

DAFTAR PUSTAKA

- Alam A., Bröms J.E., Kumar R., Sjöstedt A. (2021). The Role of ClpB in Bacterial Stress Responses and Virulence. *Frontiers in Molecular Biosciences*, 8, 668910.
- Almehdar, H.A., El-Fakharany, E.M., Uversky, V.N., & Redwan, E.M. (2015). Disorder in milk proteins: Structure, functional disorder, and biocidal potentials of lactoperoxidase. *Current Protein and Peptide Science*, 16(4), 352 – 365.
- Arena, S., Renzone, G., Novi, G., Paffetti, A., Bernardini, G., Santucci, A., & Scaloni, A. (2010). Modern proteomic methodologies for the characterization of lactosylation protein targets in milk. *Proteomics*, 10(19), 3414 – 3434.
- Arena, M. P., Capozzi, V., Spano, G., & Fiocco, D. (2017). The potential of lactic acid bacteria to colonize biotic and abiotic surfaces and the investigation of their interactions and mechanisms. *Applied Microbiology and Biotechnology*, 101(7), 2641–2657.
- Aryana, K. J., & Olson, D. W. (2017). A 100-year review: Yogurt and other cultured dairy products. *J. Dairy Sci*, 100, 9987–10013.
- Balogh, G., Péter, M., Liebisch, G., Horváth, I., Török, Z., Nagy, E., Maslyanko, A., Benk, S., Schmitz, G., Harwood, J.L., & Vigh, L. (2010). Lipidomics reveals membrane lipid remodelling and release of potential lipid mediators during early stress responses in a murine melanoma cell line. *Biochimica et Biophysica Acta - Molecular and Cell Biology of Lipids*, 1801(9), 1036 – 1047.
- Bao, Q., Song, Y., Xu, H., Yu, J., Zhang, W., Menghe, B., Zhang, H., & Sun, Z. (2016). Multilocus sequence typing of *Lactobacillus casei* isolates from naturally fermented foods in China and Mongolia. *Journal of Dairy Science*, 99(7), 5202–5213.
- Barbosa, J., Borges, S. and Teixeira, P. (2015), *Pediococcus acidilactici* as a potential probiotic to be used in food industry. *Int J Food Sci Technol*, 50, 1151-1157.
- Behera P. & Balaji S. (2021). The forgotten sugar: A review on multifarious applications of melezitose. *Carbohydrate Research*, 500.
- Bingol, K., Bruschweiler-Li, L., Yu, C., Somogyi, A., Zhang, F., & Bruschweiler, R. (2015). Metabolomics beyond spectroscopic databases: A combined MS/NMR strategy for the rapid identification

- of new metabolites in complex mixtures. *Analytical Chemistry*, 87, 3864–3870.
- Boch, J., Kempf, B., Schmid, R., & Bremer, E. (1994). Synthesis of the osmoprotectant glycine betaine in *Bacillus subtilis*. *Journal of Bacteriology*, 176 (17), 5364–5372.
- Bolha L., Dušanić D., Narat M., Oven I. (2012). Comparison of methods for relative quantification of gene expression using real-time PCR [Primerjava metod za relativno kvantifikacijo genskega izražanja s PCR v realnem času]. *Acta Agriculturae Slovenica*, 100 (2), pp. 97 – 106.
- Bouchard, D. S., Rault, L., Berkova, N., Le Loir, Y., & Even, S. (2013). Inhibition of *Staphylococcus aureus* invasion into bovine mammary epithelial cells by contact with live *Lactocaseibacillus casei*. *Applied and Environmental Microbiolog*, 79(3), 877-885.
- Brennan, M., Wanismail, B., & Ray, B. (1983). Prevalence of viable *Lactobacillus acidophilus* in dried commercial products. *J. Food Prot*, 46, 887.
- Broeckx, G., Vandenheuvel, D., Claes, I. J. J., Lebeer, S., & Kiekens, F. (2016). Drying techniques of probiotic bacteria as an important step towards the development of novel pharmabiotics. *International Journal of Pharmaceutics*, 505 (1–2), 303–318.
- Buda, B., Dylus, E., Górska-Frączek, S., Brzozowska, E., & Gamian, A. (2013). Biological properties of *Lactobacillus* surface proteins. *Postepy Higieny i Medycyny Doswiadczalnej*, 67, 229 - 237
- Cai, H., Thompson, R., Budinich, M. F., Broadbent, J. R., & Steele, J. L. (2009). Genome sequence and comparative genome analysis of *Lactobacillus casei*: insights into their niche-associated evolution. *Genome Biol. Evol*, 1, 239–257.
- Calvalhao, A. S., Silva, J., Ho, P., et al. (2003b). Impedimetric Method for Estimating the Residual Activity of Freeze-dried *Enterococcus faecalis* and *Enterococcus durans*. *Journal of Applied Microbiology*, 94, 947-962.
- Cano-Higueta, D.M., Malacrida, C.R., & Telis, V.R.N. (2015). Stability of curcumin microencapsulated by spray and freeze drying in binary and ternary matrices of maltodekstrin, gum arabik and modified starch. *J. Food Process. Preserv*, 39, 2049–2060.

