



Precision
Biotics®



Clinical
Evidence
Summary

Vaginal health
and a balanced
vaginal
microbiome.

A unique
combination
of probiotic
lactobacilli:
ASTARTE™ & LA-5®

Scientific information. For healthcare professionals only.

CLINICAL EVIDENCE SUMMARY

Vaginal health and a balanced vaginal microbiome. A unique combination of probiotic lactobacilli: **ASTARTE™** & **LA-5®**

Key Points

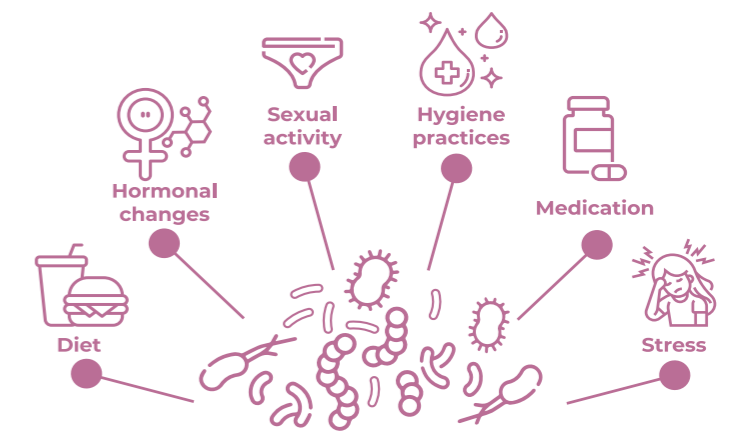
- ▶ The vaginal microbiome is a dynamic ecosystem that is influenced by hormonal changes, diet, and lifestyle factors^{1,2}.
- ▶ In a healthy state, *Lactobacillus* species dominate the vaginal microbiota. They maintain vaginal acidity and prevent infections, though their levels fluctuate through life^{3,4}.
- ▶ Vaginal dysbiosis, affecting up to 50% of women, leads to conditions like bacterial vaginosis (BV) and yeast infections^{5,6}.
- ▶ Routine management of vaginal dysbiosis may involve antibiotic treatment, but the rise in antibiotic resistance has prompted interest in other management options⁷⁻⁹.
- ▶ There is research evidence that certain probiotic lactobacilli may help to reduce the risk of recurrent yeast infection^{8,10}.
- ▶ Clinical studies support that **ASTARTE™***:
 - Helps to establish a healthy vaginal microbiota^{11,12}
 - Reduces bacterial imbalance in the vagina^{11,12}
 - Reduces vaginal discomfort¹²
- ▶ Clinical studies support that **LA-5®** may:
 - Reduce yeast overgrowth in the vagina^{13,14}
 - Reduce vaginal discomfort associated with vaginal yeast overgrowth¹⁴

***ASTARTE™** is a unique combination of four probiotic strains:
Lactobacillus crispatus, LBV 88 ; *Lactobacillus jensenii*, LBV 116 ;
Lactobacillus gasseri, LBV 150N ; *Lacticaseibacillus rhamnosus*, LBV 96.

Vaginal health

Vaginal health is a crucial component of women's overall well-being. The vagina functions as a dynamic ecosystem, influenced by hormonal changes, microbiota composition, diet, sexual activity, hygiene practices, and medical interventions^{1,2}.

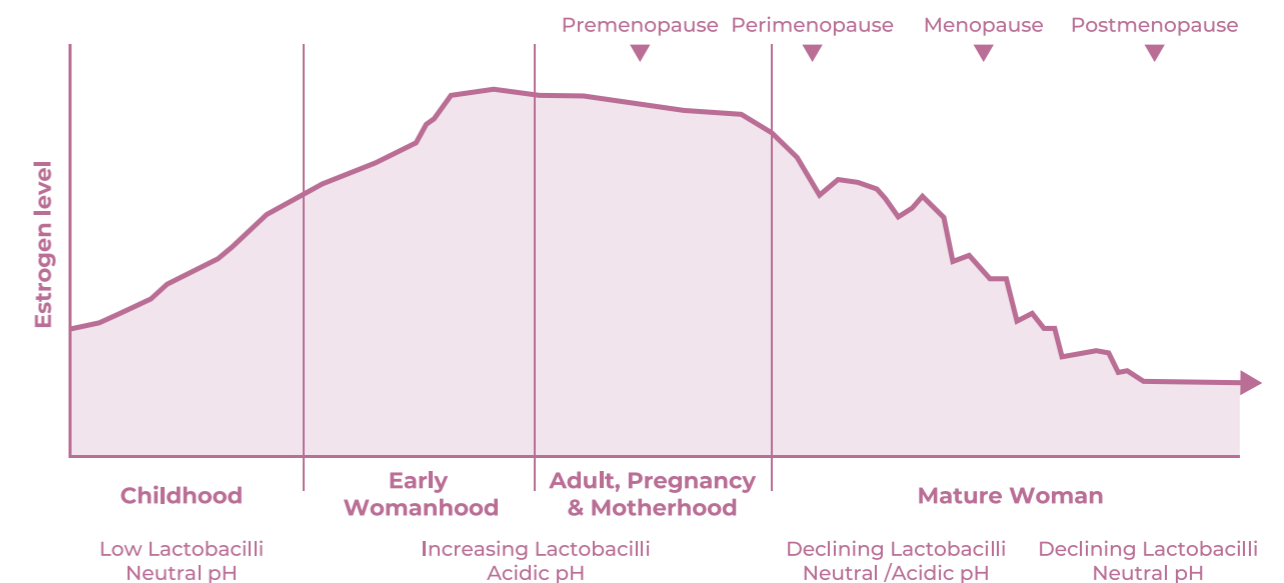
The vaginal microbiome plays a crucial role in maintaining this ecosystem and fluctuates throughout life^{3,15}.



