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Research Article

Use of Eutoplac for the Prevention of Septic Complications in Post-Bariatric Patients Undergoing Body Contouring Surgery

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Abstract

Background: Post-bariatric body-contouring surgery carries a 20-45% risk of minor wound-healing disorders and Surgical-Site Infection (SSI) despite standard peri-operative antibiotic prophylaxis. Disruption of the cutaneous microbiome is increasingly recognised as an independent risk factor for SSI and topical probiotics can restore eubiosis and enhance infection protection. We evaluated whether a 7-day pre-operative course of EUTOPLAC® a topical blend of Lactobacillus crispatus P17631 and Lacticaseibacillus paracasei I1688 (TOPLAC® mixture) improves early wound outcomes in post-bariatric patients scheduled for body-contouring surgery.

Methods: In this single-centre, parallel-group pilot study, 25 female post-bariatric patients applied for seven days before surgery one squeezable capsule of EUTOPLAC daily to the future incision zone on the right side only, leaving the contralateral side untreated (self-control design). Clinical signs (erythema, oedema, pain, burning, pruritus, bleeding, dryness) were graded 0 - 3 at surgery (V1), day 7 (V2) and day 23 (V3). Primary outcome was the proportion of signs rated ≤ 1 (absent/light); secondary outcomes were adverse events and tolerability.

Results: Across all visits, treated wounds showed significantly higher proportions of absent/light scores than untreated counterparts. At V3, moderate-severe erythema persisted in 84% of untreated sites but only 4% of treated sites. Similar advantages were observed for burning (72% vs. 4%) and pruritus (64% vs. 16%). Perilesional skin mirrored these trends, with treated areas maintaining ≥ 98% scores ≤ 1 at V3. No probiotic-related adverse events occurred.

Conclusion: Seven-day topical pre-habilitation with EUTOPLAC markedly reduced early inflammatory and septic cutaneous complications without side effects. These findings support the concept that restoring the skin microbiome before incision is a feasible, antimicrobic-sparing adjunct to current SSI-prevention bundles. Larger randomised trials are warranted to confirm efficacy and to explore mechanistic links between probiotic colonisation, innate immunity and scar quality.

Keywords: Topical Probiotics; Lactobacillus Crispatus; Skin Microbiome; Surgical-Site Infection; Body-Contouring Surgery; Bariatric Surgery; Wound Healing

Level of Evidence: IV

Introduction

Massive weight loss following bariatric procedures leaves many patients with redundant skin folds that compromise mobility, personal hygiene and quality of life. Body-Contouring Surgery (BCS) addresses these sequelae but carries complication rates as

high as 28% for minor wound disorders and up to 9% for major events such as wound dehiscence or 4% for SSI. Risk is amplified by residual obesity, metabolic syndrome, micronutrient deficiencies and long operative times.

Such complications prolong recovery, worsen scarring and often necessitate revisional procedures. This clinical problem has prompted a search for innovative adjuncts to improve wound healing and infection prevention in BCS. One emerging paradigm involves leveraging the skin microbiome's role in cutaneous immunity and surgical infection risk. The skin is not a sterile canvas but rather an ecosystem where commensal microbes form a first line of defense against pathogens. Cutaneous homeostasis depends on a diverse microbiota dominated by commensal *Staphylococcus, Corynebacterium* and, at moist sites, *Lactobacillus species*. Trauma, antiseptics and antibiotics induce dysbiosis that favors pathogenic overgrowth and pathogens' biofilm formation key steps in SSI pathogenesis [1-5].

Restorative strategies using topical probiotics have emerged from dermatology and burn care, demonstrating accelerated re-epithelialisation, reduced inflammatory cytokines and competitive exclusion of pathogens.

Lactobacillus crispatus (formerly *L. crispatus*) and *Lacticaseibacillus paracasei* (formerly *L. paracasei*) are acid-producing, bacteriocin-secreting strains that inhibit *Staphylococcus aureus, Pseudomonas aeruginosa* and *Cutibacterium acnes*, while modulating keratinocytes Toll-like receptor signalling. Clinical interest in *L. crispatus* stems from vaginal applications where colonisation correlates with lower bacterial vaginosis relapse and improved mucosal immunity.

However, few controlled studies have examined their cutaneous use in surgery [8].