- Capra, M.L., Quiberoni, A., Reinheimer, J.A. (2004). Thermal and chemical resistance of *Lactobacillus casei* and *Lactobacillus paracasei* bacteriophages. *Letters in Applied Microbiology*, 38(6), 499 – 504.
- Cardenas, N., Calzada, J., Peiroten, A., Jimenez, E., Escudero, R., Rodriguez, J. M., Medina, M., & Fernandez, L. (2014). Development of a potential probiotic fresh cheese using two *Lactobacillus salivarius* strains isolated from human milk. *BioMed Research International*.
- Chan, Y. C., Raengpradub, S., Boor, K. J., and Wiedmann, M. (2007). Microarray-based characterization of the *Listeria monocytogenes* cold regulon in log- and stationary-phase cells. *Appl. Environ. Microbiol.* 73, 6484–6498.
- Chen, Y., Liu, Y., Bai, Y., Xu, S., Yang, X., & Cheng, B. (2022). Intestinal metabolomics of juvenile lenok (*Brachymystax lenok*) in response to heat stress. *Fish Physiology and Biochemistry*, 48 (5), 1389 - 1400.
- Cotter, P. D. dan Hill, C. (2003). Surviving the acid test: Responses of gram-positive bacteria to low pH. *Microbiol. Mol. Biol. Rev.* 67, 429–453.
- Cratiú-Moreira, M. T., Martins, E., Perrone, I. T., De Freitas, R., Queiroz, L. S., & De Carvalho, A. F. (2021). Challenges Associated with Spray Drying of Lactic Acid Bacteria: Understanding Cell Viability Loss. *Compr Rev Food Sci Food Saf.* 20, 3267-3283.
- de Angelis, M. & Gobetti, M. (2004). Environmental stress responses in *Lactobacillus*: A review. *Proteomics*, 4, 106–122.
- de Nadal, E., Ammerer, G., & Posas, F. (2011). Controlling gene expression in response to stress. *Nat Rev Genet*, 12, 833–845.
- Desjardins, P. & Conklin, D. NanoDrop microvolume quantitation of nucleic acids. *J. Vis Exp*, 45, 2565.
- Dicks, L. & Endo, A. (2013). The family lactobacillaceae: Genera other than *Lactobacillus*. *The Prokaryotes: Firmicutes and Tenericutes*, 203 – 212.
- Dietrich, C. G., Kottmann, T., & Alavi, M. (2014). Commercially available probiotic drinks containing *Lactobacillus casei* Dn-114001 reduce antibiotic associated diarrhea. *World J. Gastroenterol*, 20, 15837–15844.
- Dimitrellou, D., Kandyli, P., Petrović, T., Dimitrijević-Branković, S., Lević, S., Nedović, V., et al. (2016). Survival of spray dried microencapsulated *Lactobacillus casei* ATCC 393 in simulated

gastrointestinal conditions and fermented milk. *LWT-Food Science and Technology*, 71, 169–174.

- Empadinhas, N., & Da Costa, M. S. (2008). Osmoadaptation mechanisms in prokaryotes: Distribution of compatible solutes. *International Microbiology*, 11(3), 151–161.
- Farkye N.Y. & Shah N. (2014). Milk Proteins. *Applied Food Protein Chemistry*, 9781119944492, 427 – 458.
- Faruq, M. F. F. & Widodo W. (2025). Pengaruh formula media tumbuh *Pediococcus acidilactici* BE menggunakan whey powder terhadap nilai pH, keasaman dan mikrobiologis susu sapi fermentasi. *SKRIPSI. Ilmu dan Industri Peternakan*. Universitas Gadjah Mada.
- Fleury, B., Kelley, W.L., Lew, D., Götz, F., Proctor, R.A., & Vaudaux, P. (2009). Transcriptomic and metabolic responses of *Staphylococcus aureus* exposed to supra-physiological temperatures. *BMC Microbiology*, 9, 76.
- Forster, S. C., & Lawley, T. D. (2015). Systematic discovery of probiotics. *Nature Biotechnology*, 33(1), 47 – 49.
- Foster, P. L. (2007). Stress-induced mutagenesis in bacteria. *Critical Reviews in Biochemistry and Molecular Biology*, 42(5), 373–397.
- Franz, C.M.A.P., Endo, A., Abriouel, H., Van Reenen, C.A., Gálvez, A., & Dicks, L.M. (2014). The genus *Pediococcus*. *Lactic Acid Bacteria: Biodiversity and Taxonomy*, 9781444333831, 359 - 376.
- Fu, N., & Chen, X. D. (2011). Towards a maximal cell survival in convective thermal drying processes. *Food Research International*, 44(5), 1127–1149.
- Fu, N., Huang, S., Xiao, J., Chen, X. (2018). Producing Powders Containing Active Dry Probiotics with the Aid of Spray Drying. *Advances in Food and Nutrition Research, Academic Press*, 85, 211-262.
- Gharsallaoui, A., Roudaut, G., Chambin, O., Voilley, A., Saurel, R. (2007). Applications of spray-drying in microencapsulation of food ingredients: an overview. *Food Res. Int.*, 40, 1107–1121
- Goula, A.M., & Adamopoulos, K.G. (2008). Effect of maltodextrin addition during spray drying of tomato pulp in dehumidified air: I. Powder properties. *Dry. Technol.*, 26, 726–737.
- Gul, O. dan Atalar, I. (2019). Different stress tolerance of spray and freeze-dried *Lactobacillus casei* Shirota microcapsules with different

encapsulating agents. *Food Science and Biotechnology*, 28(3), 807 – 816.

Gul, O., Atalar, I., & Gul, L.B. (2019). Effect of different encapsulating agent combinations on viability of *Lactobacillus casei* Shirota during storage, in simulated gastrointestinal conditions and dairy dessert. *Food Science and Technology International*, 25(7), 608 – 617.

