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DAFTAR PUSTAKA

Abdulkhaleq, L.A., Assi, M.A., Abdullah, R., Zamri-Saad, M., Taufiq-Yap, Y.H., dan Hezmee, M.N.M. 2018, The Crucial Roles of Inflammatory Mediators in Inflammation: A Review, *Veterinary World*, **11**:627–635.

Abuga, I., Sulaiman, S.F., Abdul Wahab, R., Ooi, K.L., dan Abdull Rasad, M.S.B. 2020, In Vitro Antibacterial Effect of the Leaf Extract of *Murraya koenigii* on Cell Membrane Destruction Against Pathogenic Bacteria and Phenolic Compounds Identification, *European Journal of Integrative Medicine*, **33**:101010.

Adegbola, S.O., Sahnan, K., Warusavitarne, J., Hart, A., dan Tozer, P. 2018, Anti-TNF Therapy in Crohn's Disease, *International Journal of Molecular Sciences*, **19**.

Adelizzi, R. 2021, COX-1 and COX-2 in Health and Disease, *The Journal of the American Osteopathic Association*, **99**:7–12.

Aggeletopoulou, I., Kalafateli, M., Tsounis, E.P., dan Triantos, C. 2024, Exploring the Role of IL-1β in Inflammatory Bowel Disease Pathogenesis, *Frontiers in Medicine*, **11**.

Al-mosawi, R.H., Alhuda, N., dan Alebadi, M. 2023, Usage of Corticosteroids as Therapeutic Agents in Diseases, *Medical Journal of Babylon*, **20**:447–450.

Al-Qahtani, A.A., Alhamlan, F.S., dan Al-Qahtani, A.A. 2024, Pro-Inflammatory and Anti-Inflammatory Interleukins in Infectious Diseases: A Comprehensive Review, *Tropical Medicine and Infectious Disease*, **9**.

Al Arif, M.A., Warsito, S.H., Lamid, M., Lokapirnasari, W.P., Khairullah, A.R., Ayuti, S.R., dkk. 2024, Phytochemical Analysis of Curry Leaf Extract (*Murraya koenigii* L.) as a Potential Animal Feed and Medicinal Ingredient, *Pharmacognosy Journal*, **16**:471–477.

Amna, U., Halimatussakdiah, H., Ihsan, F.N., dan Wahyuningsih, P. 2021, Evaluation of Antioxidant Activities from Ethyl Acetate Fraction of Curry Leaf Using DPPH Method, *Elkawnie*, **7**:96.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Aniqa, A., Sarvnarinder, K., dan Sadwal, S. 2022, A Review of the Anti-Cancer Potential of *Murraya koenigii* (Curry Tree) and Its Active Constituents, *Nutrition and Cancer*, **74**:12–26.

Antolovich, M., Prenzler, P.D., Patsalides, E., McDonald, S., dan Robards, K. 2002, Methods for Testing Antioxidant Activity, *The Analyst*, **127**:183–198.

Apostoli, P. 2002, Elements in Environmental and Occupational Medicine, *Journal of Chromatography B*, **778**:63–97.

Arulselvan, P., Fard, M.T., Tan, W.S., Gothai, S., Fakurazi, S., Norhaizan, M.E., dkk. 2016, Role of Antioxidants and Natural Products in Inflammation, *Oxidative Medicine and Cellular Longevity*.

Azahan, N.S.M., Mani, V., Ramasamy, K., Lim, S.M., James, R.M.J., Alsharidah, M., Alhowail, A., dan Majeed, A.B.A. 2020, Mahanimbine-Induced Neuroprotection via Cholinergic System and Attenuated Amyloidogenesis as Well as Neuroinflammation in Lipopolysaccharides-Induced Mice, *Pharmacognosy Magazine*, **16**:S57–S63.

Azzubaidi, M.S., Saxena, A.K., Alattraqchi, A.G., dan Abdualkader, A.M. 2014, Chronic LD50 vs Safest Dose for the Methanolic Extract of Curry Leaves (*Murraya koenigii*) Cultivated in Malaysia, *Journal of Applied Pharmaceutical Science*, **4**:56–58.

Balakrishnan, R., Vijayraja, D., Jo, S.-H., Ganesan, P., Su-Kim, I., dan Choi, D.-K. 2020, Medicinal Profile, Phytochemistry, and Pharmacological Activities of *Murraya koenigii* and Its Primary Bioactive Compounds, *Antioxidants*, **9**.

Barale, C. dan Russo, I. 2020, Influence of Cardiometabolic Risk Factors on Platelet Function, *International Journal of Molecular Sciences*, **21**:1–27.

Baud, V. dan Karin, M. 2001, Signal Transduction by Tumor Necrosis Factor and Its Relatives, *Trends in Cell Biology*, **11**:372–377.

Belova, D. dan Dyshlyuk, L. 2016, The Study of Natural Polysaccharides: Organoleptic, Physical, Chemical, Microbiological Properties, and Thermodynamic Characteristic of Aqueous Solution, *Science Evolution*, **1**:72–79.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Bhandari, P. 2012, Curry Leaf (*Murraya koenigii*) or Cure Leaf: Review of Its Curative Properties, *Journal of Medical Nutrition and Nutraceuticals*, **1**:92.

Boezaart, A., Smith, C., Chembrovich, S., Zasimovich, Y., Server, A., Morgan, G., dkk. 2021, Visceral versus Somatic Pain: An Educational Review of Anatomy and Clinical Implications, *Regional Anesthesia & Pain Medicine*, **46**:629–636.

