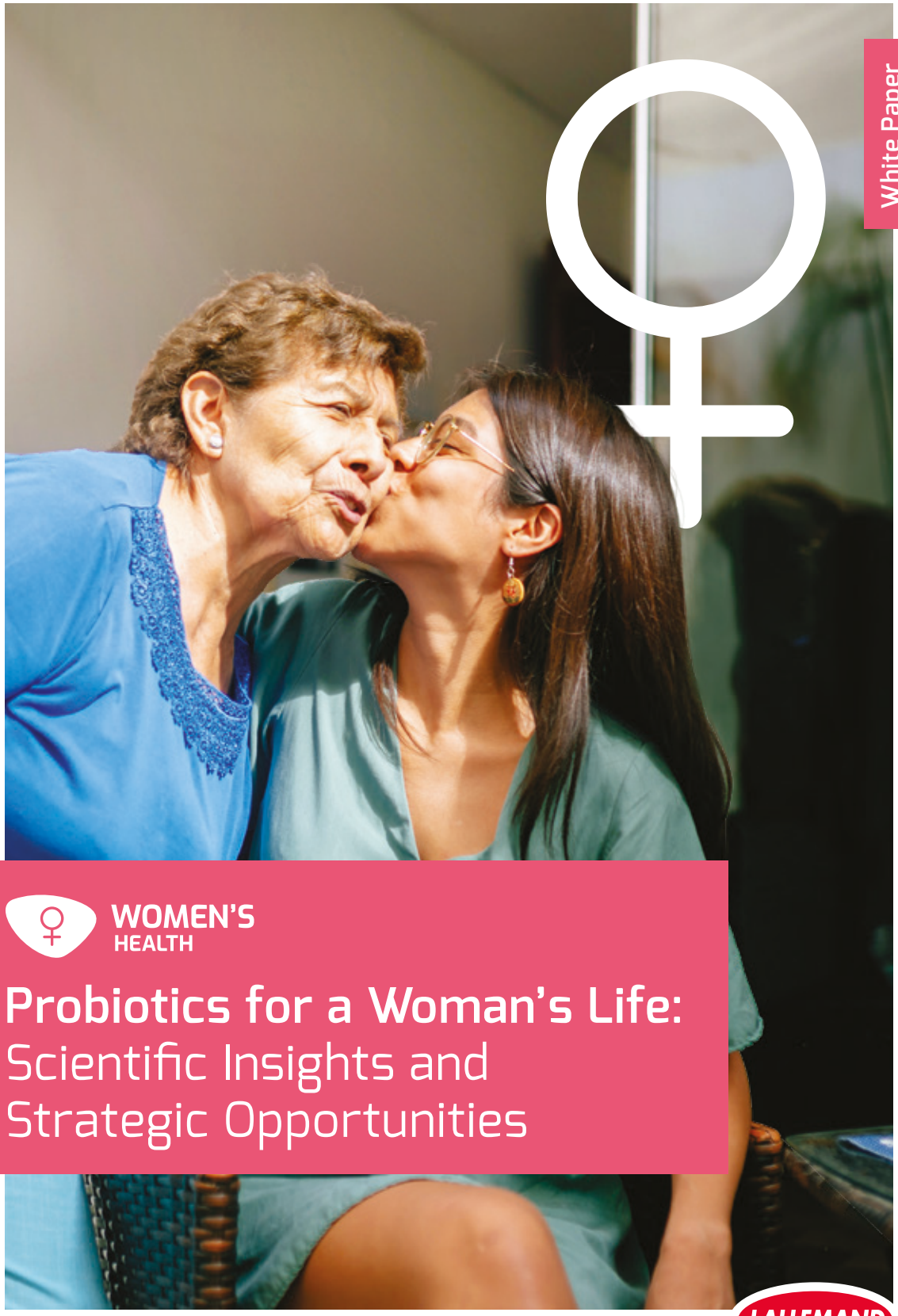
White Paper



WOMEN'S HEALTH

Probiotics for a Woman's Life: Scientific Insights and Strategic Opportunities

LALLEMAND HEALTH SOLUTIONS

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Women's Health: Driving Growth Across the Wellness Space

