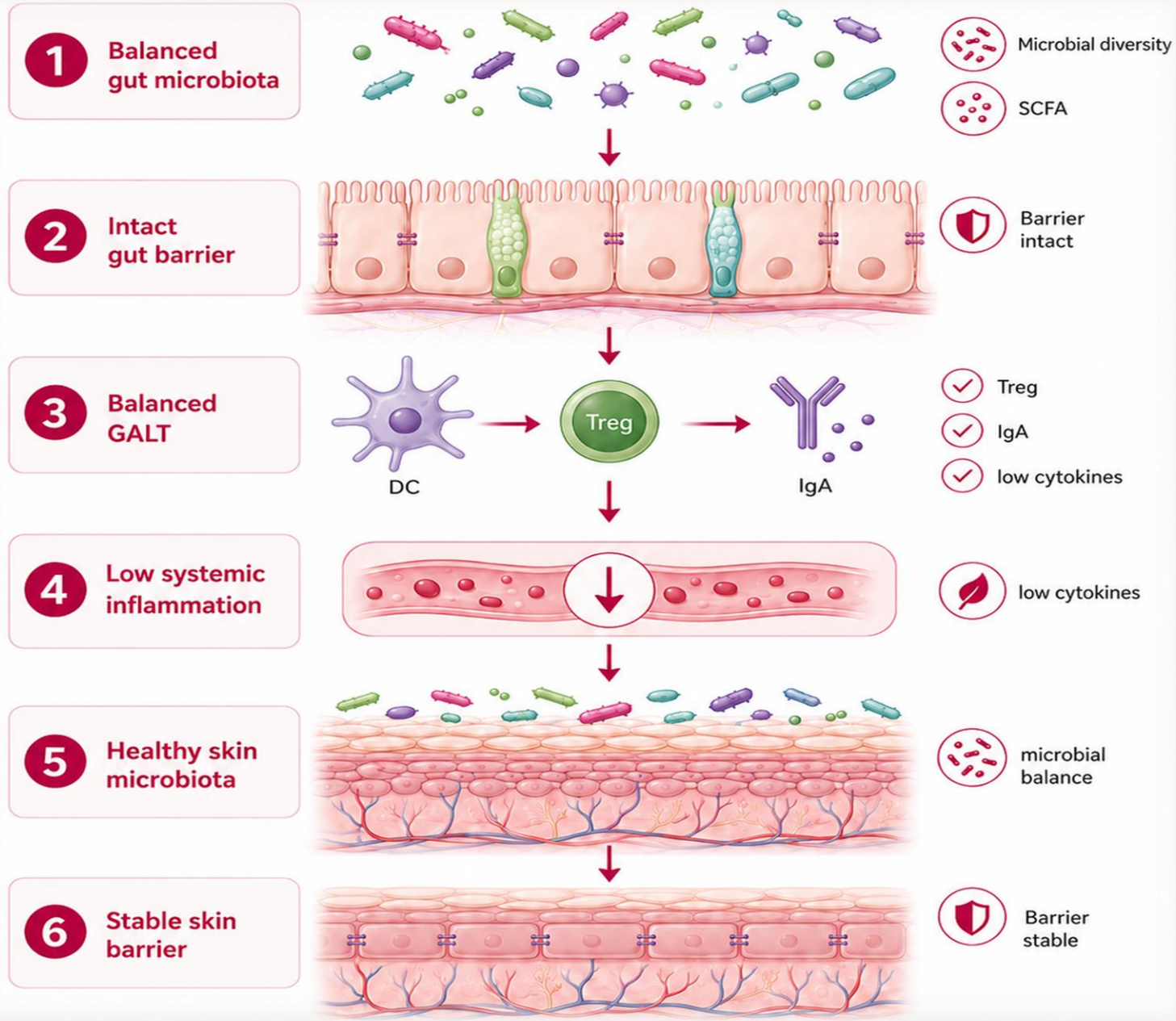
EUBIOSIS

a healthy Gut-Skin-Axis



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Gut-Skin-Axis

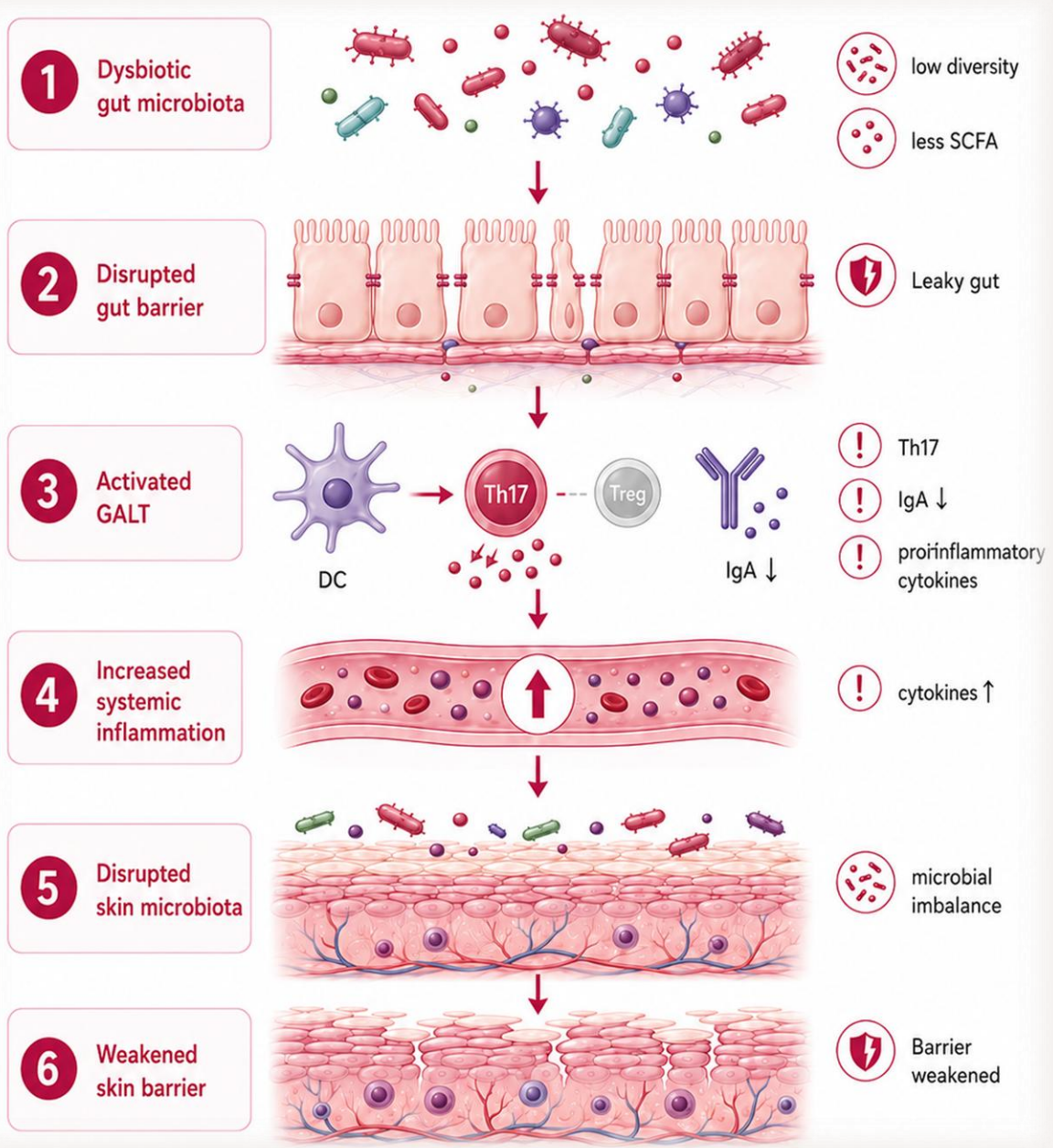
The gut microbiome influcences the skin microbiome via

