UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

Abe, H. 2000. Role of histidine-related compounds as intracellular proton buffering constituents in vertebrate muscle. Biochemistry C/C Of Biokhimiia 65 (7): 757-765.

Abramov, V.M., I.V. Kosarev, A.V. Machulin, T.V. Priputnevich, E.I. Deryusheva, E.L. Nemashkalova, & A.V. Karlyshev. 2023. *Limosilactobacillus fermentum* 3872 that produces class III bacteriocin forms co-aggregates with the antibiotic-resistant *Staphylococcus aureus* strains and induces their lethal damage. Antibiotics 12 (3): 471. https://doi.org/10.3390/antibiotics12030471

Afrin, S., M. A. Hoque, A. K. Sarker, M. A. Satter, & M. N. I. Bhuiyan. 2021. Characterization and profiling of bacteriocin-like substances produced by lactic acid bacteria from cheese samples. *Access microbiology*, *3*(6), 000234. https://doi.org/10.1099/acmi.0.000234

Aguirre-Garcia, Y.L., N.C. Cerda-Alvarez, R.M. Santiago-Santiago, A.R. Chantre-López, S.D.C. Rangel-Ortega & R. Rodríguez-Herrera. 2025. The Metabolites Produced by Lactic Acid Bacteria and Their Role in the Microbiota–Gut–Brain Axis. Fermentation 11 (7): 378. https://doi.org/10.3390/fermentation11070378

Ahmad, V., M. S. Khan, Q. M. S. Jamal, M. A. Alzohairy, M. A. Al Karaawi, & M. U. Siddiqui. 2017. Antimicrobial potential of bacteriocins: in therapy, agriculture and food preservation. International Journal of Antimicrobial Agents, 49(1): 1–11. https://doi.org/10.1016/j.ijantimicag.2016.08.016

Aini, M., S. Rahayuni, V. Mardina, Q. Quranayati, & N. Asiah. 2021. Bakteri *Lactobacillus* spp dan peranannya bagi kehidupan. *Jurnal Jeumpa*, *8*(2): 614-624.

Akirthasary, D. 2021. Review artikel: enzim l-histidin dekarboksilase dan mekanisme penghambatan. Unesa Journal of Chemistry 10 (2): 147-157.

Al-Hammam, M.Y., M.P. Putra, A.H. Mardinsyah, G. Cahyati, & I.D. Puspita. 2023. The antibacterial activity of *Lactobacillus* sp. GMP1 and *Weisella* sp. GMP12 against some foodborne disease-causing bacteria. Jurnal Pengolahan Hasil Perikanan Indonesia 26 (2): 206-215.

Allen, R.J. & B. Waclaw. 2019. Bacterial growth: a statistical physicist's guide. Reports on Progress in Physics 82 (1): 016601. https://doi.org/10.1088/1361-6633/aae546

Alvarez-Sieiro, P., M. Montalbán-López, D. Mu, & O. P. Kuipers. 2016. Bacteriocins of lactic acid bacteria: extending the family. Applied microbiology and biotechnology, 100(7): 2939-2951. https://doi.org/10.1007/s00253-016-7343-9

An, Y., X. Cai, L. Cong, Y. Hu, R. Liu, S. Xiong, & Hu. 2022. Quality improvement of zhayu, a fermented fish product in china: effects of inoculated fermentation with three kinds of lactic acid bacteria. Foods 11 (18): 1-17.

Anand, R., R. Lütticken, L. De Laporte, A. Herrmann, & E. Heine. 2026. An optimized CRISPR/Cas9-based genome editing platform enhances bacteriocin production in *Lactiplantibacillus plantarum*. Journal of Biological Engineering. https://doi.org/10.1186/s13036-026-00739-5

UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Aristyan, I., R. Ibrahim, dan L. Rianingsih. 2014. Pengaruh perbedaan kadar garam terhadap mutu organoleptik dan mikrobiologis terasi rebon (*Acetes* sp.). Jurnal Pengolahan dan Bioteknologi Hasil Perikanan 3(2): 60–66.

Arivo, D. & N. Annissatussholeha. 2017. Pengaruh tekanan osmotik pH, dan suhu terhadap pertumbuhan bakteri *Escherichia coli*. *Jurnal Ilmu Kedokteran dan Kesehatan*, *4*(3).

Arnison, P. G., M.J. Bibb, G. Bierbaum, A. A. Bowers, T. S. Bugni, G. Bulaj, & W. A. Van Der Donk. 2013. Ribosomally synthesized and post-translationally modified peptide natural products: overview and recommendations for a universal nomenclature. *Natural product reports*, *30*(1), 108-160. https://doi.org/10.1039/c2np20085f

Belleggia, L. & A. Osimani. 2023. Fermented fish and fermented fish-based products, an ever-growing source of microbial diversity: A literature review. *Food Research International*, *172*, 113112. https://doi.org/10.1016/j.foodres.2023.113112

Bellur, A., S. Mukherjee, P. Sharma, V. Jayaraman, & H. Balaram. 2023. Enantioselectivity in the enzymatic dehydration of malate and tartrate: Mirror image specificities of structurally similar dehydratases. Protein Science, 32(10), Article e4779. https://doi.org/10.1002/pro.4779

