

DAFTAR PUSTAKA

- Ahmed, S., Islam, Md.S., Ullah, B., Kanti Biswas, S., Samad Azad, Md.A., dan Hossain, Md.S., 2020. A Review Article on Pharmaceutical Analysis of Pharmaceutical Industry According to Pharmacopoeias. *Oriental Journal of Chemistry*, **36**: 01–10.
- Ahuja, S. dan Dong, M.W., 2005. *Handbook of Pharmaceutical Analysis by HPLC*, 1st ed. ed, Separation science and technology. Elsevier Academic Press, Amsterdam Boston, 201-207.
- Alexander, A., Khichariya, A., Gupta, S., Patel, R.J., Giri, T.K., Tripathi, D.K., dkk., 2013. Recent expansions in an emergent novel drug delivery technology: Emulgel. *Journal of Controlled Release*, **171**: 122–132.
- Amroyan, E., Gabrielian, E., Panossian, A., Wikman, G., dan Wagner, H., 1999. Inhibitory effect of andrographolide from *Andrographis paniculata* on PAF-induced platelet aggregation. *Phytomedicine*, **6**: 27–31.
- Aqil, Mohd., Kamran, Mohd., Ahad, A., dan Imam, S.S., 2016. Development of clove oil based nanoemulsion of olmesartan for transdermal delivery: Box–Behnken design optimization and pharmacokinetic evaluation. *Journal of Molecular Liquids*, **214**: 238–248.
- Azeem, A., Rizwan, M., Ahmad, F.J., Iqbal, Z., Khar, R.K., Aqil, M., dkk., 2009. Nanoemulsion Components Screening and Selection: a Technical Note. *AAPS PharmSciTech*, **10**: 69–76.
- Bandyopadhyay, S., Katare, O.P., dan Singh, B., 2012. Optimized self nano-emulsifying systems of ezetimibe with enhanced bioavailability potential using long chain and medium chain triglycerides. *Colloids and Surfaces B: Biointerfaces*, **100**: 50–61.
- Barradas, T.N., Senna, J.P., Cardoso, S.A., Nicoli, S., Padula, C., Santi, P., dkk., 2016. Hydrogel-thickened nanoemulsions based on essential oils for topical delivery of psoralen: Permeation and stability studies. *European Journal of Pharmaceutics and Biopharmaceutics*, 116:38-50.

- Barry, B.W., 2001. Novel mechanisms and devices to enable successful transdermal drug delivery. *European journal of pharmaceutical sciences*, **14**: 101–114.
- Bartosova, L. dan Bajgar, J., 2012. Transdermal Drug Delivery In Vitro Using Diffusion Cells. *Current Medicinal Chemistry*, **19**: 4671–4677.
- Bhaskar, K., Anbu, J., Ravichandiran, V., Venkateswarlu, V., dan Rao, Y., 2009. Lipid nanoparticles for transdermal delivery of flurbiprofen: formulation, in vitro, ex vivo and in vivo studies. *Lipids in Health and Disease*, **8**: 6.
- Bolton, S. dan Bon, C., 2004. *Pharmaceutical Statistics: Practical and Clinical Applications*, 4th ed., Drugs and the pharmaceutical sciences. M. Dekker, New York. 107.
- Bothiraja, C., Shinde, M.B., Rajalakshmi, S., dan Pawar, A.P., 2009. Evaluation of molecular pharmaceutical and in-vivo properties of spray-dried isolated andrographolide-PVP. *Journal of Pharmacy and Pharmacology*, **61**: 1465–1472.
- Chao, W.-W. dan Lin, B.-F., 2010. Isolation and identification of bioactive compounds in *Andrographis paniculata* (Chuanxinlian). *Chinese Medicine*, **5**: 1.
- Chaudhary, H., Kohli, K., dan Kumar, V., 2014. A novel nano-carrier transdermal gel against inflammation. *International Journal of Pharmaceutics*, **465**: 175–186.
- Chellampillai, B. dan Pawar, A.P., 2011. Improved bioavailability of orally administered andrographolide from pH-sensitive nanoparticles. *European Journal of Drug Metabolism and Pharmacokinetics*, **35**: 123–129.
- Chen, L., Jin, H., Ding, L., Zhang, Huarong, Wang, X., Wang, Z., dkk., 2007. On-line coupling of dynamic microwave-assisted extraction with high-performance liquid chromatography for determination of andrographolide and dehydroandrographolide in *Andrographis paniculata* Nees. *Journal of Chromatography A*, **1140**: 71–77.
- Chin, L.Y., Tan, J.Y.P., Choudhury, H., Pandey, M., Sisinthy, S.P., dan Gorain, B., 2021. Development and optimization of chitosan coated nanoemulgel of

