

DAFTAR PUSTAKA

- Abdelfatah, A., Fawzy, M., El-Khouly, M.E. dan Eltaweil, A.S., 2021. Efficient Adsorptive Removal of Tetracycline from Aqueous Solution Using Phytosynthesized Nano-Zero Valent Iron. *J. Saudi Chem. Soc.* 25, 1–12. doi: 10.3390/ijerph18105115.
- Abdillah, H., Baharits, M., Abidin, R. dan Biantoro, F.R., 2022. Sintesis Pernis Nanopartikel Perak Anti Mikroba dengan Bioreduktor Daun Kelor (*Moringa olififera*). *J. Kim. Reka.* 2(2), 84–93. doi: 10.31001/jkireka.v2i2.38.
- Abriyanto, H., Susanto, H., Maharani, T., Filardli, A.M.I., Desiriani, R. dan Aryanti, N., 2022. Synergistic Effect of Chitosan and Metal Oxide Additives on Improving the Organic and Biofouling Resistance of Polyethersulfone Ultrafiltration Membranes. *ACS Omega* 7(50), 46066–46078. doi: 10.1021/acsomega.2c03685.
- Aguayo, P.R., Larenas, T.B., Godoy, C.A., Rivas, B.C., González-Casanova, J., Rojas-Gómez, D. et al., 2020. Antimicrobial and Antibiofilm Capacity of Chitosan Nanoparticles against Wild Type Strain of *Pseudomonas* sp. Isolated from Milk of Cows Diagnosed with Bovine Mastitis. *Antibiotics* 9(9), 1–15. doi: 10.3390/antibiotics9090551.
- Agustina, T.E., Handayani, W. dan Imawan, C., 2021. The UV-Vis Spectrum Analysis from Silver Nanoparticles Synthesized Using *Diospyros maritima* Blume. Leaves Extract. *Adv. Biol. Sci. Res.* 14, 411-419. doi: 10.2991/abstr.k.210621.070.
- Aliasghari, A., Khorasgani, M.R., Vaezifar, S., Rahimi, F., Younesi, H. dan Khoroushi, M., 2016. Evaluation of Antibacterial Efficiency of Chitosan and Chitosan Nanoparticles on Cariogenic Streptococci: An In Vitro Study. *Iran J. Microbiol* 8(2), 93–100.
- Al-Mousawi, H.T.M. dan Al-Janabi, N.H., 2021. Anti-biofilm Effects and Substantively Properties of Magnetic Iron Oxide Nanoparticles Synthesized Against Clinical Isolates for MDR *Acinetobacter baumannii* and Related with Expression Gene. *J. Genet. Environ. Resour. Conserv.* 9(1), 122–133.
- Alves-Barroco, C., Paquete-Ferreira, J., Santos-Silva, T. dan Fernandes, A.R., 2020. Singularities of Pyogenic Streptococcal Biofilms—From Formation to Health Implication. *Front. Microbiol.* 11, 1–22. doi: 10.3389/fmicb.2020.584947.
- Ansari, A., Siddiqui, V.U., Akram, M.K., Siddiqi, W.A., Khan, A., Al-Romaizan, A.N. et al., 2022. Synthesis of Atmospherically Stable Zero-Valent Iron Nanoparticles (nZVI) for the Efficient Catalytic Treatment of High-Strength Domestic Wastewater. *Catalysts* 12(1), 1–16. doi: 10.3390/catal12010026.
- Azad, A., Zafar, H., Raza, F. dan Sulaiman, M., 2023. Factors Influencing the Green Synthesis of Metallic Nanoparticles Using Plant Extracts: A Comprehensive Review. *Pharma. Fronts* 5(3), 117–131. doi: 10.1055/s-0043-1774289.

- Bharti, S., 2019. A Critical Review on Flocculants and Flocculation. *Non-Metallic Mater. Sci.* 1(1): 11–21. doi: 10.30564/nmms.v1i1.645.
- Bianchera, A., Buttini, F. dan Bettini, R., 2020. Micro/Nanosystems and Biomaterials for Controlled Delivery of Antimicrobial and Antibiofilm Agents. *Expert Opin. Ther. Pat.* 1–42. doi: 10.1080/13543776.2020.1839415.
- Bua, A.R.R., 2024. Sintesis dan Karakterisasi Nanopartikel Ag-Cd dengan Ekstrak Air Batang Sidaguri (*Sida rhombifolia* L.) sebagai Bioreduktor serta Aplikasinya sebagai Antibakteri. Skripsi tidak diterbitkan, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Hasanuddin, Makassar.
