



## DAFTAR PUSTAKA

- Abbas, A.K., Lichtman, A.H., Pillai, S., Baker, D.L., dan Baker, A., 2018. *Cellular and Molecular Immunology*, Ninth edition. ed. Elsevier, Philadelphia, PA.
- Ahmada, F.N., 2019. 'Uji Aktivitas Imunomodulator Kombinasi Ekstrak Etanolik Herba Meniran (*Phyllanthus niruri L.*) Dan Rimpang Temu Mangga (*Curcuma mangga Val.*) terhadap Fagositosis Makrofag Tikus Jantan Galur Sprague-Dawley', Skripsi, . Fakultas Farmasi, Universitas Gadjah Mada, Yogayakarta.
- Andrina, S., Churiyah, C., dan Nuralih, N., 2015. Anti-Inflammatory Effect of Ethanolic Extract of *Curcuma aeruginosa Roxb Rhizome*, *Morinda Citrifolia* Fruit and *Apium graveolens* Leaf on Lipoplysaccharide-induce RAW 264.7 Cell Lines. *Indonesian Journal of Cancer Chemoprevention*, **6**: 84.
- Anonim, 2017. *Farmakope Herbal Indonesia*, II. ed. Kementerian Kesehatan Republik Indonesia, Jakarta.
- Aro, A.O., Dzoyem, J.P., Eloff, J.N., dan McGaw, L.J., 2016. Extracts of six Rubiaceae species combined with rifampicin have good in vitro synergistic antimycobacterial activity and good anti-inflammatory and antioxidant activities. *BMC Complementary and Alternative Medicine*, **16**: 385.
- Asher, G.N., Corbett, A.H., dan Hawke, R.L., 2017. Common Herbal Dietary Supplement–Drug Interactions **96**: 7.
- Bagalkotkar, G., Sagineedu, S.R., Saad, M.S., dan Stanslas, J., 2006. Phytochemicals from *Phyllanthus niruri* Linn. and their pharmacological properties: a review. *Journal of Pharmacy and Pharmacology*, **58**: 1559–1570.
- Bai, Y., Jiang, Y., Liu, T., Li, F., Zhang, J., Luo, Y., dkk., 2019. Xinjiang herbal tea exerts immunomodulatory activity via TLR2/4-mediated MAPK signaling pathways in RAW264.7 cells and prevents cyclophosphamide-induced immunosuppression in mice. *Journal of Ethnopharmacology*, **228**: 179–187.
- Behl, T., Kumar, K., Brisc, C., Rus, M., Nistor-Cseppento, D.C., Bustea, C., dkk., 2021. Exploring the multifocal role of phytochemicals as immunomodulators. *Biomedicine & Pharmacotherapy*, **133**: 110959.
- Bijnsdorp, I.V., Giovannetti, E., dan Peters, G.J., 2011. Analysis of Drug Interactions, dalam: Cree, I.A. (Ed.), *Cancer Cell Culture, Methods in Molecular Biology*. Humana Press, Totowa, NJ, hal. 421–434.
- Bimakr, M., Ganjloo, A., Zarringhalami, S., dan Ansarian, E., 2017. Ultrasound-assisted extraction of bioactive compounds from *Malva sylvestris* leaves and its comparison with agitated bed extraction technique. *Food Science and Biotechnology*, **26**: 1481–1490.
- Bonaventura, P., Lamboux, A., Albarède, F., dan Miossec, P., 2018. Differential effects of TNF- $\alpha$  and IL-1 $\beta$  on the control of metal metabolism and



- cadmium-induced cell death in chronic inflammation. *PLOS ONE*, **13**: e0196285.
- Caesar, L.K. dan Cech, N.B., 2019. Synergy and antagonism in natural product extracts: when 1 + 1 does not equal 2. *Natural Product Reports*, **36**: 869–888.
