

DAFTAR PUSTAKA

- Agrawal, A., Kulkarni, S., Sharma, S., 2015. Recent Advancements and Applications of Multiple Emulsions. *Int. j. adv* 4, 94–103. <https://doi.org/10.7439/ijap.v4i6.2648>
- Albadran, H.A., Chatzifragkou, A., Khutoryanskiy, V.V., Charalampopoulos, D., 2015. Stability of Probiotic *Lactobacillus plantarum* In Dry Microcapsules Under Accelerated Storage Conditions. *Food Res. Int.* 74, 208–216. <https://doi.org/10.1016/j.foodres.2015.05.016>
- Angmo, K., Kumari, A., Savitri, Bhalla, T.C., 2016. Probiotic Characterization of Lactic Acid Bacteria Isolated from Fermented Foods and Beverage of Ladakh. *LWT - Food Science and Technology* 66, 428–435. <https://doi.org/10.1016/j.lwt.2015.10.057>
- Arancibia, C., Navarro-Lisboa, R., Zúñiga, R.N., Matiacevich, S., 2016. Application of CMC as Thickener on Nanoemulsions Based on Olive Oil: Physical Properties and Stability. *Int J Polym Sci* 2016, 1–10. <https://doi.org/10.1155/2016/6280581>
- Boitard, L., Cottinet, D., Kleinschmitt, C., Bremond, N., Baudry, J., Yvert, G., Bibette, J., 2012. Monitoring Single-Cell Bioenergetics Via The Coarsening Of Emulsion Droplets. *PNAS* 109, 7181–7186. <https://doi.org/10.1073/pnas.1200894109>
- Burgain, J., Gaiani, C., Linder, M., Scher, J., 2011. Encapsulation of Probiotic Living Cells: From Laboratory Scale To Industrial Applications. *J. Food Eng* 104, 467–483. <https://doi.org/10.1016/j.jfoodeng.2010.12.031>
- Bustamante, M., Oomah, B.D., Rubilar, M., Shene, C., 2017. Effective *Lactobacillus plantarum* and *Bifidobacterium infantis* Encapsulation With Chia Seed (*Salvia hispanica* L.) and Flaxseed (*Linum usitatissimum* L.) Mucilage and Soluble Protein by Spray Drying. *Food Chem* 216, 97–105. <https://doi.org/10.1016/j.foodchem.2016.08.019>
- Calabro, S., Tritto, E., Pezzotti, A., Taccone, M., Muzzi, A., Bertholet, S., De Gregorio, E., O'Hagan, D.T., Baudner, B., Seubert, A., 2013. The Adjuvant Effect of MF59 is Due To The Oil-In-Water Emulsion Formulation, None of The Individual Components Induce A Comparable Adjuvant Effect. *Vaccine* 31, 3363–3369. <https://doi.org/10.1016/j.vaccine.2013.05.007>
- Chen, G., Tao, D., 2005. An Experimental Study of Stability of Oil–Water Emulsion. *Fuel Process. Technol* 86, 499–508. <https://doi.org/10.1016/j.fuproc.2004.03.010>