EUTOPLAC is a topical squeezable capsule containing an oily suspension of *L. crispatus* P17631 and *L. paracasei* I1688 (TOPLAC® mixture) at ≥ 10^6 Colony Forming Unit (CFU). By formulating live bacteria in a lipid matrix, the product aims to deliver viable cells into the stratum corneum pre-operatively, thereby re-establishing a protective bio-film before incision. The present pilot study explores the prophylactic efficacy and tolerability of a 7-day EUTOPLAC "pre-habilitation" regimen in post-bariatric women undergoing BCS.

Materials and Methods

Study Design and Participants

This single-centre, open-label, parallel-group pilot study was conducted at Chirurgia Plastica Medical Wellness Asti, Italy, between May 2024 and December 2024 and adhered to the Declaration of Helsinki. The protocol was approved by the local ethics committee; all patients provided written informed consent. Eligible subjects were women or men aged 18-70 years with a history of bariatric surgery and scheduled for elective BCS (abdominoplasty, brachioplasty, thigh lift, buttock lift or mastopexy). Exclusion criteria included active dermatologic or immune disorders, non-formerly obese patients, use of topical/systemic antibiotics within 30 days, known hypersensitivity to probiotic components or inability to comply.

Intervention

Participants received seven squeezable capsules of EUTOPLAC (batch 4866182, exp. 02/2025 - Proge Farm S.r.l.) and were instructed to apply one capsule nightly to the planned incision zone on the right side only, spreading its contents evenly over the area where the surgical wound will be done, for seven consecutive days prior to surgery (days 1 to 7). The application took place always on the right side of the area interested by the surgical wound (for example, the right side of the surgical wound after abdominoplasty or buttocks lifting) or on the right anatomical segment of the interventions relating to breasts, upper and lower limbs. This way, the left side served as an intra-patient untreated control. No further topical agents were permitted on either side before surgery. Standard systemic antibiotic prophylaxis (cefazolin 2 g i.v.) was administered at induction.

Outcomes

Clinical assessments were performed by the operating surgeon at three visits: VISIT 1 or V1 (intra-operative or day 7 of the study), V2 (post-operative day 7 or day 14 of the study) and V3 (post-operative day 23 or day 30 of the study). At each visit, five wound parameters (erythema, bleeding, pain, burning, pruritus) and six perilesional parameters (erythema, oedema, pain, burning, pruritus, dryness) were graded 0 = absent, 1 = light, 2 = moderate, 3 = intense. Each side was evaluated and recorded. Scores ≤ 1 were considered favourable. Adverse Events (AEs) were recorded until V3. Wound (cicatricial hypertrophy,

wound/scar diastasis, necrotic tissue, fibrin, granulation tissue, infection) and perilesional skin (maceration) were evaluated globally for the wound and in the right and left side for the perilesional skin and recorded.

Results

Patient Characteristics

A total of 25 Caucasian female patients, aged between 26 and 66 years, were enrolled and completed the study. Among them, 14 patients had undergone previous BCS. Procedures performed in the study included abdominoplasty (n=8), brachioplasty (n=11), thigh lift (n=3), buttock lift (n=1) and breast contouring (n=2).

Wound Evaluation (Table 1)

At the date of surgery (V1), wounds pre-treated with EUTOPLAC exhibited fewer moderate-to-severe signs and symptoms compared to untreated wounds. Specifically, the treated side showed higher percentages of absent/light intensity (score 0-1) across erythema (56% vs. 32%), bleeding (100% vs. 97%), pain (100% vs. 60%), burning (92% vs. 48%) and pruritus (96% vs. 84%). The overall mean percentage of mild or absent symptoms was significantly higher in treated wounds (88.8%) compared to untreated wounds (64.2%). Conversely, the treated side showed lower percentages of moderate/intense (score 2.3) across all the aspects. For each patient the total score of intensity of all signs/symptoms has been calculated both for the right side of the wound and for the left side of the wound (Fig. 1).

At V1, the signs/symptoms of surgery complications were globally lower in the right side of the wound in comparison with the left side of the wound.