Women's health spans the full range of biological, reproductive, and gender specific factors that shape well-being throughout a woman's life. This includes areas unique to women, such as menstrual, reproductive, and gynecological health, fertility, pregnancy, postpartum recovery, and menopause, as well as the maintenance of a healthy vaginal microbiota, which plays a key role in supporting balanced yeast and bacterial levels and overall urogenital health. Beyond reproduction, women's health also encompasses broader physical, hormonal, and physiological needs that evolve across life stages, ultimately influencing long term wellness, resilience, and quality of life.

Women As Key Drivers of Economic Growth

Women represent nearly half of the world's population, about 4.09 billion individuals in 2025, according to United Nations demographic projections. Their presence spans every age group and region, from rapidly expanding female populations in Sub Saharan Africa to aging yet economically influential cohorts in Europe and East Asia. These demographic patterns, combined with rising levels of education with primary school completion rates exceeding 90% for women in many European countries, are reshaping global economic influence.

In 2025, women controlled an estimated $31.8 trillion in global consumer spending and were responsible for 70–80% of purchasing decisions across most categories, from daily household essentials to larger investments such as homes, cars, and health products. Their influence is particularly strong in the health and wellness sector, where women are not only the primary decision makers for their households but are also increasingly proactive consumers seeking effective, evidence based solutions for themselves [1].

In 2025, women controlled

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Women were responsible for

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> **"According to the United Nations, gender equality and the empowerment of women are essential for sustainable development and a prosperous society. As women represent half of the world's population and half of its potential, placing them at the center of decision-making and ensuring their well-being is critical to achieving global progress."**

This combination of demographic scale, rising educational attainment, and growing economic influence positions women as a driving force in the health supplement landscape, one whose needs, expectations, and purchasing behaviors are reshaping product innovation, scientific research priorities, and brand strategies worldwide.

Market Insights: Health and Beauty Supplement Trends

The global women's probiotics category is experiencing strong and sustained expansion. In 2025, the market is valued at **USD 1.8 billion, with projections indicating a rise to USD 9.6 billion by 2035**, driven by an impressive **18.1% value based CAGR over the decade [2].**

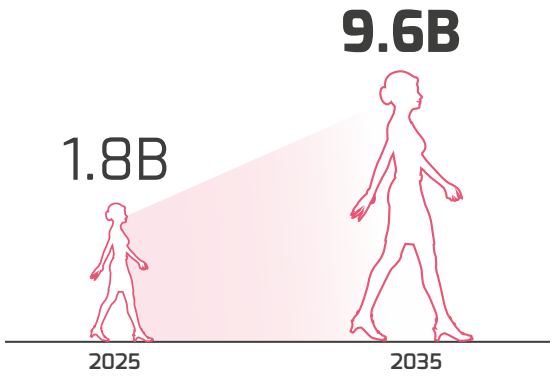
This momentum reflects rising awareness of women's specific health needs, growing interest in microbiome focused solutions, and increased demand for targeted products addressing vaginal health, prenatal and postnatal support, digestive comfort, and premenstrual syndrome management.

E-commerce continues to accelerate category growth. On Amazon US, the women's probiotics segment shows exceptional performance, with dollar sales up 68% year over year, propelled by interest in specialized, life stage specific formulations. In parallel, the US brick and mortar retail market (Food, MULO, and Natural Expanded Channels) reports a **25% year over year increase** in dollar sales for women's health probiotics, evidence of broad based consumer adoption across channels [3].

Across global markets, a heightened focus on preventive health, hormonal balance, digestive wellness, and intimate health continues to reinforce the long term potential of the women's probiotic category.
As a result, it is emerging as one of the most dynamic and innovation driven segments within the broader health and wellness industry.