- Cai, Y. dan Lapitsky, Y., 2020. Biomolecular Uptake Effects on Chitosan/Tripolyphosphate Micro- and Nanoparticle Stability. *Colloids Surf. B Biointerfaces* 193, 1–9. doi: 10.1016/j.colsurfb.2020.111081.
- Caroff, M. dan Novikov, A., 2020. Lipopolysaccharides: Structure, Function and Bacterial Identification. *OCL* 27(31), 1–10. doi: 10.1051/ocl/2020025.
- Chen, B., Chen, Y., Cao, Y., Huang, J., Chen, X. dan Pan, X., 2024. Collaboratively Scavenge Tetracycline and Cu^{2+} From Their Combined System by Fe^{3+} -Modified Magnetic Chitosan: Performance, Mechanisms and Dynamic Sorption Process. *Chem. Eng. J.* 484, 1–14. doi: 10.1016/j.cej.2024.149625.
- Chikada, T., Kanai, T., Hayashi, M., Kasai, T., Oshima, T. dan Shiomi, D., 2021. Direct Observation on Conversion from Walled Cells to Wall-Deficient L-Form and Vice Versa in *Escherichia coli* Indicates the Essentiality of the Outer Membrane for Proliferation of L-Form Cells. *Front. Microbiol.* 12, 1–15. doi: 10.3389/fmicb.2021.645965.
- Confederat, L.G., Tuchilus, C.G., Dragan, M., Sha'at, M. dan Dragostin, O.M., 2021. Preparation and Antimicrobial Activity of Chitosan and Its Derivatives: A Concise Review. *Molecules* 26(12), 1–17. doi: 10.3390/molecules26123694.
- Costa, E.M., Silva, S., Vicente, S., Veiga, M., Tavaría, F. dan Pintado, M.M., 2017. Chitosan as An Effective Inhibitor of Multidrug Resistant *Acinetobacter baumannii*. *Carbohydr. Polym.* 178, 347–351. doi: 10.1016/j.carbpol.2017.09.055.
- Cuana, R., Panre, A.M., Istiqomah, N.I., Tumbelaka, R.M., Sunaryono, Wicaksono, S.T. et al., 2022. Green Synthesis of Fe_3O_4 /Chitosan Nanoparticles Utilizing *Moringa Oleifera* Extracts and Their Surface Plasmon Resonance Properties. *JSS* 11(8), 1–22. doi: 10.1149/2162-8777/ac8b36.
- Dada, A.O., Adekola, F.A., Odebunmi, E.O., Ogunlaja, A.S. dan Bello, O.S., 2021. Two-Three Parameters Isotherm Modeling, Kinetics with Statistical Validity, Desorption and Thermodynamic Studies of Adsorption of Cu(II) Ions onto Zerovalent Iron Nanoparticles. *Sci. Rep.* 11, 1–15. doi: 10.1038/s41598-021-95090-8.

- Dastidar, M.G., Niveditha, B. dan Pooja, 2020. Effects of Green Iron Nanoparticles on Biofilm-Forming Bacteria. *Asian J. Pharm. Clin. Res.* 13(6), 93–97. doi: 10.22159/ajpcr.2020.v13i11.37632.
- Dhevishri, S., Parameswari, B.D., Hariharan, A., Shankar, M.S.S. dan Kumar, S.R., 2023. Antimicrobial Properties of Green Synthesized Silver and Chitosan Nanocomposites. *Bioinformation* 19(6), 745–748. doi: 10.6026/97320630019745.
- Dincer, S., Uslu, F.M. dan Delik, A., 2020. Antibiotic Resistance in Biofilm. *TechOpen*, 9, 1–14. doi: 10.5772/intechopen.92388.
- El-Naggar, N.E., Shiha, A.M., Mahrous, H. dan Mohammed, A.B.A., 2022. Green Synthesis of Chitosan Nanoparticles, Optimization, Characterization and Antibacterial Efficacy Against Multi Drug Resistant Biofilm-Forming *Acinetobacter baumannii*. *Sci. Rep* 12, 1–19. doi: 10.1038/s41598-022-24303-5.
- Elnouby, M.S., Taha, T.H., Abu-Saied, M.A., Alamri, S.A., Mostafa, Y.S.M. dan Hashem, M., 2021. Green and Chemically Synthesized Magnetic Iron Oxide Nanoparticles-Based Chitosan Composites: Preparation, Characterization, and Future Perspectives. *J. Mater. Sci: Mater. Electron.* 32, 10587–10599. doi: 10.1007/s10854-021-05715-x.