Seven days after surgery (V2), treated wounds continued to show significantly higher percentages of absent/light intensity (score 0-1) for erythema (92% vs. 24%), bleeding (100% vs. 88%), pain (100% vs. 64%), burning (100% vs. 68%) and pruritus (100% vs. 74%) compared to untreated wounds. Mean percentage of mild or absent symptoms was considerably higher in treated wounds (98.4%) versus untreated wounds (63.6%). Conversely, percentages of moderate/intense symptoms (score 2-3) were notably lower on the treated side across all evaluated symptoms: erythema (8% vs. 76%), bleeding (0% vs. 12%), pain (0% vs. 36%), burning (0% vs. 32%) and pruritus (0% vs. 26%). Individual intensity scores across all symptoms remained significantly lower on the treated side (Fig. 2).

At twenty-three days after surgery (V3), wounds treated with EUTOPLAC maintained higher percentages of absent/light intensity (score 0-1) for erythema (96% vs. 36%), bleeding (100% vs. 100%), pain (100% vs. 80%), burning (100% vs. 40%) and pruritus (100% vs. 36%) compared to untreated wounds. Overall mean percentage of mild or absent symptoms remained significantly higher in treated wounds (99.2%) versus untreated wounds (58.4%). Similarly, the treated side showed substantially lower percentages of moderate/intense symptoms (score 2-3): erythema (4% vs. 64%), bleeding (0% vs. 0%), pain (0% vs. 20%), burning (0% vs. 60%) and pruritus (0% vs. 64%). The cumulative intensity scores across all symptoms further confirmed the sustained improvement observed on the treated side at V3 (Fig. 3).

Perilesional Skin Evaluation (Table 2)

At VISIT 1, perilesional skin treated with EUTOPLAC showed similar percentages of mild/absent and moderate-to-severe intensity signs compared to untreated perilesional skin (Fig. 4).

At VISIT 2, the differences became apparent, with treated perilesional skin presenting complete absence of moderate-to-severe symptoms (100% mild/absent) compared to untreated perilesional skin (88.7% mild/absent). Untreated areas showed notable persistence of moderate-to-severe erythema and edema (24%) (Fig. 5).

At VISIT 3, perilesional skin on the treated side continued to exhibit superior outcomes (mean 98.6% mild/absent) compared to untreated sides (97.3%), with fewer cases of persistent erythema, edema and burning on treated sites (Fig.6).

High-Risk Areas Subgroup Analysis

In patients undergoing surgery in high-risk areas (abdomen, buttocks and thighs), treated wounds consistently displayed fewer and less intense complications across all visits compared to untreated wounds. These differences were most pronounced at VISIT

3, emphasizing EUTOPLAC's efficacy in regions particularly susceptible to post-surgical complications (Fig. 7-9).

Safety and Tolerability

No AEs associated with EUTOPLAC treatment were reported. All participants tolerated the treatment well and there were no discontinuations or protocol deviations.

Score	**Local Erythema**				**Bleeding**				**Pain**				**Burning**				**Pruritus**				**Mean%**	
	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R	L
0	0	56	0	32	25	100	23	97	19	100	12	60	10	92	8	48	23	96	20	84	88.8	64.2
1	14		8		0		1		6		3		13		4		1		1			
2	10	44	14	68	0	0	1	3	0	0	10	40	1	8	12	52	0	4	3	16	11.2	35.8
3	1		3		0		0		0		0		1		1		1		1			
VISIT 2																						
Score	**Local Erythema**				**Bleeding**				**Pain**				**Burning**				**Pruritus**				**Mean%**	
	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R	L
0	5	92	0	24	25	100	19	88	23	100	13	64	15	100	8	68	14	100	13	74	98.4	63.6
1	18		6		0		3		2		3		10		9		11		5			
2	1	8	15	76	0	0	3	12	0	0	9	36	0	0	6	32	0	0	6	26	1.6	36.4
3	1		4		0		0		0		0		0		2		0		1			
VISIT 3																						
Score	**Local Erythema**				**Bleeding**				**Pain**				**Burning**				**Pruritus**				**Mean%**	
	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R(n)	R(%)	L(n)	L(%)	R	L
0	20	96	2	36	25	100	24	100	24	100	20	80	16	100	7	40	3	100	5	36	99.2	58.4
1	4		7		0		1		1		0		9		3		22		4			
2	1	4	15	64	0	0	0	0	0	0	5	20	0	0	15	60	0	0	16	64	0.8	41.6
3	0		3		0		0		0		0		0		0		0		0			
0 = absence; 1 = light, 2 = moderate, 3 = intense R= right side; L= left side , n =number of patients;% = percentage of patients																						

Table 1: Wound results.