- telmisartan for intranasal delivery: A comparative study. *Journal of Drug Delivery Science and Technology*, **62**: 102341.
- Das, S.K., Khanam, J., dan Nanda, A., 2016. Optimization of preparation method for ketoprofen-loaded microspheres consisting polymeric blends using simplex lattice mixture design. *Materials Science and Engineering: C*, **69**: 598–608.
- Das, Sujata, Pradhan, G.K., Das, Subhadip, Nath, D., dan Das Saha, K., 2015. Enhanced protective activity of nano formulated andrographolide against arsenic induced liver damage. *Chemico-Biological Interactions*, **242**: 281–289.
- Date, A. dan Nagarsenker, M., 2007. Design and evaluation of self-nanoemulsifying drug delivery systems (SNEDDS) for cefpodoxime proxetil☆. *International Journal of Pharmaceutics*, **329**: 166–172.
- Duangjit, S., Chairat, W., Opanasopit, P., Rojanarata, T., dan Ngawhirunpat, T., 2015. Application of Design Expert for the investigation of capsaicin-loaded microemulsions for transdermal delivery. *Pharmaceutical Development and Technology*, 1–8.
- Duangjit, S. dan Kraisit, P., 2018. Optimization of orodispersible and conventional tablets using simplex lattice design: Relationship among excipients and banana extract. *Carbohydrate Polymers*, **193**: 89–98.
- Duangjit, S., Mehr, L.M., Kumpugdee-Vollrath, M., dan Ngawhirunpat, T., 2014. Role of Simplex Lattice Statistical Design in the Formulation and Optimization of Microemulsions for Transdermal Delivery. *Biological and Pharmaceutical Bulletin*, **37**: 1948–1957.
- Edwin, E.-S., Vasantha-Srinivasan, P., Senthil-Nathan, S., Thanigaivel, A., Ponsankar, A., Pradeepa, V., dkk., 2016. Anti-dengue efficacy of bioactive andrographolide from *Andrographis paniculata* (Lamiales: Acanthaceae) against the primary dengue vector *Aedes aegypti* (Diptera: Culicidae). *Acta Tropica*, **163**: 167–178.