- Cizauskaite, U., Marksa, M., Bernatoniene, J., 2018. The Optimization of Technological Processes, Stability and Microbiological Evaluation of Innovative Natural Ingredients-Based Multiple Emulsion. *Pharm Dev Technol* 23, 636–645. <https://doi.org/10.1080/10837450.2017.1350981>
- Cook, M.T., Tzortzis, G., Charalampopoulos, D., Khutoryanskiy, V.V., 2012. Microencapsulation of Probiotics For Gastrointestinal Delivery. *J Control Release* 162, 56–67. <https://doi.org/10.1016/j.jconrel.2012.06.003>
- Corona-Hernandez, R.I., Álvarez-Parrilla, E., Lizardi-Mendoza, J., Islas-Rubio, A.R., de la Rosa, Laura.A., Wall-Medrano, A., 2013. Structural Stability and Viability of Microencapsulated Probiotic Bacteria: A Review. *Compr Rev Food Sci Food Saf.* 12, 614–628. <https://doi.org/10.1111/1541-4337.12030>
- Crowley, M.M., 2013. Solutions, Emulsions, Suspensions, and Extracts, in: Felton, L.A. (Ed.), *Remington Essentials of Pharmaceutics*. Pharmaceutical Press, London, pp. 448–453.
- De Prisco, A., Mauriello, G., 2016. Probiotication of foods: A focus on microencapsulation tool. *Trends Food Sci Technol* 48, 27–39. <https://doi.org/10.1016/j.tifs.2015.11.009>
- deMan, J.C., Rogosa, M., Sharpe, M.E., 1960. A Medium for Cultivation of *Lactobacilli*. *J. Appl. Microbiol.* 23 (1), 130–135. <https://doi.org/10.1111/j.1365-2672.1960.tb00188.x>
- Devi, N., Deka, C., Maji, T., Kakati, D., 2016. Gelatin and Gelatin-Polyelectrolyte Complexes: Drug Delivery. pp. 3557–3569. <https://doi.org/10.1081/E-EBPP-120049954>
- Dianawati, D., Mishra, V., Shah, N.P., 2016. Survival of Microencapsulated Probiotic Bacteria after Processing and during Storage: A Review. *Crit Rev Food Sci Nutr* 56, 1685–1716. <https://doi.org/10.1080/10408398.2013.798779>
- Ding, S., Serra, C.A., Vandamme, T.F., Yu, W., Anton, N., 2019. Double emulsions prepared by two-step emulsification: History, state-of-the-art and perspective. *J Control Release* 295, 31–49. <https://doi.org/10.1016/j.jconrel.2018.12.037>
- Dodoo, C.C., Wang, J., Basit, A.W., Stapleton, P., Gaisford, S., 2017. Targeted delivery of probiotics to enhance gastrointestinal stability and intestinal colonisation. *Int. J. Pharm* 530, 224–229. <https://doi.org/10.1016/j.ijpharm.2017.07.068>
- Dolly, P., Alavudeen, A., Joseph, G., Chinnaswamy, A., 2011. Microencapsulation of *Lactobacillus plantarum* (MTCC 5422) by spray-freeze-drying method and evaluation of survival in simulated gastrointestinal conditions. *J microencapsul* 28, 568–74. <https://doi.org/10.3109/02652048.2011.599435>
- Eckert, C., Serpa, V., Santos, A., Costa, S., Dalpubel, V., Lehn, D., Souza, C., 2017. Microencapsulation of *Lactobacillus plantarum* ATCC 8014



through spray drying and using dairy whey as wall materials. *LWT - Food Science and Technology* 82, 176–183.

<https://doi.org/10.1016/j.lwt.2017.04.045>

Fiorentini, A.M., Ballus, C.A., Oliveira, M.L. de, Cunha, M.F., Klajn, V.M., 2011. The influence of different combinations of probiotic bacteria and fermentation temperatures on the microbiological and physicochemical characteristics of fermented lactic beverages containing soybean hydrosoluble extract during refrigerated storage. *J. Food Sci. Technol* 31, 597–607. <https://doi.org/10.1590/S0101-20612011000300008>

Forssten, S.D., Sindelar, C.W., Ouwehand, A.C., 2011. Probiotics from an industrial perspective. *Anaerobe* 17, 410–413.

<https://doi.org/10.1016/j.anaerobe.2011.04.014>

Fox, C.B., 2009. Squalene emulsions for parenteral vaccine and drug delivery. *Molecules* 14, 3286–3312. <https://doi.org/10.3390/molecules14093286>

Fu, W., Mathews, A.P., 1990. Lactic acid production from lactose by *Lactobacillus plantarum*: kinetic model and effects of pH, substrate, and oxygen. *Biochem Eng J* 3 (1999), 163–170.