Businesses that invest in research driven innovation, life stage specific positioning, and regionally tailored growth strategies will be strongly positioned to lead in this rapidly expanding global marketplace.

The global women's health probiotics market (in $US) [2]



With an estimated **CAGR** of

18.1%

over the decade [2]

25%

year over year increase in dollar sales for women's health probiotics [3]

According to Grand View Research, women aged 31–50 represented the largest share of category revenue in 2024, accounting for **40% of the market,** reflecting strong demand among women navigating mid-life hormonal changes, family responsibilities, and proactive wellness management.

From a consumer-need perspective, general women's health remained the dominant segment, representing **30% of total interest in 2024**, ahead of more specialized categories such as prenatal, postnatal, or menopausal support.

[Source: Grand View Research, Women's Health and Beauty Supplements Market (2025–2030)].

Women's Health Across the Lifecycle: Evolving Needs and Opportunities

Women's health is profoundly influenced by hormonal activity, with fluctuations in key hormones shaping physical, emotional, and metabolic well-being across every life stage. Hormones act as biochemical messengers that coordinate essential bodily functions, including metabolism, blood sugar regulation, sleep, reproduction, and mood, and more than 50 of them work continuously to maintain internal balance.

Among these, **sex hormones play a central role in the female lifecycle**. Oestrogen and progesterone, regulated by follicle stimulating hormone (FSH) and luteinising hormone (LH), drive puberty, the menstrual cycle, fertility, pregnancy, and the transition into menopause.

- **Oestrogen** not only regulates reproductive processes but also supports cardiovascular function, bone density, skin health, and cholesterol balance.
- **Progesterone** prepares the uterine lining for pregnancy, supports thyroid activity, reduces inflammation, influences breast health, and provides a naturally calming neurological effect.

Other hormones also shape daily health and well-being:

- **Testosterone** influences libido, bone and muscle strength, and mood.
- **Cortisol** governs the stress response, energy levels, and immune function.
- **Thyroid hormones** regulate metabolism and contribute to menstrual regularity, cognition, and temperature balance.

Together, these hormonal systems create the dynamic physiological landscape that defines women's health needs across the lifecycle [4].

Hormonal Variations Across Life Stages

Hormonal patterns shift in predictable yet distinct ways throughout a woman's life, influencing physical development, reproductive capacity, metabolic function, and emotional well-being. Each life stage presents its own hormonal profile and corresponding health considerations.

Puberty (around ages 8–13)

Puberty marks the onset of reproductive maturity. Rising oestrogen levels initiate breast development and growth of the uterus and ovaries, eventually triggering the first menstrual period. These hormonal changes also influence bone growth, fat distribution, and emotional development.

Reproductive Years (teens to late 30s/40s)

During the reproductive years, cyclical fluctuations of oestrogen and progesterone prepare the body for potential pregnancy each month. These cycles influence not only fertility but also mood, energy, appetite regulation, cognition, skin health, and metabolic function.

Perimenopause (typically in the 40s)

Perimenopause is a transitional phase marked by increasingly irregular ovarian hormone production as egg supply declines. Women may experience irregular cycles, hot flushes, sleep disturbances, changes in mood or cognition, and shifts in menstrual flow. This stage can last several years, with symptoms varying widely among individuals.

Menopause (around ages 45–55)

Menopause, defined clinically as twelve consecutive months without menstruation, corresponds to a significant reduction in oestrogen production. Many women experience night sweats, vasomotor symptoms, vaginal dryness, and emotional variability during this transition.

Postmenopause (around 55+)

In postmenopause, hormone levels stabilise at lower baselines. Although acute symptoms often ease, reduced oestrogen increases long term risks such as osteoporosis, cardiovascular disease, and genitourinary changes, making ongoing preventive support especially important.