- Carmagnani, J.H., Mansano, B.G., dan Sobreira, F., 2020. Optimization of the extraction process of *< i>Phyllanthus niruri</i>* L. *O Mundo da Saúde*, **44**: 134–143.
- Catanzaro, M., Corsini, E., Rosini, M., Racchi, M., dan Lanni, C., 2018. Immunomodulators Inspired by Nature: A Review on Curcumin and Echinacea. *Molecules*, **23**: 2778.
- Chang, C.-C., Yang, M.-H., Wen, H.-M., dan Chern, J.-C., 2002. Estimation of Total Flavonoid Content in Propolis by Two Complementary Colorimetric Methods. *Journal of Food and Drug Analysis*, **10**: 5.
- Chaplin, D.D., 2010. Overview of the Immune Response 41.
- Che, C.-T., Wang, Z., Chow, M., dan Lam, C., 2013. Herb-Herb Combination for Therapeutic Enhancement and Advancement: Theory, Practice and Future Perspectives. *Molecules*, **18**: 5125–5141.
- Chemat, F., Rombaut, N., Sicaire, A.-G., Meullemiestre, A., Fabiano-Tixier, A.-S., dan Abert-Vian, M., 2017. Ultrasound assisted extraction of food and natural products. Mechanisms, techniques, combinations, protocols and applications. A review. *Ultrasonics Sonochemistry*, **34**: 540–560.
- Chemat, F., Zill-e-Huma, dan Khan, M.K., 2011. Applications of ultrasound in food technology: Processing, preservation and extraction. *Ultrasonics Sonochemistry*, **18**: 813–835.
- Chou, T.-C., 2010. Drug Combination Studies and Their Synergy Quantification Using the Chou-Talalay Method. *Cancer Research*, **70**: 440–446.
- Chung, Y.C., Park, S.-M., Kim, J.H., Lee, G.S., Lee, J.N., dan Hyun, C.-G., 2018. Anti-inflammatory Effect of Pratol in LPS-stimulated RAW 264.7 Cells via NF- $\kappa$ B Signaling Pathways. *Natural Product Communications*, **13**: 4.
- Darmawan, K.H., Martien, R., Erlangga, N.D., Sitohang, S.M., dan Pambudi, H., 2017. Utilization Of Nano Ethanolic Extract Combination Chamber Bitter (*Phyllanthus Niruri L.*) And Garlic (*Allium Sativum L.*) As A Natural Immunomodulator In Nanoherbal Development, In Silico And In Vitro Study. *JPSCR : Journal of Pharmaceutical Science and Clinical Research*, **2**: 110.
- Dorrington, M.G. dan Fraser, I.D.C., 2019. NF- $\kappa$ B Signaling in Macrophages: Dynamics, Crosstalk, and Signal Integration. *Frontiers in Immunology*, **10**: 705.
- El Hassouni, B., Mantini, G., Li Petri, G., Capula, M., Boyd, L., Weinstein, H.N.W., dkk., 2019. To Combine or Not Combine: Drug Interactions and Tools for Their Analysis. Reflections from the EORTC-PAMM Course on Preclinical and Early-phase Clinical Pharmacology. *Anticancer Research*, **39**: 3303–3309.
- Elbagory, A.M., Hussein, A.A., dan Meyer, M., 2019. The In Vitro Immunomodulatory Effects Of Gold Nanoparticles Synthesized From



- Hypoxis hemerocallidea Aqueous Extract And Hypoxoside On Macrophage And Natural Killer Cells. *International Journal of Nanomedicine*, **Volume 14**: 9007–9018.
- Elisia, I., Pae, H.B., Lam, V., Cederberg, R., Hofs, E., dan Krystal, G., 2018. Comparison of RAW264.7, human whole blood and PBMC assays to screen for immunomodulators. *Journal of Immunological Methods*, **452**: 26–31.
- El-Zayat, S.R., Sibaii, H., dan Mannaa, F.A., 2019. Toll-like receptors activation, signaling, and targeting: an overview. *Bulletin of the National Research Centre*, **43**: 187.