- Eid, A.M., 2014. Preparation, Characterization and Anti-Inflammatory Activity of *Swietenia macrophylla* Nanoemulgel. *Journal of Nanomedicine & Nanotechnology*, **05**: 1-10.
- Elnaggar, Y.S.R., El-Massik, M.A., dan Abdallah, O.Y., 2009. Self-nanoemulsifying drug delivery systems of tamoxifen citrate: Design and optimization. *International Journal of Pharmaceutics*, **380**: 133–141.
- Haq, A., Goodyear, B., Ameen, D., Joshi, V., dan Michniak-Kohn, B., 2018. Strat-M® synthetic membrane: Permeability comparison to human cadaver skin. *International Journal of Pharmaceutics*, **547**: 432–437.
- Hidalgo, M.A., Hancke, J.L., Bertoglio, J.C., dan Burgos, R.A., 2013. Andrographolide a New Potential Drug for the Long Term Treatment of Rheumatoid Arthritis Disease, dalam: Matsuno, H. (Ed.), *Innovative Rheumatology*. InTech. London. 10.5772/55642.
- Hu, Q., Lin, H., Wang, Y., Wang, X., Yao, J., Fu, X., dkk., 2021. Design, optimization and evaluation of a microemulsion-based hydrogel with high malleability for enhanced transdermal delivery of levamisole. *International Journal of Pharmaceutics*, **605**: 120829.
- Jeengar, M.K., Rompicharla, S.V.K., Shrivastava, S., Chella, N., Shastri, N.R., Naidu, V.G.M., dkk., 2016. Emu oil based nano-emulgel for topical delivery of curcumin. *International Journal of Pharmaceutics*, **506**: 222–236.
- Kassem, A.A., Mohsen, A.M., Ahmed, R.S., dan Essam, T.M., 2016. Self-nanoemulsifying drug delivery system (SNEDDS) with enhanced solubilization of nystatin for treatment of oral candidiasis: Design, optimization, in vitro and in vivo evaluation. *Journal of Molecular Liquids*, **218**: 219–232.
- Kaur, L., Singh, K., Paul, S., Singh, Sukhprit, Singh, Shashank, dan Jain, S.K., 2018. A Mechanistic Study to Determine the Structural Similarities Between Artificial Membrane Strat-M™ and Biological Membranes and Its Application to Carry Out Skin Permeation Study of Amphotericin B Nanoformulations. *AAPS PharmSciTech*, **19**: 1606–1624.

- Kawakami, K., Yoshikawa, T., Hayashi, T., Nishihara, Y., dan Masuda, K., 2002. Microemulsion formulation for enhanced absorption of poorly soluble drugs II. In vivo study. *Journal of Controlled Release*, 8.
- Kementerian Kesehatan RI, 2020. *Farmakope Indonesia Edisi VI*. Kementerian Kesehatan RI, Jakarta. 2037.
- Khurana, S., Jain, N.K., dan Bedi, P.M.S., 2013. Nanoemulsion based gel for transdermal delivery of meloxicam: Physico-chemical, mechanistic investigation. *Life Sciences*, **92**: 383–392.
- Kristof, J., Miyamoto, H., Tran, A.N., Blajan, M., dan Shimizu, K., 2017. Feasibility of transdermal delivery of Cyclosporine A using plasma discharges. *Biointerphases*, **12**: 02B402.
- Lala, R.R. dan Awari, N.G., 2014. Nanoemulsion-based gel formulations of COX-2 inhibitors for enhanced efficacy in inflammatory conditions. *Applied Nanoscience*, **4**: 143–151.
- Lim, J.C.W., Chan, T.K., Ng, D.S., Sagineedu, S.R., Stanslas, J., dan Wong, W.F., 2012. Andrographolide and its analogues: versatile bioactive molecules for combating inflammation and cancer: Andrographolide for inflammation and cancer. *Clinical and Experimental Pharmacology and Physiology*, **39**: 300–310.
- Lu, W.-C., Chiang, B.-H., Huang, D.-W., dan Li, P.-H., 2014. Skin permeation of d-limonene-based nanoemulsions as a transdermal carrier prepared by ultrasonic emulsification. *Ultrasonics Sonochemistry*, **21**: 826–832.
- Lucero, M.J., Ferris, C., Sánchez-Gutiérrez, C.A., Jiménez-Castellanos, M.R., dan de-Paz, M.-V., 2016. Novel aqueous chitosan-based dispersions as efficient drug delivery systems for topical use. Rheological, textural and release studies. *Carbohydrate Polymers*, **151**: 692–699.
- McClements, D.J., 2012. Nanoemulsions versus microemulsions: terminology, differences, and similarities. *Soft Matter*, **8**: 1719–1729.
- Mishra, N., Yadav, K.S., Rai, V.K., dan Yadav, N.P., 2016. Polysaccharide Encrusted Multilayered Nano-Colloidal System of Andrographolide for Improved Hepatoprotection. *AAPS PharmSciTech*, **18**(2):381-392.