The Cycles of Life

Women's hormone levels, primarily oestrogen, progesterone, and testosterone, fluctuate significantly across the lifespan, shaping development, reproductive function, and the ageing process. Key stages include **puberty,** which marks the beginning of hormonal cycling; **child-bearing age**, characterised by profound and sustained hormonal surges; **perimenopause**, defined by widening and unpredictable fluctuations; and **menopause**, which brings a permanent decline in ovarian hormone production. These transitions influence multiple aspects of health, including gut comfort, immune function, mood, energy, bone integrity, and metabolic balance, creating evolving needs at every stage of life [5].

Life cycles of ovarian hormones

Opportunities For Targeted Solutions

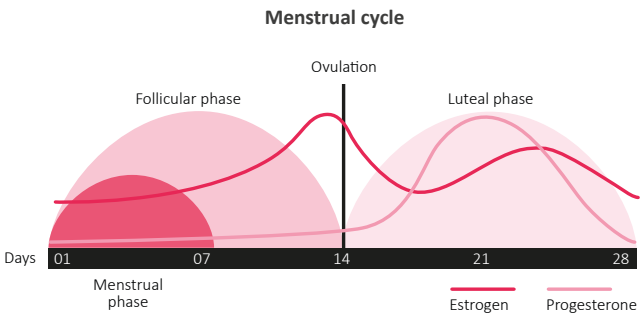
Understanding these hormonal patterns is essential for businesses developing women's health solutions, as they indicate when support needs shift and reveal clear opportunities for targeted interventions. Accounting for hormonal fluctuations, and the unique physiological requirements associated with each life stage, is key to designing solutions that are truly tailored to women.

When supported by scientific evidence, supplements can play an important role in addressing **specific needs, including sleep quality, mood balance, energy levels, immune support, digestive comfort, and urogenital wellness**. Aligning product innovation with these evolving physiological demands enables brands to deliver more effective, relevant, and differentiated solutions for women throughout their lives.

Monthly Hormonal Cycles and Their Physiological Impacts

Within the menstrual cycle, predictable hormonal fluctuations give rise to recognisable physical, cognitive, and emotional patterns. During the **follicular phase**, rising oestrogen levels are often associated with improved mood, heightened motivation, and enhanced cognitive performance, alongside subtle boosts in energy and metabolic efficiency. **Ovulation**, which occurs mid cycle, marks the peak of fertility and is characterised by the highest concentrations of oestrogen. In the **luteal phase**, declining oestrogen combined with rising progesterone can contribute to common premenstrual experiences such as irritability, fatigue, changes in appetite or digestion, food cravings, headaches, breast tenderness, or mild cramping. Toward the end of this phase, progesterone drops sharply, which can intensify both emotional sensitivity and physical discomfort in some women.

During the **first days of menstruation**, the shedding of the uterine lining and associated inflammatory responses may lead to gastrointestinal discomfort, including bloating, heaviness, cramping, and noticeable changes in gut transit, reflecting the close connection between hormonal activity, the nervous system, and digestive function [6].



Microbiome Dynamics in Perinatal Health

During pregnancy, coordinated endocrine and immunological adaptations, including trimester specific cytokine shifts, a general trend toward a more anti-inflammatory profile, and localized immune tolerance at the maternal-fetal interface, reshape mucosal physiology and broader microbial ecosystems. These systemic and localized immune changes also influence the genital tract environment.

In healthy pregnancies, the vaginal microbiota is typically **low in diversity and dominated by *Lactobacillus* species**, a profile considered protective due to the production of lactic acid and maintenance of a low vaginal pH. As pregnancy progresses, especially from the third trimester to childbirth, vaginal microbial diversity increases while *Lactobacillus* abundance gradually declines. This shift becomes most notable at the end of pregnancy and during labor, often resulting in a **transient dysbiosis.**

These microbiome changes, combined with pregnancy related physiological shifts, contribute to an increased susceptibility to urinary tract infections (UTIs), which affect **approximately 8% of pregnancies** [7]. Bacterial vaginosis (BV), characterized by reduced *Lactobacillus* levels and a more diverse microbial profile, is also relatively common during pregnancy and has been associated with a significantly higher risk of preterm birth, with meta-analyses suggesting 1.4- to 2-fold increased odds [8]. *Lactobacillus* species, through lactic acid production and antimicrobial activity, remain a key first-line defense against BV-associated opportunistic microorganisms.