- Eze, C.O., Nworu, C.S., Esimone, C.O., dan Okore, V.C., 2014. Immunomodulatory activities of methanol extract of the whole aerial part of *Phyllanthus niruri L.* *Journal of Pharmacognosy and Phytotherapy*, **6**: 41–46.
- Fard, M., Arulselvan, P., Karthivashan, G., Adam, S., dan Fakurazi, S., 2015. Bioactive extract from moringa oleifera inhibits the pro-inflammatory mediators in lipopolysaccharide stimulated macrophages. *Pharmacognosy Magazine*, **11**: 556.
- Fujihara, M., Muroi, M., Tanamoto, K., Suzuki, T., Azuma, H., dan Ikeda, H., 2003. Molecular mechanisms of macrophage activation and deactivation by lipopolysaccharide: roles of the receptor complex. *Pharmacology & Therapeutics*, **100**: 171–194.
- Gandjar, I.G. dan Rohman, A., 2007. *Kimia Farmasi Analisis*. Pustaka Pelajar, Yogyakarta.
- Ganeshpurkar, A. dan Saluja, A.K., 2017. Protective effect of rutin on humoral and cell mediated immunity in rat model. *Chemico-Biological Interactions*, **273**: 154–159.
- Geraghty, R.J., Capes-Davis, A., Davis, J.M., Downward, J., Freshney, R.I., Knezevic, I., dkk., 2014. Guidelines for the use of cell lines in biomedical research. *British Journal of Cancer*, **111**: 1021–1046.
- Guimarães, M.R., Leite, F.R.M., Spolidorio, L.C., Kirkwood, K.L., dan Rossa, C., 2013. Curcumin abrogates LPS-induced pro-inflammatory cytokines in RAW 264.7 macrophages. Evidence for novel mechanisms involving SOCS-1, -3 and p38 MAPK. *Archives of Oral Biology*, **58**: 1309–1317.
- Günther, J., Koy, M., Berthold, A., Schuberth, H.-J., dan Seyfert, H.-M., 2016. Comparison of the pathogen species-specific immune response in udder derived cell types and their models. *Veterinary Research*, **47**: 22.
- Guo, C., Bi, J., Li, X., Lyu, J., Liu, X., Wu, X., dkk., 2021. Immunomodulation effects of polyphenols from thinned peach treated by different drying methods on RAW264.7 cells through the NF-κB and Nrf2 pathways. *Food Chemistry*, **340**: 127931.
- Heo, S.-J., Yoon, W.-J., Kim, K.-N., Oh, C., Choi, Y.-U., Yoon, K.-T., dkk., 2012. Anti-inflammatory effect of fucoxanthin derivatives isolated from *Sargassum siliquastrum* in lipopolysaccharide-stimulated RAW 264.7 macrophage. *Food and Chemical Toxicology*, **50**: 3336–3342.



- Huang, S.-H., Lee, C.-H., Wang, H.-M., Chang, Y.-W., Lin, C.-Y., Chen, C.-Y., dkk., 2014. 6-Dehydrogingerdione Restrains Lipopolysaccharide-Induced Inflammatory Responses in RAW 264.7 Macrophages. *Journal of Agricultural and Food Chemistry*, **62**: 9171–9179.
- Hwang, J., Ma, J., Park, J., Jung, H., dan Park, Y., 2019. Anti-inflammatory and antioxidant effects of MOK, a polyherbal extract, on lipopolysaccharide-stimulated RAW 264.7 macrophages. *International Journal of Molecular Medicine*, .
- Jantan, I., Haque, Md.A., Ilangkovan, M., dan Arshad, L., 2019. An Insight Into the Modulatory Effects and Mechanisms of Action of *Phyllanthus* Species and Their Bioactive Metabolites on the Immune System. *Frontiers in Pharmacology*, **10**: 878.