Score	**Erythema**				**Oedema**				**Pain**				**Burning**				**Pruritus**				**Dryness**				**Mean%**	
	R (n)	R (%)	L (n)	L (%)	R (n)	R (%)	L (n)	L (%)	R (n)	R (%)	L (n)	L (%)	R (n)	R (%)	L (n)	L (%)	R (n)	R (%)	L (n)	L (%)	R (n)	R (%)	L (n)	L (%)	R	L
0	12	92	5	80	19	96	10	92	0	100	0	100	20	96	16	96	20	100	18	96	0	100	0	100	97.3	94
1	11		15		5		13		0		0		4		7		5		6		0		0			
2	1	8	4	20	0	4	1	8	0	0	0	0	0	4	1	4	0	0	1	4	0	0	0	0	11.2	35.8
3	1		1		1		1		0		0		1		1		0		0		0		0			
0 = absence; 1 = light, 2 = moderate, 3 = intense R= right side; L= left side , n =number of patients;% = percentage of patients																										

Table 2: Perilesional skin results

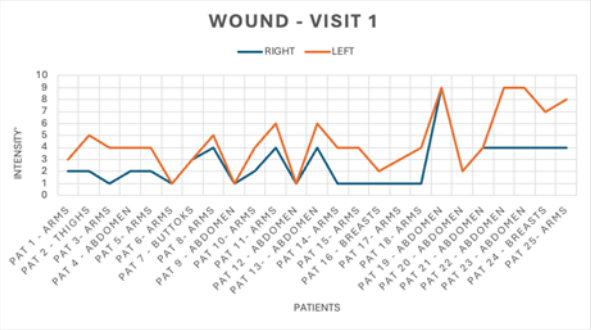

Figure 1: Wound visit 1.

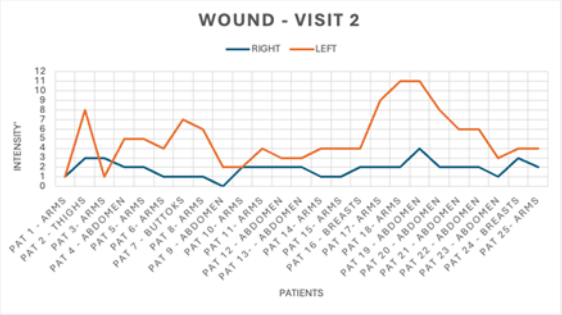

Figure 2: Wound - VISIT 2

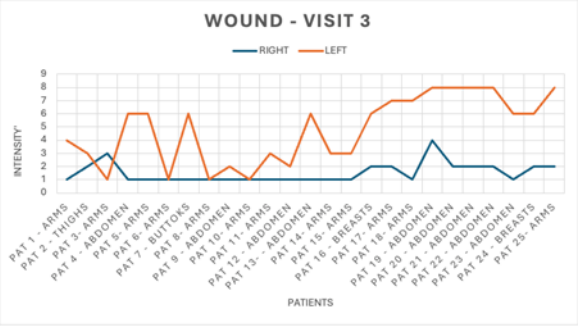

Figure 3: Wound - VISIT 3.

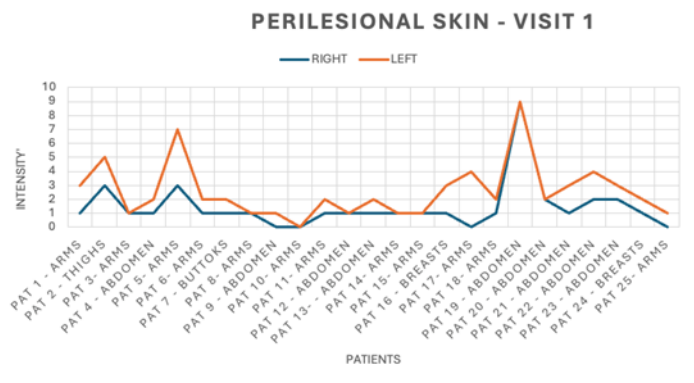

Figure 4: Perilesional skin - VISIT 1.