From Pregnancy to Early Life

A range of maternal and environmental factors influences the early colonization of the neonatal microbiome. **Mode of delivery** is a major determinant: vaginally delivered infants are exposed to maternal vaginal and gut bacteria, acquiring *Lactobacillus, Prevotella*, and other commensal species. In contrast, infants delivered by C-section initially acquire more skin and hospital associated microorganisms, including opportunistic species, although these differences tend to diminish over time as colonization stabilizes.

Infant feeding practices further shape early microbial development. Breastfeeding provides human milk oligosaccharides (HMOs) and maternal microbes that promote ***Bifidobacterium* dominance**, typically resulting in lower gut microbial diversity compared with formula fed infants. HMOs also support immune maturation and gut barrier development during this critical period [9].

Probiotics in Pregnancy: An Evolving Area of Interest

The use of probiotics during pregnancy is a growing field of investigation. Maintaining a balanced gut microbiome becomes especially important during this time, as it supports digestion, nutrient absorption, metabolic health, and immune function. Probiotics, beneficial live microorganisms, play a key role in supporting microbial balance and are increasingly recognized by expectant mothers for their potential contribution to digestive comfort, immune support, and overall well-being. Importantly, probiotics are **generally considered safe during pregnancy**, with large systematic reviews showing **no increased risk of adverse maternal or neonatal outcomes [10].** As research continues to expand, interest in targeted probiotic interventions for perinatal health is likely to grow, creating new opportunities for evidence driven product development in this segment.

Birth and C-section rates

[Source: Source World Health Organization].

Tracing the Microbial Path: From Gut to Vaginal Microbiota

The Gut Microbiota: A Central Regulator of Systemic Health

The gut microbiota is a vast community of microorganisms, including bacteria, viruses, fungi, and archaea, that inhabit the human digestive tract. These microbes play essential roles in digestion, nutrient absorption, immune system modulation, and the production of key metabolites that influence **metabolic, cognitive, and immune function**. A balanced gut microbiota supports overall well-being, whereas disturbances in its composition or diversity have been associated with various metabolic, immune, and gastrointestinal disorders.

This complex microbial ecosystem **begins developing at birth and continues to evolve throughout life**, shaped by diet, lifestyle, environment, medication exposure, and health status.

The Vaginal Microbiota: A Dynamic and Protective Ecosystem

The vaginal microbiota is a critical component of women's health. In healthy women of reproductive age, it is typically **dominated by *Lactobacillus* species**, which help maintain an acidic vaginal pH through the production of lactic acid (and, for some species, hydrogen peroxide). This acidic environment helps reduce colonization by opportunistic microorganisms and supports mucosal immunity [11].

However, this balance is **sensitive** and can be disrupted by factors such as hormonal fluctuations, stress, sexual activity, antibiotics, immune changes, or microbial transfer from the gut to the vagina. Throughout a woman's life, **shifts in hormones and physiology influence the composition of the vaginal microbiota.**
When *Lactobacillus* levels decline, microbial imbalance, or dysbiosis, may occur. Dysbiosis has been associated with conditions such as **bacterial vaginosis** and **vulvovaginal candidiasis**, each characterized by distinct microbial patterns.

Because the vaginal microbiota plays a central role in epithelial protection and immune defence, maintaining its stability is essential for intimate well-being.

The Role of Targeted Probiotics

Targeted probiotics containing *Lactobacillus* strains have shown promising potential to help replenish or maintain a healthy vaginal microbiome. Clinical and mechanistic research indicates that certain *Lactobacillus* strains can:

- adhere to vaginal epithelial cells,
- competitively inhibit pathogen colonization,
- help modulate local immune responses, and
- contribute to re-acidification of the vaginal environment in cases of occasional imbalance.