- **Production of specific metabolites** (ceramides, cholesterol, SCFAs and cholesterol esters)
- **Interaction with the immune system**
- **Defense against pathogens**
- Regulation of the **composition of the skin microbiome** (SCFAs and carbohydrate metabolites)
- **Positive feedback** via epithelial vascularization
- **Control of fibroblast production** for tissue repair

Salem I, Ramser A, Isham N, Ghannoum MA. The gut microbiome as a major regulator of the gut-skin axis. Front Microbiol. 2018;9(JUL):1–14.

DYSBIOSIS

a disrupted Gut-Skin-Axis



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Probiotics - a natural support

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Chronic wounds in patients with diabetes

Journal of Wound Care, Vol. 33, No. 6 · Research

Effect of oral multispecies probiotic on wound healing, periodontitis and quality of life on patients with diabetes

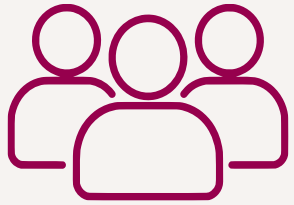
Ewa Klara Stuermer ✉, Corinna Bang, Anna Giessler, Ralf Smeets, Toni Maria Janke, Filip David Seki, Eike Sebastian Debus, Andre Franke, Matthias Augustin

Published Online: 6 Jun 2024 | https://doi.org/10.12968/jowc.2023.0302



STUDY DESIGN

Stuermer et al. 2024



20 **diabetes mellitus type 2** patients with **chronic wounds**

Investigator-initiated study (IIT):

Intake of **OMNi-BiOTiC® *HETOX***

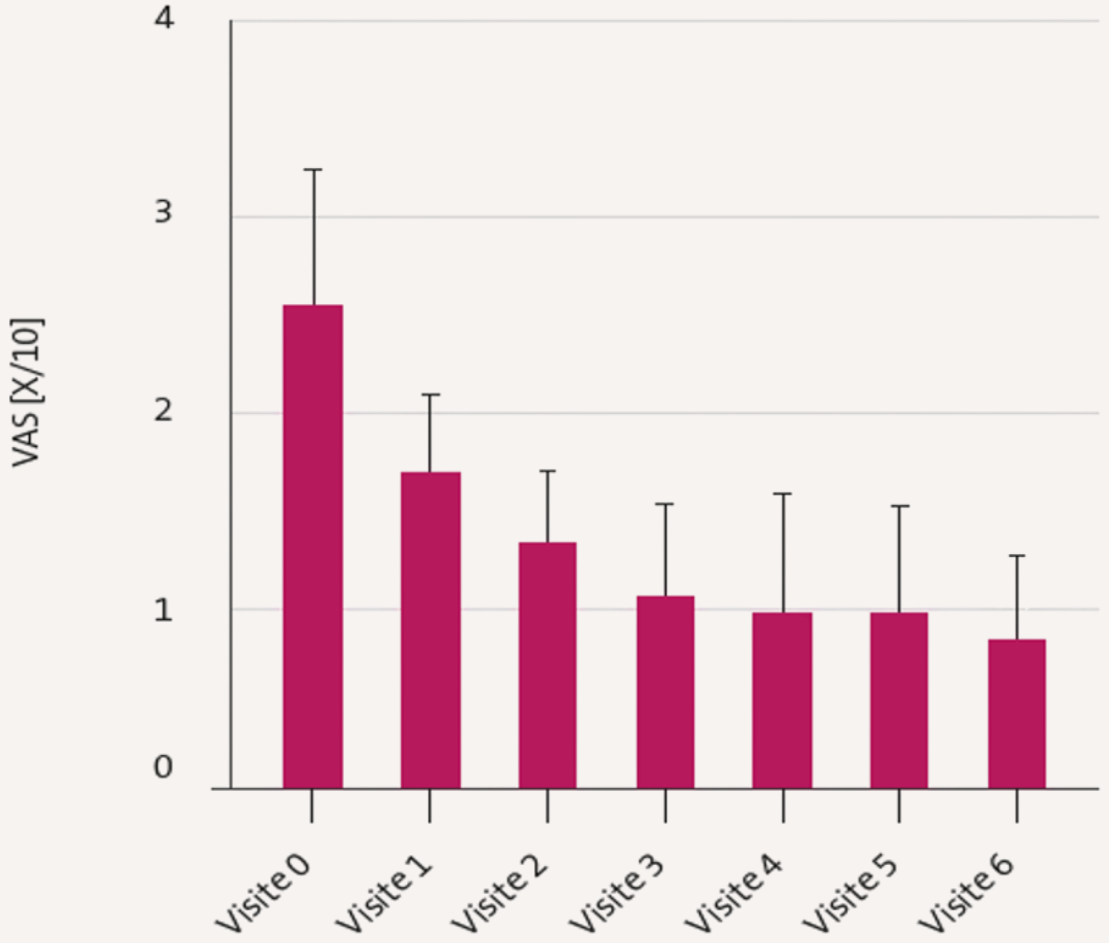
6 months, 1 x daily

Parameters:

- Wound healing (appearance, exudation, size)
- Wound-associated quality of life (Wound-QOL-17)
- Wound pain (VAS= Visual Analogue Scale)
- Examination of the oral, stool and wound microbiome
- Periodontitis screening