- Eskikaya, O., Özdemir, S., Gonca, S., Dizge, N., Balakrishnan, D., Shaik, F. et al., 2023. A Comparative Study of Iron Nanoflower and Nanocube in Terms of Antibacterial Properties. *Appl. Nanosci.* 13, 1–13. doi: 10.1007/s13204-023-02822-5.
- Fahmy, T. dan Sarhan, A., 2021. Characterization and Molecular Dynamic Studies of Chitosan-Ion Complexes. *Bull. Mater. Sci.* 44(142), 1–10. doi: 10.1007/s12034-021-02434-1.
- Far, B.F., Naimi-Jamal, M.R., Jahanbakhshi, M., Hadizadeh, A., Dehghan, S. dan Hadizadeh, S., 2024. Enhanced Antibacterial Activity of Porous Chitosan-Based Hydrogels Crosslinked with Gelatin and Metal Ions. *Sci. Rep.* 14, 1–15. doi: 10.1038/s41598-024-58174-9.
- Franco, D., Calabrese, G., Guglielmino, S.P.P. dan Conoci, S., 2022. Metal-Based Nanoparticles: Antibacterial Mechanisms and Biomedical Application. *Microorganisms* 10(9), 1–22. doi: 10.3390/microorganisms10091778.
- Garcia-Ivars, J., Corbaton-Baguena, M. dan Iborra-Clar, M., 2019. Development of Mixed Matrix Membranes: Incorporation of Metal Nanoparticles in Polymeric Membranes. Dalam: Thomas, S., Pasquini, D., Leu, S. dan Gopakumar, D.A. (eds.) *Nanoscale Materials in Water Purification*. Elsevier, Amsterdam, pp. 153–178. doi: 10.1016/B978-0-12-813926-4.00011-2.

- Gedefie, A., Demsis, W., Ashagrie, M., Kassa, Y., Tesfaye, M., Tilahun, M. et al., 2021. *Acinetobacter baumannii* Biofilm Formation and Its Role in Disease Pathogenesis: A Review. *Infect. Drug. Resist.* 14, 3711–3719. doi: 10.2147/IDR.S332051.
- Govindan, R., Chackaravarthi, G., Ramachandran, G., Chelliah, C.K., Muthuchamy, M., Quero, F. et al., 2022. Effective Removal of Biofilm Formation in *Acinetobacter baumannii* using Chitosan Nanoparticles Loaded Plant Essential Oils. *J. King Saud Uni. Sci.* 34(3), 1–8. doi: 10.1016/j.jksus.2022.101845.
- Guarnieri, A., Triunfo, M., Scieuzo, C., Ianniciello, D., Tafi, E., Hahn, T. et al., 2022. Antimicrobial Properties of Chitosan from Different Developmental Stages of the Bioconverter Insect *Hermetia illucens*. *Sci. Rep.* 12(1), 1–12. doi: 10.1038/s41598-022-12150-3.
- Huang, D., Ren, Z., Li, X. dan Jing, Q., 2021. Mechanism of Stability and Transport of Chitosan-Stabilized Nano Zero-Valent Iron in Saturated Porous Media. *Int. J. Environ. Res. Public Health* 18(10), 1–16. doi: 10.3390/ijerph18105115.
- Hussain, M.H., Bakar, N.F.A., Mustapa, A.N., Low, K., Othman, N.H. dan Adam, F., 2020. Synthesis of Various Size Gold Nanoparticles by Chemical Reduction Method with Different Solvent Polarity. *Nanoscale. Res. Lett.* 15(1), 1–10. doi: 10.1186/s11671-020-03370-5.
- Isnaeni, 2017. Aggregation Effect on Absorbance Spectrum of Laser Ablated Gold Nanoparticles. *J. Phys.: Conf. Ser.* 817, 1–8. doi: 10.1088/1742-6596/817/1/012039.
- Jongwachirachai, P. dan Jiemvarangkul, P., 2021. Effects of Nano-Scale Zero Valent Iron Fresh and Aged Particles on Environmental Microbes. *Environ. Nat. Resour.* 19(5), 381–390. doi: 10.32526/enrj/19/202100031.
- Kanchi, S. dan Ahmed, S., 2018. *Synthesis, Characterization and Their Applications.* Wiley, Massachusetts.