Importantly, **probiotic effects are strain specific**. Only certain strains have demonstrated the ability to support a protective vaginal microbiota or reduce the recurrence of dysbiosis in studied populations.

The Gut-Vagina Axis: How Oral Probiotics Reach the Vaginal Environment

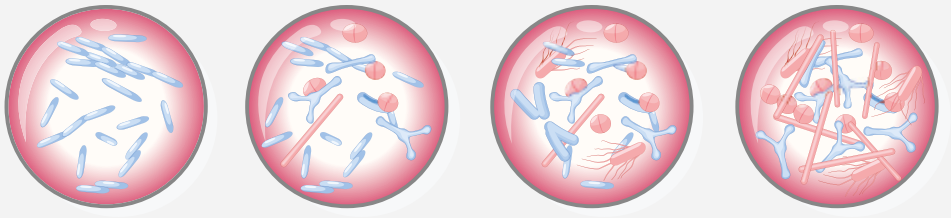
Orally consumed probiotics first pass through the digestive tract, colonize or interact with the gut microbiota, and are eventually excreted through the feces. Because the anus and vagina are anatomically close, bacteria—including both commensal and opportunistic species—can migrate from the gut to the vaginal area. This natural phenomenon is well documented in the context of "bad" bacteria causing infections, but it also occurs with "good" bacteria, including certain probiotic strains.

Recent evidence has shown that some orally administered *Lactobacillus* strains can survive gastrointestinal passage and subsequently reach the vaginal environment.

These findings reinforce the concept of the **gut-vagina axis** and open new avenues for women specific probiotic strategies designed to support vaginal health through oral supplementation.

LBG score

Vaginal microbiome health can be investigated on microscopic criteria, scoring the relative number and types of bacteria to assess a total score called **Lactobacillary grade (LBG)**:



LBG I (Normal flora)
Lactobacilli are predominant, no other bacteria are present

LBG IIa (Intermediate +)
Mixed flora, but predominantly *lactobacilli*

LBG IIb (Intermediate -)
Mixed flora but other types other than *lactobacilli* are predominant

LBG III (Abnormal vaginal flora)
Lactobacilli are absent, other types are present

Probiotics for Women's Health: Driving Innovation in Targeted Science Backed Solutions

Women's health throughout key life stages, from pregnancy to intimate well-being and menstrual comfort, can be effectively supported through targeted, clinically documented probiotics. Prenatis™ has been shown in a large trial of 180 pregnant women to help reduce the frequency of maternal infections and promote the early establishment of a healthy infant microbiome, even in C-section newborns. Lacidofil® contributes to maintaining microbial balance around C-section delivery, particularly when taken proactively. Women's intimate health concerns remain common and often recurring, highlighting the growing interest in microbiome focused solutions. *L. plantarum* ROSELLA stands out as a well studied strain supporting vaginal health, contributing to the microflora balance. Beyond intimate health, *B. bifidum* Rosell®-71 has demonstrated benefits for digestive comfort during menstruation, specifically reducing bloating. Altogether, this clinical evidence underscores the essential role of microbiome-targeted probiotics in supporting women's health across life stages.

Prenatis™: Supporting Perinatal Immunity and Infants Gut Microbiome Establishment

Prenatis™ was evaluated in a **large-scale clinical trial with 180 healthy women** in the third trimester of pregnancy [12]. Participants received 5 billion CFU of Prenatis™ (*L. rhamnosus* Rosell®-11 and *B. bifidum* HA-132) daily for 12 weeks before birth and continued supplementation for an additional 4 to 6 weeks post-partum. Follow-ups were conducted with both mothers and their infants up to one year of age. The results demonstrated a **statistically significant reduction in the proportion of women who experienced at least one diagnosed infection** in the Prenatis™ group. There was also a trend toward reduced incidence of bacterial vaginosis, one of the most diagnosed infections during pregnancy due to microbiota imbalance [13].