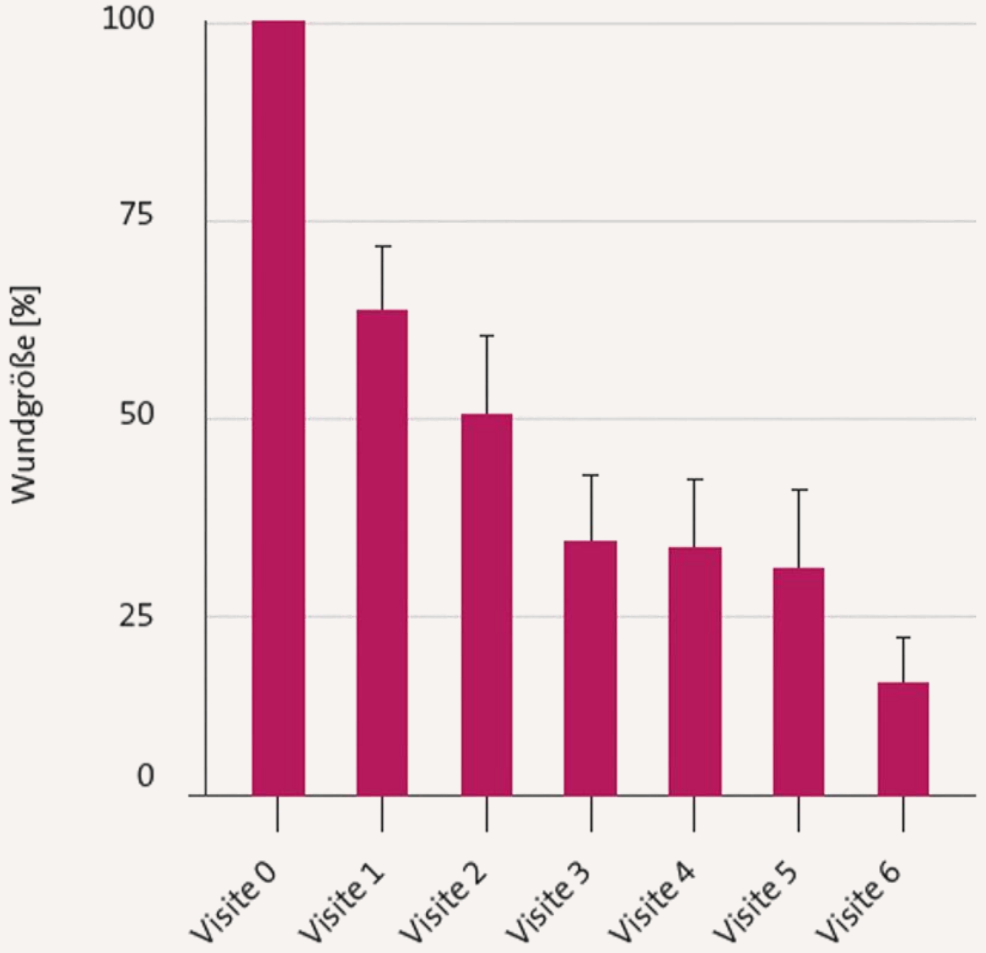
RESULTS

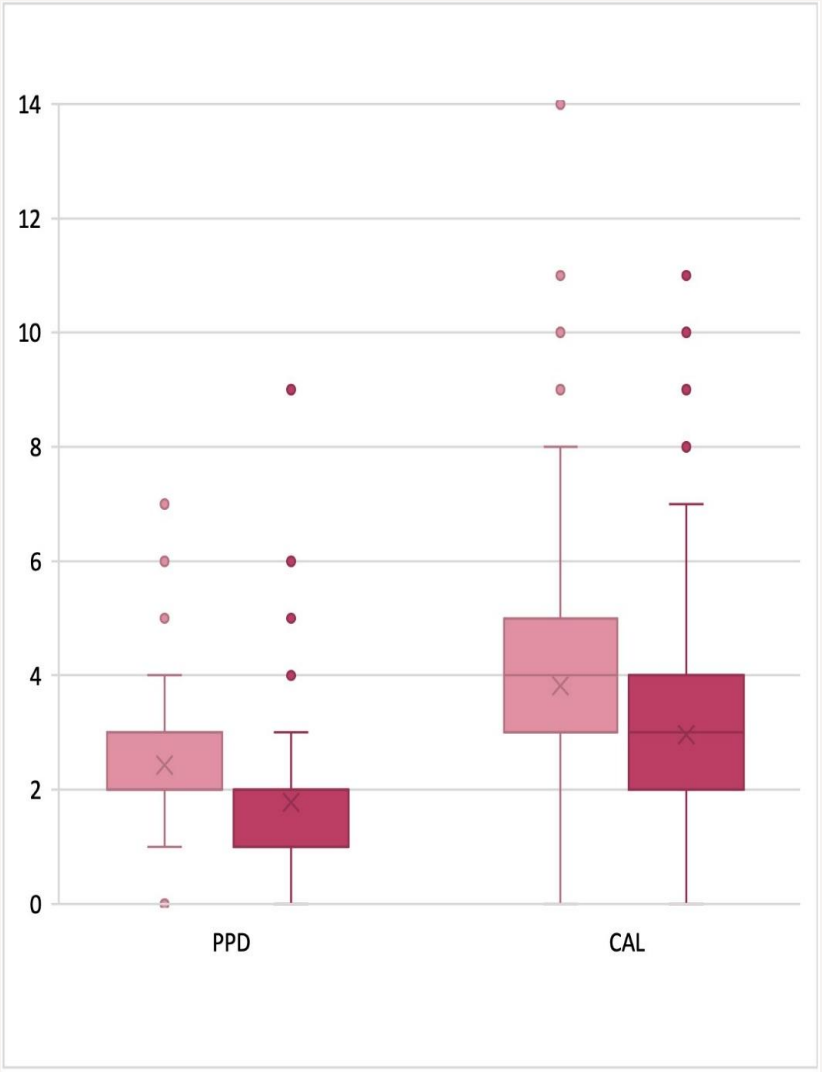
Significant reduction of wound pain



RESULTS

Complete wound healing in 38,5 %





PPD: pocket probing depth
CAL: clinical attachment loss

Clinically visible effects even in the mouth - significant reduction of periodontitis

Pocket Probing Depth:

- Significant reduction in the probing depth of the gingival pockets by - 0.65 mm

Clinical Attachment Loss:

- Significant reduction in the destruction of the periodontium by - 0.75 mm

Stuermer EK, Bang C, Giessler A, et al. Effect of oral multispecies probiotic on wound healing, periodontitis and quality of life on patients with diabetes. J Wound Care. 2024;33(6):394-407. doi:10.12968/jowc.2023.0302

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Initial examination | after 2 months | after 3 months

Stuermer EK, Bang C, Giessler A, et al. Effect of oral multispecies probiotic on wound healing, periodontitis and quality of life on patients with diabetes. J Wound Care. 2024;33(6):394-407.
doi:10.12968/jowc.2023.0302

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Initial examination



after 3 months



after 6 months

Stuermer EK, Bang C, Giessler A, et al. Effect of oral multispecies probiotic on wound healing, periodontitis and quality of life on patients with diabetes. J Wound Care. 2024;33(6):394-407.
doi:10.12968/jowc.2023.0302

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• Is IBS a chronic wound?

European Journal of Nutrition
https://doi.org/10.1007/s00394-018-1826-7

ORIGINAL CONTRIBUTION

CrossMark

Effects of an oral synbiotic on the gastrointestinal immune system and microbiota in patients with diarrhea-predominant irritable bowel syndrome

Adrian Mathias Moser[1,2] · Walter Spindelboeck[1,2] · Bettina Halwachs[2,3] · Heimo Strohmaier[4] · Patrizia Kump[1,2] · Gregor Gorkiewicz[2,3] · Christoph Högenauer[1,2]

Received: 21 February 2018 / Accepted: 18 September 2018

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Changes in the gut microbiome of IBS patients

- **Microbial composition:** Differs between IBS patients and healthy controls.
- **Beta diversity:** Shifts are frequently associated with IBS, suggesting altered microbial composition even when overall diversity remains unchanged.