Adapted from Lehtoranta et al., 2022¹ and Condori et al., 2022².

The vaginal microbiome through life stages

In a healthy vaginal environment, *Lactobacillus* species dominate the microbiota, producing antimicrobial compounds that maintain an acidic pH (3.8-4.5), effectively inhibiting pathogen growth^{3,4}. However, the number of lactobacilli can fluctuate throughout a woman's life, influenced by hormonal changes and lifestyle factors^{16,17}.



Adapted from Odamaki et al., 2016¹⁶ and Korpela et al., 2018¹⁷.

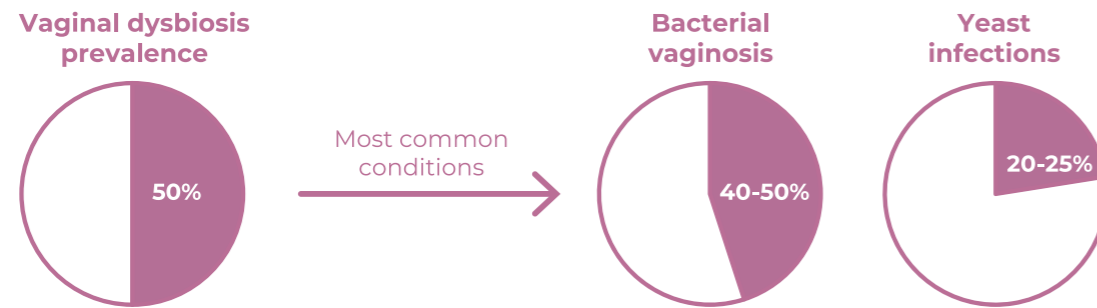
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Prevalence of vaginal issues

Vaginal dysbiosis, a disruption of the composition and functionality of the microbiota in the vagina, is a common issue, affecting up to 50% of women at some point in their lives^{5,18,19}.

The most common conditions associated with an unbalanced vaginal microbiome include bacterial vaginosis (BV)⁶ accounting for 40% to 50% of cases, followed by yeast infections, which affect about 20% to 25% of women at least once in their lifetime²⁰.

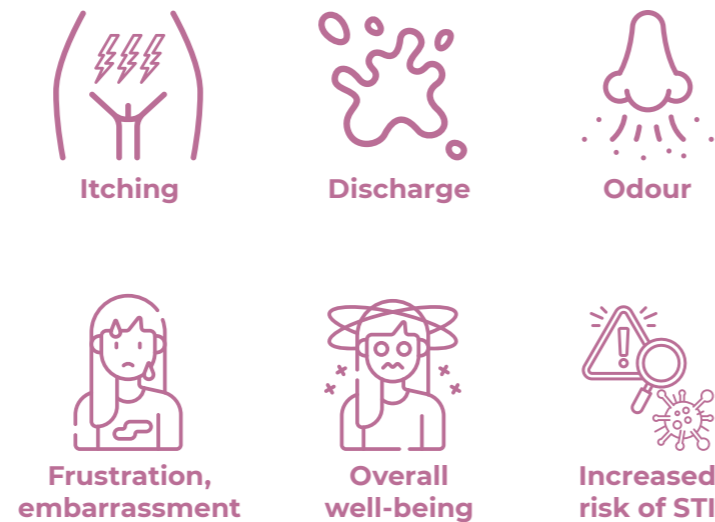


Impact of vaginal infections

Vaginal infections are often recurrent, with over 50% of affected women experiencing a recurrent episode within 12 months⁵.

Women with vaginal health issues often face symptoms such as itching, discharge, and odour, which can significantly affect their daily lives²¹.

These challenges frequently lead to frustration, insecurity, and embarrassment, negatively impacting overall well-being^{21,22}. Additionally, vaginal dysbiosis increases the risk of sexually transmitted infections (STI), contributing to both personal and public health burdens¹⁸.



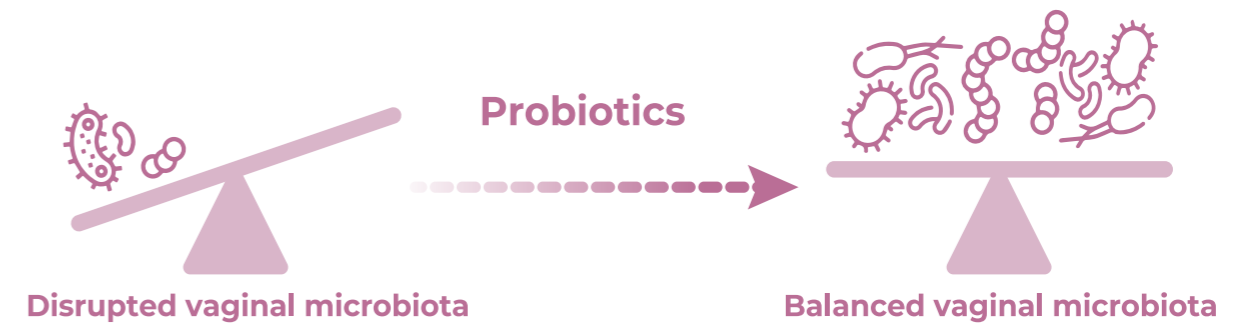
Management of vaginal dysbiosis

The routine management of vaginal dysbiosis often involves the use of antibiotics, which are prescribed to inhibit pathogenic microbes⁷. However, with the rise in antibiotic resistance, there is a growing need for alternatives^{8,9}. This has led to increased interest in probiotic interventions, which can support vaginal health by promoting a balanced vaginal microbiome while avoiding the risk of antibiotic resistance.