Gul, Osman. (2017). Microencapsulation of *Lactobacillus casei* Shirota by spray drying using different combinations of wall materials and application for probiotic dairy dessert. *Journal of Food Processing and Preservation*, 41(5), e13198.

Heeney, D. D., Zhai, Z., Bendiks, Z., Barouei, J., Martinic, A., Slupsky, C., *et al.* (2019). *Lactobacillus plantarum* bacteriocin is associated with intestinal and systemic improvements in diet-induced obese mice and maintains epithelial barrier integrity in vitro. *Gut Microbes*. 10, 382–397.

Heidebach, T., Forst, P., & Kulozik, U. (2012). Microencapsulation of probiotic cells for food applications. *Crit. Rev. Food Sci. Nutr*, 52, 291–311.

Hill, C., Guarner, F., Reid, G. *et al.* (2014). The International Scientific Association for Probiotics and Prebiotics consensus statement on the scope and appropriate use of the term probiotic. *Nat Rev Gastroenterol Hepatol* 11, 506–514.

Hoffmann, T., Wensing, A., Brosius, M., Steil, L., Völker, U., & Bremer, E. (2013). Osmotic control of opuA expression in *Bacillus subtilis* and its modulation in response to intracellular glycine betaine and proline pools. *J Bacteriol*. 195 (3), 510-22.

Hofman, D. L., van Buul, V. J., & Brouns, F. J. (2016). Nutrition, health, and regulatory aspects of digestible maltodextrins. *Critical Reviews in Food Science and Nutrition*, 56(12), 2091–2100.

Holtmann, G., & Bremer, E. (2004). Thermoprotection of *Bacillus subtilis* by exogenously provided glycine betaine and structurally related compatible solutes: Involvement of Opu Transporters. *Journal of Bacteriology*, 186(6), 1683 – 1693.

Huang, S., Cauty, C., Dolivet, A., Le Loir, Y., Chen, X. D., Schuck, P., *et al.* (2016b). Double use of highly concentrated sweet whey to improve the biomass production and viability of spray-dried probiotic bacteria. *J. Funct. Foods*. 23, 453–463.

- Hussain, M., Knight, M. and Britz, M. L. (2009a). Proteomic analysis of lactose starved *Lactobacillus casei* during stationary growth phase. *J. Appl. Microbiol.* 106:764–773.
- Ianniello R.G., Zotta T., Matera A., Genovese F., Parente E., Ricciardi A. (2016) Investigation of factors affecting aerobic and respiratory growth in the oxygen-tolerant strain *Lactobacillus casei* N87. *PLoS ONE*, 11 (11), e0164065
- Ilha, E. C., da Silva, T., Lorenz J. G., de Oliveira Rocha, G., Sant'Anna, E. S. (2015). *Lactobacillus paracasei* isolated from grape sourdough: acid, bile, salt, and heat tolerance after spray drying with skim milk and cheese whey. *Eur. Food Res. Technol.*, 240: 977–984
- Iranmanesh, M., Ezzatpanah, H., Mojgani, N., Amir, M., Torshizi, K., dan Aminafshar, M. (2012). Isolation of lactic acid bacteria from ewe milk, traditional yoghurt and sour buttermilk in Iran. *European Journal of Food Research & Review*, 2(3), 79–92.
- Ivanisevic, J., Benton, H. P., Rinehart, D., et al. (2014). An Interactive Cluster Heat Map to Visualize Multidimensional Metabolomic Data. *Metabolomics*, 11, 4.
- Jiang, L., Sullivan, H., Wang, B. (2022). Principal Component Analysis (PCA) Loading and Statistical Tests for Nuclear Magnetic Resonance (NMR) Metabolomics Involving Multiple Study Groups. *Analytical Letters*, 55 (10), pp. 1648 - 1662.
- Jonathan, I., Devanthi, P. V P., Arham, A. G. A., Crystalia, A. A., Ying, C. L. S., dan Pramanda, I.T. (2023). Effects of Temperature Shock on Viability and Stress-Related Gene Expression in *Pediococcus acidilactici*, a Probiotic Lactic Acid Bacteria. *IOP Conf. Series: Earth and Environmental Science*. 1255 012068.
- Jones, O. A. H., & Cheung, V. L. (2007). An introduction to metabolomics and its potential application in veterinary science. *Comparative Medicine*, 57, 436–442.
- Kamal, M.K., Maifiah, M.H., Rahim, A. N., Hashim, Y.Z.H.-Y., Sani, A. M. S., Azizan, K.A. (2022). Bacterial Metabolomics: Sample Preparation Methods. *Biochemistry Research International*, art. no. 9186536.
- Kandansamy, K., & Somasundaram, P. D. (2012). Microencapsulation of colors by spray drying- a review. *International Journal of Food Engineering*. 8(2).
- Katayama K., Sato T., Arai T., Amao H., Ohta Y., Ozawa T., Kenyon P.R., Hickson R.E., Tazaki H. (2013). Non-targeted analyses of animal

plasma: Betaine and choline represent the nutritional and metabolic status. *Journal of Animal Physiology and Animal Nutrition*, 97 (1), 119 – 125.

Kathiriya, M., Vekariya, Yogesh, Hati, & Subrota. (2023). Understanding the probiotic bacterial responses against various stresses in food matrix and gastrointestinal tract: A Review. *Probiotics and Antimicrobial Proteins*, 15, 1-17.

Kavitake, D., Kandasamy, S., Devi, P. B., & Shetty, P. H. (2018). Recent developments on encapsulation of lactic acid bacteria as potential starter culture in fermented foods– A review. *Food Bioscience*, 21, 34–44.