Braz-Silva, P.H., Bergamini, M.L., Mardegan, A.P., De Rosa, C.S., Hasseus, B., dan Jonasson, P. 2019, Inflammatory Profile of Chronic Apical Periodontitis: A Literature Review, *Acta Odontologica Scandinavica*, **77**:173–180.

Brusco, I., Fialho, M.F.P., Becker, G., Brum, E.S., Favarin, A., Marquezin, L.P., dkk. 2023, Kinins and Their B1 and B2 Receptors as Potential Therapeutic Targets for Pain Relief, *Life Sciences*, **314**:121302.

Buchineni, M., Ravi, N., Kudagi, B., Kumar, R., Pathapati, R., dan Chandra, B. 2015, Analgesic and Anti-Inflammatory Properties of the Aqueous Extract Leaves of *Murraya koenigii* Linn. in Small Animal Models, *International Journal of Basic & Clinical Pharmacology*, **4**:41.

Cahyaningsih, E., Sandhi, P.E., dan Susanthi, I.M. 2018, Uji Efek Antiinflamasi Ekstrak Etanol Daun Salam India (*Murraya koenigii* L.) terhadap Tikus (*Rattus norvegicus*) Jantan yang Diinduksi Karagenan 1%, **4**:25–31.

Cao, S., Liang, J., Chen, M., Xu, C., Wang, X., Qiu, L., dkk. 2025, Comparative Analysis of Extraction Technologies for Plant Extracts and Absolutes, *Frontiers in Chemistry*, **13**:1–16.

Carrillo, J.L., Garcia, F.P., dan Coronado. 2017, Physiology and Pathology of Innate Immune Response Against Pathogens, dalam: *Physiology and Pathology of Immunology*, IntechOpen, 99–134.

Catarro, M., Serrano, J.L., Ramos, S.S., Silvestre, S., dan Almeida, P. 2019, Nimesulide Analogues: From Anti-Inflammatory to Antitumor Agents, *Bioorganic Chemistry*, **88**:102966.

Cavanna, D., Righetti, L., Elliott, C., dan Suman, M. 2018, The Scientific Challenges in Moving from Targeted to Non-Targeted Mass Spectrometric

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Methods for Food Fraud Analysis: A Proposed Validation Workflow to Bring About a Harmonized Approach, *Trends in Food Science and Technology*, **80**:223–241.

Haachouay, N., dan Zidane, L., 2024. Plant-Derived Natural Products: A Source for Drug Discovery and Development. *Drugs and Drug Candidates*, **3**:184–207.

Husna, F., Suyatna, F.D., Arozal, W., Purwaningsih, E.H., dan Sani, Y. 2020, Restoration of Pro-Inflammatory Cytokines and Histopathological Changes in Pancreas and Liver of Hyperglycemic Rats by *Murraya koenigii* Leaves Extract, *Journal of Applied Pharmaceutical Science*, **10**:8–15.

Chang, C., Yang, M., Wen, H., dan Chern, J., 2002. Estimation of Total Flavonoid Content in Propolis by Two Complementary Colorimetric Methods. *J Food Drug Anal.*, **10**:82–178.

Chauhan, B., dan Mashru, R.C., 2017. Review on *Murraya koenigii*: Versatile Role in Management. *World Journal of Pharmacy and Pharmaceutical Sciences*, **6**:476–493.

Chen, L., Deng, H., Cui, H., Fang, J., Zuo, Z., Deng, J., dkk., 2018. Inflammatory Responses and Inflammation-Associated Diseases in Organs. *Oncotarget*, **9**:7204–7218.

Chen, Y.-M., Cao, N.-K., Zhu, S.-S., Ding, M., Liang, H.-Z., Zhao, M.-B., dkk., 2025. Euchrestifolines A–O, Fifteen Novel Carbazole Alkaloids with Potent Anti-Ferroptotic Activity from *Murraya euchrestifolia*. *Natural Products and Bioprospecting*, **15**:5.

Chowdhury, J.U., Bhuiyan, M.N.I., dan Yusuf, M., 2008. Chemical Composition of the Leaf Essential Oils of *Murraya koenigii* (L.) Spreng and *Murraya paniculata* (L.) Jack. *Bangladesh Journal of Pharmacology*, **3**.

Corsini, E.R., Paola, B., Viviana, T., Genovese, E., Mazzon, L., Lucchi, M., dkk., 2005. Increased Carrageenan-Induced Acute Lung Inflammation in Old Rats. *Immunology*, **115**:253–261.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Cullen, S.P., Kearney, C.J., Clancy, D.M., dan Martin, S.J., 2015. Diverse Activators of the NLRP3 Inflammasome Promote IL-1β Secretion by Triggering Necrosis. *Cell Reports*, **11**:1535–1548.

Cuman, R.K.N., Bersani-Amado, C.A., dan Fortes, Z.B., 2001. Influence of Type 2 Diabetes on the Inflammatory Response in Rats. *Inflammation Research*, **50**:460–465.

Darabi, P., Khazali, H., dan Mehrabani Natanzi, M., 2020. Therapeutic Potentials of the Natural Plant Flavonoid Apigenin in Polycystic Ovary Syndrome in Rat Model: via Modulation of Pro-Inflammatory Cytokines and Antioxidant Activity. *Gynecological Endocrinology*, **36**:582–587.

Darvekar, V.M., Patil, V.R., Choudhari, A.B., dan Road, D., 2011. Anti-Inflammatory Activity of *Murraya koenigii* Spreng on Experimental Animals. *Journal of Natural Products and Plant Resources*, **1**:65–69.

Das, K.C., Chakraborty, D.P., dan Bose, P.K., 1965. Antifungal Activity of Some Constituents of *Murraya koenigii* Spreng. *Experientia*, **21**:340.