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Probiotics and vaginal health

Recent studies indicate that probiotics can significantly restore and maintain the vaginal microbiota, particularly after disruptions from antibiotics or other factors²³. Certain probiotic lactobacilli strains have been shown to reduce the recurrence of BV and yeast infections by replenishing beneficial bacteria and restoring the vaginal natural acidity¹⁰.



The growing evidence supports the use of probiotics as a natural and effective strategy for maintaining vaginal health, especially in preventing and managing BV and yeast infections.

ASTARTE™

A unique combination of probiotic lactobacilli

ASTARTE™ is a combination of four specific strains of *Lactobacillus* that have been scientifically selected for their beneficial properties. The four strains are:

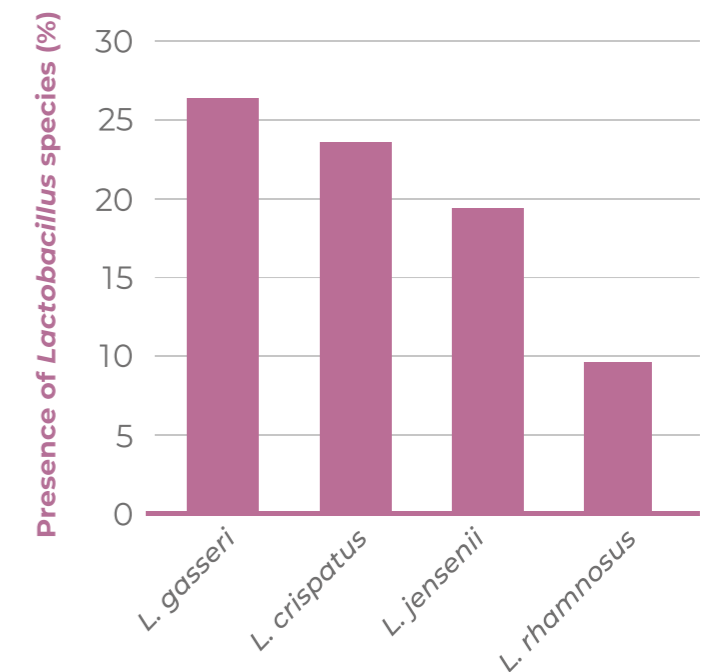
- *Lactobacillus crispatus*, LBV 88
- *Lactobacillus jensenii*, LBV 116
- *Lactobacillus gasseri*, LBV 150N
- *Lacticaseibacillus rhamnosus*, LBV 96

These strains originated from healthy pregnant women and demonstrate aerobic and anaerobic growth potential and resistance to bile salts.

The combination is associated with several health benefits:

- Diminishing bacterial imbalance in the vagina^{11,12}
- Establishing and maintaining a healthy vaginal microbiota dominated by *Lactobacillus* species^{11,12,25,26}
- Reducing both digestive and vaginal complaints¹²

Species abundance in the vagina of healthy pregnant women²⁴



Adapted from Kiss et al., 2007²⁴

LA-5®

Lactobacillus acidophilus

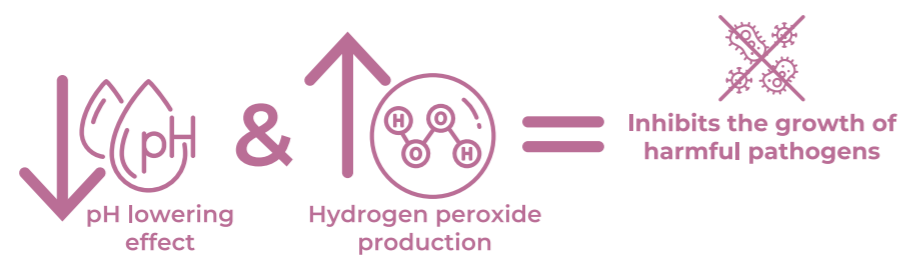
A clinically documented strain that has shown benefit for vaginal health by helping to reduce the risk of yeast overgrowth.

LA-5® has a favorable impact on:

- Reducing yeast overgrowth in the vagina^{13,14}.
- Reducing vaginal discomfort associated with yeast overgrowth in the vagina¹⁴.

ASTARTE™ In vitro evidence Contribution to a balanced vaginal microbiota

The unique combination of four *Lactobacillus* strains (*L. crispatus*, LBV 88; *L. jensenii*, LBV 116; *L. gasseri*, LBV 150N; *L. rhamnosus*, LBV 96) have been evaluated for their specific effects on vaginal health. They show a significant pH-lowering effect, which is crucial for maintaining an acidic vaginal environment that inhibits the growth of harmful pathogens. They also produce extracellular hydrogen peroxide, which further helps in suppressing the growth of potentially harmful bacteria, thereby contributing to a balanced and healthy vaginal microbiota²⁷.