KEGG. (2024). *Pediococcus acidilactici* opuA-like gene (A4V11_05765). KEGG Pathway Database. Retrieved July 29, 2025, from https://www.kegg.jp/entry/paci:A4V11_05765.

Klaenhammer, T.R. (1993). Genetics of bacteriocins produced by lactic acid bacteria. *FEMS Microbiol. Rev*, 12, 39S-85S

Kolida, S., Saulnier, D., & Gibson G. (2006). Gastrointestinal microflora: Probiotics. *Adv. Appl. Microbiol*, 59, 187-219.

Lagage, V., & Uphoff, S. (2020). Pulses and delays, anticipation and memory: Seeing bacterial stress responses from a single-cell perspective. *FEMS Microbiology Reviews*, 44(5), 565–571.

Lebeer, S., Vanderleyden, J., & De Keersmaecker, S. C. (2008). Genes and molecules of lactobacilli supporting probiotic action. *Microbiology and Molecular Biology Reviews*, 72(4), 728-764.

Lee, S.J., Jeon, H.S., Yoo, J.Y., Kim, J.H. (2021). Some important metabolites produced by lactic acid bacteria originated from kimchi. *Foods*. 10, 2148.

Li, J., Chen, X., Xie, Z., Liang, L., Li, A., Zhao, C., Wen, Y., Lou, Z. (2023). Screening and Metabolomic Analysis of Lactic Acid Bacteria Antagonizing *Pseudomonas aeruginosa*. *Foods*, 12, 2799

Li, Q., Liu, D., Liang, M., Zhu, Y., Yousaf, M., Wu, Y. (2024). Mechanism of probiotics in the intervention of colorectal cancer: a review. *World J Microbiol Biotechnol*, 40(10), 306.

Liang, S., Gao, D., Liu, H., Wang, C., & Wen, J. (2018). Metabolomic and proteomic analysis of d-lactate-producing *Lactobacillus delbrueckii* under various fermentation conditions. *Journal of Industrial Microbiology & Biotechnology*, 45, 681–696.

- Liao, L.K., Wei, X.Y., Gong, X., Li, J.H., Huang, T., Xiong, T. (2017). Microencapsulation of *Lactobacillus casei* LK-1 by spray drying related to its stability and in vitro digestion. *LWT—Food Sci. Technol*, 82, 82–89.
- Liong, M.T. & Shah, N.P. (2005). Optimization of growth of *Lactobacillus casei* ASCC 292 and production of organic acids in the presence of fructooligosaccharide and maltodextrin. *Journal of Food Science*, 70 (2), M113-M120.
- Maajid, H. S., Nurliyani, N., dan Widodo, W. (2022). Exopolysaccharide production in fermented milk using *Lactobacillus casei* strains AP and AG. *AIMS Microbiol.* 8(2), 138-152.
- Madi-Moussa, D., Coucheney, F., & Drider, D. (2021). Expression of five class II bacteriocins with activity against *Escherichia coli* in *Lactocaseibacillus paracasei* CNCM I-5369, and in a heterologous host. *Biotechnology Reports*, 30.
- Mandal, S., Puniya, A.K., Singh, K. (2006). Effect of alginate concentrations on survival of microencapsulated *Lactobacillus casei* NCDC-298. *International Dairy Journal*, 16(10), 1190 - 1195.
- Manis C., Casula M., Chessa M., Mangia N.P., Caboni P. (2025). Lipidomic and Metabolomic Signatures of the Traditional Fermented Milk Product Gioddu. *Dairy*, 6 (5).
- Marcinowska, R., Trygg, J., Wolf-Watz, H., Mortiz, T. & Surowiec, I. (2011). Optimization of a sample preparation method for the metabolomic analysis of clinically relevant bacteria. *Journal of Microbiological Methods*, 87(1), 24 - 31.
- Margolles, A., B. Mayo & P. Ruas-Madiedo. (2009). Screening, Identification, and Characterization of *Lactobacillus* and *Bifidobacterium* Strains, pp 4–24. In Y.K. Lee and S. Salminen (Eds.) *Handbook of Probiotics and Prebiotics 2nd Edition*. Hoboken: John Wiley & Sons Inc.
- Mariod, A.A. (2018). Functional Properties of Gum arabik. *Gum arabik: Structure, Properties, Application and Economics*, 283 – 295.
- Mathys, S., U. Von Ah, C. Lacroix, E. Staub, R. Mini, T. Cereghetti, & L. Meile. (2007). Detection of the pediocin gene *pedA* in strains from human faeces by real-time PCR and characterization of *Pediococcus acidilactici* UVA1. *BMC Biotechnol*, 7, 55–64.