- Morteza-Semnani, K., Saeedi, M., Akbari, J., Eghbali, M., Babaei, A., Hashemi, S.M.H., dkk., 2021. Development of a novel nanoemulgel formulation containing cumin essential oil as skin permeation enhancer. *Drug Delivery and Translational Research*, **12**(6):1455-1465.
- Nugroho, A.K., Binnarjo, A., Hakim, A.R., dan Ermawati, Y., 2014. Compartmental Modeling Approach of Losartan Transdermal Transport In Vitro. *Indonesian Journal of Pharmacy*, **25**: 31.
- Nugroho, A.K., Della Pasqua, O., Danhof, M., dan Bouwstra, J.A., 2004. Compartmental Modeling of Transdermal Iontophoretic Transport: I. In Vitro Model Derivation and Application. *Pharmaceutical Research*, **21**: 1974–1984.
- Panossian, A., Hovhannisyan, A., Mamikonyan, G., Abrahamian, H., Hambardzumyan, E., Gabrielian, E., dkk., 2000. Pharmacokinetic and oral bioavailability of andrographolide from *Andrographis paniculata* fixed combination Kan Jang in rats and human. *Phytomedicine*, **7**: 351–364.
- Parhi, R., 2016. Development and optimization of pluronic® F127 and HPMC based thermosensitive gel for the skin delivery of metoprolol succinate. *Journal of Drug Delivery Science and Technology*, **36**: 23–33.
- Parmar, N., Singla, N., Amin, S., dan Kohli, K., 2011. Study of cosurfactant effect on nanoemulsifying area and development of lercanidipine loaded (SNEDDS) self nanoemulsifying drug delivery system. *Colloids and Surfaces B: Biointerfaces*, **86**: 327–338.
- Pawar, A., Rajalakshmi, S., Mehta, P., Shaikh, K., dan Bothiraja, C., 2016. Strategies for formulation development of andrographolide. *RSC Adv.*, **6**: 69282–69300.
- Pawestri, S.A., Nugroho, A.K., dan Lukitaningsih, E., 2021. In vitro Transdermal Transport of Domperidone by Compartmental Modeling Approach **32**: 7.
- Pholphana, N., Rangkadilok, N., Saehun, J., Rittruechai, S., dan Satayavivad, J., 2013. Changes in the contents of four active diterpenoids at different growth stages in *Andrographis paniculata* (Burm.f.) Nees (Chuanxinlian). *Chinese Medicine*, **8**: 2.

- Porter, C.J.H., Pouton, C.W., Cuine, J.F., dan Charman, W.N., 2008. Enhancing intestinal drug solubilisation using lipid-based delivery systems. *Advanced Drug Delivery Reviews*, **60**: 673–691.
- Prasetyo, B.F., Wientarsih, I., Sajuthi, D., dan Juniantito, V., 2018. Characterization of Andrographolide in Inclusion Complex using Beta Cyclodextrin. *International Journal of Pharmaceutical Sciences and Research*, **9**: 1291–1296.
- Rohman, A., Luthfianasari, H., Irnawati, I., Riyanto, S., Rafi, M., Prajogo, B., dkk., 2021. HPLC-FTIR spectroscopy combined with multivariate calibration for analysis of Andrographolide in *Andrographis paniculata* extract. *Journal of Applied Pharmaceutical Science*, **11**(5): 32–38.
- Sanka, K., Suda, D., dan Bakshi, V., 2016. Optimization of solid-self nanoemulsifying drug delivery system for solubility and release profile of clonazepam using simplex lattice design. *Journal of Drug Delivery Science and Technology*, **33**: 114–124.
- Sareer, O., Ahmad, S., dan Umar, S., 2014. *Andrographis paniculata*: a critical appraisal of extraction, isolation and quantification of andrographolide and other active constituents. *Natural Product Research*, **28**: 2081–2101.
- Schmook, F.P., Meingassner, J.G., dan Billich, A., 2001. Comparison of human skin or epidermis models with human and animal skin in in-vitro percutaneous absorption. *International journal of pharmaceutics*, **215**: 51–56.
- Serna-Jiménez, C.E., del Rio-Sancho, S., Calatayud-Pascual, M.A., Balaguer-Fernández, C., Femenía-Font, A., López-Castellano, A., dkk., 2015. Development of antimigraine transdermal delivery systems of pizotifen malate. *International Journal of Pharmaceutics*, **492**: 223–232.
- Shakeel, F., Baboota, S., Ahuja, A., Ali, J., Aqil, M., dan Shafiq, S., 2007. Nanoemulsions as vehicles for transdermal delivery of aceclofenac. *AAPS PharmSciTech*, **8**: 191–199.
- Shakeel, F., Haq, N., Alanazi, F.K., dan Alsarra, I.A., 2013. Impact of various nonionic surfactants on self-nanoemulsification efficiency of two grades of