In vitro study: inhibition of pathogenic vaginal species²⁷

Species	<i>Candida krusei</i>		<i>Candida albicans</i>		<i>Candida albata</i>		<i>Gardnerella vaginalis</i>	
	Cd25	Cd26	Cd30	Cd31	Cd33	Cd34	Ga1	Ga3
<i>L. crispatus</i> , LbV 88	+	-	+/**	+	+	+	+++	+++
<i>L. rhamnosus</i> , LbV 96	+++	+++	+++	+++	++	+	+++	+++
<i>L. jensenii</i> , LbV 116	+/**	-/+	++	+/**	+	+	+++	+++
<i>L. gasseri</i> , LbV 150N	+++	+++	+++	+/**	+	-	+++	+++

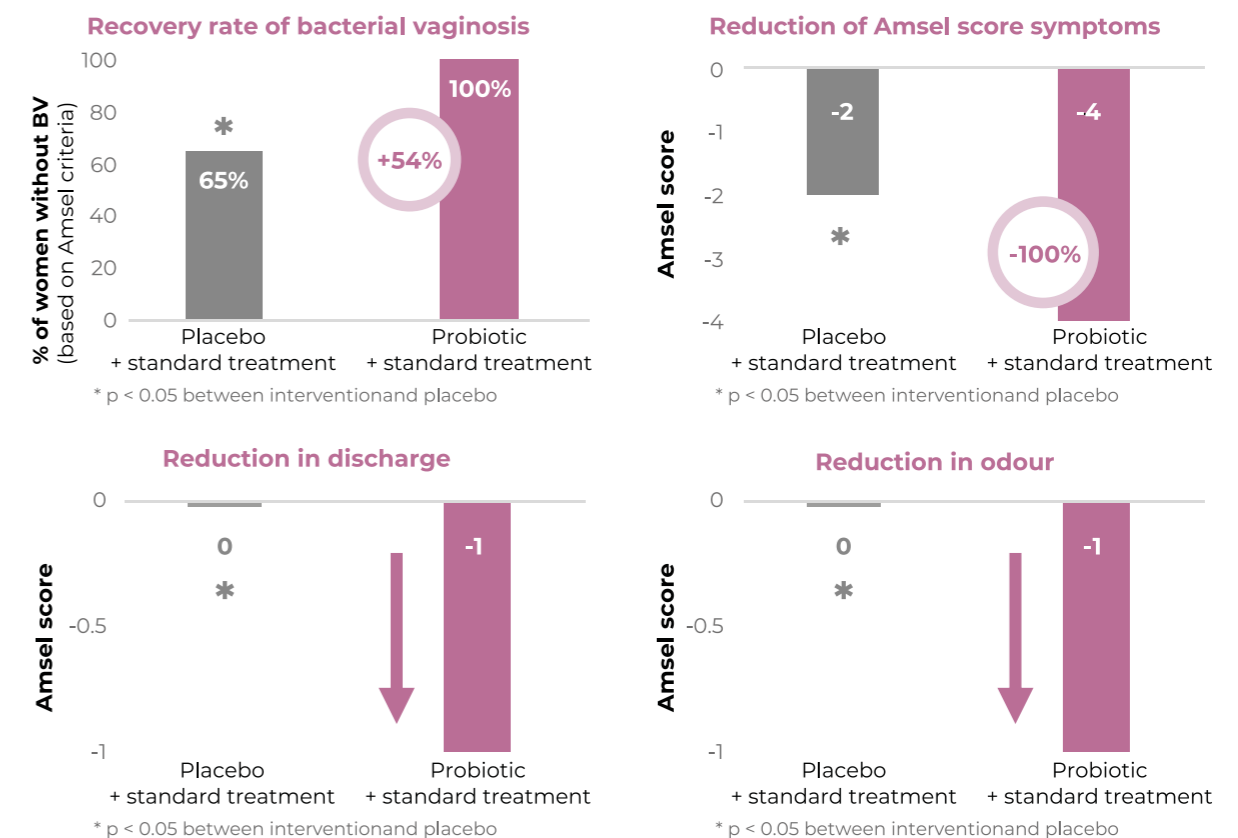
+++ = pronounced impact on growth reduction; ++ = some impact; + = weak impact; - = no impact. It shall be noted that it is not given that this effect occurs *in vivo*.

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ASTARTE™ Clinical Evidence Improvement of the vaginal microbiota and comfort

A double-blind, randomised, controlled pilot trial assessed the effect of a yoghurt drink on BV. The women assigned to the probiotic intervention group consumed a yoghurt containing a combination of four bacterial strains (*L. crispatus*, LBV 88; *L. jensenii*, LBV 116; *L. gasseri*, LBV 150N; *L. rhamnosus*, LBV 96) daily for four weeks (2.5 x 10⁹ colony forming units (CFU) of each strain per day in total). The women assigned to the placebo group consumed a chemically acidified milk product daily for four weeks. The population was adult women (≥18 years of age) diagnosed with BV and treated with metronidazole and Amsel criteria* was used to clinically assess BV¹¹.