- Mayonu, M., Babae, S., Jiang, L., Wilson, D., & Wang, B. (2025). Evaluation of a new approach for principal component analysis application in metabolomic studies. *Analytical Letters*.
- Mehta, R., Arya, R., Goyal, K., Singh, M., & Sharma, A.K. (2013). Bio-preservative and therapeutic potential of pediocin: recent trends and future perspectives. *Recent Pat. Biotechnol*, 7, 172-178.
- Michel, C., Kravtchenko, T. P., David, A., Gueneau, S., Kozlowski, F., & Cherbut, C. (1998). In vitro prebiotic effects of acacia gums onto the human intestinal microbiota depends on both botanical origin and environmental pH. *Anaerobe*, 4(6), 257–266.
- Mishra S., & Mishra, H. (2012). Technological aspect of probiotic functional food development. *Nutrafoods*, 11, 117-130.
- Mortazavian, A. M., Ehsani, M. R., Mousavi, S. M., Sohrabvandi, S., & Reinheimer, J. V. (2006). Combined effects of temperature-related variables on the viability of probiotic micro-organisms in yogurt. *Australian Journal of Dairy Technology*, 61 (3), pp. 248 – 252.
- Mosilhey, S. H. (2003). Influence of different capsule materials on the physiological properties of microencapsulated *Lactobacillus acidophilus*. *Abstract Dissertation*. Institut für Lebensmitteltechn. Bonn.
- Moulay, M, Benlancén, K., Aggad, H., & Kihal, M. (2013). Diversity and Technological Properties of predominant Lactic Acid Bacteria Isolated From Algerian raw goat milk. *Advances in Environmental Biology*. 7, 6, 999-1007.
- Mu, W., Yang Y., Jia J., Zhang T., Jiang B. (2010). Production of 4-hydroxyphenyllactic acid by *Lactobacillus sp.* SK007 fermentation. *Journal of Bioscience and Bioengineering*, 109 (4), pp. 369 – 371.
- Muhalidin, B. J., Meor Hussin, A. S., Kadum, H., Abdul Hamid, A., & Jaafar, A. H. (2021). Metabolomic changes and biological activities during the lacto-fermentation of jackfruit juice using *Lactobacillus casei* ATCC334. *LWT*, 141, 110940.
- Murugesan, R., & Orsat, V. (2012). Spray drying for the production of nutraceutical ingredients—a review. *Food and Bioprocess Technology*, 5(1), 3-14.
- Mydla, M., & Koščová, H. (2011). Probiotics: Properties and effects Vlastnosti a účinky probiotík. *Farmaceutický Obzor*, 80(1), 3–8.
- Naziha, K. B. E. & Widodo, W. (2025). Evaluasi kualitas fisiko-kimia dan viabilitas *Lacticaseibacillus casei* AP dan *Lacticaseibacillus casei*

AG dalam susu kambing probiotik. *SKRIPSI*. Ilmu dan Industri Peternakan. Universitas Gadjah Mada.

- Neuhaus F.C. & Baddiley J. (2003). A Continuum of Anionic Charge: Structures and Functions of D-Alanyl-Teichoic Acids in Gram-Positive Bacteria. *Microbiology and Molecular Biology Reviews*, 67 (4), pp. 686 – 723.
- Nguyen, T. K. N., Van Duong, H., Nguyen, T. T., Dinh, M. T. N., & Nguyen, M. H. (2020). Characteristic of co-culture biofilm formed by *Lactobacillus plantarum* and *Pediococcus acidilactici*, and antagonistic effects of this biofilm on pathogen growth. *Japan Journal of Food Engineering*, 21 (2), 81 – 87.
- Ockerman, W. H., & Basu, L. (2007). Fermented meat products: Production and consumption. In F. Toldra (Ed.), *Handbook of fermented meat and poultry* (pp. 9–16). Blackwell Publishing Iowa, 50014, USA.
- Ortega, V. V. R. (2017). Comparative viability of spray dried lactobacilli affected by different protective agents and storage conditions. *LSU MASTER THESIS*. 4481.
- Otter, D.E., Wu, S., & Jayasinghe, D.N.D.S. (2022). Galactooligosaccharides and other products derived from lactose. *Advanced Dairy Chemistry: Volume 3: Lactose, Water, Salts and Minor Constituents*, 125 - 228.
- Paéz, R., Lavari, L., Vinderola, G., Audero, G., Cuatrin, A., Zaritzky, N., & Reinheimer, J. (2012). Effect of heat treatment and spray drying on lactobacilli viability and resistance to simulated gastrointestinal digestion. *Food Research International*, 48(2), 748-754.
- Pan, D., Wiedemann, N., & Kammerer, B. (2019). Heat stress-induced metabolic remodeling in *Saccharomyces cerevisiae*. *Metabolites*, 9(11), 266.
- Papadimitriou, K., Alegría, Á., Bron, P. A., de Angelis, M., Gobbetti, M., Kleerebezem, M., Lemos, J. A., Linares, D. M., Ross, P., Stanton, C., Turroni, F., van Sinderen, D., Varmanen, P., Ventura, M., Zúñiga, M., Tsakalidou, E., & Kok, J. (2016). Stress physiology of lactic acid bacteria. *Microbiology and Molecular Biology Review*, 80(3), 837–890.
- Paray, A. A., Singh, M., Mir, M. A., & Kaur, A. (2023). Gram Staining: A Brief Review. *International Journal of Research and Review*, 10, 9.