- Kang, X., Yang, X., He, Y., Guo, C., Li, Y., Ji, H. et al., 2023. Strategies and Materials for the Prevention and Treatment of Biofilms. *Mater. Today Bio* 23, 1–20. doi: 10.1016/j.mtbio.2023.100827.
- Kasim, S., Taba, P., Ruslan dan Romianto, 2020. Sintesis Nanopartikel Perak Menggunakan Ekstrak Daun Eceng Gondok (*Eichornia crassipes*) sebagai Bioreduktor. *KOVALEN: J. Ris. Kim.* 6(2), 126–133. doi: 10.22487/kovalen.2020.v6.i2.15137.
- Kaur, R., Kaur, K., Alyami, M.H., Lang, D.K., Saini, B., Bayan, M.F. et al., 2023. Combating Microbial Infections Using Metal-Based Nanoparticles as Potential Therapeutic Alternatives. *Antibiotics* 12(5), 1–17. doi: 10.3390/antibiotics12050909.

- Kazemi, S., Hosseingholian, A., Gohari, S.D., Feirahi, F., Moammeri, F., Meshabian, G. Et al., 2023. Recent Advances in Green Synthesized Nanoparticles: From Production to Application. *Mater. Today Sustain.* 24, 1–22. doi: 10.1016/j.mtsust.2023.100500.
- Ke, C., Deng, F., Chuang, C. dan Lin, C., 2021. Antimicrobials Actions and Applications of Chitosan. *Polymers* 13(6), 1–21. doi: 10.3390/polym13060904.
- Khalir, W.K.A.W.M., Shameli, K., Jazayeri, S.D., Othman, N.A., Jusoh, N.W.C. dan Hassan, N.M., 2020. Biosynthesized Silver Nanoparticles by Aqueous Stem Extract of *Entada spiralis* and Screening of Their Biomedical Activity. *Front. Chem.* 8, 1–15. doi: 10.3389/fchem.2020.00620.
- Kim, Y., Son, H., Park, S., Lee, J., Jang, M. dan Lee, J.R., 2023. Antibiofilm Effects of Rationally Designed Peptides Against Planktonic Cells and Pre-Formed Biofilm of *Pseudomonas aeruginosa*. *Antibiotics* 12(2), 1–12. doi: 10.3390/antibiotics12020349.
- Kining, E., Firdiani, D., Sogandi, Aminullah dan Asma, S., 2022. Aktivitas Antibakteri dan Antibiofilm Ekstrak Air Daun Melinjo terhadap Bakteri *Pseudomonas aeruginosa*. *INRPJ* 7(1), 19–31. doi: 10.52447/inrpj.v7i1.5901.
- Kou, S.G., Peters, L. dan Mucalo, M., 2022. Chitosan: A Review of Molecular Structure, Bioactivities and Interactions with the Human Body and Microorganisms. *Carbohydr. Polym.* 282, 1–15. doi: 10.1016/j.carbpol.2022.119132.
- Lange., A., Grzenia, A., Wierzbicki, M., Strojny-Cieslak, B., Kalińska, A., Gołębiwski, M. et al., 2021. Silver and Copper Nanoparticles Inhibit Biofilm Formation by Mastitis Pathogens. *Animals* 11(7), 1–11. doi: 10.3390/ani11071884.
- Lázár, I. dan Szabó, H.J., 2018. Prevention of the Aggregation of Nanoparticles during the Synthesis of Nanogold-Containing Silica Aerogels. *Gels* 4(2), 1–9. doi: 10.3390/gels4020055.
- Luthfiyana, N., Bija, S., Anwar, E., Laksmiawati, D.R. dan Rosalinda, G.L., 2022. Characteristics and Activity of Chitosan from Mud Crab Shells on Acne Bacteria: *Staphylococcus aureus*, *S. epidermidis* and *Propionibacterium acnes*. *Biodiversitas* 23(12), 6645–6651. doi: 10.13057/biodiv/d231263.
- Makabenta, J.M.V., Nabawy, A., Li, C.H., Schmidt-Malan, S., Patel, R. dan Rotello, V.M., 2021. Nanomaterial-Based Therapeutics for Antibiotic-Resistant Bacterial Infections. *Nat. Rev. Microbiol.* 19, 23–36. doi: 10.1038/s41579-020-0420-1.
- Malaekeh-Nikouei, B., Bazzaz, B.S.F., Mirhadi, E., Tajani, A.S. dan Khameneh, B., 2020. The Role of Nanotechnology in Combating Biofilm-Based Antibiotic Resistance. *J. Drug Deliv. Sci. Technol.* 60, 1–15. doi: 10.1016/j.jddst.2020.101880.