Population	Sample size	Probiotic	Comparator	Duration
Women >18 years of age with diagnosed BV and treated with metronidazole (2 x 500 mg/d)	n=18: placebo n=18: probiotic	Combination of four strains (<i>L. crispatus</i> , LBV 88; <i>L. jensenii</i> , LBV 116; <i>L. gasseri</i> , LBV 150N; <i>L. rhamnosus</i> , LBV 96) (2.5 x 10 ⁹ CFU of each strain in total daily)	Placebo: chemically acidified milk	4 weeks



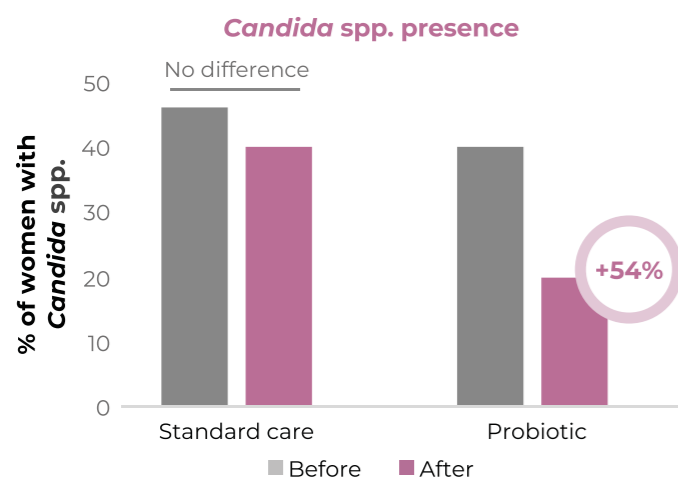
A probiotic intervention with the unique **ASTARTE™** probiotic combination resulted in a significant increase in the percentage of women who recovered from BV (p<0.05), with a 54% improvement in recovery rates. Additionally, according to Amsel score criteria, the probiotic intervention led to a significant -100% (2-fold) reduction in overall BV symptoms (p<0.05). The intervention group specifically experienced a notable decrease in discharge and odour.

*Diagnosis of BV was based on Amsel criteria²⁸, i.e. at least three of four criteria had to be present: (1) vaginal pH above 4.5; (2) thin, homogeneous discharge; (3) release of amine ('fishy') odour after the addition of 10% KOH (whiff test) to vaginal smear; (4) clue cells on saline wet mount of vaginal smear (in phase contrast microscopy).

ASTARTE™ Clinical Evidence Improvement of vaginal discomfort

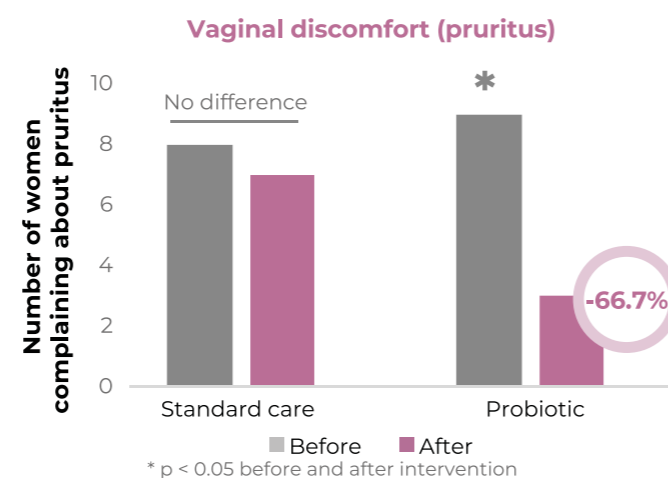
An open randomised controlled study evaluated the efficacy of a unique probiotic combination in complex therapeutic and preventive measures for pregnant women with herpes virus infection (HVI). Pregnant women with HVI assigned to the probiotic intervention group received two capsules containing a combination of four bacterial strains (*L. crispatus*, LBV 88; *L. jensenii*, LBV 116; *L. gasseri*, LBV 150N; *L. rhamnosus*, LBV 96) daily for 1 week (5×10^9 CFU per day in total). The outcomes were compared to two comparator groups - pregnant women with HVI receiving standard prenatal care and healthy pregnant women without HVI¹².

Population	Sample size	Probiotic	Comparator	Duration
Pregnant women with and without HVI	n=30: pregnant women with HVI. Prenatal standard care. n=30: pregnant women with HVI. Probiotics intervention. n=50: healthy pregnant women, without HVI.	2 capsules containing a combination of four strains (<i>L. crispatus</i> , LBV 88; <i>L. jensenii</i> , LBV 116; <i>L. gasseri</i> , LBV 150N; <i>L. rhamnosus</i> , LBV 96) twice a day (5×10^9 CFU per day in total).	Pregnant women with HVI, standard prenatal care. Healthy pregnant women without HVI.	1 week



After a probiotic intervention with a combination of four bacterial strains (*L. crispatus*, LBV 88; *L. jensenii*, LBV 116; *L. gasseri*, LBV 150N; *L. rhamnosus*, LBV 96) the percentage of pregnant women with HVI who tested positive for *Candida* spp. was reduced compared to before the intervention. This effect represented a 50% improvement compared to before the probiotic intervention, although the difference was not statistically significant. Notably, this improvement was not observed in the group receiving standard prenatal care.