1. Li X, Li X, Xiao H, et al. (2024). Meta-analysis of gut microbiota alterations in patients with irritable bowel syndrome. Frontiers in Microbiology, 15, 1492349. https://doi.org/10.3389/fmicb.2024.14923492. Wang ZZ, Chen YK, Li X, et al. (2026). Altered molecular signature of the intestinal microbiota in irritable bowel syndrome patients versus healthy controls: An updated systematic review. Indian Journal of Gastroenterology, 45(4), 647–665. https://doi.org/10.1007/s12664-025-01845-w3. Li J, et al. (2024). Cross-Cohort Gut Microbiome Signatures of Irritable Bowel Syndrome Presentation and Treatment. Advanced Science. https://pubmed.ncbi.nlm.nih.gov/39243395/

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STUDY DESIGN

Moser, Högenauer et al. 2018



10 patients with diarrhea-predominant irritable bowel syndrome

↓

Academic study

OMNi-BiOTiC® STRESS Repair

Twice daily for 4 weeks

↓

Parameters measured through endoscopy:

Microbial diversity

Short chain fatty acids

Fecal zonulin

Disease severity

RESULTS

IBS-Symptom severity is reduced significantly



Moser AM, et al. Högenauer C, Effects of an oral synbiotic on the gastrointestinal immune system and microbiota in patients with diarrhea-predominant irritable bowel syndrome. Eur J Nutr 2018, doi:10.1007/s00394-018-1826-7.

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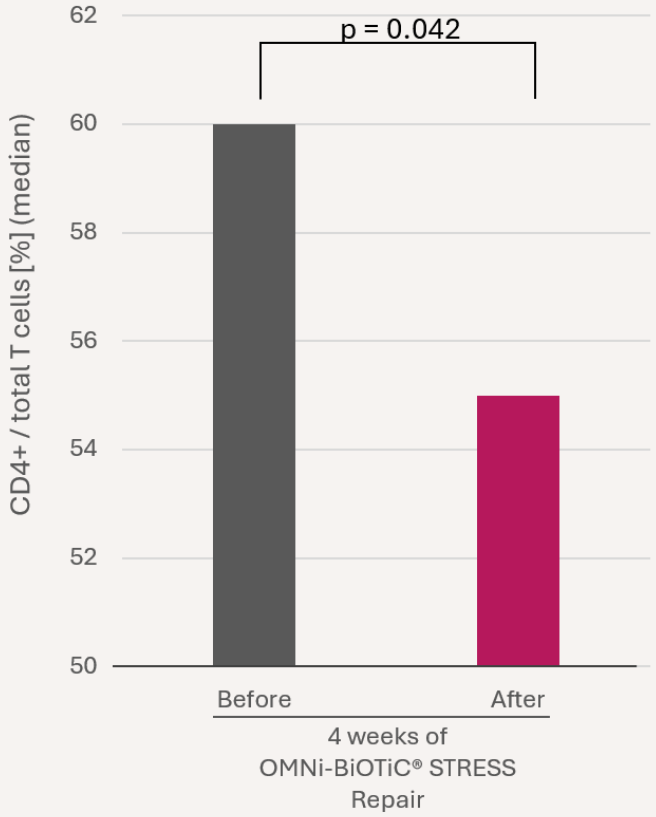
RESULTS

Anti-inflammatory effects + significant reduction of mucosal CD4 + CD3- double negative T cells



AM, et al. Högenauer C, Effects of an oral synbiotic on the gastrointestinal immune system and microbiota in patients with diarrhea-predominant irritable bowel syndrome. Eur J Nutr 2018, doi:10.1007/s00394-018-1826-7.

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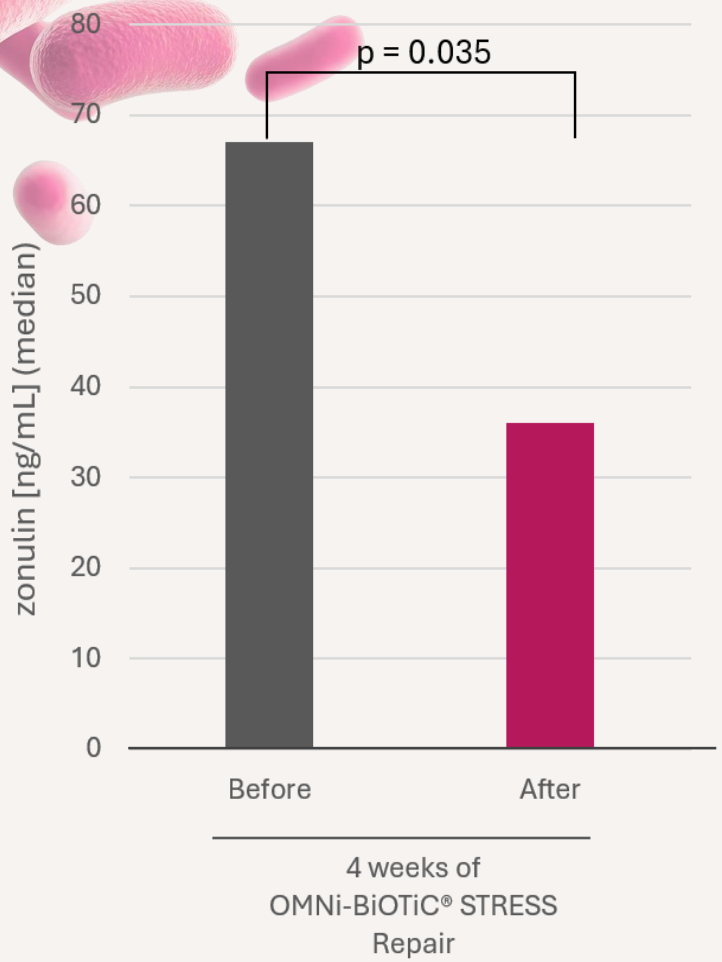
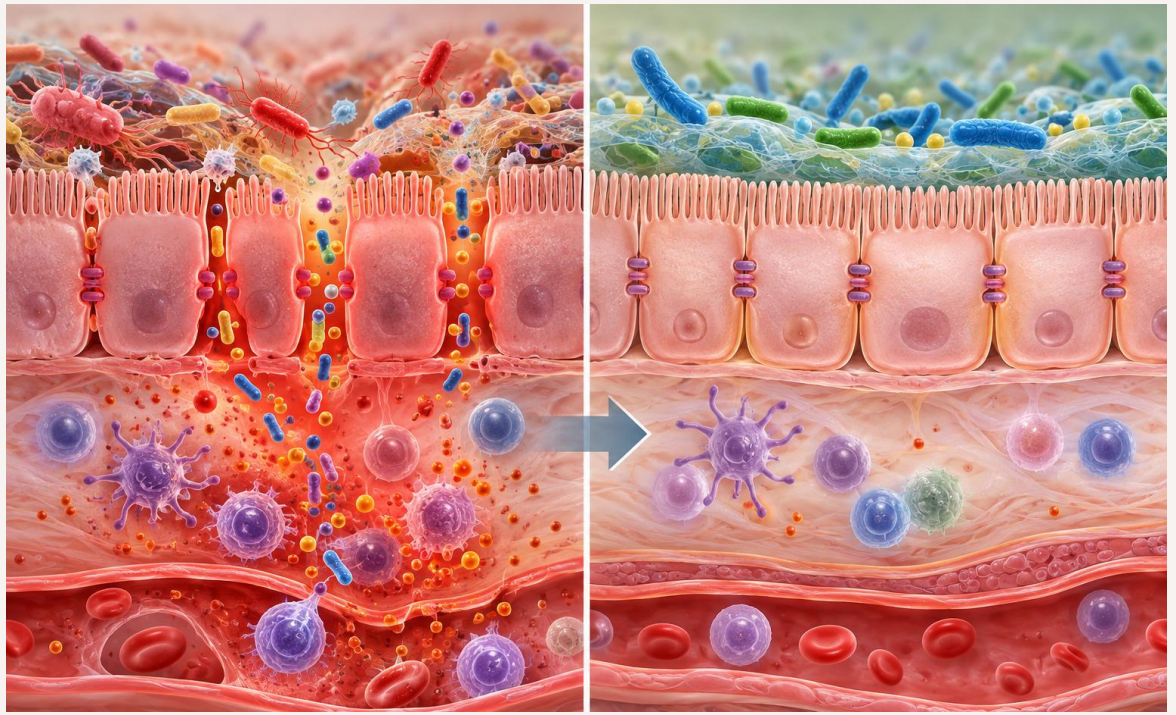
Probiotic therapy reduces leaky gut (zonulin)