Bernardeau, M., J. P. Vernoux, S. Henri-Dubernet, & M. Guéguen. 2008. Safety assessment of dairy microorganisms: the *Lactobacillus* genus. *International journal of food microbiology*, *126*(3): 278-285. https://doi.org/10.1016/j.ijfoodmicro.2007.08.015

Biji, K. B., C. N. Ravishankar, R. Venkateswarlu, C. O. Mohan, & T. S. Gopal. 2016. Biogenic amines in seafood: a review. *Journal of food science and technology*, *53*(5), 2210-2218. https://doi.org/10.1007/s13197-016-2224-x

Borges-Lopes, L. D., R. C. Soares, & R. M. de Freitas. 2025. Co-culture of microalgae and bacteria for the production fof bioactive compounds. Annals of Microbiology 75: 16. https://doi.org/10.1186/s13213-025-01804-y

Cheigh CI & Y. R. Pyun. 2005. Biosintesis nisin dan sifat-sifatnya. Biotechnology Letters. 27(21):1641–1648. https://doi.org/10.1007/s10529-005-2721-x

Chen, X., H. Bai, W. Mo, X. Zheng, H. Chen, Y. Yin, & H. Peng. 2025. Lactic acid bacteria bacteriocins: safe and effective antimicrobial agents. International Journal of Molecular Sciences 26 (9): 4124. https://doi.org/10.3390/ijms26094124

Chevrette, M.G., C.S. Thomas, A. Hurley, N. Rosario-Meléndez, K. Sankaran, Y. Tu, A. Hall, S. Magesh & J. Handelsman. 2022. Microbiome composition modulates secondary metabolism in a multispecies bacterial community. Proceedings of the National Academy of Sciences of the United States of America 119 (42): e2212930119. https://doi.org/10.1073/pnas.2212930119

Coventry, M. J., J. B. Gordon, M. Alexander, M. W. Hickey, & J. Wan. 1996. A food-grade process for isolation and partial purification of bacteriocins of lactic acid bacteria that uses diatomite calcium silicate. Applied and Environmental Microbiology, *62*(5): 1764-1769. https://doi.org/10.1128/aem.62.5.1764-1769.1996

UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Cui, Y., L. Luo, X. Wang, Y. Lu, Y. Yi, Y. Shan, dan X. Lü. 2021. Mining, heterologous expression, purification, antibactericidal mechanism, and application of bacteriocins: A review. Comprehensive Reviews in Food Science and Food Safety, *20*(1): 863-899. https://doi.org/10.1111/1541-4337.12658

Daba, G.M. & W.A. Elkhateeb. 2024. Ribosomally synthesized bacteriocins of lactic acid bacteria: Simplicity yet having wide potentials–A review. International Journal of Biological Macromolecules 256: 128325. https://doi.org/10.1016/j.ijbiomac.2023.128325

Datta, F.U., A.N. Daki, I. Benu, A.I.R. Detha, N.D. Foeh, dan N.A. Ndaong. 2019. Uji aktivitas antimikroba bakteri asam laktat cairan rumen terhadap pertumbuhan *Salmonella enteritidis*, *Bacillus cereus*, *Escherichia coli* dan *Staphylococcus aureus* menggunakan metode difusi sumur agar. Jurnal Kajian Veteriner: 66-85.

de Souza Rodrigues, J.Z., M. R. Passos, N. S. de Macêdo Neres, R. S. Almeida, L. S. Pita, I. A. Santos, & R. Yatsuda. 2020. Antimicrobial activity of *Lactobacillus fermentum* TcUESC01 against *Streptococcus mutans* UA159. Microbial Pathogenesis 142: 104063. https://doi.org/10.1016/j.micpath.2020.104063

Dey, B.C., N. Rai, S. Das, S. Mandal & V. Mandal. 2019. Partial purification, characterization and mode of action of bacteriocins produced by three strains of *Pediococcus* sp. Journal of Food Science and Technology 56 (5): 2594-2604. https://doi.org/10.1007/s13197-019-03744-3

Díaz-Domínguez, E., A. K. Khanzada, Z. Askarniya, S. Ciesielski, X. Xu, G. Boczkaj, & J. L. García-Morales. 2025. Enhancing lactic acid production from food waste through cavitation pretreatment and biocatalyst amendment–a comparative study. *Journal of Environmental Chemical Engineering*, 120249. https://doi.org/10.1016/j.jece.2025.120249

Drider, D., G. Fimland, Y. Héchard, L. M. McMullen, & H. Prévost. 2006. The continuing story of class IIa bacteriocins. *Microbiology and molecular biology reviews*, *70*(2): 564-582. https://doi.org/10.1128/mmbr.00016-05

Ekblad, B., P.K. Kyriakou, C. Oppegard, J. Nissen-Meyer, Y.N. Kaznessis & P.E. Kristiansen. 2016. Structure–function analysis of the two-peptide bacteriocin plantaricin EF. Biochemistry 55 (36): 5106-5116. https://doi.org/10.1021/acs.biochem.6b00588

Fathurrozi, S. A., S. Winarti & J. Jariyah. 2024. Pengaruh konsentrasi garam dan lama fermentasi terhadap karakteristik kimia dan organoleptik bubuk terasi nabati dari tempe. *Jurnal Teknologi Pangan*, *18*(1): 15-28. https://doi.org/10.33005/jtp.v18i1.4495

Feliatra, F., Z.A. Muchlisin, H.Y. Teruna, W.R. Utamy, N. Nursyirwani & A. Dahliaty. 2018. Potential of bacteriocins produced by probiotic bacteria isolated from tiger shrimp and prawns as antibacterial to *Vibrio*, *Pseudomonas*, and *Aeromonas* species on fish. F1000Research 7: 415. https://doi.org/10.12688/f1000research.13958.1

Feng, L., Y. Qiao, H. Xu, G. Wang, S. Ren, X. Ouyang & X. Feng. 2026. Extracellular injection system combined with peptides for intracellular *Staphylococcus aureus* treatment. bioRxiv. 2026-07.

UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Gao, C.H., H. Cao, P. Cai, & S. J. Sørensen. 2020. The initial inoculation ratio regulates bacterial coculture interactions and metabolic capacity. ISME Journal 15: 29-40. https://doi.org/10.1038/s41396-020-00751-7

Garcia-Gonzalez, N., N. Battista, R. Prete, & A. Corsetti. 2021. Health-promoting role of *Lactiplantibacillus plantarum* isolated from fermented foods. Microorganisms 9 (2): 349. https://doi.org/10.3390/microorganisms9020349

Giani, A., F. Bovio, M. Forcella, P. Fusi, G. Sello, & P. Di Gennaro. 2019. Identification of a bacteriocin-like compound from *Lactobacillus plantarum* with antimicrobial activity and effects on normal and cancerogenic human intestinal cells. AMB Express 9 (1): 88. https://doi.org/10.1186/s13568-019-0813-6

Gillor, O., A. Etzion, & M. A. Riley. 2008. The dual role of bacteriocins as anti-and probiotics. Applied Microbiology and Biotechnology 81 (4): 591-606.

Goh, H.F. & K. Philip. 2015. Purification and characterization of bacteriocin produced by *Weissella confusa* A3 of dairy origin. PLOS ONE 10 (10): e0140434. https://doi.org/10.1371/journal.pone.0140434

Gómez, N. C., J. Manetsberger, N. Benomar, H. Abriouel & B.D.G. de Melo Franco. 2025. Co-cultures of lactic acid bacteria from Brazilian foods as inhibitors of *Listeria monocytogenes* and *Escherichia coli* O157: H7 biofilm formation. Heliyon 11 (11).

Gong, W., H. Fadhilatunnur, M. Kanazawa, J. Villena, K. Nishiyama & H. Kitazawa. 2026. Lactic acid bacteria-derived antimicrobial and anti-biofilm strategies: mechanisms, functional molecules, and emerging biomaterial applications. International. Journal of Molecular Sciences 27 (13): 5749. https://doi.org/10.3390/ijms27135749

Guan, C., F. Li, P. Yu, X. Chen, Y. Yin, Chen, D., & Pang, B. 2024. Isolation, identification and antibacterial characteristics of *Lacticaseibacillus rhamnosus* YT. *Foods*, *13*(17): 2706. https://doi.org/10.3390/foods13172706

Guryanova, S. V. 2023. Immunomodulation, bioavailability and safety of bacteriocins. *Life*, *13*(7), 1521. https://doi.org/10.3390/life13071521

Halder, D. & S. Mandal. 2018. Insights into the antagonism of *Lactobacillus fermentum* curd isolate against Gram-positive and Gram-negative pathogenic bacteria. Bioscience Biotechnology Research Communications. https://doi.org/10.21786/bbrc/11.3/15

Haryati, K. & N. Dianingsih. 2021. Analisis kimia ikan ekor kuning asap industri rumah tangga di Kota Jayapura. Jurnal Biologi Papua 13 (1): 52-57. https://doi.org/10.1016/j.foodcont.2013.03.001

He, W., Y. Zeng, J. Shen, K. Li, Y. Zhou, X. Zeng & D. Pan. 2025. Enhanced bacteriocin production by lactic acid bacteria by co-culture of *Lactiplantibacillus plantarum* and *Limosilactobacillus fermentum*. Food Bioscience 68: 106358. https://doi.org/10.1016/j.fbio.2025.106358

Hertzberger, R., J. Arents, H.L. Dekker, R.D. Pridmore, C. Gysler, M. Kleerebezem & M.J. de Mattos. 2014. H_2O_2 production in species of the *Lactobacillus acidophilus* group: a central role for a novel NADH-dependent flavin reductase. Applied and Environmental Microbiology 80 (7): 2229-2239. https://doi.org/10.1128/AEM.04272-13

UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Heruwati, E. S., S. T. Sukarto, S. T., & Syah, S. U. 2017. Perkembangan Histamin selama proses fermentasi peda dari ikan kembung (*Rasfrelliger negtecfus*). *Jurnal Penelitian Perikanan Indonesia*, *10*(3): 47-55. https://doi.org/10.15578/jpbkp.v10i3.371 .