- Mamera, M., Tol, J.J., Aghoghovwia, M.P. dan Kotze, E., 2020. Sensitivity and Calibration of the FT-IR Spectroscopy on Concentration of Heavy Metal Ions in River and Borehole Water Sources. *Appl. Sci.* 10(21), 1–16. doi: 10.3390/app10217785.
- Maninkandan, A. dan Sathiyabama, M., 2015. Green Synthesis of Copper-Chitosan Nanoparticles and Study of Its Antibacterial Activity. *J. Nanomed. Nanotechnol.* 6(1), 1–5. doi: 10.4172/2157-7439.1000251.
- Menichetti, A., Mavridi-Printezi, A., Mordini, D. dan Montalti, M., 2023. Effect of Size, Shape and Surface Functionalization on the Antibacterial Activity of Silver Nanoparticles. *J. Funct. Biomater.* 14(5), 1–21. doi: 10.3390/jfb14050244.
- Messaoudi, O. dan Bendahou, M., 2020. Biological Synthesis of Nanoparticles Using Endophytic Microorganisms: Current Development, *Nanotechnol. Environ.* 12, 1–20. doi: 10.5772/intechopen.93734.
- Miao, J., Lin, S., Soteyome, T., Peters, B.M., Li, Y, Chen, H. et al., 2019. Biofilm Formation of *Staphylococcus aureus* under Food Heat Processing Conditions: First Report on CML Production within Biofilm. *Sci. Rep.* 9(1), 1–9. doi: 10.1038/s41598-018-35558-2.
- Mirda, E., Idroes, R., Khairan, K., Tallei, T.E., Ramli, M., Earlia, N. et al., 2021. Synthesis of Chitosan-Silver Nanoparticles Composite Spheres and Their Antimicrobial Activities. *Polymers* 13(22), 1–13. doi: 10.3390/polym13223990.
- Mishra, S., Gupta, A., Upadhye, V., Singh, S.C., Sinha, R.P. dan Hader, D., 2023. Therapeutic Strategies Against Biofilm Infections. *Life* 13(1), 1–24. doi: 10.3390/life13010172.
- Mohaidin, N.L.M., Aris, F., Amin, I.M. dan Zain, N., 2022. Antibiofilm Property of Green Synthesized Iron Oxide Nanoparticles from Neem Leaves. *JSSM* 17(3), 279–290. doi: 10.46754/jssm.2022.03.021.
- Mohanta, Y.K., Chakrabarty, I., Mishra, A.K., Chopra, H., Mahanta, S., Avula, S.K. et al., 2023. Nanotechnology in Combating Biofilm: A Smart and Promising Therapeutic Strategy. *Front. Microbiol.* 13, 1–30. doi: 10.3389/fmicb.2022.1028086.
- Mondal, P.A., Aweshan, A. dan Purkait, M.K., 2020. Green Synthesis and Environmental Application of Iron-Based Nanomaterials and Nanocomposite: A Review. *Chemosphere* 259. doi: 10.1016/j.chemosphere.2020.127509.
- Mondal, S.K., Chakraborty, S., Manna, S. dan Mandal S.M., 2024. Antimicrobial Nanoparticles: Current Landscape and Future Challenges. *RSC Pharm.* 1, 388-402. doi: 10.1039/D4PM00032C.
- Muthmainnah, A., 2019. Potensi Antibakteri Nanopartikel Zink Sulfida Hasil Reduksi *Escherichia coli* pada Sel Planktonik dan Biofilm Bakteri. Skripsi tidak diterbitkan, Fakultas Farmasi, Universitas Hasanuddin, Makassar.

- Nalawati, A.N., Suyatma, N.E. dan Wardhana, D.I., 2021. Sintesis Nanopartikel Perak (NPAg) dengan Bioreduktor Ekstrak Biji Jarak Pagar dan Kajian Aktivitas Antibakterinya. JTIP 32(2), 98–106. doi: 10.1016/j.radphyschem.2021.109842.
- Nandiyanto, A.B.D., Ragadhita, R. dan Fiandini, M., 2023. Interpretation of Fourier Transform Infrared Spectra (FTIR): A Practical Approach in the Polymer/Plastic Thermal Decomposition. Indo. J. Sci. Technol. 8(1), 113–126. doi: 10.17509/ijost.v8i1.53297.
- Nate, Z., Moloto, M.J., Mubiayi, P.K. dan Sibiya, P.N., 2018. Green Synthesis of Chitosan Capped Silver Nanoparticles and Their Antimicrobial Activity. MRS Adv. 3, 2505–2517. doi: 10.1557/adv.2018.368.