- Parlindungan, E., & Jones, O. A. H. (2023). Using metabolomic to understand stress responses in lactic acid bacteria and their applications in the food industry. *Metabolomic*, (19), 99.
- Parlindungan, E., May, B. K., & Jones, O. A. H. (2019). Metabolic insights into the effects of nutrient stress on *Lactobacillus plantarum* B21. *Frontiers in Molecular Biosciences*, 6, 75.
- Patel, R., Patel, M., & Suthar, A. (2009). Spray drying technology: an overview. *Indian Journal of Science and Technology*, 2(10), 44-47.
- Pehkonen K.S., Roos Y.H., Miao S., Ross R.P., & Stanton C. (2008). State transitions and physicochemical aspects of cryoprotection and stabilization in freeze-drying of *Lactobacillus rhamnosus* GG (LGG). *Journal of Applied Microbiology* 10, 4 (6), 1732 – 1743.
- Peighambardoust, S., Tafti, A. G., & Hesari, J. (2011). Application of spray drying for preservation of lactic acid starter cultures: a review. *Trends in Food Science & Technology*, 22(5), 215-224.
- Perdana, J., Bereschenko, L., Fox, M. B., Kuperus, J. H., Kleerebezem, M., Boom, R. M., & Schutyser, M. A. (2013). Dehydration and thermal inactivation of *Lactobacillus plantarum* WCFS1: Comparing single droplet drying to spray and freeze drying. *Food Research International*, 54(2), 1351-1359.
- Pérez-Enciso, M., & Tenenhaus, M. (2003). Prediction of clinical outcome with microarray data: A partial least squares discriminant analysis (PLS-DA) approach. *Human Genetics*, 112 (5-6), 581 - 592.
- Peter, S. B., Qiao, Z., Godspower, H. N., Ajeje, S. B., Xu, M., Zhang, X., Yang, T., & Rao, Z. (2022). Biotechnological Innovations and Therapeutic Application of *Pediococcus* and Lactic Acid Bacteria: The Next-Generation Microorganism. *Frontiers in Bioengineering and Biotechnology*, 9 – 2021.
- Phoem, A.N., Chanthachum, S., & Voravuthikunchai, S.P. (2015). Preparation of eleutherine americana-alginate complex microcapsules and application in *Bifidobacterium longum*. *Nutrients*, 7, 831–848.
- Pittelkow, M., Tschapek, B., Smits, S., Schmitt, L., & Bremer, E. (2011). The Crystal Structure of the Substrate-Binding Protein OpuBC from *Bacillus subtilis* in Complex with Choline. *Journal of molecular biology*, 411, 53-67.
- Purwijantiningsih, E. (2007). Pengaruh jenis prebiotik terhadap kualitas yoghurt probiotik. *Biota*, 12 (3), 177-185.

- Putri, S. P., Nakayama, Y., Matsuda, F., Uchikata, T., Kobayashi, S., Matsubara, A., & Fukusaki, E. (2013). Current metabolomic: Practical applications. *Journal of Bioscience and Bioengineering*, 115, 579–589.
- Qi, N. L., Gong, X., Yang, C. L., Cheng, Z. H., Zhou, W., & Li, J. H. (2018). ¹H NMR-based metabolic profile of *Lactobacillus salivarius* FDB89 under osmotic stress. *Applied Ecology and Environmental Research*, 16: 3489–500.
- Rama, G. R., Kuhn, D, Beux, S., Maciel, M.J., & Volken de Souza, C. F. (2020). Cheese whey and ricotta whey for the growth and encapsulation of endogenous lactic acid bacteria. *Food and Bioprocess Technology*, 13(2), 308–322.
- Ranadheera, C. S., Vidanarachchi, J. K., Rocha, R. S., Cruz, A. G., & Ajlouni, S. (2017). Probiotic Delivery through Fermentation: Dairy vs. Non-Dairy Beverages. *Fermentation*, 3(4), 67.
- Ranadheera, C.S., Evans, C.A., Adams, M.C., & Baines, S.K. (2014). Microencapsulation of *Lactobacillus acidophilus* LA-5, *Bifidobacterium animalis subsp. lactis* BB-12 and *Propionibacterium jensenii* 702 by spray drying in goat's milk. *Small Rumin*, 123, 155–159.
- Ruiz-Perez D., Guan H., Madhivanan P., Mathee K., Narasimhan G. (2020). So you think you can PLS-DA?. *BMC Bioinformatics*, 21.
- Ryan, P. M., Ross, R. P., Fitzgerald, G. F., Caplice, N. M., & Stanton, C. (2015). Sugar-coated: exopolysaccharide producing lactic acid bacteria for food and human health applications. *Food Funct*, 6, 679–693.
- Sada, M., Kimura, H., Nagasawa, N., Akagawa, M., Okayama, K., Shirai, T., Sunagawa, S., Kimura, R., Saraya, T., Ishii, H., Kurai, D., Tsugawa, T., Nishina, A., Tomita, H., Okodo, M., Hirai, S., Ryo, A., Ishioka, T., & Murakami, K. (2022). Molecular Evolution of the *Pseudomonas aeruginosa* DNA Gyrase *gyrA* Gene. *Microorganisms*, 10 (8), 1660.
- Santivarangkna, C., Kulozik, U., & Foerst, P. (2007). Alternative drying processes for the industrial preservation of lactic acid starter cultures. *Biotechnology Progress*, 23(2), 302- 315.
- Schmidt, C. (2004). Metabolomic takes its place as latest up-and coming “omic” science. *Journal of the National Cancer Institute*, 96, 732–734.