- Jantan, I., Harun, N.H., Septama, A.W., Murad, S., dan Mesaik, M.A., 2011. Inhibition of chemiluminescence and chemotactic activity of phagocytes in vitro by the extracts of selected medicinal plants. *Journal of Natural Medicines*, **65**: 400–405.
- Jeong, J.-W., Lee, H.H., Han, M.H., Kim, G.-Y., Hong, S.H., Park, C., dkk., 2014. Ethanol extract of *Poria cocos* reduces the production of inflammatory mediators by suppressing the NF-kappaB signaling pathway in lipopolysaccharide-stimulated RAW 264.7 macrophages. *BMC Complementary and Alternative Medicine*, **14**: 101.
- Kaewkroek, K., Wattanapiromsakul, C., dan Tewtrakul, S., 2010. Anti-inflammatory Mechanisms of Compounds from *Curcuma Mangga* Rhizomes using RAW264.7 Macrophage Cells. *Natural Product Communications*, **5**: 1934578X1000501.
- Kamruzzaman, H. dan Hoq, O., 2016. A review on ethnomedicinal, phytochemical and pharmacological properties of *Phyllanthus niruri*. *Journal of Medicinal Plants Studies*, **4**: 173–180.
- Kawai, T. dan Kawasaki, T., 2014. Toll-like receptor signaling pathways. *Frontiers in Immunology*, **5**: 8.
- Kim, J.-B., Han, A.-R., Park, E.-Y., Kim, J.-Y., Cho, W., Lee, J., dkk., 2007. Inhibition of LPS-Induced iNOS, COX-2 and Cytokines Expression by Poncirin through the NF- $\kappa$  B Inactivation in RAW 264.7 Macrophage Cells **30**: 7.
- Kotra, V.S.R., Satyabanta, L., dan Goswami, T.K., 2019. A critical review of analytical methods for determination of curcuminoids in turmeric. *Journal of Food Science and Technology*, **56**: 5153–5166.
- Kusumastuti, A.P., 2018. 'Evaluasi Aktivitas Imunomodulator Kombinasi Ekstrak Etanolik Herba Meniran (*Phyllanthus niruri L.*) dan Rimpang Temu Mangga (*Curcuma mangga Val.*) pada Respon Imun Spesifik secara In Vivo', *Skripsi*, . Fakultas Farmasi, Universitas Gadjah Mada, Yogayakarta.
- Lee, J., Choi, J.W., Sohng, J.K., Pandey, R.P., dan Park, Y.I., 2016. The immunostimulating activity of quercetin 3-O-xyloside in murine macrophages via activation of the ASK1/MAPK/NF- $\kappa$ B signaling pathway. *International Immunopharmacology*, **31**: 88–97.



- Lim, T.K., 2016. Curcuma mangga, dalam: *Edible Medicinal and Non-Medicinal Plants*. Springer International Publishing, Cham, hal. 363–370.
- Liu, Y., Wu, X., Jin, W., dan Guo, Y., 2020. Immunomodulatory Effects of a Low-Molecular Weight Polysaccharide from Enteromorpha prolifera on RAW 264.7 Macrophages and Cyclophosphamide- Induced Immunosuppression Mouse Models. *Marine Drugs*, **18**: 340.
- Lopes, G., Daletos, G., Proksch, P., Andrade, P., dan Valentão, P., 2014. Anti-Inflammatory Potential of Monogalactosyl Diacylglycerols and a Monoacylglycerol from the Edible Brown Seaweed *Fucus spiralis* Linnaeus. *Nitric Oxide Is Essential for the Development of Aerenchyma in Wheat Roots under Hypoxic Stress*, **12**: 1406–1418.
- Madhvi, A., Mishra, H., Leisching, G., Mahlobo, P., dan Baker, B., 2019. Comparison of human monocyte derived macrophages and THP1-like macrophages as in vitro models for *M. tuberculosis* infection. *Comparative Immunology, Microbiology and Infectious Diseases*, **67**: 101355.