- Naveed, M., Makhdoom, S.I., Rehman, S., Aziz, T., Ali, U., Alharbi, M. et al., 2023. Biosynthesis and Mathematical Interpretation of Zero-Valent Iron NPs Using *Nigella sativa* Seed Tincture for Indemnification of Carcinogenic Metals Present in Industrial Effluents. Molecules 28(8), 1–23. doi: 10.3390/molecules28083299.
- Park, S.Y., Sivakumar, R. dan Lee, N.Y., 2024. D-Glucose-Mediated Gold Nanoparticle Fabrication for Colorimetric Detection of Foodborne Pathogens. Biosensors 14(6), 1–12. doi: 10.3390/bios14060284.
- Peng, Q., Tang, X., Dong, W., Sun, N. dan Yuan, W., 2023. A Review of Biofilm Formation of *Staphylococcus aureus* and Its Regulation Mechanism. Antibiotics 12(1), 1–21. doi: 10.3390/antibiotics12010012.
- Phan, T.T.V., Phan, D.T., Cao, X.T., Huynh, T. dan Oh, J., 2021. Roles of Chitosan in Green Synthesis of Metal Nanoparticles for Biomedical Applications. Nanomaterials 11(2), 1–15. doi: 10.3390/nano11020273.
- Picos-Corrales, L.A., Morales-Burgos, A.M., Ruelas-Levy, J.P., Crini, G., Garcia-Armenta, E., Jimenez-Lam, S.A. et al., 2023. Chitosan as An Outstanding Polysaccharide Improving Health-Commodities of Humans and Environmental Protection. Polymers 15(3), 1–27. doi: 10.3390/polym15030526.
- Poggel, C., 2021. UV-Vis-NIR Spectroscopy for Nanomaterials Research. Wiley, Chichester.
- Pokhum, C. dan Chawengkijwanich, C., 2021. nZVI-Responsive Biofilm Production of *Pseudomonas putida* Under Mild nZVI Condition. J. Nanopart. Res. 23(147), 1–11. doi: 10.1007/s11051-021-05279-1.
- Polat, T., Soyhan, I., Cebeci, S., İldeniz, T.A.O., Gök, O., Elmas, M.A. et al., 2024. New-Generation Biofilm Effective Antimicrobial Peptides and A Real-Time Antibiofilm Activity Assay: CoMIC. Appl. Microbiol. Biotechnol. 108(1), 1–14. doi: 10.1007/s00253-024-13134-1.

- Pour, N.K., Dusane, D.H., Dhakephalkar, P.K., Zamin, F.R., Zinjarde, S.S. dan Chopade, B.A., 2011. Biofilm Formation by *Acinetobacter baumannii* Strains Isolated from Urinary Tract Infection and Urinary Catheters. FEMS Immunol. Med. Microbiol. 62, 328–338. doi: :10.1111/j.1574-695X.2011.00818.x.
- Pourbaghaei, N.Z., Anbia, M. dan Rahimi, F., 2021. Fabrication of Nano Zero Valent Iron/Biopolymer Composite with Antibacterial Properties for Simultaneous Removal of Nitrate and Humic Acid: Kinetics and Isotherm Studies. J. Polym. Environ. 30, 907–924. doi: 10.1007/s10924-021-02209-z.
- Pratama, I., Purwitasari, I., Marzuki, I. dan Mercy, 2020. Biosynthesis and Characterization of Silver Nanoparticles Using Cacao (*Theobroma cacao* L.) Skin Extract. Indo. Chimica Acta 13, 73–78. doi: 10.20956/ica.v13i2.11602.
- Rattanawongwiboon, T., Soontaranon, S., Hemvichian, K., Lertsarawut, P., Laksee, S. dan Picha, R., 2022. Study on Particle Size and Size Distribution of Gold Nanoparticles by TEM and SAXS. Radiat. Phys. Chem. 191, 1–5. doi: 10.1016/j.radphyschem.2021.109842.
- Rezazadeh, N.H., Buazar, F. dan Matroodi, S., 2020. Synergistic Effects of Combinatorial Chitosan and Polyphenol Biomolecules on Enhanced Antibacterial Activity of Biofunctionalized Silver Nanoparticles. Sci. Rep. 10, 1–13. doi: 10.1038/s41598-020-76726-7.