improved intestinal barrier function.





AM, et al. Högenauer C, Effects of an oral synbiotic on the gastrointestinal immune system and microbiota in patients with diarrhea-predominant irritable bowel syndrome. Eur J Nutr 2018, doi:10.1007/s00394-018-1826-7. Picture created with AI

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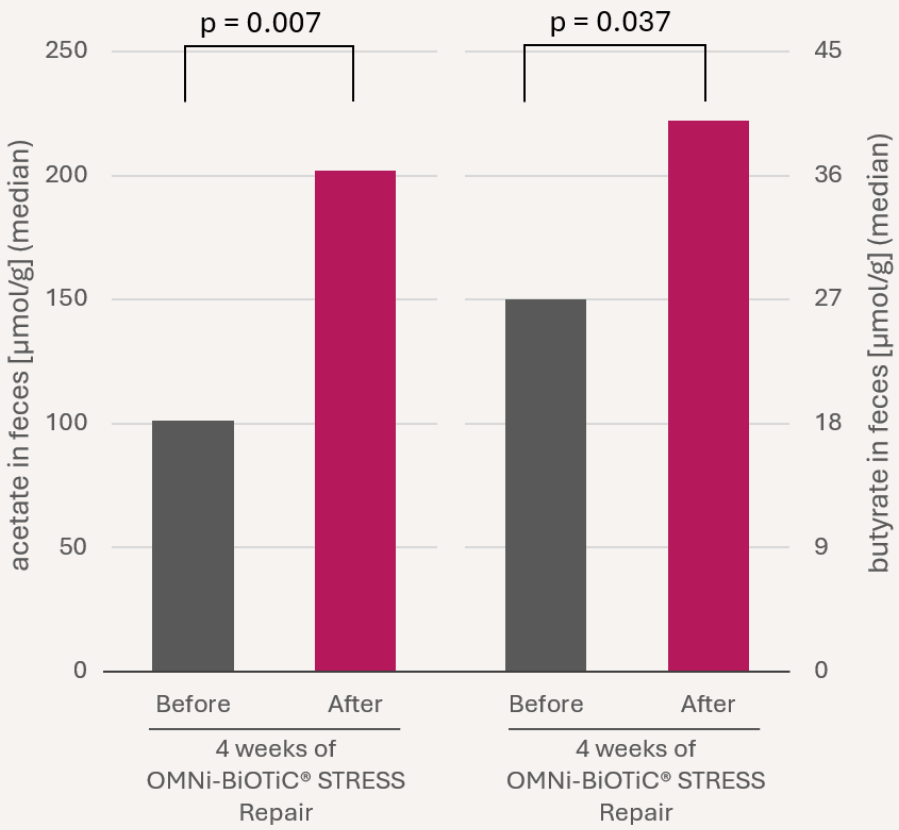
RESULTS

OMNi-BiOTiC® STRESS Repair increases significantly the levels of short chain fatty acids



Moser AM, et al. Högenauer C, Effects of an oral synbiotic on the gastrointestinal immune system and microbiota in patients with diarrhea-predominant irritable bowel syndrome. Eur J Nutr 2018, doi:10.1007/s00394-018-1826-7.

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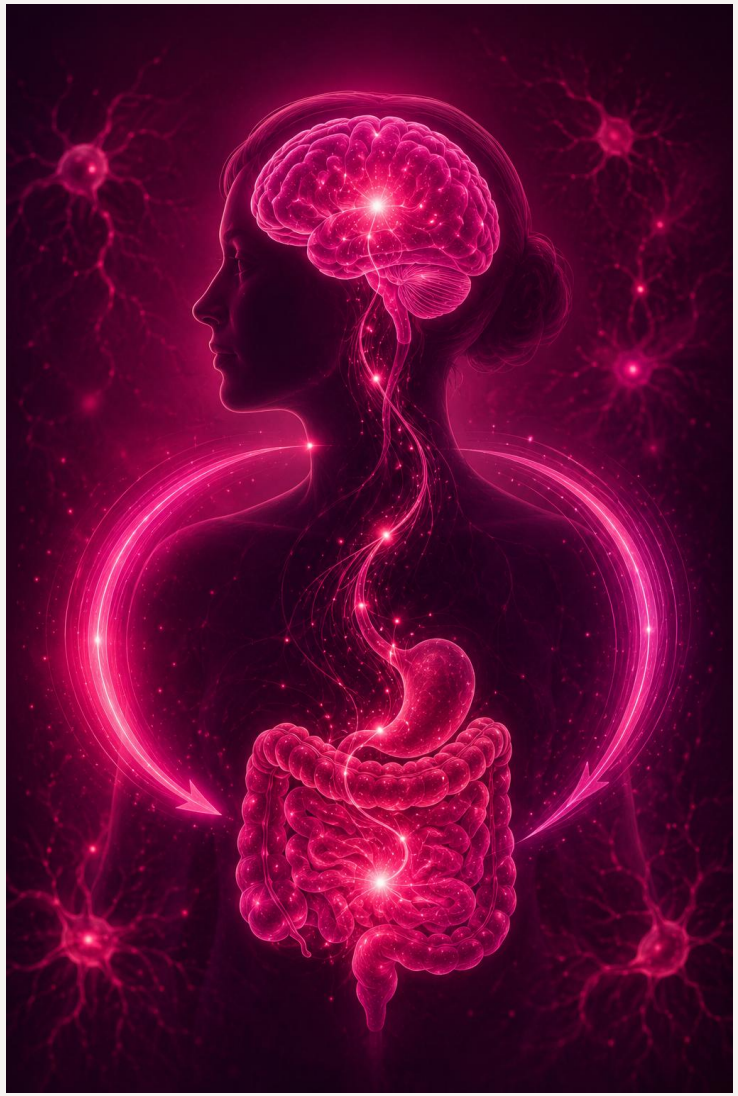