- Mao, X., Wu, L.-F., Guo, H.-L., Chen, W.-J., Cui, Y.-P., Qi, Q., dkk., 2016. The Genus *Phyllanthus* : An Ethnopharmacological, Phytochemical, and Pharmacological Review. *Evidence-Based Complementary and Alternative Medicine*, **2016**: 1–36.
- Marshall, J.S., Warrington, R., Watson, W., dan Kim, H.L., 2018. An introduction to immunology and immunopathology. *Allergy, Asthma & Clinical Immunology*, **14**: 49.
- Maulana, R., 2018. 'Evaluasi Aktivitas Imunomodulator Kombinasi Ekstrak Etanolik Herba Meniran (*Phyllanthus niruri L.*) dan Rimpang Temu Mangga (*Curcuma mangga Val.*) pada Respon Imun Non Spesifik secara In Vivo', *Skripsi*, . Universitas Gadjah Mada, Yogyakarta.
- Mediani, A., Abas, F., Maulidiani, M., Khatib, A., Tan, C.P., Ismail, I.S., dkk., 2017. Characterization of Metabolite Profile in *Phyllanthus niruri* and Correlation with Bioactivity Elucidated by Nuclear Magnetic Resonance Based Metabolomics. *Molecules*, **22**: 902.
- Merly, L. dan Smith, S.L., 2017. Murine RAW 264.7 cell line as an immune target: are we missing something? *Immunopharmacology and Immunotoxicology*, **39**: 55–58.
- Muchtaromah, B., Analisa, N.I., Ahmad, M., Fitriasari, P.D., Habibi, S., Hayati, A., dkk., 2022. Immunomodulatory Activity of *Allium sativum*, *Curcuma mangga*, and *Acorus calamus* Combination Nanoparticle on Mice Leukocytes Profile. *Jurnal Biodjati*, 11.
- Muchtaromah, B., Annisa, R., dan Sofiya, S., 2019. Pengaruh Poliherbal Ekstrak Jeringau, Temu Mangga Dan Bawang Putih Pada Fungsi Hepar Tikus (*Rattus norvegicus*). *Biosel: Biology Science and Education*, **8**: 71.
- Muchtaromah, B., Muti'ah, R., Yusmalasari, D.R., Mardyana, P., Sharmin, T., dan Fadholly, A., 2020a. Efficacy of *Allium sativum*, *Curcuma mangga* and *Acorus calamus* Extract Combination on Rat Fertility. *Pharmacognosy Journal*, **12**: 197–203.



- Muchtaromah, B., Mutmainah, F.N., Prahardika, B.A., dan Ahmad, M., 2020b. Antioxidant and Antifungal Activities of Temu mangga (*Curcuma mangga Val.*) Extract in Some Solvents. *Iranian Journal of Pharmaceutical Sciences*, **16**: 1–18.
- Muniandy, K., Gothai, S., Badran, K.M.H., Suresh Kumar, S., Esa, N.M., dan Arulselvan, P., 2018. Suppression of Proinflammatory Cytokines and Mediators in LPS-Induced RAW 264.7 Macrophages by Stem Extract of *Alternanthera sessilis* via the Inhibition of the NF-  $\kappa$  B Pathway. *Journal of Immunology Research*, **2018**: 1–12.
- Nguang, S.L., Yeong, Y.L., Pang, S.F., dan Gimbun, J., 2017. Ultrasonic Assisted Extraction on Phenolic and Flavonoid Content from *Phyllanthus niruri* Plant. *Indian Journal of Science and Technology*, **10**: .
- Nicholson, L.B., 2016. The immune system. *Essays in Biochemistry*, **60**: 275–301.
- Novianto, F., Zulkarnain, Z., Triyono, A., Ardiyanto, D., dan Fitriani, U., 2020. Pengaruh Formula Jamu Temulawak, Kunyit, dan Meniran terhadap Kebugaran Jasmani: Suatu Studi Klinik. *Media Penelitian dan Pengembangan Kesehatan*, **30**: 37–44.