Derwich, M., Mitus-Kenig, M., dan Pawlowska, E., 2021. Orally Administered NSAIDs—General Characteristics and Usage in the Treatment of Temporomandibular Joint Osteoarthritis—A Narrative Review. *Pharmaceuticals*, **14**.

Dillingh, M.R., Van Poelgeest, E.P., Malone, K.E., Kemper, E.M., Stroes, E.S.G., Moerland, M., dkk., 2014. Characterization of Inflammation and Immune Cell Modulation Induced by Low-Dose LPS Administration to Healthy Volunteers. *Journal of Inflammation (United Kingdom)*, **11**:1–9.

Domingo-Fernández, D., Gadiya, Y., Mubeen, S., Healey, D., Norman, B., dan Colluru, V., 2023. Exploring the Known Chemical Space of the Plant Kingdom: Insights into Taxonomic Patterns, Knowledge Gaps, and Bioactive Regions. *Journal of Cheminformatics*, **15**.

Faki, Y., dan Er, A., 2021. Different Chemical Structures and Physiological/Pathological Roles of Cyclooxygenases. *Rambam Maimonides Medical Journal*, **12**.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Fayez, N., Khalil, W., Abdel-Sattar, E., dan Abdel-Fattah, A.F.M., 2023. *In Vitro* and *In Vivo* Assessment of the Anti-Inflammatory Activity of Olive Leaf Extract in Rats. *Inflammopharmacology*, **31**:1529–1538.

Feng, W., Li, M., Zhiyou, H., dan Zhang, J., 2019. Analytical Methods of Isolation and Identification. Dalam: *Phytochemicals in Human Health*.

Franyoto, Y.D., Nurrochmad, A., dan Fakhrudin, N., 2024. *Murraya koenigii* L. Spreng.: An Updated Review of Chemical Composition, Pharmacological Effects, and Toxicity Studies. *Journal of Applied Pharmaceutical Science*, **0**:1–17.

Gangawat, R., Parashar, R., dan Yadav, R.K., 2024. Hepatoprotective Potential of *Murraya koenigii* (Curry Leaves) against Xenobiotics, Heavy Metals, and Hepatotoxic Agents: A Comprehensive Review. *Current Drug Discovery Technologies*.

Gonfa, Y.H., Tessema, F.B., Bachheti, A., Rai, N., Tadesse, M.G., Nasser Singab, A., dkk., 2023. Anti-Inflammatory Activity of Phytochemicals from Medicinal Plants and Their Nanoparticles: A Review. *Current Research in Biotechnology*, **6**:100152.

Guo, Z., Yang, Y., Liao, Y., Shi, Y., dan Zhang, L., 2022. Emerging Roles of Adipose Tissue in the Pathogenesis of Psoriasis and Atopic Dermatitis in Obesity. *JID Innovations*, **2**:100064.

Gupta, S., Gerge, M., Singhal, M., Sharma, G.N., dan Garg, V., 2010. Leaves Extract of *Murraya koenigii* Linn for Anti-Inflammatory and Analgesic Activity in Animal Models. *Journal of Advanced Pharmaceutical Technology and Research*, **1**:68–77.

Hakim, A.R., dan Saputri, R., 2020. Anti-Inflammatory Activity of [Article Title Not Specified]. *Jurnal Surya Medika*, **6**(1):177–180.

Halvey, E.J., Haslam, N., dan Mariano, E.R., 2023. Non-Steroidal Anti-Inflammatory Drugs in the Perioperative Period. *BJA Education*, **23**:440–447.

Harborne, J.B., 1987. *Metode Fitokimia: Penentuan Cara Modern Menganalisis Tumbuhan*. Bandung: ITB.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Harirforoosh, S., Asghar, W., dan Jamali, F., 2013. Adverse Effects of Nonsteroidal Antiinflammatory Drugs: An Update of Gastrointestinal, Cardiovascular, and Renal Complications. *Journal of Pharmacy and Pharmaceutical Sciences*, **16**:821–847.

Igara, C., Omoboyowa, D., Ahuchaogu, A., Orji, N., dan Ndukwe, M., 2016. Phytochemical and Nutritional Profile of *Murraya koenigii* (Linn) Spreng Leaf. *Journal of Pharmacognosy and Phytochemistry*, **5**:4–7.

Iman, V., Mohan, S., Abdelwahab, S.I., Karimian, H., Nordin, N., Fadaeinasab, M., dkk., 2017. Anticancer and Anti-Inflammatory Activities of Girinimbine Isolated from *Murraya koenigii*. *Drug Design, Development and Therapy*, **11**:103–121.

Ito, C., Thoyama, Y., Omura, M., Kajiura, I., dan Furukawa, H., 1993. Alkaloidal Constituents of *Murraya koenigii*: Isolation and Structural Elucidation of Novel Binary Carbazolquinones and Carbazole Alkaloids. *Chemical Pharmaceutical Bulletin*, **41**:2096–2100.

Jang, G., Lee, S., Hong, J., Park, B., Kim, D., dan Kim, C., 2021. Anti-Inflammatory Effect of 4,5-Dicaffeoylquinic Acid on RAW264.7 Cells and a Rat Model of Inflammation. *Nutrients*, **13**:1–10.

Jang, A., Lee, S., Shin, H., Song, H., Park, J., Kang, T., dkk., 2021. The Role of Tumor Necrosis Factor Alpha (TNF-α) in Autoimmune Disease and Current TNF-α Inhibitors in Therapeutics. *International Journal of Molecular Sciences*, **22**.

