

DAFTAR PUSTAKA

- Ahmad, S., Baqar, T. and Kumar, R. 2023. A Comprehensive Review on Types of Vaccines: From Classic to Cutting-Edge. *Vaccines & Vaccination Open Access*. 8(23): 000164.
- Ahn, J., Peng, S., Hung, C.F., Roden, R.B. and Best, S.R., 2018. Prophylactic immunization with human papillomavirus vaccines induces oral immunity in mice. *The Laryngoscope*. 128(1): E16-E20.
- Akhtar, M., Islam, M.R., Khaton, F., Soltana, U.H., Jafrin, S.A., Rahman, S.I.A., Tauheed, I., Ahmed, T., Khan, I.I., Akter, A. and Khan, Z.H. 2023. Appearance of tolerance-induction and non-inflammatory SARS-CoV-2 spike-specific IgG4 antibodies after COVID-19 booster vaccinations. *Frontiers in Immunology*. 14(23):1309997.
- Alamoudi, W.A., Ahmad, F., Acharya, S., Haque, S., Alsamman, K., Herzallah, H.K. and Al-Otaibi, S.T. 2018. A simplified colorimetric method for rapid detection of cell viability and toxicity in adherent cell culture systems. *Journal of Buon*. 23(5): 1505-1513.
- Aranaz, I., Alcántara, A.R., Civera, M.C., Arias, C., Elorza, B., Heras Caballero, A. and Acosta, N. 2021. Chitosan: An overview of its properties and applications. *Polymers*. 13(19): 3256.
- Aydin, S., Emre, E., Ugur, K., Aydin, M.A., Sahin, İ., Cinar, V. and Akbulut, T. 2025. An overview of ELISA: a review and update on best laboratory practices for quantifying peptides and proteins in biological fluids. *Journal of International Medical Research*. 53(2): p.03000605251315913.
- Bhatti, N., Hajam, Y.A., Mushtaq, S., Kaur, L., Kumar, R. and Rai, S., 2024. A review on dynamic pharmacological potency and multifaceted biological activities of propolis. *Discover Sustainability*. 5(1): 185.
- Bruni, L.B.R.L., Albero, G., Serrano, B., Mena, M., Collado, J.J., Gómez, D., Muñoz, J., Bosch, F.X. and De Sanjosé, S. 2023. Human papillomavirus and related diseases report. *ICO/IARC information centre on HPV and Cancer (HPV Information Centre)*. 7(23): 26-42.

- Carpenter, S. and O'Neill, L.A. 2024. From periphery to center stage: 50 years of advancements in innate immunity. *Cell*. 187(9): 2030-2051.
- Chan, C.K., Aimagambetova, G., Ukybassova, T., Kongrtay, K. and Azizan, A. 2019. Human papillomavirus infection and cervical cancer: epidemiology, screening, and vaccination—review of current perspectives. *Journal of oncology*. 2019(1): 3257939.
- Cheng, L., Wang, Y. and Du, J. 2020. Human papillomavirus vaccines: an updated review. *Vaccines*. 8(3): 1-15.
- Cheung, R.C.F., Ng, T.B., Wong, J.H. and Chan, W.Y. 2015. Chitosan: an update on potential biomedical and pharmaceutical applications. *Marine drugs*. 13(8): 5156-5186.
- Chi, H., Pepper, M. and Thomas, P.G. 2024. Principles and therapeutic applications of adaptive immunity. *Cell*. 187(9): 2052-2078.
- Cimica, V. and Galarza, J.M. 2017. Adjuvant formulations for virus-like particle (VLP) based vaccines. *Clinical immunology*. 183(17): 99-108.
- Danaei, M.R.M.M., Dehghankhold, M., Ataei, S., Hasanzadeh Davarani, F., Javanmard, R., Dokhani, A., Khorasani, S. and Mozafari, Y.M. 2018. Impact of particle size and polydispersity index on the clinical applications of lipidic nanocarrier systems. *Pharmaceutics*. 10(2): 57.
- Das, T., Venkatesh, M.P., Kumar, T.P. and Koland, M. 2020. SLN based alendronate in situ gel as an implantable drug delivery system—A full factorial design approach. *Journal of Drug Delivery Science and Technology*. 55(20): 101415
- Ellingson, M.K., Sheikha, H., Nyhan, K., Oliveira, C.R. and Niccolai, L.M. 2023. Human papillomavirus vaccine effectiveness by age at vaccination: a systematic review. *Human Vaccines & Immunotherapeutics*. 19(2): 1-19.
- Feng, J., Shi, Y., Yu, Q., Sun, C. and Yang, G. 2016. Effect of emulsifying process on stability of pesticide nanoemulsions. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 497:286-292.