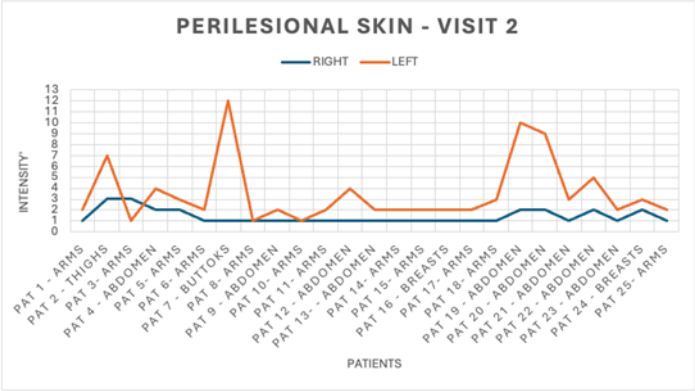

Figure 5: Perilesional skin - VISIT 2.

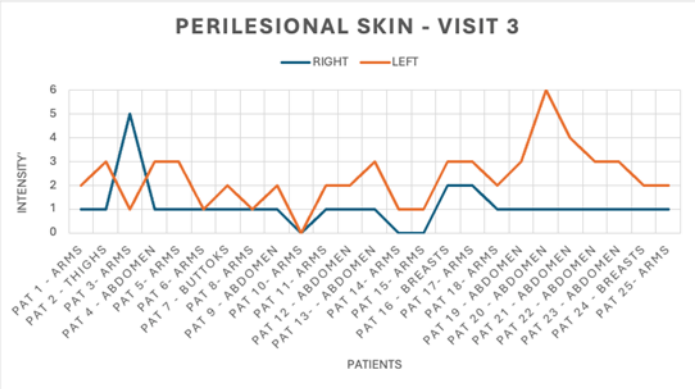

Figure 6: Perilesional skin - VISIT 3.

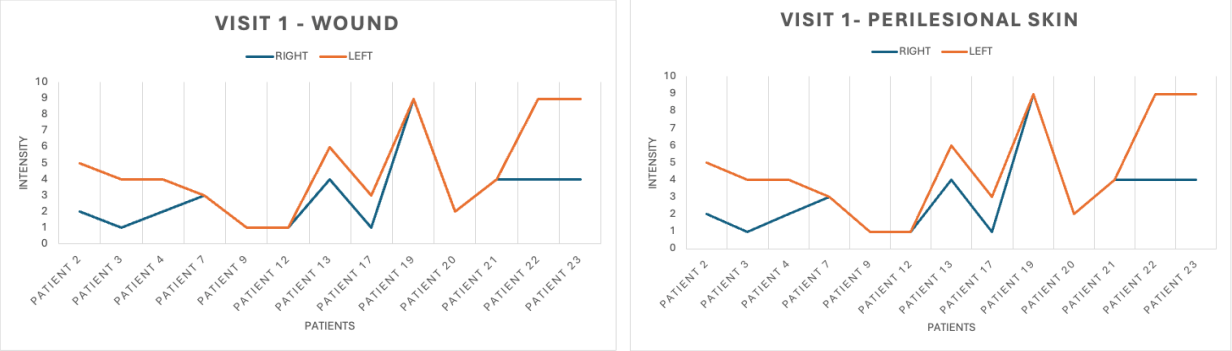

Figure 7: Wound and perilesional skin – VISIT 1 in patients who underwent BCS in high risk areas.

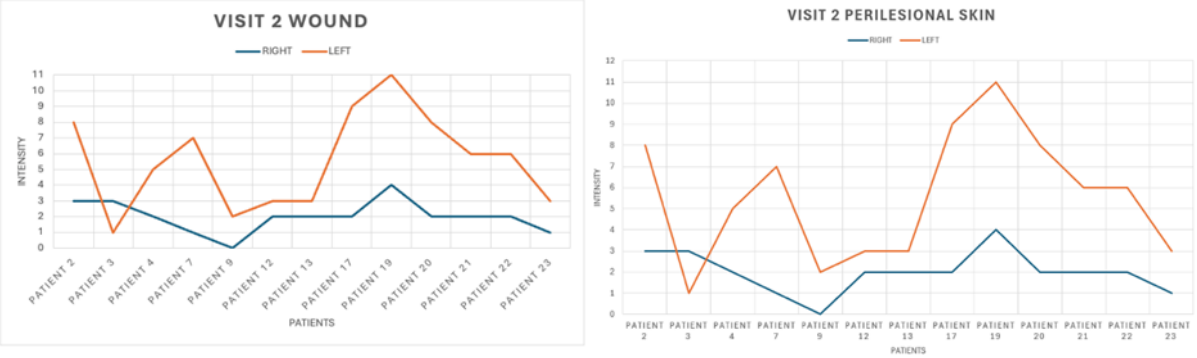

Figure 8: Wound and perilesional skin - VISIT 2 in patients who underwent BCS in high risk areas.