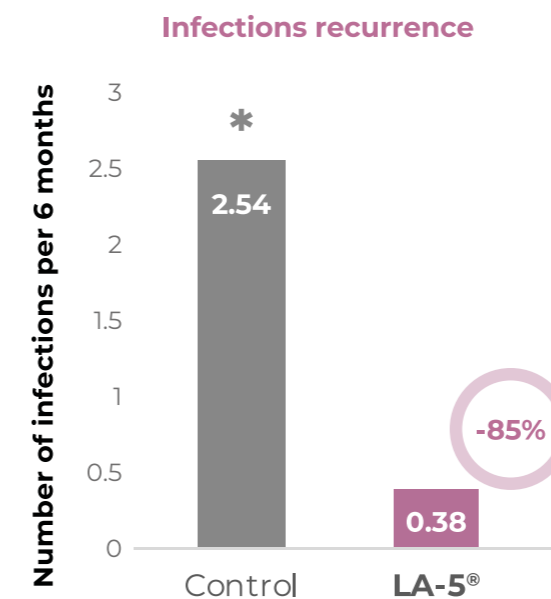
Vaginal discomfort was assessed by the number of women reporting pruritus. The probiotic intervention with **ASTARTE™** led to a significant 66.7% reduction ($p < 0.05$) in pruritus complaints within the probiotic group compared to before the treatment. This improvement was not observed in the group receiving standard prenatal care.



LA-5® Clinical Evidence Association with reduced yeast overgrowth

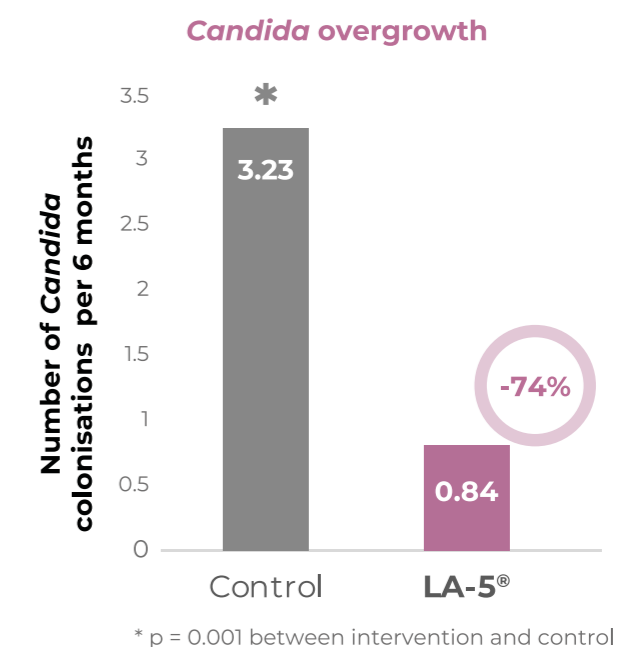
A crossover, two-arm study assessed whether *Lactobacillus acidophilus*, **LA-5®** prevents vulvovaginal candidal infections. A yoghurt containing *Lactobacillus acidophilus*, **LA-5®** (2.4×10^{10} CFU) was consumed daily for six months (n=13). As a control, the same participants consumed yoghurt without the live lactobacilli for six months (n=13). The intervention lasted one year in total¹³.

Population	Sample size	Probiotic	Comparator	Duration
Women with recurring yeast overgrowth. (24-50 years of age)	n=13	Yoghurt containing <i>Lactobacillus acidophilus</i> , LA-5® (2.4×10^{10} CFU)	Yoghurt free of probiotics. Crossover control	6 months



An intervention with yoghurt containing *Lactobacillus acidophilus*, **LA-5®** significantly reduced the number of infections over 6 months in women with recurring yeast overgrowth ($p < 0.001$). This resulted in an 85% reduction in infection recurrence in the probiotic group compared to the control group, which received yoghurt without probiotics.

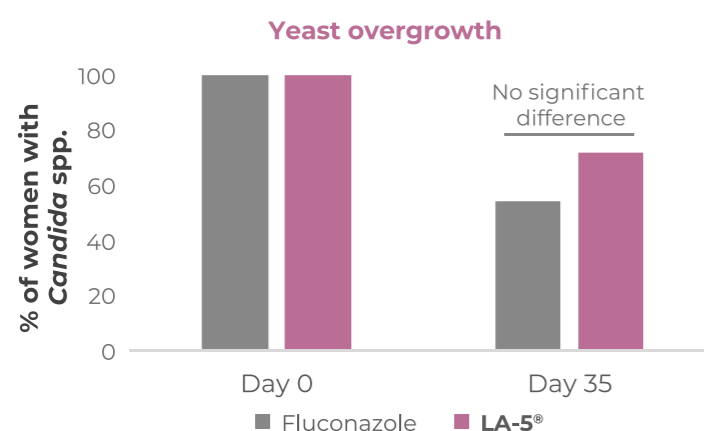
Candida overgrowth was assessed by the number of colonisations over a 6-month period. The intervention with the *Lactobacillus acidophilus*, **LA-5®** significantly reduced yeast overgrowth by 74% ($p = 0.001$) compared to the control group, which received yoghurt without probiotics.