Horrocks, V., C.K. Hind, M.E. Wand, P.E. Fady, J. Chan, J.C. Hopkins & A.J. Mason. 2022. Nuclear magnetic resonance metabolomics of symbioses between bacterial vaginosis-associated bacteria. mSphere 7 (3): e00166-22. https://doi.org/10.1128/msphere.00166-22

Hossain, T. J. 2022. Functional genomics of the lactic acid bacterium *Limosilactobacillus fermentum* LAB-1: metabolic, probiotic and biotechnological perspectives. *Heliyon*, *8*(11). https://doi.org/10.1016/j.heliyon.2022.e11412

Ibrahim, S.A., R.D. Ayivi, T. Zimmerman, S.A. Siddiqui, A.B. Altemimi, H. Fidan, & R.V. Bakhshayesh. 2021. Lactic acid bacteria as antimicrobial agents: Food safety and microbial food spoilage prevention. Foods 10 (12): 3131. https://doi.org/10.3390/foods10123131

Indriati, N., S.T. Sukarto & S.U. Syah. 2005. Perkembangan produksi histamin ikan peda pada penyimpanan dengan cara berbeda. Jurnal Penelitian Perikanan Indonesia 11 (4): 71-78.

Jaehme, M., A. Guskov, & D. J. Slotboom, D. J. 2014. Crystal structure of the vitamin B3 transporter PnuC, a full-length SWEET homolog. *nature structural & molecular biology*, *21*(11):1013-1015. https://doi.org/10.1038/nsmb.2909

Janes, M. E., R. Nannapaneni, A. Proctor, & M. G. Johnson. 1998. Rice hull ash and silicic acid as adsorbents for concentration of bacteriocins. *Applied and environmental microbiology*, *64*(11):4403-4409. https://doi.org/10.1128/AEM.64.11.4403-4409.1998

Javed, A., M.D. Balhuizen, A. Pannekoek, F.J. Bikker, D.A. Heesterbeek, H.P. Haagsman, ... & E.J. Veldhuizen. 2023. Effects of *Escherichia coli* LPS structure on antibacterial and anti-endotoxin activities of host defense peptides. Pharmaceuticals 16 (10): 1485. https://doi.org/10.3390/ph16101485

Karaseva, O., G. Ozhegov, D. Khusnutdinova, M. Siniagina, E. Anisimova, F. Akhatova, & D. Yarullina. 2023. Whole genome sequencing of the novel probiotic strain *Lactiplantibacillus plantarum* FCa3L. Microorganisms 11 (5): 1234. https://doi.org/10.3390/microorganisms11051234

Kaunsui, M., C. Masinambou, E.D. Saragih, S.D. Harikedua, E. Pandey, D. Wonggo & D.M. Makapedua. 2023. Efek penambahan ekstrak daun tagalolo (*Ficus septica Burm.* F) terhadap kadar histamin dan total bakteri ikan cakalang (*Katsuwonus pelamis* L). Media Teknologi Hasil Perikanan 11 (1): 51-58.

Khatouf, R., S. Dahani, O. El Hariri, R. Amiyare, & N. Bouchriti. 2024. Microbiological profile and prevalence of histamine-producing bacteria in fresh sardines stored at different temperatures. *Veterinary World*, *17*(10), 2376. https://doi.org/10.14202/vetworld.2024.2376-2384

Kim, G., L. Azmi, S. Jang, T. Jung, H. Hebert, A.J. Roe & J.J. Song. 2019. Aldehyde-alcohol dehydrogenase forms a high-order spirosome architecture critical for its activity. Nature Communications 10 (1): 4527. https://doi.org/10.1038/s41467-019-12427-8

UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Klayraung, S. & S. Okonogi. 2009. Antibacterial and Antioxidant Activities of Acid and Bile Resistant Strains of *Lactobacillus fermentum* Isolated from Miang. Brazilian Journal of Microbiology 40 (4): 757-766. https://doi.org/10.1590/S1517-83822009000400005

Kusmarwati, A., U. Hizamah & S. Wibowo. 2020. Microbiological and chemical quality of a traditional salted-fermented fish (peda) product of Banten, Indonesia using *Leuconostoc mesenteroides* ssp. Cremonis BN12 as starter culture. IOP Conference Series: Earth and Environmental Science 462 (1): 012020. IOP Publishing.

Ladensi, M.A., S. Winarti & L.A. Wicaksono. 2024. Pengaruh konsentrasi garam dan lama fermentasi terhadap karakteristik fisikokimia dan kandungan asam glutamat terasi nabati dari tempe gembus. Jurnal Sains dan Teknologi Pangan 9 (4).

Larsen, R., J. Kok & O.P. Kuipers. 2005. Interaction between ArgR and AhrC controls regulation of arginine metabolism in *Lactococcus lactis*. Journal of Biological Chemistry 280 (19): 19319-19330. https://doi.org/10.1074/jbc.m413983200

Leite, A. M., M. A. L. Miguel, R. S. Peixoto, P. Ruas-Madiedo, V. M. F. Paschoalin, Mayo, B., & S. Delgado. 2015. Probiotic potential of selected lactic acid bacteria strains isolated from Brazilian kefir grains. *Journal of dairy science*, *98*(6): 3622-3632. https://doi.org/10.3168/jds.2014-9265

Li, J., X. Yang, G. Shi, J. Chang, Z. Liu & M. Zeng. 2019. Cooperation of lactic acid bacteria regulated by the AI-2/LuxS system involve in the biopreservation of refrigerated shrimp. Food Research International 120: 679-687. https://doi.org/10.1016/j.foodres.2018.11.025