- Schutyser, M. A. I., Perdana, J., & Boom, R. M. (2012). Single droplet drying for optimal spray drying of enzymes and probiotics. *Trends in Food Science & Technology*, 27(2), 73–82.
- Seftiarini, W., Widodo W., & Pratiwi R. (2025). Karakterisasi dan Aktivitas Imunomodulator Eksopolisakarida *Lacticaseibacillus casei* AP dan *Lacticaseibacillus casei* AG pada Kultur Sel Makrofag RAW 264.7. *TESIS*. Bioteknologi. Universitas Gadjah Mada.
- Semyonov, D., Ramon, O., & Shimoni, E. (2011). Using ultrasonic vacuum spray dryer to produce highly viable dry probiotics. *LWT - Food Science and Technology*, 44 (9): 1844-1852.
- Seregina T, Shakulov R, Quarta G, Shatalin K, Sklyarova S, Petrushanko I, Fedulov AP, Ivanov AV, Mitkevich V, Makarov A, Mironov AS, Nudler E. 2025. Ribose-5-phosphate metabolism protects *E. coli* from antibiotic lethality. *mBio* 16:e00654-25.
- Sheehan, V. M., Sleator, R. D., Fitzgerald, G. F., and Hill, C. (2006). Heterologous expression of BetL, a betaine uptake system, enhances the stress tolerance of *Lactobacillus salivarius* UCC118. *Appl. Environ. Microbiol.* 72, 2170–2177.
- Shendurse, A.M. & Khedkar, C.D. (2015). Lactose. *Encyclopedia of Food and Health*, 509 - 516.
- Shenhar, Y., Rasouly, A., Biran, D., & Ron, E.Z. (2009). Adaptation of *Escherichia coli* to elevated temperatures involves a change in stability of heat shock gene transcripts. *Environmental Microbiology*, 11 (12), 2989 - 2997.
- Sleator, R.D. & Hill, C. (2002). Bacterial osmoadaptation: the role of osmolytes in bacterial stress and virulence. *FEMS Microbiology Reviews*, 26 (1), 49–71.
- Stadhouders, J., Janson, L. A., & Hup, G. 1969. Preservation of starters and mass production of starter bacteria. *Neth. Milk Dairy J*, 23, 182-199.
- Stevenson K., McVey A.F., Clark I.B.N., Swain P.S., Pilizota T. (2016). General calibration of microbial growth in microplate readers. *Scientific Reports*, 6, 38828.
- Sun, Z., Harris, H. M., Mccann, A., Guo, C., Argimon, S., Zhang, W., et al. (2015). Expanding the biotechnology potential of lactobacilli through comparative genomics of 213 strains and associated genera. 6, 8322.
- Susko, E. (2010). First-order correct bootstrap support adjustments for splits that allow hypothesis testing when using maximum likelihood estimation. *Molecular Biology and Evolution*, 27 (7), 1621 – 1629.

- Swati, M. K., & Wagh, M. (2014). Review on spray drying technology. *International Journal of Pharmaceutical, Chemical and Biological Sciences*, 4, 219-225.
- Tang, H., Huang, W., & Yao, Y.F. (2023). The metabolites of lactic acid bacteria: classification, biosynthesis and modulation of gut microbiota. *Microb Cell*. 10(3), 49-62.
- Teresa, R. & Carmen, P. (2009). *Characterization of Lactic Acid Bacteria Used as Starter Cultures*. Handbook of Dairy Foods Analysis.
- Tian, H., Wang, W., Zheng, N., Cheng, J., Li S., Zhang, Y., & Wang, J. (2015). Identification of diagnostic biomarkers and metabolic pathway shifts of heat-stressed lactating dairy cows. *Journal of Proteomics*, 125, 17 - 28.
- Tirta, G. D., Martin, L., Bani, M. D., Kho, K., Pramanda, I. T., Pui, L. P., How, Y. H., Lim, C. S. Y., & Devanthi, P. V. P. (2023). Spray Drying Encapsulation of *Pediococcus acidilactici* at Different Inlet Air Temperatures and Wall Material Ratios. *Foods*, 12(1), 165.
- Tomita, S., Saito, K., Nakamura, T., Sekiyama, Y., & Kikuchi, J. (2017). Rapid discrimination of strain-dependent fermentation characteristics among *Lactobacillus* strains by NMR-based metabolomics of fermented vegetable juice. *PLoS ONE*, 12, e0182229.
- Tripathi, M., & Giri, S. (2014). Probiotic functional foods: Survival of probiotics during processing and storage. *Journal of Functional Foods*, 9, 225-241.
- Turner, M.S., Xiang, Y., Liang, Z.X., Marcellin, E., & Pham, H.T. (2023). Cyclic-di-AMP signalling in lactic acid bacteria. *FEMS Microbiol Rev*, 19, 47(3).
- Ughy B., Nagyapati S., Lajko D.B., Letoha T., Prohaszka A., Deeb D., Der A., Pettko-Szandtner A., Szilak L. (2023). Reconsidering Dogmas about the Growth of Bacterial Populations. *Cells*, 12 (10), 1430.
- Umu, Ö.C., Bäuerl, C., Oostindjer, M., Pope, P. B., Hernández, P. E., Pérez-Martínez, G., et al. (2016). The potential of class II bacteriocins to modify gut microbiota to improve host health. *PloS One*, 11, e0164036.
- Upadrasta, A., Stanton, C., Hill, C., Fitzgerald, G.F., & Ross, R. P. (2011). *Improving the Stress Tolerance of Probiotic Cultures: Recent Trends and Future Directions*. E. Tsakalidou and K. Papadimitriou (eds.), Stress Responses of Lactic Acid Bacteria, Food Microbiology and Food Safety.