LA-5® Clinical Evidence Reduction of vaginal discomfort levels

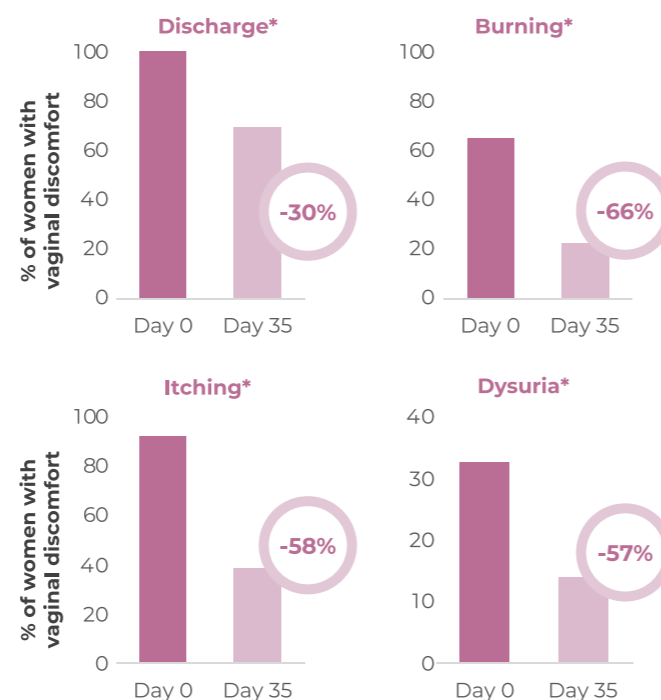
A triple-blinded randomised controlled study compared the effects of *Lactobacillus acidophilus*, **LA-5®** and fluconazole (antifungal) on the treatment and recurrence of vulvovaginal candidiasis (VVC). All the women in the study received a single dose of fluconazole (150 mg). The women assigned to the probiotic intervention (n=36) also received a probiotic capsule containing *Lactobacillus acidophilus*, **LA-5®** (0.5×10^9 CFU) and a fluconazole placebo daily for one month. The women assigned to the comparator group (n=33) received standard treatment (150mg fluconazole daily) and a probiotic placebo daily for one month¹⁴.

Population	Sample size	Probiotic	Comparator	Duration
Women with positive <i>Candida</i> spp. culture 18-49 years old	n=33: Fluconazole n=36: Probiotic	<i>Lactobacillus acidophilus</i> , LA-5® (0.5×10^9 CFU daily) + fluconazole placebo	Fluconazole (150mg) + probiotic placebo	1 month



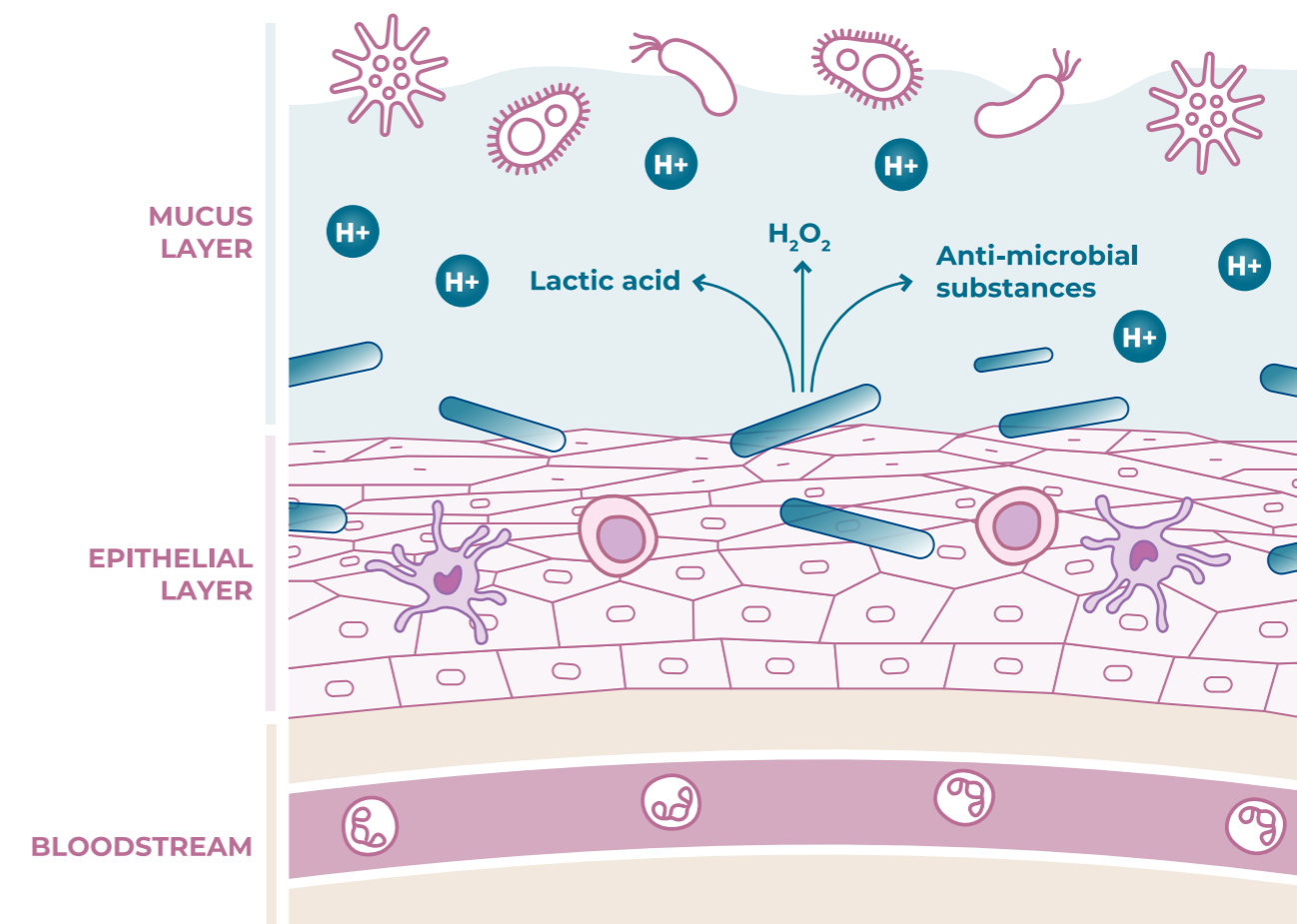
The number of women with vaginal yeast overgrowth decreased after receiving standard treatment with Fluconazole (50mg) or **LA-5®** as an adjuvant. Both interventions resulted in a significant reduction in the percentage of women with *Candida* spp. presence between day 0 and the end of the treatment, but there was no significant difference between the two treatment groups regarding yeast overgrowth.