Jomova, K., Alomar, S.Y., Valko, R., Liska, J., Nepovimova, E., Kuca, K., dkk., 2025. Flavonoids and Their Role in Oxidative Stress, Inflammation, and Human Diseases. *Chemico-Biological Interactions*, **413**:111489.

Jones, H., Robb, C., Perretti, M., dan Rossi, A.G., 2016. The Role of Neutrophils in Inflammation Resolution. *Seminars in Immunology*, **28**:137–145.

Ju, Z., Li, M., Xu, J., Howell, D.C., Li, Z., dan Chen, F.-E., 2022. Recent Development on COX-2 Inhibitors as Promising Anti-Inflammatory Agents: The Past 10 Years. *Acta Pharmaceutica Sinica B*, **12**:2790–2807.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Kaloni, D., Chakraborty, D., Tiwari, A., dan Biswas, S., 2020. *In Silico* Studies on the Phytochemical Components of *Murraya koenigii* Targeting TNF-α in Rheumatoid Arthritis. *Journal of Herbal Medicine*, **24**:100396.

Karcz, M., Abd-Elsayed, A., Chakravarthy, K., Aman, M.M., Strand, N., Malinowski, M.N., dkk., 2024. Pathophysiology of Pain and Mechanisms of Neuromodulation: A Narrative Review (A Neuron Project). *Journal of Pain Research*, **17**:3757–3790.

Kemenkes RI, 2018. Hasil Riset Kesehatan Dasar Tahun 2018. *Kementerian Kesehatan Republik Indonesia*, **53**:1689–1699.

Kim, J., dan Park, E., 2002. Cytotoxic Anticancer Candidate from Natural Resources. *Current Medicinal Chemistry – Anti-Cancer Agents*, **2**:485–537.

Kolb, P., Ayaub, E., Zhou, W., Yum, V., Dickhout, J., dan Ask, K., 2015. The Therapeutic Effects of 4-Phenylbutyric Acid in Maintaining Proteostasis. *The International Journal of Biochemistry & Cell Biology*, **61**.

Kumar, N., Madhusmita, M., Kumar, A., Dash, C., Ranjan, R., Majhi, S., dkk., 2024. The Interplay between Cytokines, Inflammation, and Antioxidants: Mechanistic Insights and Therapeutic Potentials of Various Antioxidants and Anti-Cytokine Compounds. *Biomedicine & Pharmacotherapy*, **178**:117177.

Landmark, L., Sunde, H.F., Fors, E.A., Kennair, L.E.O., Sayadian, A., Backelin, C., dkk., 2024. Associations between Pain Intensity, Psychosocial Factors, and Pain-Related Disability in 4285 Patients with Chronic Pain. *Scientific Reports*, **14**:13477.

Li, H., Qian, F., Liu, H., dan Zhang, Z., 2019. Elevated Uric Acid Levels Promote Vascular Smooth Muscle Cells (VSMC) Proliferation via an NOD-Like Receptor Protein 3 (NLRP3)-Inflammasome-Dependent Mechanism. *Medical Science Monitor*, **25**:8457–8464.

Li, L., Ni, R., Kun, H., Chang, H., dan Kang, S., 2014. Carrageenan and Its Application in Drug Delivery. *Carbohydrate Polymers*, **103**:1–11.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Li, S., Li, W., Wu, X., Zhang, B., Liu, L., dan Yin, L., 2024. Immune Cell-Derived Extracellular Vesicles for Precision Therapy of Inflammatory-Related Diseases. *Journal of Controlled Release*, **368**:533–547.

Lin, C.M.A., Isaacs, J.D., dan Cooles, F.A.H., 2024. Role of IFN-α in Rheumatoid Arthritis. *Current Rheumatology Reports*, **26**:37–52.

Lindell, D., dan Lukacs, N., 2010. Cytokines and Chemokines in Inflammation. Dalam: Ayoub, S., Serhan, C., Ward, P., dan Gilroy, D. (eds.), *Fundamentals of Inflammation*. Cambridge: Cambridge University Press, 175–185.

Liu, W., Cui, X., Zhong, Y., Ma, R., Liu, B., dan Xia, Y., 2023. Phenolic Metabolites as Therapeutic Agents in Inflammation and Neoplasms: Molecular Pathways Explaining Their Efficacy. *Pharmacological Research*, **193**:106812.

Liu, W., Feng, Y., Yu, S., Fan, Z., Li, X., Li, J., dan Yin, H. 2021, The Flavonoid Biosynthesis Network in Plants, *International Journal of Molecular Sciences*, 22:12824.

Ma, Q., Wei, R., Yang, M., Huang, X., Zhong, G., Sang, Z., dkk., 2019. Structures and Biological Evaluation of Phenylpropanoid Derivatives from *Murraya koenigii*. *Bioorganic Chemistry*, **86**:159–165.

Ma, Y., Jiang, J., Zhao, C., Wei, B., dan Gao, J., 2025. Arachidonic Acid Metabolism in Metabolic Dysfunction–Associated Steatotic Liver Disease and Liver Fibrosis. *Hepatology Communications*, **9**.

MacLeod, A.S., dan Mansbridge, J.N., 2015. The Innate Immune System in Acute and Chronic Wounds. *Advances in Wound Care*, **5**:65–78.

Mahipal, P., dan Pawar, R.S., 2017. Nephroprotective Effect of *Murraya koenigii* on Cyclophosphamide-Induced Nephrotoxicity in Rats. *Asian Pacific Journal of Tropical Medicine*, **10**:808–812.