Li, Y.Z., W. Q. Zhang, P. F. Hu, Q. Q. Yang, I. Molnár, P. Xu & B. B. Zhang. 2025. Harnessing microbial co-culture to increase the production of known secondary metabolites. Natural Product Reports 42 (3): 623-637. https://doi.org/10.1039/d4np00052h

Liang, S., D. Gao, H. Liu, C. Wang & J. Wen. 2018. Metabolomic and proteomic analysis of D-lactate-producing *Lactobacillus delbrueckii* under various fermentation conditions. Journal of Industrial Microbiology and Biotechnology 45 (8): 681-696. https://doi.org/10.1007/s10295-018-2048-y

Lim, E.S. 2016. Inhibitory effect of bacteriocin-producing lactic acid bacteria against histamine-forming bacteria isolated from Myeolchi-jeot. Fisheries and Aquatic Sciences 19 (1): 42. https://doi.org/10.1186/s41240-016-0040-x

Lim, E.S. 2022. Influence of bacteriocin-producing *Bacillus* strains on quality characteristics of fermented soybean product with biogenic amine-forming lactic acid bacteria. Applied Biological Chemistry 65 (1): 5. https://doi.org/10.1186/s13765-021-00664-9

Liu, F., Lin, Y., Liang, Q., Chen, X., & Zhao, B. 2026. Co-Culture Reveals the Quorum-Sensing Regulatory Mechanism of Bacteriocin PlnJK Synthesis in Lactiplantibacillus plantarum EL2. *Microorganisms*, *14*(4), 730. https://www.mdpi.com/2076-2607/14/4/730

Liu, G., R. Nie, Y. Liu, X. Li, J. Duan, X. Hao, S. Yumeng & J. Zhang. 2022. *Bacillus subtilis* BS-15 effectively improves plantaricin production and the regulatory

UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

biosynthesis in *Lactiplantibacillus plantarum* RX-8. Frontiers in Microbiology 12: 772546. https://doi.org/10.3389/fmicb.2021.772546

Ly, D., S. Mayrhofer, J. M. Schmidt, U. Zitz, & Domig, K. J. 2020. Biogenic amine contents and microbial characteristics of Cambodian fermented foods. Foods, 9(2):1–19. https://doi.org/10.3390/foods9020198

Mahulette, F., N.R. Mubarik & A. Suwanto. 2018. Diversity of lactic acid bacterial in inasua fermentation. Iranian Journal of Microbiology 10 (5): 314.

Mardinsyah, A. H. 2022. Isolasi Bakteri Asam Laktat Halofilik dari Pakasam dan Uji Aktivitas Antibakteri Supernatan Bebas Selnya Terhadap Bakteri Pembentuk Histamin. Skripsi. Departemen Perikanan Fakultas Pertanian Universitas Gadjah Mada.

Meera, N.S. & M.C. Devi. 2021. Detection, optimization and characterization of bacteriocin produced by *Lactobacillus fermentum* a strain isolated from home made curd-Indian traditional food. Paripex - Indian Journal of Research 10 (10). https://doi.org/10.36106/paripex/3908023

Meng, F., H. Zhao, T. Nie, F. Lu, C. Zhang, Y. Lu & Z. Lu. 2021. Acetate activates *Lactobacillus* bacteriocin synthesis by controlling quorum sensing. Applied and Environmental Microbiology 87 (13): e00720-21. https://doi.org/10.1128/AEM.00720-21

Meng, F., Y. Liu, T. Nie, C. Tang, F. Lyu, X. Bie & Z. Lu. 2022. Plantaricin A, derived from *Lactiplantibacillus plantarum*, reduces the intrinsic resistance of gram-negative bacteria to hydrophobic antibiotics. Applied and Environmental Microbiology 88 (10): e00371-22. https://doi.org/10.1128/aem.00371-22

Ming, T., L. Geng, Y. Feng, C. Lu, J. Zhou, Y. Li, & X. Su. 2019. iTRAQ-based quantitative proteomic profiling of Staphylococcus aureus under different osmotic stress conditions. *Frontiers in Microbiology*, *10*: 1082. https://doi.org/10.3389/fmicb.2019.01082

Mitsuyama, J., R. Hiruma, A. Yamaguchi & T. Sawai. 1987. Identification of porins in outer membrane of *Proteus*, *Morganella*, and *Providencia* spp. and their role in outer membrane permeation of beta-lactams. Antimicrobial Agents and Chemotherapy 31 (3): 379-384. https://doi.org/10.1128/aac.31.3.379

Mussatto, S. I., M. Fernandes, I. M. Mancilha, & I. C. Roberto. 2008. Effects of medium supplementation and pH control on lactic acid production from brewer's spent grain. *Biochemical Engineering Journal*, *40*(3): 437-444. https://doi.org/10.1016/j.bej.2008.01.013

Narkthewan, P., & W. Makkapan. 2020. Determination of histamine-forming bacteria, total coliform and *Escherichia coli* in fermented foods. *GEOMATE Journal*, 19(72): 69-74. ff

Naz, S.A., N. Jabeen, M. Sohail & S.A. Rasool. 2015. Biophysicochemical characterization of Pyocin SA189 produced by *Pseudomonas aeruginosa* SA189. Brazilian Journal of Microbiology 46 (4): 1147-1154. https://doi.org/10.1590/S1517-838246420140737