- Nworu, C.S., Akah, P.A., Okoye, F.B.C., Proksch, P., dan Esimone, C.O., 2010. The Effects of *Phyllanthus niruri* Aqueous Extract on the Activation of Murine Lymphocytes and Bone Marrow-Derived Macrophages. *Immunological Investigations*, **39**: 245–267.
- Park, C., HwangBo, H., Lee, H., Kim, G.-Y., Cha, H.-J., Choi, S.H., dkk., 2020. The immunostimulatory effect of indole-6-carboxaldehyde isolated from *Sargassum thunbergii (Mertens) Kuntze* in RAW 264.7 macrophages. *Animal Cells and Systems*, **24**: 233–241.
- Park, S.H., Kyeong, M.S., Hwang, Y., Ryu, S.Y., Han, S.-B., dan Kim, Y., 2012. Inhibition of LPS binding to MD-2 co-receptor for suppressing TLR4-mediated expression of inflammatory cytokine by 1-dehydro-10-gingerdione from dietary ginger. *Biochemical and Biophysical Research Communications*, **419**: 735–740.
- Pekal, A. dan Pyrzynska, K., 2014. Evaluation of Aluminium Complexation Reaction for Flavonoid Content Assay. *Food Anal. Methods*, **7**: 1776–1782.
- Pérez-Recalde, M., Matulewicz, M.C., Pujol, C.A., dan Carlucci, M.J., 2014. In vitro and in vivo immunomodulatory activity of sulfated polysaccharides from red seaweed *Nemalion helminthoides*. *International Journal of Biological Macromolecules*, **63**: 38–42.
- Qi, Q., Dong, Z., Sun, Y., Li, S., dan Zhao, Z., 2018. Protective Effect of Bergenin against Cyclophosphamide-Induced Immunosuppression by Immunomodulatory Effect and Antioxidation in Balb/c Mice. *Molecules*, **23**: 2668.
- Rahaman, Md.M., Rakib, A., Mitra, S., Tareq, A.M., Emran, T.B., Shahid-Ud-Daula, A.F.M., dkk., 2020. The Genus Curcuma and Inflammation: Overview of the Pharmacological Perspectives. *Plants*, **10**: 63.



- Rajkumari, S. dan Sanatombi, K., 2017. Nutritional value, phytochemical composition, and biological activities of edible *Curcuma* species: A review. *International Journal of Food Properties*, **20**: S2668–S2687.
- Sagala, R.J., Murwanti, R., Gani, A.P., dan Yuswanto, A., 2020. The Combination of Ethanol Extracts of *Phyllanthus niruri* Linn, *Typhonium flagelliforme* and *Piper crocatum* increase the Macrophage Phagocytosis In Vitro. *Majalah Obat Tradisional*, **25**: 67.
- Schoch, C.L., 2020. NCBI Taxonomy: a comprehensive update on curation, resources and tools. *Curcuma mangga*, .
- Sepahpour, S., Selamat, J., Abdul Manap, M., Khatib, A., dan Abdull Razis, A., 2018. Comparative Analysis of Chemical Composition, Antioxidant Activity and Quantitative Characterization of Some Phenolic Compounds in Selected Herbs and Spices in Different Solvent Extraction Systems. *Molecules*, **23**: 402.
- Seyed, M.A., 2019. A comprehensive review on *Phyllanthus* derived natural products as potential chemotherapeutic and immunomodulators for a wide range of human diseases. *Biocatalysis and Agricultural Biotechnology*, **17**: 529–537.
- Shilpa, V., Muddukrishnaiah, K., Thavamani, B., Dhanapal, V., Arathi, K., Vinod, K., dkk., 2018. In vitro immunomodulatory, antifungal, and antibacterial screening of *Phyllanthus niruri* against to human pathogenic microorganisms. *Environmental Disease*, **3**: 63.
- Singh, N., Tailang, M., dan Mehta, S.C., 2016. A REVIEW ON HERBAL PLANTS AS IMMUNOMODULATORS. *International Journal of Pharmaceutical Sciences and Research*, **7**: 9.