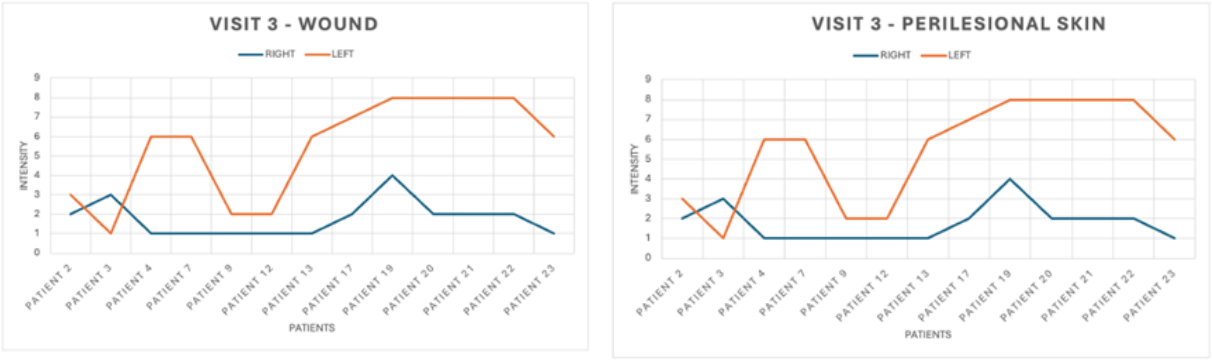

Figure 9: Wound and perilesional skin - VISIT 3 in patients who underwent BCS in high risk areas.

Discussion

Injuries and surgical incisions can affect the microbial balance, enabling normally contained bacteria to colonize wounds and trigger infection. Therefore, maintaining or restoring a healthy skin microbiome is increasingly recognized as crucial for optimal wound healing.

In light of the skin microbiome's importance, there is growing interest in applying beneficial bacteria (probiotics) to the skin to prevent SSIs and favor healing. *Lactobacillus* species long used as probiotics in other body sites offer multiple bioactive mechanisms that could enhance wound outcomes such as acidification, production of bacteriocines, pathogens biofilm interference and immune modulation.

Current SSI prevention strategies in surgery do not exploit these microbiome-mediated benefits. Preoperative skin preparation traditionally relies on broad-spectrum antiseptics (e.g. chlorhexidine or iodine) and systemic antibiotic prophylaxis. While largely effective at reducing overt contamination, these measures have important limitations. Antiseptic scrubs transiently sterilize the skin surface but cannot eliminate bacteria residing in deeper follicles and glands; surviving flora can rebound and potentially seed the incision. Moreover, indiscriminate antibiotics and antiseptics also eradicate beneficial commensals, potentially creating a dysbiotic state devoid of the microbiome's protective functions.

Indeed, a viability-based analysis of skin prep found that pathogenic bacteria often persist or re-colonize even after standard pre-op antisepsis. Compounding this concern is the plateau in SSI rate reductions despite routine antibiotic prophylaxis, alongside a worrisome rise in SSIs caused by antibiotic-resistant organisms. These trends signal an evidence gap in our current approach to SSI prevention - simply escalating antibiotic use is increasingly "unsustainable" and may further disrupt the microbiome without eliminating infection risk.

Leading surgical infection experts now advocate for alternative strategies that "leverage non-antibiotic measures" and incorporate microbiome science into perioperative care. In other words, the next leap in SSI prophylaxis may come not from newer antibiotics, but from preserving or restoring the patient's own microbial defenses.