[https://doi.org/10.1016/S1369-703X\(99\)00014-5](https://doi.org/10.1016/S1369-703X(99)00014-5)

Herrera, M.L., 2012. Analytical Techniques for Studying the Physical Properties of Lipid Emulsions. *SpringerBriefs in Food, Health, and Nutrition* 3, 1–61. <https://doi.org/10.1007/978-1-4614-3256-2>

Hu, Y.-T., Ting, Y., Hu, J.-Y., Hsieh, S.-C., 2017. Techniques and methods to study functional characteristics of emulsion systems. *J Food Drug Anal* 25, 16–26. <https://doi.org/10.1016/j.jfda.2016.10.021>

Huan, Y., Zhang, S., Vardhanabhuti, B., 2016. Influence of the molecular weight of carboxymethylcellulose on properties and stability of whey protein-stabilized oil-in-water emulsions. *J Dairy Sci* 99, 3305–3315. <https://doi.org/10.3168/jds.2015-10278>

Isa, J.K., Razavi, S.H., 2017. Characterization of *Lactobacillus plantarum* as a Potential Probiotic In vitro and Use of a Dairy Product (Yogurt) as Food Carrier. *Appl. Food Biotechnol* 4, 11–18.

Joint FAO/WHO Working Group Report on Drafting for the Evaluation of Probiotics in Food. Guidelines for the evaluation of probiotics in food. London, Ontario, Canada: FAO/WHO;2002

Kadri, H.E., Gun, R., Overton, T.W., Bakalis, S., Gkatzionis, K., 2016. Modulating the release of *Escherichia coli* in double W1/O/W2 emulsion globules under hypo-osmotic pressure. *RSC Adv.* 6, 93694–93706. <https://doi.org/10.1039/C6RA17091A>

Kailaku, S.I., Hidayat, T., Setiabudy, D.A., 2012. Pengaruh Kondisi Homogenisasi Terhadap Karakteristik Fisik Dan Mutu Santan Selama Penyimpanan. *J Penelit Tanam Ind* 18, 31–39. <https://doi.org/10.21082/litri.v18n1-.2012.31-39>



- Khan, B.A., Akhtar, N., Khan, H.M.S., Waseem, K., Mahmood, T., Rasul, A., Iqbal, M., Khan, H., 2011. Basics of pharmaceutical emulsions: A review. *AJPP* 5, 2715–2725. <https://doi.org/10.5897/AJPP11.698>
- Kim, S.-K., Karadeniz, F., 2012. Biological Importance and Applications of Squalene and Squalane, in: *Advances in Food and Nutrition Research*. Elsevier, pp. 223–233.
<https://doi.org/10.1016/B978-0-12-416003-3.00014-7>
- Kronberg, B., Holmberg, K., Lindman, B., 2014. Types of Surfactants, their Synthesis, and Applications, in: *Surface Chemistry of Surfactants and Polymers*. John Wiley & Sons, Ltd, Chichester, UK, pp. 1–47.
<https://doi.org/10.1002/9781118695968.ch1>
- Lactobacillus plantarum* [WWW Document], n.d. URL <https://www.uniprot.org/taxonomy/1590> (accessed 2.8.19).
- Ly, M.H., Naïtali-Bouchez, M., Meylheuc, T., Bellon-Fontaine, M.-N., Le, T.M., Belin, J.-M., Waché, Y., 2006. Importance of bacterial surface properties to control the stability of emulsions. *Int. J. Food Microbiol.* 112, 26–34.
<https://doi.org/10.1016/j.ijfoodmicro.2006.05.022>
- Madaan, V., Chanana, A., Kataria, M.K., Bilandi, A., 2014. Emulsion Technology and Recent Trends in Emulsion Applications. *Int. Res. J. Pharm* 5, 533–542.
- Mahdi, E.S., Sakeena, M.H., Abdulkarim, M.F., Abdullah, G.Z., Sattar, M.A., Noor, A.M., 2011. Effect of surfactant and surfactant blends on pseudoternary phase diagram behavior of newly synthesized palm kernel oil esters. *Drug Des Devel Ther* 5, 311–323.
<https://doi.org/10.2147/DDDT.S15698>
- Maleki, D., Azizi, A., Vaghef, E., Balkani, S., Homayouni, A., 2015. Methods of Increasing Probiotic Survival in Food and Gastrointestinal Conditions. *Prensa Med Argent* 101:4. <https://doi.org/10.4172/lpma.1000154>
- Malik, B., Gupta, R.K., Rath, G., Goyal, A.K., 2014. Development of pH responsive novel emulsion adjuvant for oral immunization and in vivo evaluation. *Eur J Pharm Biopharm* 87, 589–597.
<https://doi.org/10.1016/j.ejpb.2014.03.014>
- Mandal, S., Hati, S., 2017. Microencapsulation of Bacterial Cells by Emulsion Technique for Probiotic Application. *Methods Mol. Biol.* 1479, 273–279.
https://doi.org/10.1007/978-1-4939-6364-5_22
- Mao, L., Miao, S., 2015. Structuring Food Emulsions to Improve Nutrient Delivery During Digestion. *Food Eng Rev* 7, 439–451.
<https://doi.org/10.1007/s12393-015-9108-0>
- Marco, M.L., Heeney, D., Binda, S., Cifelli, C.J., Cotter, P.D., Foligné, B., Gänzle, M., Kort, R., Pasin, G., Pihlanto, A., Smid, E.J., Hutkins, R., 2017. Health benefits of fermented foods: microbiota and beyond. *Curr. Opin. Biotechnol.* 44, 94–102.
<https://doi.org/10.1016/j.copbio.2016.11.010>