- Rocchetti, L., Amato, A. dan Beolchini, F., 2015. Recovery of Indium from Liquid Crsytal Displays. J. Clean. Prod. 116, 299–305. doi: 10.1016/j.jclepro.2015.12.080.
- Rohde, M., 2019. The Gram-Positive Bacterial Cell Wall. Microbiol. Spectr. 7(3), 1–21. doi: 10.1128/microbiolspec.gpp3-0044-2018.
- Sadek, A.H., Asker, M.S. dan Abdelhamid, S.A., 2021. Bacteriostatic Impact of Nanoscale Zero-Valent Iron Against Pathogenic Bacteria in the Municipal Wastewater. Biologia 76(9), 2785–2809. doi: 10.1007/s11756-021-00814-w.
- Samudra, K.A.G., Soulissa, A.G. dan Widyarman, A.S., 2022. Antibiofilm Efficacy of Black Shrimp (*Penaeus monodon*) Chitosan Against *Aggregatibacter actinomycetemcomitans* and *Treponema denticola*. e-Gigi 10(2), 162–167. doi: 10.35790/eg.v10i2.39052.
- Sarampang, D.E., 2022. Sintesis dan Karakterisasi Nanopartikel Bimetal Ag-Cu dengan Bioreduktor Ekstrak Air Batang Tanaman Binahong (*Anredera Cordifolia* L.) dan Aplikasinya sebagai Antibakteri. Skripsi tidak diterbitkan, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Hasanuddin, Makassar.
- Savitri, S.E., Shinta, Minarno, E.B. dan Annisa, R., 2023. Chemical Characterization of Silver Nanoparticle Compounds using Red Algae (*Fucus vesiculosus*) in Freeze Dry Methods. J. Exp. Life Sci. 13(1), 52–60.

- Sewwandi, K.A.H.S. dan Nitorisravut, R., 2020. Nano Zero Valent Iron Embedded on Chitosan for Enhancement of Biohydrogen Production in Dark Fermentation. *Energy Rep.* 6, 392–396. doi: 10.1016/j.egy.2020.11.225.
- Shanmugam, A., Subhapradha, N., Suman, S., Ramasamy, P., Saravanan, R., Shanmugam, V. et al., 2012. Characterization of Biopolymer “Chitosan” from the Shell of Donacid Clam *Donas scortum* L. and Its Antioxidant Activity. *Int. J. Pharm. Pharma. Sci.* 4(2), 460–465. doi: 10.4103/2231-0738.106990.
- Sharma, A., Tyagi, N. dan Shrivastava, R., 2023. Optimization of Protocol for Quantification of Biofilm Formed by Pathogenic Rapidly-Growing Nontuberculous Mycobacteria for Diagnostic Screening. Dalam: Gurtler, V. dan Patrauchan, V. (eds.) *Methods in Microbiology Vol. 53 Biofilms*. Elsevier, Amsterdam, pp. 67–99.
- Shi, S., Jia, J., Guo, X., Zhao, Y., Chen, D., Guo, Y. et al., 2016. Reduced *Staphylococcus aureus* Biofilm Formation in the Presence of Chitosan-Coated Iron Oxide Nanoparticles. *Int. J. Nanomed.* 11, 6499–6506. doi: 10.2147/IJN.S41371.
- Song, M., Tang, Q., Ding, Y., Tan, P., Zhang, Y., Wang, T. et al., 2024. *Staphylococcus aureus* and Biofilms: Transmission, Threats and Promising Strategies in Animal Husbandry. *J. Anim. Sci. Biotechnol.* 15(44), 1–16. doi: 10.1186/s40104-024-01007-6.
- Stack, M., Parikh, D., Wang, H., Wang, L., Xu, M., Zou, J. et al., 2019. Electrospun Nanofibers for Drug Delivery. Dalam: Ding, B., Wang, X. dan Yu, J. (eds.) *Electrospinning: Nanofabrication and Applications*. Elsevier, Amsterdam, pp. 735–764.
- Tarannum, N., Divya, dan Gautam, Y.K., 2019. Facile Green Synthesis and Applications of Silver Nanoparticles: A State-of-the-Art Review. *RCS Adv.* 9(60), 34926–34948. doi: 10.1039/C9RA04164H.
- Upmanyu, K., Haq, Q.M.R. dan Singh, R., 2022. Factors Mediating *Acinetobacter baumannii* Biofilm Formation: Opportunities for Developing Therapeutics. *Curr. Res. Microbiol. Sci.* 3, 1–14. doi: 10.1016/j.crmicr.2022.100131.