Nevado, D.L., S.D. Santos, G. Bastian, J. Deyta, E.J. Managuelod, J.A. Fortaleza & R. De Jesus. 2023. Detection, identification, and inactivation of histamine-

UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

forming bacteria in seafood: a mini-review. Journal of Food Protection 86 (3): 100049. https://doi.org/10.1016/j.jfp.2023.100049

Ngouénam, J. R., C. H. M. Kenfack, E. M. F. Kouam, P. M. Kaktcham, R. Maharjan, & F. Z. Ngoufack. 2021. Lactic acid production ability of *Lactobacillus* sp. from four tropical fruits using their by-products as carbon source. *Heliyon*, *7*(5). https://doi.org/10.1016/j.heliyon.2021.e07079

Noroozi, E., N. Mojgani, E. Motevaseli, M.H. Modarressi & M. Tebianian. 2019. Physico-chemical and cytotoxic analysis of a novel large molecular weight bacteriocin produced by *Lactobacillus casei* TA0021. Iranian Journal of Microbiology 11 (5): 397.

Nova, B., E.S. Wardi & D. Sartika. 2024. Metabolit Bioaktif Bakteri: Tinjauan tentang Potensi Antimikroba dan Aplikasinya. Journal of Pharmaceutical and Sciences: 399-410.

Ojha, A. K., N. P. Shah, dan V. Mishra. 2021. Conjugal transfer of antibiotic resistances in *Lactobacillus* spp. Current Microbiology 78(8): 2839–2849.

Okfrianti, Y., D. Darwis & A. Pravita. 2018. Bakteri asam laktat *Lactobacillus plantarum* C410LI dan *Lactobacillus rossiae* LS6 yang diisolasi dari Lemea rejang terhadap suhu, pH dan garam empedu berpotensi sebagai prebiotik. Jurnal Ilmu dan Teknologi Kesehatan 6 (1): 49-58.

Pakroo, S., A. Tarrah, R. Takur, M. Wu, V. Corich, & A. Giacomini. 2022. *Limosilactobacillus fermentum* ING8, a potential multifunctional non-starter strain with relevant technological properties and antimicrobial activity. *Foods*, *11*(5): 703. https://doi.org/10.3390/foods11050703

Panesar, P. S., J. F. Kennedy, D. N. Gandhi, dan K. Bunko. 2007. Bioutilisation of whey for lactic acid production. Food Chemistry 105(1): 1–14.

Pang, X., X. Song, M. Chen, S. Tian, Z. Lu, J. Sun & H.G. Yuk. 2022. Combating biofilms of foodborne pathogens with bacteriocins by lactic acid bacteria in the food industry. Comprehensive Reviews in Food Science and Food Safety 21 (2): 1657-1676. https://doi.org/10.1111/1541-4337.12922

Pérez-Ramos, A., D. Madi-Moussa, F. Coucheney & D. Drider. 2021. Current knowledge of the mode of action and immunity mechanisms of LAB-bacteriocins. Microorganisms 9 (10): 2107. https://doi.org/10.3390/microorganisms9102107

Pujato, S.A., D.J. Mercanti, M. Briggiler Marcó, M.L. Capra, A. Quiberoni & D.M. Guglielmotti. 2024. Bacteriocins from lactic acid bacteria: strategies for the bioprotection of dairy foods. Frontiers in Food Science and Technology 4: 1439891. https://doi.org/10.3389/frfst.2024.1439891

Putra, M.M.P., M.Y. Al-Hammam, G. Ahsan, K.K.B. Chandra & I.D. Puspita. 2022. Antibacterial potency of cell free supernatant produced by lactic acid bacteria isolated from Indonesian fermented fish products against histamine-producing bacteria. Saintek Perikanan: Indonesian Journal of Fisheries Science and Technology 18 (1): 13-18. https://doi.org/10.14710/ijfst.18.1.13-18

Putri, R. N., S. N. Wahidah, Hosiyah, I. T. Al Hafidz, & Faisal. 2023. Uji daya hambat antimikroba secara difusi sumuran dan difusi paper disk. Era Sains: Journal of Science, Engineering and Information Systems Research, 1(4): 28–33.

UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Rahmi, N., P. Wulandari & L. Advinda. 2021. Pengendalian cemaran mikroorganisme pada ikan─Mini Review. Dalam Prosiding Seminar Nasional Biologi 1 (2): 611-623.

Rasheed, H.A., T. Tuoheti, Y. Zhang, F. Azi, M. Tekliye & M. Dong. 2020. Purification and partial characterization of a novel bacteriocin produced by bacteriocinogenic *Lactobacillus fermentum* BZ532 isolated from Chinese fermented cereal beverage (Bozai). LWT 124: 109113. https://doi.org/10.1016/j.lwt.2020.109113

Rasouli, M. & F. Safari. 2024. Principles of Indirect Co-culture Method Using Transwell. Dalam K. Turksen (Ed.), Stem Cell Niche. Methods in Molecular Biology. Vol. 2939. Humana. New York, NY. https://doi.org/10.1007/7651_2024_537

Ray, R.C. & D. Montet. 2017. Fermented Foods, Part II: Technological Interventions. Edisi ke-1. CRC Press. https://doi.org/10.1201/9781315205359/

Riadi, S. & D. Setiyawati. 2020. Isolasi dan uji potensi bakteri asam laktat asal kimchii dan teh kombucha dalam menghambat bakteri patogen. Jurnal Kesmas Prima.