- Stanković, M., Jakovljević, D., Stojadinov, M., dan Stevanović, Z.D., 2019. Halophyte Species as a Source of Secondary Metabolites with Antioxidant Activity, dalam: Hasanuzzaman, M., Nahar, K., Öztürk, M. (Eds.), *Ecophysiology, Abiotic Stress Responses and Utilization of Halophytes*. Springer Singapore, Singapore, hal. 289–312.
- Suebsaard, P. dan Charerntantanakul, W., 2021. Rutin, α-tocopherol, and l-ascorbic acid up-regulate type I interferon-regulated gene and type I and II interferon expressions and reduce inflammatory cytokine expressions in monocyte-derived macrophages infected with highly pathogenic porcine reproductive and respiratory syndrome virus. *Veterinary Immunology and Immunopathology*, **235**: 110231.
- Sun, J., Zhang, X., Broderick, M., dan Fein, H., 2003. Measurement of Nitric Oxide Production in Biological Systems by Using Griess Reaction Assay. *Sensors*, **3**: 276–284.
- Sun, Y., Tao, X., Men, X., Xu, Z., dan Wang, T., 2017. In vitro and in vivo antioxidant activities of three major polyphenolic compounds in pomegranate peel: Ellagic acid, punicalin, and punicalagin. *Journal of Integrative Agriculture*, **16**: 1808–1818.
- Taciak, B., Bialasek, M., Braniewska, A., Sas, Z., Sawicka, P., Kiraga, Ł., dkk., 2018. Evaluation of phenotypic and functional stability of RAW 264.7 cell line through serial passages. *PLOS ONE*, **13**: e0198943.



- Takeda, K. dan Akira, S., 2004. Toll-like receptors in innate immunity. *International Immunology*, **17**: 1–14.
- Takeuchi, O., Hoshino, K., Kawai, T., Sanjo, H., Takada, H., Ogawa, T., dkk., 1999. Differential Roles of TLR2 and TLR4 in Recognition of Gram-Negative and Gram-Positive Bacterial Cell Wall Components. *Immunity*, **11**: 443–451.
- Tallarida, R.J., 2002. The interaction index: a measure of drug synergism. *Pain*, **98**: 163–168.
- Tian, C., Liu, X., Chang, Y., Wang, R., Yang, M., dan Liu, M., 2021. Rutin prevents inflammation induced by lipopolysaccharide in RAW 264.7 cells via conquering the TLR4-MyD88-TRAF6-NF- $\kappa$ B signalling pathway. *Journal of Pharmacy and Pharmacology*, **73**: 110–117.
- Tjandrawinata, R.R., Susanto, L.W., dan Nofiarny, D., 2017. The use of *Phyllanthus niruri L.* as an immunomodulator for the treatment of infectious diseases in clinical settings. *Asian Pacific Journal of Tropical Disease*, **7**: 132–140.
- Viola, A., Munari, F., Sánchez-Rodríguez, R., Scolaro, T., dan Castegna, A., 2019. The Metabolic Signature of Macrophage Responses. *Frontiers in Immunology*, **10**: 1462.
- Virág, L., Jaén, R.I., Regdon, Z., Boscá, L., dan Prieto, P., 2019. Self-defense of macrophages against oxidative injury: Fighting for their own survival. *Redox Biology*, **26**: 101261.
- Vyshali, V., Jyotsna, N.L., Bakshi, V., Ismail, S., Mohanty, D., Kavitha, T., dkk., 2021. Optimization of Extraction of Curcuminoids from Turmeric Powder (*Curcuma longa*). *Research Journal of Pharmacy and Technology*, **14**: 4615–0.
- Wang, Junya, Zhang, H., Wang, H., Wang, Jinmei, Sun-Waterhouse, D., Waterhouse, G.I.N., dkk., 2020. An immunomodulatory polysaccharide from blackberry seeds and its action on RAW 264.7 cells via activation of NF- $\kappa$ B/MAPK pathways. *Quercetin 3-O-Xyloside*, **31**: 575–586.