Supports Natural Defenses in Newborns

Prenatis™ helped establish a **healthy gut microbiome** from the beginning, especially in C-section delivered infants, demonstrating the vertical transmission from the mom to the baby. The study showed a **statistically significant reduction in the number of sick days in infants suggesting and enhanced immune resilience.** Additionally, exclusively breastfed infants, regardless of delivery mode, benefited from increased colonization of beneficial bacteria. These findings highlight Prenatis™ as a safe and effective formula for supporting maternal health during pregnancy and promoting the development of a healthy infant microbiome through breastfeeding. They outline a maternal first route to healthier infant colonization, consistent with a narrative of supporting natural defenses during pregnancy and contributing to the establishment of a healthy infant microbiome.

Health Canada has officially approved the following claims for Prenatis™:

- In conjunction with breastfeeding, helps support a healthy gut flora in newborns
- Helps support vaginal health
- Helps support healthy vaginal flora

Lacidofil® Proven Benefits in Pregnant Women Undergoing a C-section

The impact of Lacidofil® supplementation on vaginal dysbacteriosis has been carried out in women who underwent caesarean section delivery. Indeed, prophylactic antibiotherapy is used in the case of caesarean section and it may influence the development of maternal dysbacteriosis. The use of Lacidofil® administered following C-section delivery has been compared to the use of Lacidofil® administered 6 to 10 days prior to and following delivery. The results of this study demonstrated that the proactive supplementation of Lacidofil® before a C-section delivery **may reduce the incidence of opportunistic bacteria and yeast up to 3-fold**, while Lacidofil® given postoperatively only reduced incidence by 1.3-fold. Both regimens **decreased risk of microflora imbalance in the mother and infant [14] [15].**

What Are the Most Common Types of Intimate Disorders

Women's intimate health is a major concern worldwide. The different types of intimate disorders that commonly affect women include bacterial vaginosis (BV), vulvovaginal candidiasis (VVC), and urinary tract infections (UTIs).

Bacterial vaginosis

Bacterial vaginosis is caused by an imbalance in the vaginal microbiota, leading to an **overgrowth of anaerobic bacteria.**

Urinary tract infections

Urinary tract infections typically involve **pathogenic bacteria like *E. coli*** migrating to the urinary tract. These conditions can cause discomfort and have a significant impact on women's quality of life.

Vulvovaginal candidiasis

Vulvovaginal candidiasis is a fungal infection mainly due to *Candida albicans*. It occurs when the natural balance of microorganisms in the vaginal ecosystem is disrupted, allowing *Candida* to overgrow. The standard approach currently used to manage VVC involves either topical antifungal medications such as creams and suppositories, or oral such as fluconazole. These treatments are generally effective for acute episodes, but recurrence remains a challenge, up to 50% of women experience repeated infections in the same year.

Up to **50%**
of women experience repeated vulvovaginal candidiasis infections in the same year

L. plantarum Rosella: A Convenient Orally Administered Probiotic Shown to Support Women's Intimate Health

Lacticaseibacillus plantarum* ROSELLA is a probiotic strain originally isolated from the vaginal flora of a healthy woman and clinically documented across six studies involving more than 800 women. A dedicated dose finding pilot study in 24 healthy women established an optimal intake of **5 billion CFU per day** [16]. Over two cycles of 15 days' supplementation followed by 15 days washout, *L. plantarum* ROSELLA was consistently detected in both fecal and vaginal samples using strain specific PCR. Notably, its presence persisted even after washout, demonstrating its ability to survive gastrointestinal passage, reach the vaginal environment, colonize it, and remain detectable over time. Building on these results, a larger efficacy study was carried out in 93 healthy women with a history of recurrent vulvovaginal candidiasis (VVC), enrolled during a relapse free period [17]. Participants received either *L. plantarum* ROSELLA at the validated dose 5 billion CFU or a placebo for three cycles of 15 days intake and 15 days washout. At baseline, approximately 60% displayed an abnormal vaginal flora (LBG IIa–III). **After 45 days, women supplemented with *L. plantarum* ROSELLA experienced a highly significant improvement, with nearly twice as many achieving a normal flora (LBG I), a result maintained after 90 days**. In contrast, the placebo group showed no improvement in vaginal flora.