Maitri, P., dan Thakkar, M., 2022. Extraction, Isolation, Identification, and Application of Cardiac Glycoside from Leaf Extract of *Murraya koenigii*. *International Journal of Creative Research Thoughts*, **10**:518–528.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Mans, D.R., Rocha, A.D., dan Schwartsmann, G., 2000. Anti-Cancer Drug Discovery and Development in Brazil: Targeted Plant Collection as a Rational Strategy to Acquire Candidate Anti-Cancer Compounds. *The Oncologist*, **5**.

Marinova, G., dan Batchvarov, V., 2011. DPPH Radical Scavenging Assay Methods. *Bulgarian Journal of Agricultural Science*, **17**:11–24.

Medzhitov, R., 2021. The Spectrum of Inflammatory Responses. *Science*, **374**:1070–1075.

Meena, S., Rajeev Kumar, S., Dwivedi, V., Kumar Singh, A., Chanotiya, C.S., Akhtar, M.Q., Kumar, K., Kumar Shasany, A., dan Nagegowda, D.A. 2017, Transcriptomic Insight into Terpenoid and Carbazole Alkaloid Biosynthesis, and Functional Characterization of Two Terpene Synthases in Curry Tree (*Murraya koenigii*), *Scientific Reports*, 7:44126.

Meizlish, M.L., Franklin, R.A., Zhou, X., dan Medzhitov, R., 2021. Tissue Homeostasis and Inflammation. *Annual Review of Immunology*, **39**:557–581.

Mitchell, R.N., dan Cotran, R., 2015. Acute and Chronic Inflammation. Dalam: Kumar, V., Abbas, A.K., dan Fausto, N. (eds.), *Robbins and Cotran Pathologic Basis of Disease*. Elsevier Saunders, **8**:43–77.

Molyneux, P., 2003. The Use of the Stable Radical Diphenylpicrylhydrazyl (DPPH) for Estimating Antioxidant Activity. *Songklanakarin Journal of Science and Technology*, **26**.

Mondal, P., Natesh, J., Abdul Salam, A.A., dan Meeran, S.M., 2022. Mahanimbine Isolated from *Murraya koenigii* Inhibits P-Glycoprotein Involved in Lung Cancer Chemoresistance. *Bioorganic Chemistry*, **129**:106170.

Moni, S.S., Tripathi, P., Sultan, M.H., Alshahrani, S., Alqahtani, S.S., Madkhali, O.A., dkk., 2022. Wound-Healing and Cytokine-Modulating Potential of Medicinal Oil Formulation Comprising Leaf Extract of *Murraya koenigii* and Olive Oil. *Brazilian Journal of Biology*, **82**:1–7.

UNIVERSITAS
GADJAH MADA
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Mustanir, M., Al-Qarana, T.R., Gusvianna, H., dan Saidi, N., 2019. Analisa Potensi Ekstrak Daun Kari (*Murraya koenigii* L. Spreng). *Talenta Conference Series: Science and Technology*, **2**:1–8.

Nagappan, T., Ramasamy, P., Wahid, E., Chandra, T., dan Vairappan, C., 2011. Biological Activity of Carbazole Alkaloids and Essential Oil of *Murraya koenigii* Against Antibiotic Resistant Microbes and Cancer Cell Lines. *Molecules*, **16**:9651–9664.

Nagappan, T., Segaran, T.C., Wahid, M.E.A., Ramasamy, P., dan Vairappan, C.S., 2012. Efficacy of Carbazole Alkaloids, Essential Oil, and Extract of *Murraya koenigii* in Enhancing Subcutaneous Wound Healing in Rats. *Molecules*, **17**:14449–14463.

Najmi, A., Javed, S.A., Al Bratty, M., dan Alhazmi, H.A., 2022. Modern Approaches in the Discovery and Development of Plant-Based Natural Products and Their Analogues as Potential Therapeutic Agents. *Molecules*, **27**.

Nakamura, S., Nakashima, S., Oda, Y., Yokota, N., Fujimoto, K., Matsumoto, T., dkk., 2013. Alkaloids from Sri Lankan Curry-Leaf (*Murraya koenigii*) Display Melanogenesis Inhibitory Activity: Structures of Karapinchamines A and B. *Bioorganic & Medicinal Chemistry*, **21**:1043–1049.

Nalli, Y., Khajuria, V., Gupta, S., Arora, P., Riyaz-Ul-Hassan, S., Ahmed, Z., dkk., 2016. Four New Carbazole Alkaloids from *Murraya koenigii* That Display Anti-Inflammatory and Antimicrobial Activities. *Organic & Biomolecular Chemistry*, **14**:3322–3332.

Oladokun, B.O., Omisore, O.N., Osukoya, O.A., dan Kuku, A., 2019. Anti-Nociceptive and Anti-Inflammatory Activities of *Tetracarpidium conophorum* Seed Lectin. *Scientific African*, **3**:e00073.

Pacheco-Quito, E.-M., Ruiz-Caro, R., dan Veiga, M.-D., 2020. Carrageenan: Drug Delivery Systems and Other Biomedical Applications. *Marine Drugs*, **18**.

Paglia, M.D.G., Silva, M.T., Lopes, L.C., Barberato-Filho, S., Mazzei, L.G., Abe, F.C., dkk., 2021. Use of Corticoids and Non-Steroidal Antiinflammatories

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

in the Treatment of Rheumatoid Arthritis: Systematic Review and Network Meta-Analysis. *PLoS ONE*, **16**.

Panchal, N.K., dan Sabina, E.P., 2023. Non-Steroidal Anti-Inflammatory Drugs (NSAIDs): A Current Insight into Its Molecular Mechanism Eliciting Organ Toxicities. *Food and Chemical Toxicology*, **172**:113598.

Pande, M.S., dan Gupta, S.P., 2009. Hepatoprotective Activity of Spices. *International Journal of Science and Research*, **6**:764–766.