- Capryol (Capryol-90 and Capryol-PGMC). *Journal of Molecular Liquids*, **182**: 57–63.
- Shen, Y.-C., Chen, C.-F., dan Chiou, W.-F., 2002. Andrographolide prevents oxygen radical production by human neutrophils: possible mechanism(s) involved in its anti-inflammatory effect **135**: 8.
- Shivali, G., Praful, L., dan Vijay, G., 2012. A Validated Fourier Transform Infrared Spectroscopy Method for Quantification of Total Lactones in *Inula racemosa* and *Andrographis paniculata*: Quantification of Lactones in Herbal Extracts by FT-IR. *Phytochemical Analysis*, **23**: 171–176.
- Singh, P.K., Hasan, T., Prasad, O., Sinha, L., Raj, K., dan Misra, N., 2006a. FT-IR spectra and vibrational spectroscopy of Andrographolide. *Journal of Spectroscopy*, **20**: 275–283.
- Singh, P.K., Hasan, T., Prasad, O., Sinha, L., Raj, K., dan Misra, N., 2006b. FT-IR spectra and vibrational spectroscopy of Andrographolide. *Spectroscopy*, **20**: 275–283.
- Skazik, C., Wenzel, J., Marquardt, Y., Kim, A., Merk, H.F., Bickers, D.R., dkk., 2010. P-Glycoprotein ABCB1 expression in human skin is mainly restricted to dermal. *Experimental Dermatology*, **20**: 445–456.
- Snyder, L.R., Kirkland, J.J., dan Dolan, J.W., 2010. *Introduction to Modern Liquid Chromatography*, Third Edition. ed. John Wiley & Sons, Inc., New Jersey. 152, 542.
- Stefanovski, D., Moate, P.J., dan Boston, R.C., 2003. WinSAAM: a windows-based compartmental modeling system. *Metabolism*, **52**: 1153–1166.
- Suresh, K., Goud, N.R., dan Nangia, A., 2013. Andrographolide: Solving Chemical Instability and Poor Solubility by Means of Cocrystals. *Chemistry - An Asian Journal*, **8**: 3032–3041.
- Surini, S., Nastiti, P.D., Putri, A.R., dan Putri, K.S., 2020. Formulation of Andrographolide Transfersomes Gel for Transdermal Delivery: A Preliminary Study. *International Journal of Applied Pharmaceutics*, 187–191.