- Martin, M.J., Lara-Villoslada, F., Ruiz, M.A., Morales, M.E., 2013. Effect of unmodified starch on viability of alginate-encapsulated *Lactobacillus fermentum* CECT5716. *LWT - Food Science and Technology* 53, 480–486. <https://doi.org/10.1016/j.lwt.2013.03.019>
- Martín, M.J., Lara-Villoslada, F., Ruiz, M.A., Morales, M.E., 2015. Microencapsulation of bacteria: A review of different technologies and their impact on the probiotic effects. *Innov Food Sci & Emerg* 27, 15–25. <https://doi.org/10.1016/j.ifset.2014.09.010>
- McClements, D., 2007. Critical Review of Techniques and Methodologies for Characterization of Emulsion Stability. *Crit Rev Food Sci Nutr* 47, 611–49. <https://doi.org/10.1080/10408390701289292>
- McClements, D.J., Jafari, S.M., 2018. Improving emulsion formation, stability and performance using mixed emulsifiers: A review. *Adv Colloid Interface Sci* 251, 55–79. <https://doi.org/10.1016/j.cis.2017.12.001>
- Miller, D.J., Henning, T., Grunbein, W., 2001. Phase inversion of W/O emulsions by adding hydrophilic surfactant — a technique for making cosmetics products. *Colloids and Surfaces A: Physicochem. Eng. Aspects* 183–185 (2001), 681–688. [https://doi.org/10.1016/S0927-7757\(01\)00494-0](https://doi.org/10.1016/S0927-7757(01)00494-0)
- Morefield, G.L., 2011. A Rational, Systematic Approach for the Development of Vaccine Formulations. *AAPS J* 13, 191–200. <https://doi.org/10-1208/s12248-011-9261-1>
- Mortazavian, A., Mohammadi, R., Sohrabvandi, S., 2012. Delivery of Probiotic Microorganisms into Gastrointestinal Tract by Food Products. *New Advances in the Basic and Clinical Gastroenterology*, pp. 121 -146. <https://doi.org/10.5772/47946>
- Mortazavian, A.M., Ehsani, M.R., Mousavi, S.M., Rezaei, K., Sohrabvandi, S., Reinheimer, J.A., 2007. Effect of refrigerated storage temperature on the viability of probiotic micro-organisms in yogurt. *Int J Dairy Technol* 60, 123–127. <https://doi.org/10.1111/j.1471-0307.2007.00306.x>
- Mukherjee, M., De, S., 2015. Reduction of microbial contamination from drinking water using an iron oxide nanoparticle-impregnated ultrafiltration mixed matrix membrane: preparation, characterization and antimicrobial properties. *Environ. Sci.: Water Res. Technol.* 1, 204–217. <https://doi.org/10.1039/C4EW00094C>
- Muschiolik, G., Dickinson, E., 2017. Double Emulsions Relevant to Food Systems: Preparation, Stability, and Applications. *Compr Rev Food Sci Food Saf* 16, 532–555. <https://doi.org/doi:10.1111/1541-4337.12261>
- Nagpal, R., Kumar, A., Kumar, M., Behare, P.V., Jain, S., Yadav, H., 2012. Probiotics, their health benefits and applications for developing healthier foods: a review. *FEMS Microbiol Lett* 334, 1–15. <https://doi.org/10.1111/j.1574-6968.2012.02593.x>
- O’Toole, G.A., 2016. Classic Spotlight: Plate Counting You Can Count On. *J Bacteriol* 198, 3127. <https://doi.org/10.1128/JB.00711-16>