In addition to microbiota normalization, a measurable reduction in the intensity of clinical signs and symptoms associated with VVC was observed with *L. plantarum* ROSELLA supplementation. Redness and swelling of the vaginal mucosa significantly decreased after 45 days and remained improved at 90 days, whereas no comparable progress was observed in the placebo group. These results reinforce the strain's capacity to support the restoration of a balanced vaginal ecosystem. Across all studies, *L. plantarum* ROSELLA has consistently demonstrated oral to vaginal passage, colonization, and persistence, alongside observed benefits such as pH normalization, microbiota diversity restoration, and promoting comfort in women experiencing vaginal discomfort. Together, these findings position ***L. plantarum* ROSELLA** as a scientifically robust probiotic strain supporting vaginal health and microbiota balance.

**L. plantarum* ROSELLA is *L. plantarum* P17630 (Proge P17630®), licensed from PROGE FARM®, Italy.

B. bifidum Rosell®-71: Improving Gut Comfort During Menstruations, and Beyond

In a recent fully remote randomized trial, 186 women aged between 18- to 35-year-old, reporting menstrual pain, otherwise healthy, on oral contraceptives, were supplemented for eight weeks, equaling two full cycles, with *B. bifidum* Rosell®-71 at 3 billion CFU per day or placebo [Unpublished result]. The results showed a **statistically significant reduction in weekly indigestion scores, particularly in symptoms such as bloating, one of the most commonly reported gastrointestinal complaints during menstruation.** Compared to the placebo group, those taking the probiotic reported notable improvements, potentially contributing to a positive impact during this time. *B. bifidum* Rosell®-71 can be integrated daily to help support digestive well-being, during or around periods, and beyond.

During the **Pre-menstrual period**

41% of women experience bloating

[FMCG Gurus, Women's health Survey, 12 countries, 2023]

Rethinking Menopause Support: The Growing Potential of Probiotics

Declining oestrogen levels associated with menopause leads to significant shifts in the vaginal microbiota, notably the reduction of *Lactobacillus* species and the onset of genitourinary symptoms. Emerging evidence suggests that targeted probiotic strains may help replenish microbial balance, support vaginal comfort, and potentially influence oestrogen metabolism as a non hormonal approach.

Probiotics may also support with menopause related metabolic changes, associated with weight management and cardiovascular health. Combined formulations integrating probiotics with evidence supported botanicals such as ashwagandha or saffron may offer a more comprehensive strategy to address both microbiome related mechanisms and broader menopausal symptoms.

EXPERT 'Biotics™ *by LALLEMAND* for Women's Health

Additionally, Lallemand Health Solutions offers a portfolio specifically designed for women's health, targeting gut comfort during maternal health, mood balance, skin health and metabolic health, including food cravings.

Cerebiome®

Pioneering and most documented psychobiotic in the world with 11+ clinical for mood and stress, stress-related gut comfort, sleep quality, holistic wellbeing and skin appearance.

Cranberry can help **support urinary tract health** by preventing bacteria, particularly *E. coli,* from adhering to the walls of the urinary tract. This is due to compounds in cranberries called **A-type proanthocyanidins (PACs)**

Explore Our Range of Value-Added Ingredients

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- Vitamin B2
- Vitamin B6
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- Cooper
- Lalmin® Cr
- Lalmin® Se
- Lalmin® Zn
- Magnesium
- Zinc

Prebiotics
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- FOS
- GOS
- HMO
- Inulin
- MOS YE
- Organic acacia fiber
- XOS

Premium
- Ashwagandha KSM66®
- CoQ10
- Cranberry
- Enzymes
- GABA
- GASTRO AD®
- M-GARD®
- Melatonin
- Safr'Inside™

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