- Syukri, Y., Martien, R., Lukitaningsih, E., dan Nugroho, A.E., 2018. Novel Self-Nano Emulsifying Drug Delivery System (SNEDDS) of andrographolide isolated from *Andrographis paniculata* Nees: Characterization, in-vitro and in-vivo assessment. *Journal of Drug Delivery Science and Technology*, **47**: 514–520.
- Syukri, Y., Taher, M., Martien, R., Lukitaningsih, E., Nugroho, A.E., dan Zakaria, Z.A., 2020. Self-nanoemulsifying Delivery of Andrographolide: Ameliorating Islet Beta Cells and Inhibiting Adipocyte Differentiation. *Advanced Pharmaceutical Bulletin*, **11**: 171–180.
- Takeuchi, I., Kagawa, A., Makino, K., 2020, Skin permeability and transdermal delivery route of 30-nm cyclosporin A-loaded nanoparticles using PLGA-PEG-PLGA triblock copolymer, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*
- Torin Huzil, J., Sivaloganathan, S., Kohandel, M., dan Foldvari, M., 2011. Drug delivery through the skin: molecular simulations of barrier lipids to design more effective noninvasive dermal and transdermal delivery systems for small molecules, biologics, and cosmetics. *Wiley Interdisciplinary Reviews: Nanomedicine and Nanobiotechnology*, 449-450.
- Tsai, M.-J., Lu, I.-J., Fu, Y.-S., Fang, Y.-P., Huang, Y.-B., dan Wu, P.-C., 2016. Nanocarriers enhance the transdermal bioavailability of resveratrol: In-vitro and in-vivo study. *Colloids and Surfaces B: Biointerfaces*, **148**: 650–656.
- Uchida, T., Kadhum, W.R., Kanai, S., Todo, H., Oshizaka, T., dan Sugibayashi, K., 2015. Prediction of skin permeation by chemical compounds using the artificial membrane, Strat-MTM. *European Journal of Pharmaceutical Sciences*, **67**: 113–118.
- Walters, K.A. (Ed.), 2002. *Dermatological and Transdermal Formulations*, Drugs and the pharmaceutical sciences. M. Dekker, New York. 291.
- Wu, M., Wang, J., Chen, Q., dan Ding, Z., 2013. Crossing the SC: Targeting and mechanism of andrographolide via nano-emulsion system. *Journal of Controlled Release*, **172**: e56.

- Xie, Y., Ma, Y., Xu, J., Dan, J., Yue, P., Wu, Z., dkk., 2016. Roles of cryo/thermal strength for redispersibility of drug nanocrystals: a representative study with andrographolide. *Archives of Pharmacal Research*, **39**: 1404–1417.
- Yan, Y., Fang, L.-H., dan Du, G.-H., 2018. Andrographolide, dalam: *Natural Small Molecule Drugs from Plants*. Springer Singapore, Singapore, 357–362.
- Yang, T., Sheng, H.-H., Feng, N.-P., Wei, H., Wang, Z.-T., dan Wang, C.-H., 2013. Preparation of Andrographolide-Loaded Solid Lipid Nanoparticles and Their In Vitro and In Vivo Evaluations: Characteristics, Release, Absorption, Transports, Pharmacokinetics, and Antihyperlipidemic Activity. *Journal of Pharmaceutical Sciences*, **102**: 4414–4425.
- Ye, L., Wang, T., Tang, L., Liu, W., Yang, Z., Zhou, J., dkk., 2011. Poor oral bioavailability of a promising anticancer agent andrographolide is due to extensive metabolism and efflux by P-glycoprotein. *Journal of Pharmaceutical Sciences*, **100**: 5007–5017.
- Zeng, L. dan Zhang, Y., 2016. Impact of short-chain alcohols on the formation and stability of nano-emulsions prepared by the spontaneous emulsification method. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, **509**: 591–600.
- Zhang, B., Wu, M., Dong, Y., Wang, J., dan Ding, Z., 2013. Low-voltage electroporation mediated transcutaneous targeted delivery of liposomes with entrapped andrographolide. *Journal of Controlled Release*, **172**: e16.
- Zhang, J., Li, Y., Gao, W., Repka, M.A., Wang, Y., dan Chen, M., 2014. Andrographolide-loaded PLGA-PEG-PLGA micelles to improve its bioavailability and anticancer efficacy. *Expert Opinion on Drug Delivery*, **11**: 1367–1380.
- Zhang, Q., Murawsky, M., LaCount, T.D., Hao, J., Ghosh, P., Raney, S.G., dkk., 2020. Evaluation of Heat Effects on Fentanyl Transdermal Delivery Systems Using In Vitro Permeation and In Vitro Release Methods. *Journal of Pharmaceutical Sciences*, **109**: 3095–3104.



Zhang, Y., Hu, X., Liu, X., Dandan, Y., Di, D., Yin, T., dkk., 2015. Dry state microcrystals stabilized by an HPMC film to improve the bioavailability of andrographolide. *International Journal of Pharmaceutics*, **493**: 214–223.