- Ooi, L.-G., Liong, M.-T., 2010. Cholesterol-Lowering Effects of Probiotics and Prebiotics: A Review of in Vivo and in Vitro Findings. *Int J Mol Sci* 11, 2499–2522. <https://doi.org/10.3390/ijms11062499>
- Ouwehand, A.C., Röytiö, H., 2015. Probiotic fermented foods and health promotion, in: Holzappel, W. (Ed.), *Advances in Fermented Foods and Beverages*, Woodhead Publishing Series in Food Science, Technology and Nutrition. Woodhead Publishing, pp. 3–22. <https://doi.org/10.1016/B978-1-78242-015-6.00001-3>
- Papagianni, M., Anastasiadou, S., 2009. Encapsulation of *Pediococcus acidilactici* cells in corn and olive oil microcapsules emulsified by peptides and stabilized with xanthan in oil-in-water emulsions: Studies on cell viability under gastro-intestinal simulating conditions. *Enzyme Microb Technol* 45, 514–522. <https://doi.org/10.1016/j.enzmictec.2009.06.007>
- Park, S.-Y., Do, J.-R., Kim, Y.-J., Kim, K.-S., Lim, S.-D., 2014. Physiological Characteristics and Production of Folic Acid of *Lactobacillus plantarum* JA71 Isolated from Jeotgal, a Traditional Korean Fermented Seafood. *Korean J Food Sci Anim Resour* 34, 106-114 <https://doi.org/10.5851/kosfa.2014.34.1.106>
- Paula, D. de A., Martins, E.M.F., Costa, N. de A., de Oliveira, P.M., de Oliveira, E.B., Ramos, A.M., 2019. Use of gelatin and gum arabic for microencapsulation of probiotic cells from *Lactobacillus plantarum* by a dual process combining double emulsification followed by complex coacervation. *Int J Biol Macromol* 133, 722–731. <https://doi.org/10.1016/j.ijbiomac.2019.04.110>
- Pimentel-González, D., Campos-Montiel, R., Lobato-Calleros, C., Pedroza, R., Vernon-Carter, E.J., 2009. Encapsulation of *Lactobacillus rhamnosus* in double emulsions formulated with sweet whey as emulsifier and survival in simulated gastrointestinal conditions. *Food Res Int* 42, 292–297. <https://doi.org/10.1016/j.foodres.2008.12.002>
- Popa, O., Babeanu, N.E., Popa, I., Nita, S., Dinu-Parvu, C.E., 2015. Methods for Obtaining and Determination of Squalene from natural source. *Biomed Res Int* 2015, 1–16. <http://dx.doi.org/10.1155/2015/367202>
- PubChem, n.d. Polysorbate 80 [WWW Document].
URL <https://pubchem.ncbi.nlm.nih.gov/compound/5284448> (accessed 12.8.19b).
- PubChem, n.d. Sorbitan monooleate [WWW Document].
URL <https://pubchem.ncbi.nlm.nih.gov/compound/9920342> (accessed 12.8.19c).
- Rajam, R., Anandharamakrishnan, C., 2015. Microencapsulation of *Lactobacillus plantarum* (MTCC 5422) with fructooligosaccharide as wall material by spray drying. *LWT - Food Science and Technology* 60, 773–780. <https://doi.org/10.1016/j.lwt.2014.09.062>