Rivera, A., B. Viñado, N. Benito, F. Docobo-Pérez, A. Fernández-Cuenca, J. Fernández-Domínguez, & F. Navarro. 2023. Recommendations of the Spanish Antibiogram Committee (COESANT) for in vitro susceptibility testing of antimicrobial agents by disk diffusion. Enfermedades Infecciosas y Microbiología Clínica 41 (9): 571-576.

Rocchetti, M.T., P. Russo, V. Capozzi, D. Drider, G. Spano & D. Fiocco. 2021. Bioprospecting antimicrobials from *Lactiplantibacillus plantarum*: key factors underlying its probiotic action. International Journal of Molecular Sciences 22 (21): 12076. https://doi.org/10.3390/ijms222112076

Rodríguez-Sojo, M. J., A. J. Ruiz-Malagón, M. E. Rodríguez-Cabezas, J. Gálvez, & A. Rodríguez-Nogales. 2021. *Limosilactobacillus fermentum* CECT5716: mechanisms and therapeutic insights. *Nutrients*, *13*(3), 1016. https://doi.org/10.3390/nu13031016

Saavedra, L., P. Castellano & F. Sesma. 2004. Purification of bacteriocins produced by lactic acid bacteria. Dalam Public Health Microbiology: Methods and Protocols: 331–336. Humana Press. Totowa, NJ. https://doi.org/10.1385/1-59259-766-1:331

Sharma, B. R., Halami, P. M., & Tamang, J. P. 2022. Novel pathways in bacteriocin synthesis by lactic acid bacteria with special reference to ethnic fermented foods. *Food Science and Biotechnology*, *31*(1), 1-16. https://doi.org/10.1007/s10068-021-00986-w

Shin, J. M., J. W. Gwak, P. Kamarajan, J. C. Fenno, A. H. Rickard & Y. L. Kapila. 2016. Biomedical applications of nisin. Journal of Applied Microbiology 120 (6): 1449–1465. https://doi.org/10.1111/jam.13033

Siswanto, A., S. Sumardianto & R. Romadhon. 2018. Pengaruh perbedaan konsentrasi garam pada ikan peda kembung (*Rastrelliger* sp.) terhadap jumlah bakteri penghasil asam sebagai penghambat pertumbuhan *Staphylococcus aureus* dan *Escherichia coli*. Jurnal Pengolahan dan Bioteknologi Hasil Perikanan 6 (2): 17–23.

UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Straume, D., M. Kjos, I. F. Nes, & D. B. Diep. 2007. Quorum-sensing based bacteriocin production is down-regulated by N-terminally truncated species of gene activators. *Molecular Genetics and Genomics*, *278*(3): 283-293. https://doi.org/10.1007/s00438-007-0251-z

Sugrue, I., R. P. Ross, & C. Hill. 2024. Bacteriocin diversity, function, discovery and application as antimicrobials. *Nature Reviews Microbiology*, *22*(9), 556-571. https://doi.org/10.1038/s41579-024-01045-x

Sun, X., L. Kong, J. Yuan, Y. Zeng, W. He, X. Zeng & D. Pan. 2024. Regulatory mechanism of plnC in *Lactiplantibacillus plantarum* B1 on plantaricin biosynthesis. Food Bioscience 62: 105355. https://doi.org/10.1016/j.fbio.2024.105355

Tan, A., Zhao, Y., Sivashanmugan, K., Squire, K., & Wang, A. X. (2019). Quantitative TLC-SERS detection of histamine in seafood with support vector machine analysis. Food Control, 103:111–118.

Tulini, F. L., & E. C. P. De-Martinis. 2010. Improved adsorption-desorption extraction applied to the partial characterization of the antilisterial bacteriocin produced by *Carnobacterium maltaromaticum* C2. *Brazilian Journal of Microbiology*, *41*, 493-496. https://doi.org/10.1590/S1517-83822010000200032

Twomey, E., C. Hill, D. Field & M. Begley. 2021. Recipe for success: suggestions and recommendations for the isolation and characterisation of bacteriocins. International Journal of Microbiology 2021 (1): 9990635. https://doi.org/10.1155/2021/9990635

Verma, A.K., R. Banerjee, H.P. Dwivedi & V.K. Juneja. 2014. Bacteriocins | potential in food preservation.

Wafi, A.H., C. Pamungkas, A.E. Kurniawati, D. Murdiantara, S. Ariyanto & B.S. Wiratama. 2025. Outbreak investigation of scombroid fish poisoning in Pandak Sub-district, Bantul Regency, 2024. Dalam International Conference of Public Health: 82–94.

Wahyuni, S. 2011. Histamin tuna (*Thunnus* sp.) dan identifikasi bakteri pembentuknya pada kondisi suhu penyimpanan standar.