In this context, preoperative topical probiotics represent a novel and biologically inspired adjunct to bolster surgical-site infection prevention. By inoculating the surgical field with beneficial *Lactobacillus* species like *L. crispatus* and *Lacticaseibacillus paracasei*, clinicians aim to reestablish a protective flora before the first incision is made. *L. crispatus* is a dominant commensal in the healthy vaginal microbiome, known for producing lactic acid and peroxide that ward off pathogens and it may similarly fortify the skin's acid mantle. *L. paracasei* (a lactic acid bacterium used in fermented foods and probiotic skincare) has demonstrated wound-healing properties in preclinical studies. Both species were recently shown to modulate the skin microbiome when applied together: in a clinical pilot, a topical combination of *L. crispatus* P 17631 and *L. paracasei I* 1688 significantly shifted patients' skin microbial profiles, increasing *lactobacilli* while reducing the relative abundance of *Staphylococcus* and other potential pathogens [10]. These findings suggest that a targeted probiotic regimen with selected Lactic Acid Bacteria can selectively crowd out harmful flora on the skin surface. Additionally, small trials of topical probiotics in dermatologic conditions (e.g. seborrheic dermatitis and acne) have reported reduced inflammation and improved barrier function, supporting broader wound-healing benefits.

Despite these promising insights, robust clinical evidence for preoperative probiotic skin therapy is still lacking. To date, most studies have been either preclinical or focused on chronic wounds; very few have tested live probiotics as a preventive measure in an acute surgical setting. Thus, important questions remain regarding optimal strains, dosing, timing and safety in the context of surgery. The rationale for exploring topical *L. crispatus* P 17631 and *L. paracasei* I 1688 before body-contouring surgery is compelling: this approach could reduce the skin's pathogenic bioburden without invoking antibiotic resistance, while simultaneously accelerating post-operative healing through microbiome-driven pathways. Bridging the current evidence gap, ongoing research is now centered on evaluating whether preoperative probiotic skin treatment can meaningfully lower SSI rates and improve wound outcomes in post-bariatric plastic surgery. Early findings and mechanistic understanding suggest that harnessing our "microbial allies" may indeed become a viable strategy to improve surgical care. Each of these insights underpins the need for well-designed clinical trials and informs the hypothesis that a probiotic-enriched preoperative skin regimen could serve as a safe, innovative adjunct to standard SSI prophylaxis in high-risk body-contouring patients.

The present pilot study demonstrates that pre-operative topical administration of EUTOPLAC significantly reduces early post-surgical inflammatory and infectious complications in post-bariatric patients undergoing body-contouring surgery. These results align with emerging evidence highlighting the beneficial role of probiotics in managing skin health, wound healing and infection prevention through modulation of the skin microbiome.

The observed reduction in moderate-to-severe erythema, burning, pruritus and other inflammatory indicators strongly suggests that topical probiotics effectively modulate the inflammatory cascade critical in the early stages of wound healing.

Utilizing a self-controlled design minimized potential confounding variables such as systemic immunity, metabolic factors and differences in surgical technique or post-operative care, strengthening the internal validity of these results.

Nonetheless, broader generalization would require larger randomized trials, incorporating diverse patient demographics and varied surgical procedures.

Several limitations of the present study warrant consideration. The small sample size and limited follow-up duration restrict definitive conclusions regarding the probiotic's long-term efficacy, specifically on scar aesthetics and functional outcomes. Additionally, the single-center, open-label approach, though controlled intra-patient, may not fully eliminate observational biases despite blinding of outcome assessors. Another critical limitation includes the lack of direct microbiome sequencing or metabolic profiling to conclusively demonstrate probiotic colonization, which would enrich mechanistic insights and guide strain-specific optimization for future clinical applications.

This pilot investigation provides promising initial evidence supporting the clinical utility of topical probiotics as a novel adjunct in body-contouring surgery, specifically targeting improved wound healing and reduced infectious complications. As the field advances toward microbiome-informed surgical care, incorporating probiotic strategies could represent a paradigm shift, enhancing patient outcomes through sustainable and biologically tailored interventions [11].

Conclusion

Pre-operative topical application of EUTOPLAC, significantly decreased the severity of early post-surgical cutaneous signs and symptoms in post-bariatric body-contouring patients without adverse events. These results underscore the role of microbiome stewardship in modern surgical practice and pave the way for larger randomised trials to validate efficacy and cost-effectiveness in high risk patients.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Acknowledgement
The authors have no acknowledgments to declare.

Data Availability Statement
The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement
The project did not meet the definition of human subject research under the purview of the IRB according to federal regulations and therefore was exempt.

Informed Consent Statement
Informed consent was obtained from all participants included in the study.

Authors' Contributions
All authors contributed equally to this paper.

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