- Verma, R., Akanksha, K., Jha, S.K. dan Rani, L., 2023. Comparative Studies of Functional Groups Present in Invasive and Economically Important Plant Leaf Methanolic Extracts by Using FTIR Spectroscopic Analysis. *GSC Biol. Pharma. Sci.* 23(3): 184–191. doi: 10.30574/gscbps.2023.23.3.0230.
- Vijayaram, S., Razafindralambo, H., Sun, Y., Vasantharaj, S., Ghafarifarsani, H., Hoseinifar, S.H. et al., 2024. Applications of Green Synthesized Metal Nanoparticles—A Review. *Biol. Trace Elem. Res.*, 1–27. doi: 10.1007/s12011-023-03645-9.
- Vladár, A.E. dan Hodoroaba, V., 2020. Characterization of Nanoparticles by Scanning Electron Microscopy. Dalam: Hodoroaba, V., Unger, W.E.S. dan

- Shard, A.G. (eds.) *Characterization of Nanoparticles*. Elsevier, Amsterdam, pp 7–27.
- Wang, Y., Pan, P. dan Yan, X., 2023. Preparation of Chitosan-Modified Nano-Silver Solution Microcapsules and Their Effects on Antibacterial Properties of Waterborne Coatings. *Coatings* 13(8), 1–24. doi: 10.3390/coatings13081433.
- Warsito, M.F. dan Agustiani, F., 2021. A Review on Factors Affecting Chitosan Nanoparticles Formation. Dalam: *The 6th International Symposium on Applied Chemistry (ISAC 2020)*; 18–20 November 2020, Tangerang, Indonesia. IOP, Bristol, pp. 1–9. doi: :10.1088/1757-899X/1011/1/012027.
- Woo, P.J., Sethu, V. dan Selvarajoo, 2022. Treatment of Palm Oil Mill Effluent Using Fenugreek Coagulant and Aloe-Vera Gel Flocculant. *Mater. Sci. Forum* 1076(1-2), 101–108. doi: 10.4028/p-1mecs1.
- Xu, W., Yang, T., Liu, S., Du, L., Chen, Q., Li, X. et al., 2022. Insights into the Synthesis, Types and Application of Iron Nanoparticles: the Overlooked Significance of Environmental Effects. *Environ. Int.* 158, 1–24. doi: 10.1016/j.envint.2021.106980.
- Xuan, L., Ju, Z., Skonieczna, M., Zhou, P. dan Huang, R., 2023. Nanoparticles-Induced Potential Toxicity on Human Health: Applications, Toxicity Mechanisms and Evaluation Models. *MedComm* 4(4), 1–39. doi: 10.1002/mco2.327.
- Yadav, M., Kaushik, B., Rao, G.K., Srivastava, C.M. dan Vaya, D., 2023. Advances and Challenges in the Use of the Chitosan and Its Derivatives in Biomedical Fields: A Review. *Carbohydr. Polym. Technol. Appl.* 5, 1–22. doi: 10.1016/j.carpta.2023.100323.
- Yang, S., Li, X., Cang, W., Mu, D., Ji, S., An, Y. et al., 2023. Biofilm Tolerance, Resistance and Infections Increasing Threat of Public Health. *Microbial Cell* 10(11), 233–247. doi: 10.15698/mic2023.11.807.
- Yu, D., Basumatary, I.B., Kumar, S., Ye, F. dan Dutta, J., 2023. Chitosan Modified with Bio-Extract as An Antibacterial Coating with UV Filtering Feature. *Int. J. Biol. Macromol.* 230, 1-10. Doi: 10.1016/j.ijbiomac.2023.123145.
- Yu, Z., Li, X. dan Guo, J., 2022. Combat Antimicrobial Resistance Emergence and Biofilm Formation Through Nanoscale Zero-Valent Iron Particles. *Chem. Eng. J.* 444, 1–9. doi: 10.1016/j.cej.2022.136569.
- Zhang, W. dan Jiang, W., 2020. Antioxidant and Antibacterial Chitosan Film with Tea Polyphenols-Mediated Green Synthesis Silver Nanoparticle via A Novel One-Pot Method. *Int. J. Biol. Macromol.* 155, 1252–1261. doi: 10.1016/j.ijbiomac.2019.11.093.

Žorža, L., Delina, A., Selga, T. dan Muter, O., 2023. Characterization of Biofilm and Bacterial Resistance to Benzalkonium Chloride under Contrasting Cultivation Conditions. *Fermentation* 9(8), 1–17. doi: 10.3390/fermentation9080699.