- Rathore, S., Desai, P.M., Liew, C.V., Chan, L.W., Heng, P.W.S., 2013. Microencapsulation of microbial cells. *J Food Eng* 116, 369–381. <https://doi.org/10.1016/j.jfoodeng.2012.12.022>
- Rodríguez-Huezo, M.E., Estrada-Fernández, A.G., García-Almendárez, B.E., Ludeña-Urquizo, F., Campos-Montiel, R.G., Pimentel-González, D.J., 2014. Viability of *Lactobacillus plantarum* entrapped in double emulsion during Oaxaca cheese manufacture, melting and simulated intestinal conditions. *LWT - Food Science and Technology* 59, 768–773. <https://doi.org/10.1016/j.lwt.2014.07.004>
- Sánchez-Quesada, C., López-Biedma, A., Toledo, E., Gaforio, J.J., 2018. Squalene Stimulates a Key Innate Immune Cell to Foster Wound Healing and Tissue Repair. *Evid Based Complement Alternat Med* 2018. <https://doi.org/10.1155/2018/9473094>
- Schmidts, T., Dobler, D., Guldán, A.-C., Paulus, N., Runkel, F., 2010. Multiple W/O/W emulsions—Using the required HLB for emulsifier evaluation. *Colloids Surf A Physicochem Eng Asp* 372, 48–54. <https://doi.org/10.1016/j.colsurfa.2010.09.025>
- Seddik, H.A., Bendali, F., Gancel, F., Fliss, I., Spano, G., Drider, D., 2017. *Lactobacillus plantarum* and Its Probiotic and Food Potentialities. *Probiotics & Antimicro. Prot.* 9, 111–122. <https://doi.org/10.1007/s12602-017-9264-z>
- Shima, M., Morita, Y., Yamashita, M., Adachi, S., 2006. Protection of *Lactobacillus acidophilus* from the low pH of a model gastric juice by incorporation in a W/O/W emulsion. *Food Hydrocoll* 20, 1164–1169. <https://doi.org/10.1016/j.foodhyd.2006.01.001>
- Shori, A.B., 2017. Microencapsulation Improved Probiotics Survival During Gastric Transit. *HAYATI* 24, 1–5. <https://doi.org/10.1016-j.hjb.2016.12.008>
- Sohn, B., Olenskyj, A., Feng, Y., 2017. Correlation between emulsifier concentration and emulsion droplet size in oil-in-water emulsion stabilized by zein nanoparticles. *i-ACES* 3, 1–5.
- Stone, H.D., Xie, Z.X., 1990. Efficacy of experimental Newcastle disease water-in-oil oil-emulsion vaccines formulated from squalane and squalene. *Avian Dis.* 34, 979–983.
- Syamsuni, H., 2006. *Farmasetika Dasar dan Hitungan Farmasi*. Penerbit Buku Kedokteran EGC, Jakarta. pp. 128-130.
- Tadros, T.F., 2013. Emulsion Formation, Stability, and Rheology.pdf, in: Tadros, T.F. (Ed.), *Emulsion Formation and Stability*. Wiley-VCH Verlag GmbH & Co. KGaA., pp. 1–75.
- Teixé-Roig, J., Oms-Oliu, G., Velderrain-Rodríguez, G.R., Odriozola-Serrano, I., Martín-Belloso, O., 2018. The Effect of Sodium Carboxymethylcellulose on the Stability and Bioaccessibility of Anthocyanin Water-in-Oil-in-



- Water Emulsions. Food Bioprocess Technol 11, 2229–2241. <https://doi.org/10.1007/s11947-018-2181-7>
- Todorov, S.D., Franco, B.D.G.D.M., 2010. *Lactobacillus Plantarum*: Characterization of the Species and Application in Food Production. Food Rev. Int 26, 205–229. <https://doi.org/10.1080/87559129.2010.484113>
- Tripathi, M.K., Giri, S.K., 2014. Probiotic functional foods: Survival of probiotics during processing and storage. J Funct Foods 9, 225–241. <https://doi.org/10.1016/j.jff.2014.04.030>
- Wang, J., Shi, A., Agyei, D., Wang, Q., 2017. Formulation of water-in-oil-in-water (W/O/W) emulsions containing trans-resveratrol. RSC Adv. 7, 35917–35927. <https://doi.org/10.1039/C7RA05945K>
- Yang, K.M., Jiang, Z.Y., Zheng, C.T., Wang, L., Yang, X.F., 2014. Effect of *Lactobacillus plantarum* on diarrhea and intestinal barrier function of young piglets challenged with enterotoxigenic *Escherichia coli* K88. J. Anim. Sci. 92, 1496–1503. <https://doi.org/10.2527/jas.2013-6619>
- Zwietering, M.H., Jongenburger, I., Rombouts, F.M., Riet, K. van 't, 1990. Modeling of the Bacterial Growth Curve. Appl Environ Microbiol 56 No.6, 1875–1881.