- Wang, J., Zhao, W., Guo, S., Sun, Y., Yao, K., Liu, Z., Sun, Z., Kwok, L.-Y., & Peng, C. (2021). Different growth behaviors and metabolomik profiles in yogurts induced by multistrain probiotics of *Lactobacillus casei* Zhang and *Bifidobacterium lactis* V9 under different fermentation temperatures. *Journal of Dairy Science*, 104(10), 10528 – 10539.
- Wang, L., Wei, C., Chang, Y., & Ding J. (2021). Response of bacterial community in sea cucumber *Apostichopus japonicus* intestine, surrounding water and sediment subjected to high-temperature stress. *Aquaculture*, 535, 736353.
- Wang, Y., Gu, J., Zhang, F., Zhou, D., Yu, Y., Chang, M., Huo, H., Tian, K. (2024). Multi-omics analysis reveals the mechanisms by which C6-HSL enhances the resistance of typical functional bacteria in activated sludge to low-temperature stress. *Science of the Total Environment*, 954, 176454.
- Widodo, W. Anindita, N.S., Taufiq, T.T., & Wahyuningsih, T. D. (2012b). Identification of *Pediococcus* strains isolated feces of Indonesian infants with in vitro capability to consume prebiotic inulin on adhere on mucus. *Indo. J. Biotech.* 17, 132-143.
- Widodo, W. Anindita, N. S., Taufiq, T.T., & Wahyuningsih, T. D. (2014). Evaluation of Two *Lactobacillus* Strain as Probiotics with Emphasis in Utilizing Prebiotic Inulin as Energy Source. *Int. Res. J. Microbiol*, 5, 33-40.
- Widodo, W., Rachmawati, A.V., Chulaiha, R., & Budisatria, I.G.S. (2012). Produksi dan Evaluasi Kualitas Susu Bubuk Asal Kambing Peternakan Etawa (PE). *Tekno dan Industri Pangan*, XXIII(2).
- Widodo, W., Lestari, S., & Asmara, W., (2015). Detection and Identification of Adherence Genes of Intestinal-origin *Lactobacillus* and *Pediococcus* Strain Grown on Gastric Mucin in Vitro. *Indo. J. Biotechnol*, 20, 171-181.
- Widodo, W., Taufiq, T.T., Aryati, E., Kurniawati, A., & Asmara, W. (2012a). Human Origin *Lactobacillus casei* Isolated from Indonesia Infants Demonstrating Potential Characteristics as Probiotics In Vitro. *Indo J. Biotech*, 17, 79-89
- Widodo, W., Kusumaningrum, H.R.P, Wihadmadyatami, H., & Wicaksana, A. L. (2023). Milk Fermented with *Pediococcus acidilactici* Strain BE Improves High Blood Glucose Levels and Pancreatic Beta-Cell Function in Diabetic Rats. *Food Sci Anim Resour*, 43(1), 170-183.

- Wise A.D., TenBarge E.G., Mendonça J.D.C., Mennen E.C., *et. al.* (2025). Mitochondria sense bacterial lactate and drive release of neutrophil extracellular traps. *Cell Host and Microbe*, 33 (3), pp. 341 - 357
- Wu, S., Du, H., & Xu, Y. (2023). Daqu microbiota adaptability to altered temperature determines the formation of characteristic compounds. *International Journal of Food Microbiology*, 385, 109995.
- Yeo, S. K., Ewe, J. A., Tham, C. S. C., & Liong, M.-T. (2011). Carriers of Probiotic Microorganisms. *Microbiology Monographs*, 191–220.
- Yin, H., Tang, M., Zhou, Z., Fu, X., Shen, L., Liang, Y., Li, Q., Liu, H., & Liu, X. (2012). Distinctive heat-shock response of bioleaching microorganism *Acidithiobacillus ferrooxidans* observed using genome-wide microarray. *Canadian Journal of Microbiology*, 58(5), 628 - 636.
- Yu, B., Liu, R., Hsiao, F., & Chiou, P. (2008). Evaluation of *Lactobacillus reuteri* Pg4 strain expressing heterologous β -glucanase as a probiotic in a barley-base poultry diet. *Animal. Feed. Sci. Technol.*
- Yun Y. H., Liang, F., Deng B. C., Lai G. B., Vicente Gonçalves C.M., Lu H. M., Yan J., Huang X., Yi L. Z., & Liang Y. Z. (2015). Informative metabolites identification by variable importance analysis based on random variable combination. *Metabolomics*, 11(6), 1539 - 1551.
- Yoon Y., Lee H., Lee S., Kim S., Choi K.-H. (2015). Membrane fluidity-related adaptive response mechanisms of foodborne bacterial pathogens under environmental stresses. *Food Research International*, 72, 25 – 36.
- Zarour, K., Vieco, N., Pérez-Ramos, A., Nácher-Vázquez, M., Mohedano, M. L., & López, P. (2017). Food ingredients synthesized by lactic acid bacteria. In A. M. Holban & A. M. Grumezescu (Eds.), *Handbook of food bioengineering: Microbial production of food ingredients and additives* (pp. 89–124). Academic Press.
- Zheng, J., Wittouck, S., Salvetti, E., Franz, C. M. A. P. *et al.* (2020). A taxonomic note on the genus *Lactobacillus*: Description of 23 novel genera, emended description of the genus *Lactobacillus* Beijerinck 1901, and union of *Lactobacillaceae* and *Leuconostocaceae*. *International journal of systematic and evolutionary microbiology*, 70(4), 2782–2858.
- Zotta T., Ricciardi A., Guidone A., Sacco M., Muscariello L., Mazzeo M.F., Cacace G., Parente E. (2012). Inactivation of *ccpA* and aeration affect growth, metabolite production and stress tolerance in *Lactobacillus*

plantarum WCFS1. *International Journal of Food Microbiology*, 155 (1-2), 51 – 59.

Zou, Huibin & Chen, Ningning & Shi, Mengxun & Xian, Mo & Song, Yimin & Liu, Junhong. (2016). The metabolism and biotechnological application of betaine in microorganism. *Applied Microbiology and Biotechnology*. 100.