

unaffected by polyenes and polymyxin B — a pattern typical of *Amycolatopsis* spp. due to endogenous β -lactamase production and/or low-affinity target proteins.

Strain Y13 exhibited antagonistic activity against *Sclerotinia sclerotiorum* SSC21 (7 mm), *Bipolaris sorokiniana* TR1 (7.7 mm), *Alternaria arborescens* TR1 (5 mm), *Fusarium graminearum* DSM 21727 (11 mm) and *Aspergillus niger* ATCC 6275 (6 mm); the biomass extract inhibited *B. sorokiniana* TR1 (9 mm), while the culture-liquid supernatant was slightly more active (13.7 mm). In the *Triticum aestivum* L. germination bioassay, all measured morphometric parameters increased significantly ($p < 0.001$): primary root length rose from 107.83 to 127.23 mm (+18.0 %), the first lateral root from 94.53 to 116.07 mm (+22.8 %), the second lateral root from 81.63 to 105.00 mm (+28.6 %, the largest gain), and stem length from 58.87 to 75.00 mm (+27.4 %).

The isolated strain *A. roodepoortensis* Y13 combines resistance to several adverse factors with promising antimicrobial and phytostimulatory properties, indicating its potential for biotechnological application, including the reclamation of war-impacted soils.

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<https://doi.org/10.30970/apmicro.2026.29>

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BIFIDOBACTERIUM BIFIDUM LVA-3 FERMENTATE AS AN ANTIBACTERIAL AND PRECONDITIONING AGENT FOR MESENCHYMAL STEM CELLS

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Abstract. The therapeutic efficacy of adipose tissue-derived mesenchymal stem cells (AD-MSCs) can be compromised by local inflammation and microbial infections at wound sites. Preconditioning MSCs with probiotic postbiotics offers a dual strategy to prime stem cell function and provide local antibacterial

protection. This study evaluated the dose-dependent effects of heat-inactivated and sterile-filtered *Bifidobacterium bifidum* LVA-3 culture fermentate on its direct antagonistic activity against opportunistic pathogens and AD-MSC functional performance. At concentrations of 5–10 %, the fermentate effectively inhibited *S. aureus*, *E. coli*, and *P. aeruginosa* while maintaining AD-MSC adhesion, boosting metabolic activity, accelerating directional migration, and modulating lineage-specific differentiation. Preconditioning AD-MSCs with *B. bifidum* LVA-3 fermentate represents a novel biotechnological approach for optimizing cell-based therapies targeting infected and impaired tissue wounds.

Keywords: *Bifidobacterium bifidum* fermentate, mesenchymal stem cells, postbiotics, preconditioning, tissue regeneration.

Cell-based therapies utilizing human adipose tissue-derived mesenchymal stem cells (AD-MSCs) are promising for tissue regeneration and wound healing. However, local microenvironmental stressors and microbial infection can compromise MSC therapeutic efficacy. Preconditioning MSCs with bioactive bacterial products (Waterman et al., 2010; Saberian et al., 2020; Kazemi et al., 2022) offers a novel strategy to prime stem cell functional performance prior to transplantation.

This study aimed to evaluate the antibacterial properties of *Bifidobacterium bifidum* LVA-3 culture fermentate and determine its potential as a preconditioning agent by assessing its dose-dependent effects on AD-MSC adhesion, metabolic activity, migration, and multilineage differentiation potential.

Materials and Methods. *B. bifidum* LVA-3 was cultured in semi-liquid nutrient medium at 37 °C for 2 days until reaching stationary phase, heat-inactivated (60 °C, 30 min), and sterile-filtered (0.22 µm). Antagonistic activity against opportunistic pathogens (*Staphylococcus aureus* 209, *Escherichia coli*, and *Pseudomonas aeruginosa* 9027) was measured via agar diffusion assay. Human AD-MSCs (passages 4–6) were isolated as described previously (Zuk et al., 2002) with informed donor consent and bioethics approval. AD-MSCs were seeded in standard medium (α-MEM, 10 % FBS, antibiotics) supplemented with 0 % (control), 5 %, 10 %, 25 %, or 50 % fermentate, cultured for 24 h, after that cell adhesion and basal metabolic activity (resazurin assay) were assessed. Migration (scratch assay) and directed osteogenic/adipogenic differentiation capacity were evaluated following culture in corresponding media (Cormier et al., 2015; Campagnoli et al., 2001) with 5 % and 10 % fermentate.

The *B. bifidum* LVA-3 fermentate demonstrated distinct antagonistic activity against all tested opportunistic pathogens. High concentrations (25 % and 50 %) lowered media pH, impaired MSC adhesion, and suppressed metabolic activity. Conversely, preconditioning AD-MSCs with 5 % and 10 % fermentate maintained cell adhesion, significantly boosted metabolic activity, and accelerated directional cell migration. Furthermore, 5 % and 10 % fermentate preconditioning enhanced adipogenic differentiation. Under osteogenic induction, 5 % fermentate preserved osteogenic differentiation capacity, whereas 10 % fermentate exerted an inhibitory effect.

Conclusion: *B. bifidum* LVA-3 fermentate acts as an effective preconditioning agent for human AD-MSCs at low concentrations (5–10 %), significantly enhancing their metabolic and migratory functions while preserving line-specific differentiation flexibility. Combined with its intrinsic antimicrobial properties, *B. bifidum* LVA-3 fermentate preconditioning offers a novel approach for optimizing MSC-based therapies targeting infected wounds, critical tissue defects, and ischemic injuries.

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<https://doi.org/10.30970/apmicro.2026.30>

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ENGINEERING MICROBIAL PRODUCERS OF ETHANOL AND LACTIC ACID AS ALTERNATIVE FERMENTATION PRODUCTS

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Abstract. Improved pentose alcoholic fermentation in *Ogataea polymorpha* was achieved by positive selection and identification of the genetic determinants *IRA1* and *APII*. Heterologous expression of lactate dehydrogenase genes enabled efficient L-lactic acid production, demonstrating distinct strategies for redirecting yeast metabolism toward alternative fermentation products.

Keywords: *Ogataea polymorpha*, xylose, metabolic engineering, fermentation.

The use of renewable feedstocks for ethanol and L-lactic acid production requires microorganisms capable of efficient conversion of different carbon sources. The thermos-tolerant yeast *Ogataea polymorpha* utilizes a broad range of substrates, including glucose and xylose, and is capable of alcoholic fermentation at elevated temperatures.

Positive selection combined with whole-genome sequencing and reverse genetics was used to improve alcoholic fermentation of pentoses. The selected *O. polymorpha* strain A107 accumulated 20.91 g/L ethanol from xylose at 45 °C, more than 50-fold higher than the wild-type strain. Mutations affecting *IRA1* and *APII* were identified as important determinants of improved xylose and L-arabinose fermentation.