After one month of the probiotic intervention, there was a reduction in the percentage of women experiencing discharge (30%), burning (66%), itching (58%), and dysuria (57%), demonstrating the efficacy of **LA-5®** in alleviating these symptoms of VVC.



*Women who reported mild, moderate or severe symptom. Statistical analysis was not reported.

Mechanism of action of the *Lactobacillus* probiotic strains combination



Adapted from Pendharkar et al., 2023²⁹. © 2023 Chr. Hansen. All rights reserved.



The unique combination of four *Lactobacillus* strains (*L. crispatus*, LBV 88; *L. jensenii*, LBV 116; *L. gasseri*, LBV 150N; *L. rhamnosus*, LBV 96) (**ASTARTE™**) and *Lactobacillus acidophilus*, **LA-5®** promotes vaginal health by supporting a balanced vaginal microbiome, primarily characterised by lactic acid-producing bacteria that sustain an acidic environment. The proposed mechanisms of action of these lactobacilli strains include:

1. Lowering the pH by producing lactic acid²⁷
2. Production of H₂O₂ to modify bacterial imbalance²⁷
3. Normalisation of the vaginal microbiota^{11,12}
4. Increasing the abundance of common lactobacilli in the vagina²⁷

Research Evidence overview:
ASTARTE™

Reference	Recovery rate	Vaginal discomfort
Laue et al., 2018¹¹	ASTARTE™ strains significantly increased the percentage of women without BV to the 100% (p < 0.05).	ASTARTE™ strains induced a significant reduction of the Amsel score symptoms, discharge and odour (p < 0.05).
	✔	✔
Anoshina et al., 2016¹²	ASTARTE™ strains significantly reduced the percentage of women with presence of <i>Candida</i> spp. by a 50% (p < 0.05).	ASTARTE™ strains led to a significant 66.7% reduction (p<0.05) in the number of women complaining about pruritus.
	✔	✔

Lactobacillus acidophilus, LA-5®

Reference	Vaginal discomfort	Candida overgrowth
Hilton et al., 1992¹³	Not assessed.	LA-5® induced a significant 85% reduction in the number of infections (p<0.001) and a 74% reduction in the number of <i>Candida</i> colonisations per 6 months (p=0.001).
	N.A.	✔
Mollazadeh-Narestan et al., 2022¹⁴	LA-5® reduced the percentage of women experiencing discharge (by 30%), burning (by 66%), itching (by 58%), and dysuria (by 57%). Statistical analysis was not reported.	LA-5® showed no significant difference compared to fluconazole to treat VVC. Both interventions resulted in a significant reduction in the percentage of women with <i>Candida</i> spp.
	✔	✔

Summary

- Vaginal bacterial imbalance is a common issue, affecting up to 50% of women at some point in their lives^{5,18,19}. Furthermore, over 50% of affected women experience recurrent episodes within 12 months⁵.
- The most common conditions associated with an unbalanced vaginal microbiome include yeast overgrowth and BV⁶. These conditions cause discomfort such as itching, discharge and odour^{11,12,14}.
- Current management of vaginal infections typically involves antibiotics or antifungal agents. However, probiotics could be used either as adjunctive or alternative treatment.
- Clinical studies support that **ASTARTE™**, a combination of four *Lactobacillus* probiotic strains* may:
 - Help to establish a healthy vaginal microbiota^{11,12}
 - Reduce bacterial imbalance in the vagina^{11,12}
 - Reduce vaginal discomfort¹²
- Clinical studies show that the *Lactobacillus acidophilus*, LA-5® probiotic strain may:
 - Reduce yeast overgrowth in the vagina^{13,14}
 - Reduce vaginal discomfort associated with vaginal yeast overgrowth¹⁴
- Healthcare providers should consider the evidence of this probiotic combination in maintaining vaginal health.

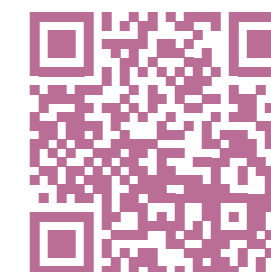
*The four probiotic strains in the unique **ASTARTE™** combination are: *Lactobacillus crispatus*, LBV 88; *Lactobacillus jensenii*, LBV 116; *Lactobacillus gasseri*, LBV 150N; *Lacticaseibacillus rhamnosus*, LBV 96.

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Learn more about how
Lactobacillus probiotics could help manage vaginal health
by visiting our CPD Learning Hub at

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