Panezai, J., dan Van Dyke, T.E., 2022. Resolution of Inflammation: Intervention Strategies and Future Applications. *Toxicology and Applied Pharmacology*, **449**:116089.

Parithy, M.T., Mohd Zin, Z., Mamat, H., Rusli, N.D., Smedley, K.L., dan Zainol, K., 2021. Antioxidant Properties of *Murraya koenigii*: A Comparative Study of Three Different Extraction Methods. *Food Research*, **5**:43–49.

Patil, K.R., Mahajan, U.B., Unger, B.S., Goyal, S.N., Belemkar, S., Surana, S.J., dkk., 2019. Animal Models of Inflammation for Screening of Anti-Inflammatory Drugs: Implications for the Discovery and Development of Phytopharmaceuticals. *International Journal of Molecular Sciences*, **20**.

Patil, R., 2018. Anti-Inflammatory Activity of Alkaloids from *Murraya koenigii* Leaves in Animal Models. *Journal of Pharmaceutical Sciences*, **4**:635–644.

Phatak, R., dan Datkhile, K., 2021. Antioxidant Activity of *Murraya koenigii* Leaves Methanolic and Aqueous Extracts on Oxidative Stress in High Fat–Fructose Fed Rats. *Journal of Food Biochemistry*, **45**.

Posadas, I., Bucci, M., Roviezzo, F., Rossi, A., Parente, L., Sautebin, L., dkk., 2004. Carrageenan-Induced Mouse Paw Oedema Is Biphasic, Age-Weight Dependent and Displays Differential Nitric Oxide Cyclooxygenase-2 Expression. *British Journal of Pharmacology*, **142**:331–338.

Prasad, G., Dua, V., dan Mathur, A., 2011. Anti-Inflammatory Activity of Leaves Extracts of *Murraya koenigii* L. *International Journal of Pharmaceutical and Biological Sciences*, **2**.

Pratibha, G., dan Shalini, T., 2022. Pharmacological Activities of *Murraya koenigii* Leaves. *International Journal of Current Science*, **12**:78–83.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Pundarikakshudu, K., 2019. Chapter 4 – Antiinflammatory and Antiarthritic Activities of Some Foods and Spices. Dalam: Watson, R.R., dan Preedy, V.R. (eds.), *Bioactive Food as Dietary Interventions for Arthritis and Related Inflammatory Diseases* (Second Edition). Academic Press, **4**:51–68.

Ramsewak, R.S., Nair, M.G., Strasburg, G.M., DeWitt, D.L., dan Nitiss, J.L., 1999. Biologically Active Carbazole Alkaloids from *Murraya koenigii*. *Journal of Agricultural and Food Chemistry*, **47**:444–447.

Rana, A., dan Yamini, 2022. Antimicrobial Properties and Phytochemical Analysis of Different Extracts of *Murraya koenigii*. *Journal of Pharmacognosy and Phytochemistry*, **11**:1–6.

Reifen, R., Karlinsky, A., Stark, A.H., Berkovich, Z., dan Nyska, A., 2015. α-Linolenic Acid (ALA) Is an Anti-Inflammatory Agent in Inflammatory Bowel Disease. *The Journal of Nutritional Biochemistry*, **26**:1632–1640.

Reisch, J., O, G., Wickramasinghe, A., Herath, H., dan Henkel, G., 1992. Carbazole Alkaloids from Seeds of *Murraya koenigii*. *Phytochemistry*, **31**:2877–2879.

Ribeiro Souto, G., Queiroz, C.M., Nogueira Guimarães De Abreu, M.H., Oliveira Costa, F., dan Alves Mesquita, R., 2014. Pro-Inflammatory, Th1, Th2, Th17 Cytokines and Dendritic Cells: A Cross-Sectional Study in Chronic Periodontitis. *PLoS ONE*, **9**.

Rose-John, S., 2020. Interleukin-6 Signalling in Health and Disease. *F1000Research*, **9**.

Roy, S., dan Chakraborty, D., 1974. Mahanimbine from *Murraya koenigii* Spreng. *Phytochemistry*, **13**:2893.

Sakarkar, D., SV, T., dan BH, M., 2017. Twenty-Eight Days Repeated Dose Toxicity Study of Ethanolic Extract of *Murraya koenigii* in Wistar Rats. *Annals of Pharmacology and Pharmaceutics*, **2**:1047.

Salman, R.S., Azeez, B.A.M.A., Munshid, M.C., dan Al-Fahham, A.A., 2024. Inflammatory Response and Pathophysiology of IL-6 Overproduction: A Review Article. *International Journal of Health & Medical Research*, **3**:568–572.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Salwe, J.K., Mirunalini, R., Mano, J., dan Manimekalai, K., 2018. Evaluation of Analgesic Activity of *Murraya koenigii* and *Coriandrum sativum* Leaves Extract in Animal Model. *Asian Journal of Pharmaceutical and Clinical Research*, **11**:328–331.

Samuel, S., Nguyen, T., dan Choi, H.A., 2017. Pharmacologic Characteristics of Corticosteroids. *Journal of Neurocritical Care*, **10**:53–59.

Sandamali, J.A.N., Hewawasam, R.P., Jayatilaka, K.A.P.W., dan Mudduwa, L.K.B., 2020. Cardioprotective Potential of *Murraya koenigii* (L.) Spreng Leaf Extract against Doxorubicin-Induced Cardiotoxicity in Rats. *Evidence-Based Complementary and Alternative Medicine*, **2020**:6023737.