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Scientific Research Publishing

World Journal of Neuroscience, 2024, 14, 103-119
https://www.scirp.org/journal/wjns
ISSN Online: 2162-2019
ISSN Print: 2162-2000

Clinical Treatment of Functional Pain Syndromes along the Microbiome-Gut-Brain-Axis: Combined Approach with Neuromodulation-Neurofeedback and Multispecies Probiotic

Maddalena Castelletti[1], Gloria Crocetti[2], Michele Masotti[3], Alberto Montagna[3], Annarita Graziani[4]

Gut-Brain-Axis

- Reduced inflammation
- Microbial metabolites → pain modulation
- Vagus nerve signaling
- Neurotransmitter regulation
- Reduced stress & pain sensitivity



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STUDY DESIGN

Castelleti et al. 2024



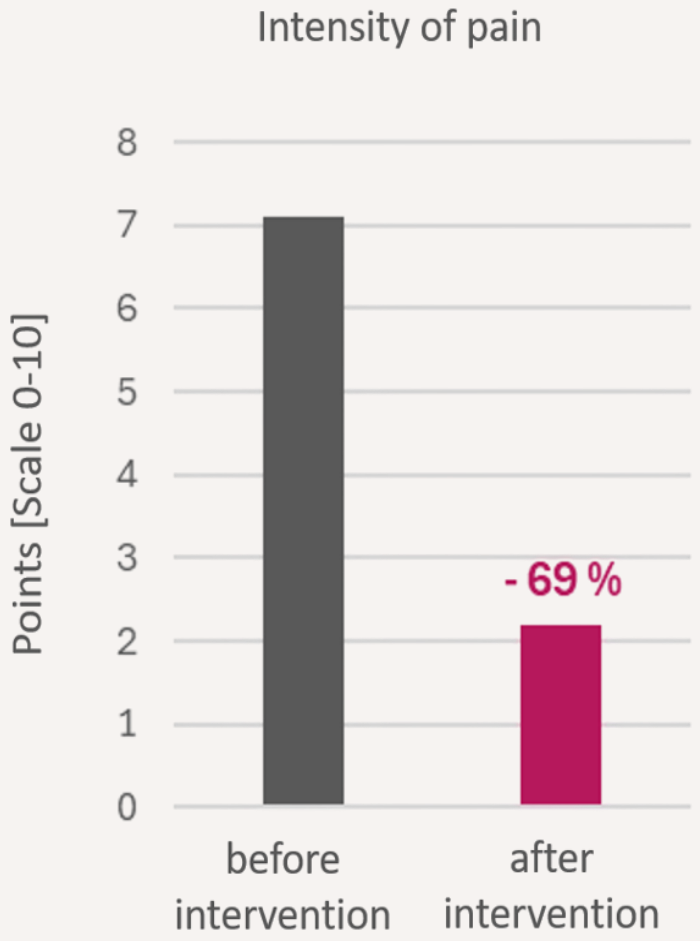
45 patients (19m/26w; age: 30-59)
diagnosed functional pain syndrome (FPS)
for more than 6 months

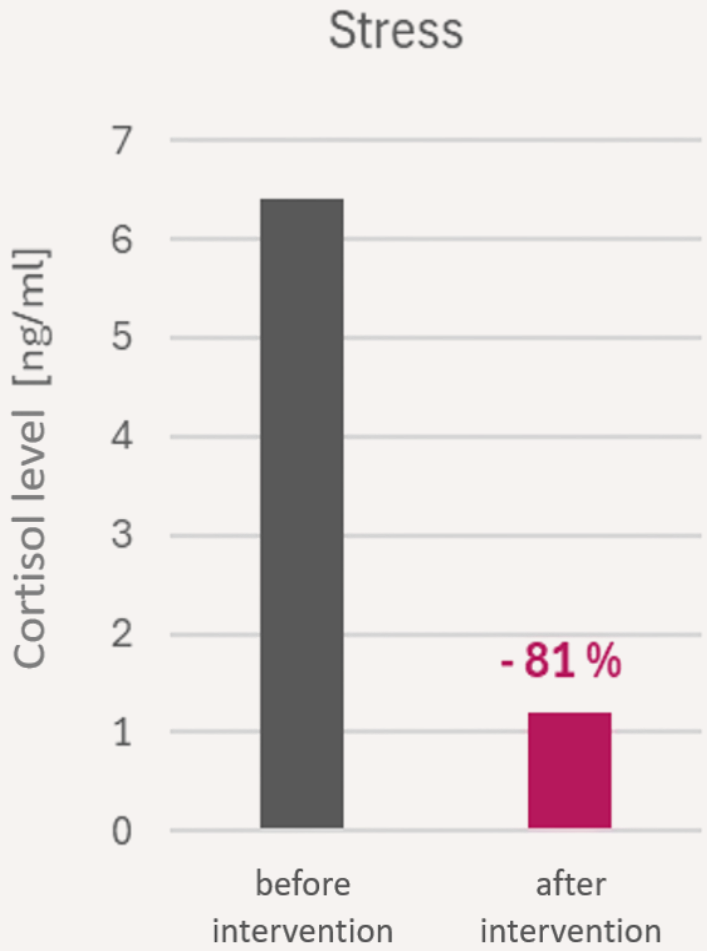
Clinical treatment +
1x daily **OMNi-BiOTiC® STRESS** Repair
for 3 months

Parameters:

- Hamilton-Fear-Score (HAMA)
- Brief Pain Inventory (BPI)
- Cortisol levels in saliva
- Increase in the *Alpha-Theta*-Neurofeedback-Training

Less pain, lower stress with probiotics in just 3 months





Castelletti, M. , Crocetti, G. , Masotti, M. , Montagna, A. and Graziani, A. (2024) Clinical Treatment of Functional Pain Syndromes along the Microbiome-Gut-Brain-Axis: Combined Approach with Neuromodulation-Neurofeedback and Multispecies Probiotic. World Journal of Neuroscience, 14, 103-119. doi: 10.4236/wjns.2024.144010.