- Warrington, R., Watson, W., Kim, H.L., dan Antonetti, F.R., 2011. An introduction to immunology and immunopathology. *Allergy, Asthma & Clinical Immunology*, **7**: S1.
- Wu, W., Li, Y., Jiao, Z., Zhang, L., Wang, X., dan Qin, R., 2019. Phyllanthin and hypophyllanthin from *Phyllanthus amarus* ameliorates immune-inflammatory response in ovalbumin-induced asthma: role of IgE, Nrf2, iNOs, TNF- $\alpha$ , and IL's. *Immunopharmacology and Immunotoxicology*, **41**: 55–67.
- Yang, H., Du, Z., Wang, W., Song, M., Sanidad, K.Z., Zheng, J., dkk., 2017. Structure and Activity Relationship of Curcumin: Role of Methoxy Group in Anti-inflammatory and Anti-colitis Effects of Curcumin. *Journal of Agricultural and Food Chemistry*, **35**.
- Yin, H., Guo, Q., Li, X., Tang, T., Li, C., Wang, H., dkk., 2018. Curcumin Suppresses IL-1 $\beta$  Secretion and Prevents Inflammation through Inhibition of the NLRP3 Inflammasome. *The Journal of Immunology*, **200**: 2835–2846.



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Efek Imunomodulator Kombinasi Ekstrak Etanolik Herba Meniran (*Phyllanthus ninuri L.*) dan Rimpang Temu Mangga (*Curcuma mangga Val. & Zijp*) melalui Jalur NF-kappaB pada Sel RAW 264.7 ANAMI RIASTRI, drh. Retno Murwanti, M.P., Ph.D.; Dr. apt. Andayana Puspitasari Gani, M.Si.

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- Yuandani, . Yuliasmi, S., . Satria, D., F. Dongoran, R., S. Sinaga, M., dan H. A. Marpaung, N., 2019. Correlation Between the Phytochemical Constituents of Curcuma mangga and its Immunomodulatory Effect. *Rasayan Journal of Chemistry*, **12**: 01–06.
- Yuandani, Nugraha, S., Laila, L., dan Satria, D., 2021. Immunomodulatory effects of standardized extract of Curcuma mangga val. on cytokines, antibody and delayed-type hypersensitivity response in Wistar rats. *Research in Pharmaceutical Sciences*, **16**: 16.
- Yuandani, Y., Nugraha, S.E., Laila, L., Silaban, S.D., dan Ramadhani, F., 2020. Short Communication: Stimulatory effect of Curcuma mangga on immune response against *Staphylococcus aureus*. *Nusantara Bioscience*, **12**: .
- Yuandani, Yuliasmi, S., dan Satria, D., 2018. Analysis of Compounds and Immunostimulatory Properties of Curcuma Mangga Rhizomes on Male Mice. *Rasayan Journal of Chemistry*, **11**: 844–849.
- Zahari, N.A.A.R., Chong, G.H., Abdullah, L.C., dan Chua, B.L., 2020. Ultrasonic-Assisted Extraction (UAE) Process on Thymol Concentration from Plectranthus Amboinicus Leaves: Kinetic Modeling and Optimization. *Processes*, **8**: 322.
- Zhai, X.-T., Zhang, Z.-Y., Jiang, C.-H., Chen, J.-Q., Ye, J.-Q., Jia, X.-B., dkk., 2016. Nauclea officinalis inhibits inflammation in LPS-mediated RAW 264.7 macrophages by suppressing the NF-κB signaling pathway. *Journal of Ethnopharmacology*, **183**: 159–165.
- Zhang, C., Yang, M., dan Ericsson, A.C., 2021. Function of Macrophages in Disease: Current Understanding on Molecular Mechanisms. *Frontiers in Immunology*, **12**: 620510.