Wang, Y., Y. Qin, Q. Xie, Y. Zhang, J. Hu & P. Li. 2018. Purification and characterization of plantaricin LPL-1, a novel class IIa bacteriocin produced by *Lactobacillus plantarum* LPL-1 isolated from fermented fish. Frontiers in Microbiology 9: 2276. https://doi.org/10.3389/fmicb.2018.02276

Wannun, P., S. Piwat, & R. Teanpaisan. 2016. Purification, characterization, and optimum conditions of fermencin SD11, a bacteriocin produced by human orally *Lactobacillus fermentum* SD11. *Applied biochemistry and biotechnology*, *179*(4): 572-582. https://doi.org/10.1007/s12010-016-2014-y

Wu, C. W., L. J. Yin, & S. T. Jiang. 2004. Purification and characterization of bacteriocin from *Pediococcus pentosaceus* ACCEL. *Journal of agricultural and food chemistry*, *52*(5), 1146-1151. https://doi.org/10.1021/jf035100d

Xu, J., Z. Wang, Z. Shi, M. Liu, X. Fan, T. Zhang & D. Pan. 2025. Detection and development of lactic acid bacteria bacteriocins a hint on the screening of bacteriocins of lactic acid bacteria. LWT 222: 117627. https://doi.org/10.1016/j.lwt.2025.117627

UNIVERSITAS
GADJAH MADA
Peningkatan Aktivitas Antibakteri Lactiplantibacillus plantarum GMP1 Melalui Ko-Kultur dengan Limosilactobacillus fermentum FNCC0322 terhadap Bakteri Kontaminan Produk Perikanan
Indah Galih Kusuma, Ir. Mgs. M. Prima Putra S.Pi., M.Sc., Ph.D., IPM., ASEAN Eng.; Indun Dewi Puspita S.P., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Yang, J.M. & G.S. Moon. 2018. Isolation of a *Lactococcus lactis* strain producing anti-staphylococcal bacteriocin. Korean Journal for Food Science of Animal Resources 38 (6): 1315–1321. https://doi.org/10.5851/kosfa.2018.e67

Yang, R., M. C. Johnson, & B. I. B. E. K. Ray. 1992. Novel method to extract large amounts of bacteriocins from lactic acid bacteria. *Applied and environmental microbiology*, *58*(10):3355-3359. https://doi.org/10.1128/aem.58.10.3355-3359.1992

Yap, P. G., Z. W. Lai, & J. S. Tan. 2022. Bacteriocins from lactic acid bacteria: purification strategies and applications in food and medical industries: a review. Beni-Suef University Journal of Basic and Applied Sciences, 11, 51. https://doi.org/10.1186/s43088-022-00227-x

Yuniati, F. A. A., dan D. A. C. Rasmi. 2014. Fermentasi ikan kembung (*Rastrelliger* sp.) dalam pembuatan peda dengan penambahan bakteri asam laktat (BAL) yang terkandung dalam terasi empang pada berbagai konsentrasi garam. Jurnal Biologi Tropis.

Zangeneh, M., S. Khorrami & M. Khaleghi. 2020. Bacteriostatic activity and partial characterization of the bacteriocin produced by *L. plantarum* sp. isolated from traditional sourdough. Food Science & Nutrition 8 (11): 6023–6030. https://doi.org/10.1002/fsn3.1890

Zelcbuch, L., S. N. Lindner, Y. Zegman, I. Vainberg Slutskin, N. Antonovsky, S. Gleizer, & A. Bar-Even, A. 2016. Pyruvate formate-lyase enables efficient growth of *Escherichia coli* on acetate and formate. *Biochemistry*, *55*(17): 2423-2426. https://doi.org/10.1021/acs.biochem.6b00184

Zeng, X., W. Xia, Q. Jiang & F. Yang. 2013. Effect of autochthonous starter cultures on microbiological and physico-chemical characteristics of Suan yu, a traditional Chinese low salt fermented fish. Food Control 33 (2): 344–351. https://doi.org/10.1016/j.foodcont.2013.03.001

Zeng, Y., W. He, K. Li, X. Zeng, Z. Wu, Y. Guo & D. Pan. 2025. The potential mechanism and key genes of bacteriocin production in *Lactiplantibacillus plantarum* ZY-1 induced by co-cultivation with *Limosilactobacillus fermentum* RC4. LWT: 118059. https://doi.org/10.1016/j.lwt.2025.118059

Zhang, H., L. Liu, Y. Hao, S. Zhong, H. Liu, T. Han & Y. Xie. 2013. Isolation and partial characterization of a bacteriocin produced by *Lactobacillus plantarum* BM-1 isolated from a traditionally fermented Chinese meat product. Microbiology and Immunology 57 (11): 746–755. https://doi.org/10.1111/1348-0421.12091

Zhang, J., Y. Yang, H. Yang, Y. Bu, H. Yi, L. Zhang & L. Ai. 2018. Purification and partial characterization of bacteriocin Lac-B23, a novel bacteriocin production by *Lactobacillus plantarum* J23, isolated from Chinese traditional fermented milk. Frontiers in Microbiology 9: 2165. https://doi.org/10.3389/fmicb.2018.02165

Zhang, Q., C. Gu, H. Chang, W. Zhang, L. Ma, F. Liu & Z. Feng. 2025. Effects of single and co-cultured lactic acid bacteria on antioxidant capacity and metabolite profiles during rambutan juice fermentation. Food Chemistry: X: 102904. https://doi.org/10.1016/j.fochx.2025.102904