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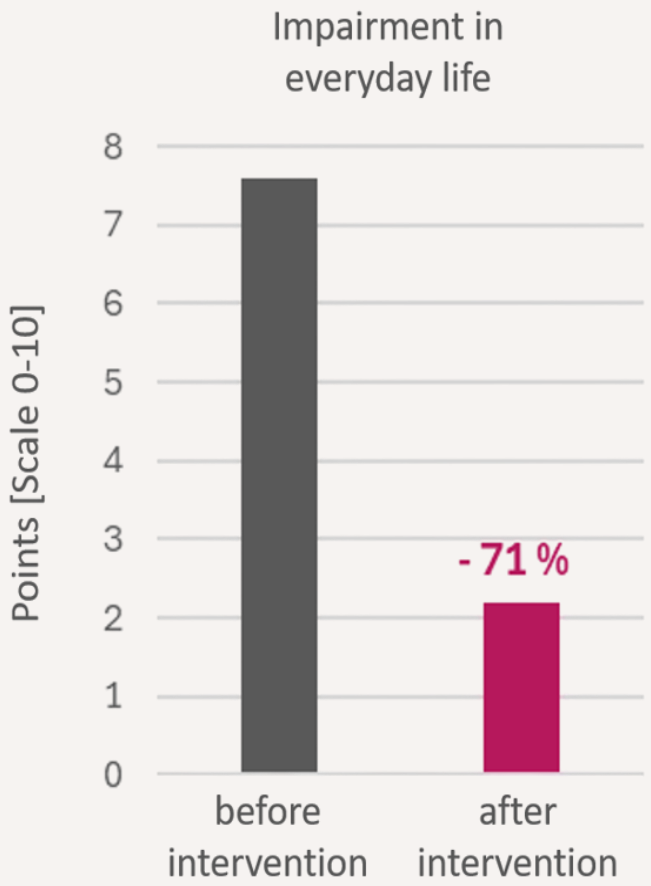
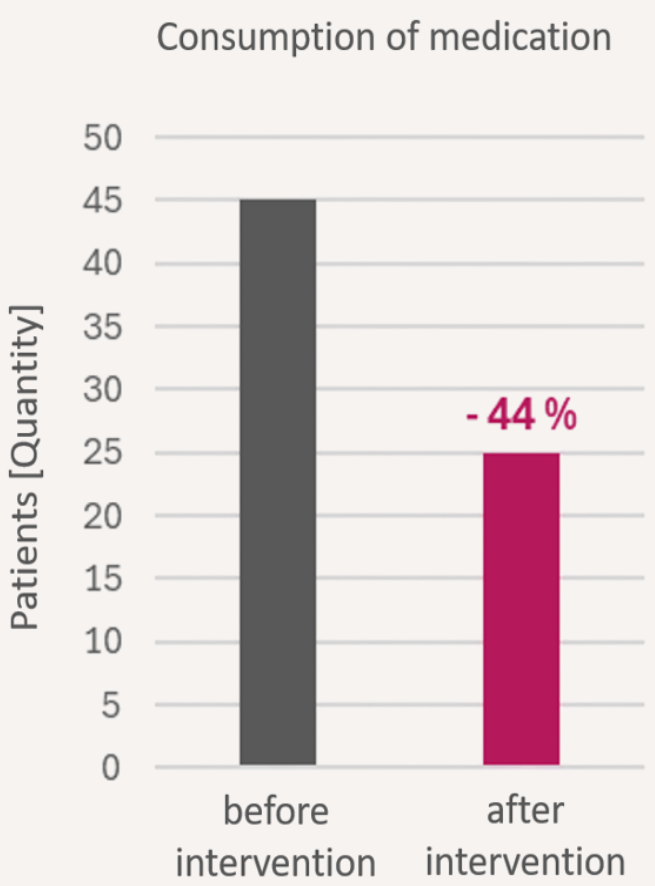
Reduction in the disease burden and a lower medication consumption





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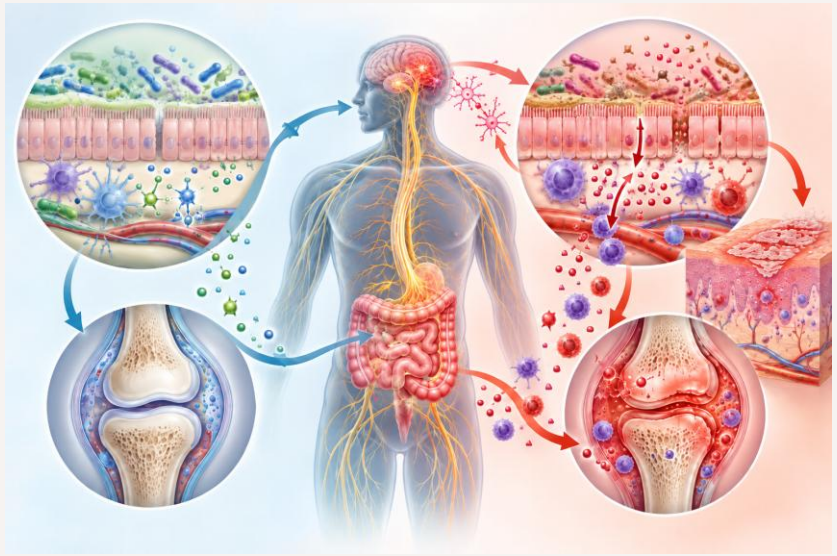
• Psoriatic Arthritis



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nutrients

MDPI

Article

Effects of Probiotic Strains on Disease Activity and Enteric Permeability in Psoriatic Arthritis–A Pilot Open-Label Study

Andreas Haidmayer [1], Philipp Bosch [1], Angelika Lackner [1], Monica D'Orazio [1], Johannes Fessler [1,2,*] and Martin H Stradner [1]

STUDY DESIGN

Haidmayer et al. 2020



patients with psoriatic arthritis (PsA)

OMNi-BiOTiC® STRESS Repair

Once daily for 12 weeks

Parameters:

- mPASDAS: modified psoriatic arthritis disease activity score
- Zonulin
- α1-Antitrypsin
- Calprotectin



RESULTS

The multispecies probiotic reduces the symptoms of psoriatic arthritis

The modified Psoriatic Arthritis Disease Activity Score (**mPASDAS**) including the variables: swollen, tender joints, dactylitis, Leeds enthesitis index,
C-reactive protein, disease activity measured by doctor and patient, and PCS (physical component summary score) from the SF-36 questionnaire was **significantly improved** through the probiotic therapy.

Haidmayer, A. et al. (2020). Effects of Probiotic Strains on Disease Activity and Enteric Permeability in Psoriatic Arthritis–A Pilot Open-Label Study. *Nutrients*, 12, 2337.

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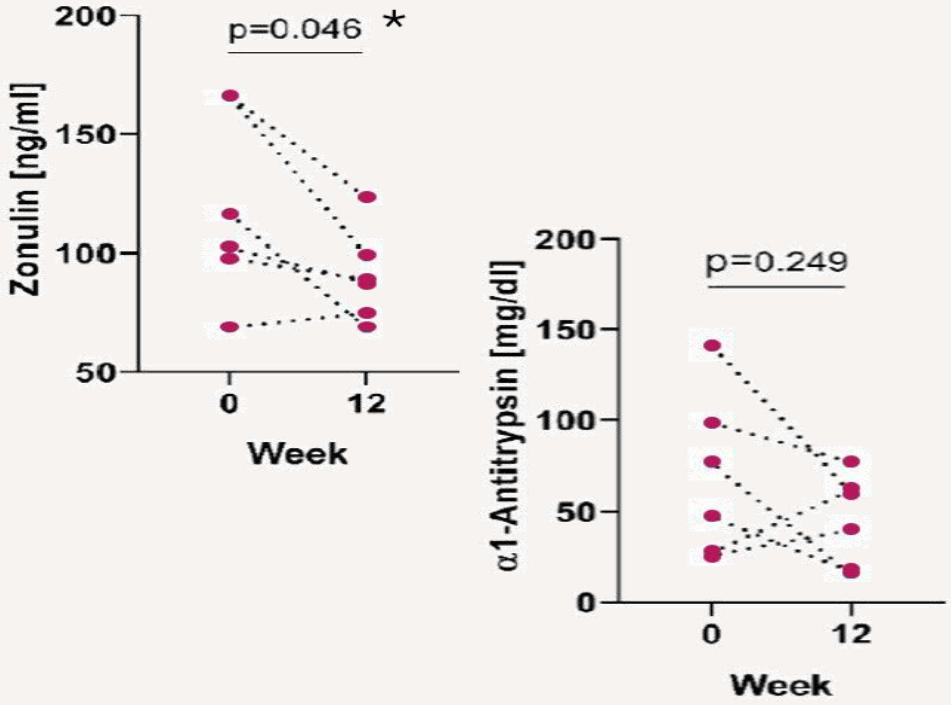
The intestinal barrier is strengthened with OMNi-BiOTiC Stress Repair

RESULTS



Patients with PsA have an impaired intestinal barrier function

- Zonulin ↑ and α1-Antitrypsin ↑

Haidmayer, A. et al. (2020). Effects of Probiotic Strains on Disease Activity and Enteric Permeability in Psoriatic Arthritis–A Pilot Open-Label Study. *Nutrients*, 12, 2337.