Sant'ana, L., Ferreira, A., Lorenzon, M., Berbara, R., dan Nora Castro, R., 2014. Correlation of Total Phenolic and Flavonoid Contents of Brazilian Honeys with Colour and Antioxidant Capacity. *International Journal of Food Properties*, **17**.

Santoru, M.L., Piras, C., Murgia, F., Spada, M., Tronci, L., Leoni, V.P., dan dkk. 2020, Modulatory Effect of Nicotinic Acid on the Metabolism of Caco-2 Cells Exposed to IL-1β and LPS, *Metabolites*, **10**:1–11.

Satyavarapu, E.M., Sinha, P.K., dan Mandal, C. 2020, Preclinical Development of Mahanine-Enriched Fraction from Indian Spice *Murraya koenigii* for the Management of Cancer: Efficacy, Temperature/pH Stability, Pharmacokinetics, Acute and Chronic Toxicity Studies, *BioMed Research International*, **2020**:Article number.

Shi, Y. 2010, Caught Red-Handed: Uric Acid Is an Agent of Inflammation, *Journal of Clinical Investigation*, **120**:1809–1811.

Singh, A., Singh, A., Chouhan, O., Tandi, G.P., Dua, M., dan Gehlot, A. 2016, Anti-Inflammatory and Analgesic Activity of Aqueous Extracts of Dried Leaves of *Murraya koenigii* Linn., *National Journal of Physiology, Pharmacy and Pharmacology*, **6**:286–290.

Simpson, J. dan Kelly, J.P. 2012, An Investigation of Whether There Are Sex Differences in Certain Behavioural and Neurochemical Parameters in the Rat, *Behavioural Brain Research*, **229**:289–300.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Singh, A., Singh, A., Chouhan, O., Tandi, G.P., Dua, M., dan Gehlot, A. 2016, Anti-Inflammatory and Analgesic Activity of Aqueous Extracts of Dried Leaves of *Murraya koenigii* Linn., *National Journal of Physiology, Pharmacy and Pharmacology*, **6**:286–290.

Sriram, K., Vishnupriya, V., Ponnulakshmi, R., Gayathri, R., Madhan, K., Shyamaladevi, B., dan dkk. 2019a, Anti-Inflammatory Activity of *Murraya koenigii*: An In Vitro Study, *Drug Invention Today*, **11**:2384–2386.

Sriram, K., Vishnupriya, V., Rajagopal, P., Gayathri, R., Krishnan, M., Shyamaladevi, B., dan dkk. 2019b, Anti-Inflammatory Activity of *Murraya koenigii*: An In Vitro Study, *Drug Invention Today*, **11**:2384–2386.

Sun, H., Huo, Y., dan Fan, Z. 2021, Editorial: Imaging and Mechanism of Leukocyte Recruitment and Function in Inflammation and Infections, *Frontiers in Cell and Developmental Biology*, **9**:1–5.

Syamimi, N., Azahan, M., Mani, V., Ramasamy, K., Lim, S.M., Alhowail, A., Sajid, S., Bakar, A., dan Majeed, A. 2019, Neuroprotective Potential of Mahanimbine against Lipopolysaccharides (LPS)-Induced Neuronal Deficits on SK-N-SH Cells and Antioxidant Potentials in ICR Mice Brain, *Journal of Pharmaceutical Research International*, **31**:1–11.

Tachibana, Y., Kikuzaki, H., Lajis, N.H., dan Nakatani, N. 2001, Antioxidative Activity of Carbazoles from *Murraya koenigii* Leaves, *Journal of Agricultural and Food Chemistry*, **49**:5589–5594.

Tan, G., Gyllenhaal, C., dan Soejarto, D. 2006, Biodiversity as a Source of Anticancer Drugs, *Current Drug Targets*, **7**:265–277.

Tan, M.A., Sharma, N., dan An, S.S.A. 2022, Phyto-Carbazole Alkaloids from the Rutaceae Family as Potential Protective Agents against Neurodegenerative Diseases, *Antioxidants*, **11**:493.

Theafelicia, Z. dan Narsito, S.W. 2023, Perbandingan Berbagai Metode Pengujian Aktivitas Antioksidan (DPPH, ABTS dan FRAP) pada Teh Hitam (*Camellia sinensis*), *Jurnal Teknologi Pertanian*, **24**:35–44.

Tripathi, Y., Anjum, N., dan Rana, A. 2018, Chemical Composition and In Vitro Antifungal and Antioxidant Activities of Essential Oil from *Murraya*

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

koenigii (L.) Spreng. Leaves, *Asian Journal of Biomedical and Pharmaceutical Sciences*, **8**:6–13.

Tsumoto, K. dan Takeuchi, T. 2024, Next-Generation Anti-TNFα Agents: The Example of Ozoralizumab, *BioDrugs*, **38**:341–351.

Turner, M.D., Nedjai, B., Hurst, T., dan Pennington, D.J. 2014, Cytokines and Chemokines: At the Crossroads of Cell Signalling and Inflammatory Disease, *Biochimica et Biophysica Acta – Molecular Cell Research*, **1843**:2563–2582.

Ullah, A., Munir, S., Badshah, S.L., Khan, N., Ghani, L., Poulson, B.G., dan dkk. 2020, Important Flavonoids and Their Role as a Therapeutic Agent, *Molecules*, **25**.

Umapathy, D., Bhuminathan, S., dan Shankar, P. 2021, Anti-Diabetic Activity of *Murraya koenigii*: A Comprehensive Review, *Journal of Pharmaceutical Research International*, **33**:462–470.

Utaipan, T., Athipornchai, A., Suksamrarn, A., Jirachotikoon, C., Yuan, X., Lertcanawanichakul, M., dan dkk. 2017, Carbazole Alkaloids from *Murraya koenigii* Trigger Apoptosis and Autophagic Flux Inhibition in Human Oral Squamous Cell Carcinoma Cells, *Journal of Natural Medicines*, **71**:158–169.