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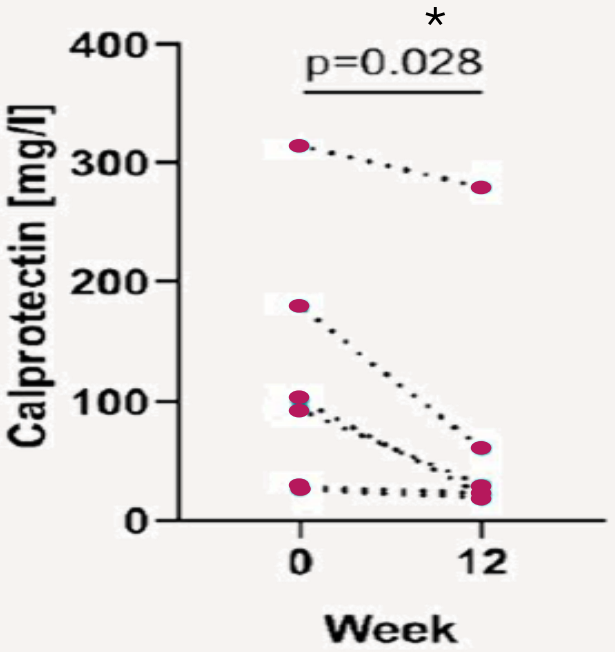
RESULTS

OMNi-BiOTiC Stress Repair reduces the inflammation marker Calprotectin significantly



Patients with PsA have elevated indicators for inflammation

- Calprotectin ↑

Haidmayer, A. et al. (2020). Effects of Probiotic Strains on Disease Activity and Enteric Permeability in Psoriatic Arthritis–A Pilot Open-Label Study. *Nutrients*, 12, 2337.

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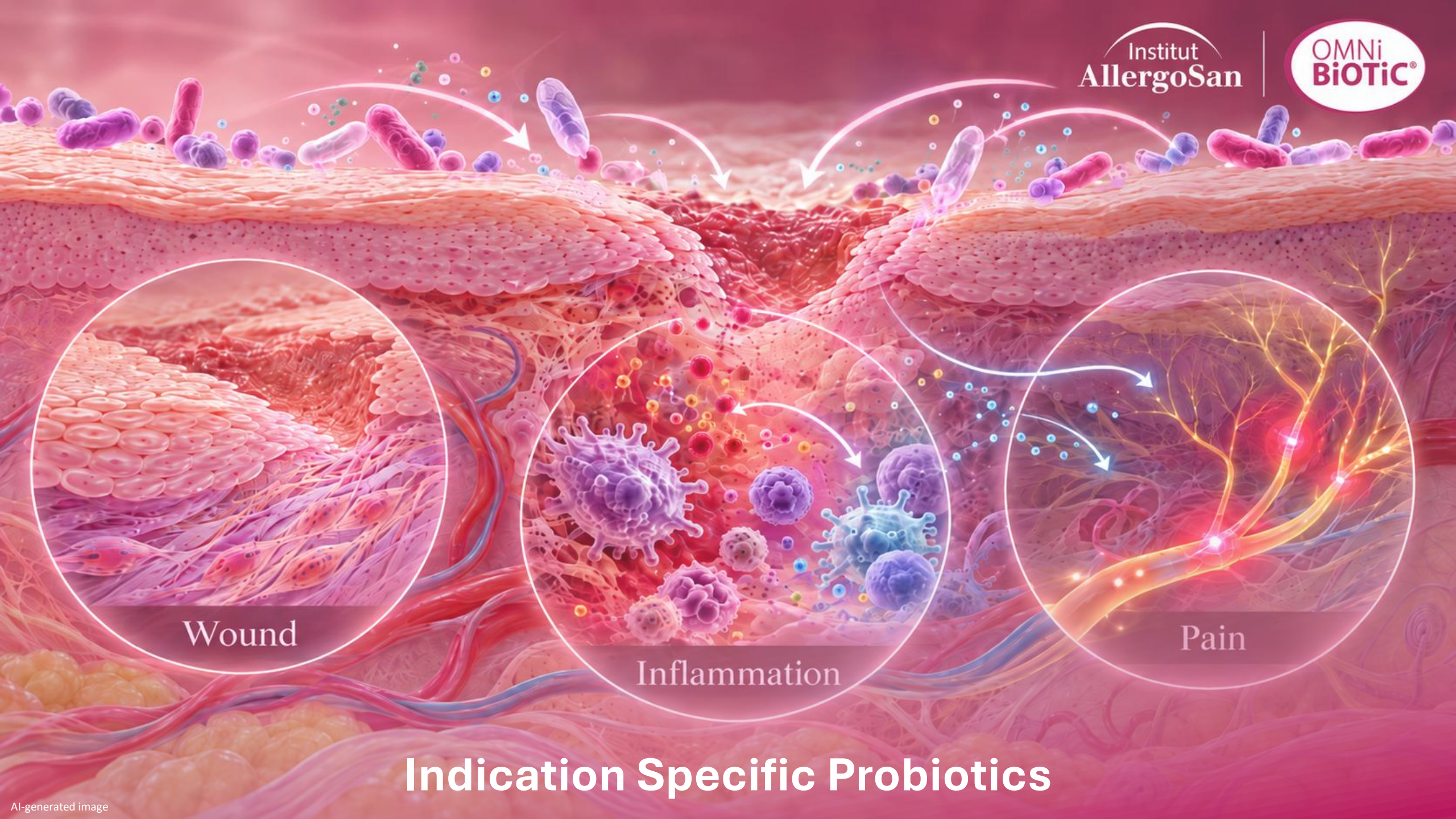
Take home message

- ✓ Chronic wounds are more than a local problem
- ✓ The gut microbiome influences healing and pain
- ✓ Reducing dysbiosis helps restoring the inflammatory balance
- ✓ **Indication specific Probiotics represent a highly effective natural supportive strategy in wound healing, reduction of inflammation and pain management**

Think beyond the wound: support the patient systemically!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OMNi BiOTiC®
Wound
Inflammation
Pain
Indication Specific Probiotics
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Thank you for your attention!



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