Varela, M.L., Mogildea, M., Moreno, I., dan Lopes, A. 2018, Acute Inflammation and Metabolism, *Inflammation*, **41**:1115–1127.

Vasavi, Y., Parthiban, N., Dinakaran, S., Banji, D., Srisutherson, N., Ghosh, S., dan dkk. 2011, Heteronuclear Multiple Bond Correlation Spectroscopy—An Overview, *International Journal of PharmTech Research*, **3**.

Venkata, B.R., Samuela, L.A., Pardha, S.M., Narashima, R.B., Naga, V.K.A., Sudhakar, M., dan dkk. 2012, Academic Sciences: Asian Journal of Pharmaceutical and Clinical Research, *Asian Journal of Pharmaceutical and Clinical Research*, **5**:99–106.

Venkatachalapathy, Y., Ganapathy, B., Packirisamy, S., Nachiyar, V., dan Subramanyan, H. 2025, Evaluation of Anti-Inflammatory Activity of

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Synthetic Derivatives in Carrageenan-Induced Paw Edema Model, *Journal of Rare Cardiovascular Diseases*, **5**:971–976.

Vishwakarma, R. 2022, The Development of COX-1 and COX-2 Inhibitors: A Review, *International Journal of Pharmaceutical Sciences and Research*, **11**:3544–3555.

Viteritti, E., Oliva, E., Eugelio, F., Fanti, F., Palmieri, S., Bafile, E., dan dkk. 2022, Analysis of Carbazole Alkaloids in *Murraya koenigii* by Means of High Performance Liquid Chromatography Coupled to Tandem Mass Spectrometry with a Predictive Multi-Experiment Approach, *Journal of Chromatography Open*, **2**:100055.

Wang, Y., Liu, Z., Shen, P., Zhao, C., Liu, B., Shu, C., dan dkk. 2022, Kynurenic Acid Ameliorates Lipopolysaccharide-Induced Endometritis by Regulating the GPR35/NF-κB Signaling Pathway, *Toxicology and Applied Pharmacology*, **438**:115907.

Wautier, J.-L. dan Wautier, M.-P. 2023, Pro- and Anti-Inflammatory Prostaglandins and Cytokines in Humans: A Mini Review, *International Journal of Molecular Sciences*, **24**.

Wen, H., Ting, J.P.-Y., dan O'Neill, L.A.J. 2012, A Role for the NLRP3 Inflammasome in Metabolic Diseases—Did Warburg Miss Inflammation?, *Nature Immunology*, **13**:352–357.

Yam, M.F., Loh, Y.C., Oo, C.W., dan Basir, R. 2020, Overview of Neurological Mechanism of Pain Profile Used for Animal "Pain-Like" Behavioral Study with Proposed Analgesic Pathways, *International Journal of Molecular Sciences*, **21**.

Yang, B., Zheng, C.-Y., Zhang, R., Zhao, C., Li, S., dan An, Y. 2021, Quercetin Efficiently Alleviates TNF-α-Stimulated Injury by Signal Transducer and Activator of Transcription 1 and Mitogen-Activated Protein Kinase Pathway in H9c2 Cells: A Protective Role of Quercetin in Myocarditis, *Journal of Cardiovascular Pharmacology*, **77**:570–577.

UNIVERSITAS
GADJAH MADA
Aktivitas antiinflamasi dan isolasi senyawa aktif dari Murraya koenigii (l.) Spreng. serta kajian mekanisme penghambatan COX dan sitokin proinflamasi
Yuvianti Dwi Franyoto, Prof. Dr. rer. nat. apt. Nanang Fakhrudin, M.Si.; Prof. Dr. apt. Arief Nurrochmad, M.Si., M.Sc.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Yu, L., Haley, S., Perret, J., Harris, M., Wilson, J., dan Qian, M. 2002, Free Radical Scavenging Properties of Wheat Extracts, *Journal of Agricultural and Food Chemistry*, **50**:1619–1624.

Zarghi, A. dan Arfaei, S. 2011, Selective COX-2 Inhibitors: A Review of Their Structure-Activity Relationships, *Iranian Journal of Pharmaceutical Research*, **10**:655–683.

Zhang, X., Wu, X., Hu, Q., Wu, J., Wang, G., Hong, Z., dan dkk. 2019, Mitochondrial DNA in Liver Inflammation and Oxidative Stress, *Life Sciences*, **236**.

Zhong, J. dan Shi, G. 2019, Editorial: Regulation of Inflammation in Chronic Disease, *Frontiers in Immunology*, **10**:1–2.

Zhu, X., Wang, B., Zhang, X., Chen, X., Zhu, J., Zou, Y., dan dkk. 2020, Alpha-Linolenic Acid Protects against Lipopolysaccharide-Induced Acute Lung Injury through Anti-Inflammatory and Anti-Oxidative Pathways, *Microbial Pathogenesis*, **142**:104077.

Zielińska, D., Zieliński, H., Laparra-Llopis, J.M., Szawara-Nowak, D., Honke, J., dan Giménez-Bastida, J.A. 2021, Caffeic Acid Modulates Processes Associated with Intestinal Inflammation, *Nutrients*, **13**:1–15.

Zotova, N., Zhuravleva, Y., Chereshnev, V., dan Gusev, E. 2023, Acute and Chronic Systemic Inflammation: Features and Differences in the Pathogenesis, and Integral Criteria for Verification and Differentiation, *International Journal of Molecular Sciences*, **24**.