- Graham, S.V. 2017. The human papillomavirus replication cycle, and its links to cancer progression: a comprehensive review. *Clinical science*. 131(17): 2201-2221.
- Hariyatno, S.P., Paramita, V., dan Amalia, R. 2021. The effect of surfactant, time and speed of stirring in the emulsification process of soybean oil in water. *Journal of Vocational Studies on Applied Research*. 3(1): 21-25.
- Hossain, R., Quispe, C., Khan, R.A., Saikat, A.S.M., Ray, P., Ongalbek, D., Yeskaliyeva, B., Jain, D., Smeriglio, A., Trombetta, D. and Kiani, R. 2022. Propolis: An update on its chemistry and pharmacological applications. *Chinese medicine*. 17(1): 100.
- Jaferník, K., Ładniak, A., Blicharska, E., Czarnek, K., Ekiert, H., Wiącek, A.E. and Szopa, A. 2023. Chitosan-based nanoparticles as effective drug delivery systems—a review. *Molecules*. 28(4): 1963.
- Jhaveri, J., Raichura, Z., Khan, T., Momin, M. and Omri, A. 2021. Chitosan nanoparticles-insight into properties, functionalization and applications in drug delivery and theranostics. *Molecules*. 26(2): 272.
- Kadian, R.. 2018. Nanoparticles: A promising drug delivery approach. *Asian J Pharmaceutical Science and Clinical Reseach*. 11(1): 30-5.
- Kianfar, E. 2021. Protein nanoparticles in drug delivery: animal protein, plant proteins and protein cages, albumin nanoparticles. *Journal of Nanobiotechnology*. 19(1): 159.
- Kwong, K.W.Y., Xin, Y., Lai, N.C.Y., Sung, J.C.C., Wu, K.C., Hamied, Y.K., Sze, E.T.P. and Lam, D.M.K., 2023. Oral vaccines: a better future of immunization. *Vaccines*. 11(7):1232.
- Laleni, N.C., Gomes, P.D.C., Gkatzionis, K. and Spyropoulos, F. 2021. Propolis particles incorporated in aqueous formulations with enhanced antibacterial performance. *Food hydrocolloids for health*. 1(21): 100040.
- Larasati, S.P. and Jusnita, N. 2020. Formulasi nanoemulsi ekstrak kunyit (*Curcuma longa* L.) sebagai antioksidan. *Journal of Pharmaceutical and Science*. 3(1):33-41.

- Lewis, S.M., Williams, A. and Eisenbarth, S.C. 2019. Structure-Function of The Immune System in the Spleen. *Science Immunology*. 4(33): 1-25.
- Li, L., Yang, Y., Wang, L., Xu, F., Li, Y. and He, X., 2023. The effects of serum albumin pre-adsorption of nanoparticles on protein corona and membrane interaction: A molecular simulation study. *Journal of Molecular Biology*. 435(1): 167771.
- Liu, S., Wang, D., Cao, Y., Lu, T., Liu, H. and Li, S. 2020. Effects of propolis on the immune enhancement of the formalin-inactivated *Aeromonas salmonicida* vaccine. *Aquaculture Research*. 51(11): 4759-4770.
- Liu, Y., Chen, D., Zhao, L., Zhang, H., Wu, S., Chen, X., Shen, E., Li, L., Yang, Z., Wang, Y. and Yin, F. 2025. Stability study of recombinant 9-valent human papillomavirus vaccine based on *Escherichia coli* expression system. *Human Vaccines & Immunotherapeutics*. 21(1): 2455807.
- Lorenzi, A.T., Syrjänen, K.J. and Longatto-Filho, A. 2015. Human papillomavirus (HPV) screening and cervical cancer burden. A Brazilian perspective. *Virology journal*. 12(15): 1-6.
- Mardhiani, Y.D., Biryani, D. A. and Fadilah, L. 2022. Astaxanthin nanoemulsion formulation and evaluation. *Indonesian Journal of Pharmaceutics*, 3(3):139-148.
- Mardiyanto, M., Fithri, N.A. and Tandry, M. 2018. Characterization and optimization of capryol-90, polysorbate-80, and peg-400 proportion in mefenamic acid self-nanoemulsifying drug delivery system (SNEDDS) with simplex-lattice-design. *Science and Technology Indonesia*. 3(4): 164-172.
- Markowitz, L.E. and Schiller, J.T. 2021. Human papillomavirus vaccines. *The Journal of infectious diseases*. 224(4): S367-S378.
- Mazonde, P., Khamanga, S.M. and Walker, R.B., 2020. Design, optimization, manufacture and characterization of Efavirenz-loaded flaxseed oil nanoemulsions. *Pharmaceutics*. 12(9): 797.
- Megha, K.B. and Mohanan, P.V. 2021. Role of immunoglobulin and antibodies in disease management. *International journal of biological macromolecules*. 169(21): 28-38.

- Németh, Z., Csóka, I., Semnani Jazani, R., Sipos, B., Haspel, H., Kozma, G., Kónya, Z. and Dobó, D.G. 2022. Quality by design-driven zeta potential optimisation study of liposomes with charge imparting membrane additives. *Pharmaceutics*. 14(9): 1798.
- Nimesh, S., Thibault, M.M., Lavertu, M. and Buschmann, M.D. 2010. Enhanced gene delivery mediated by low molecular weight chitosan/DNA complexes: effect of pH and serum. *Molecular biotechnology*. 46(2): 182-196.
- Ningtias, P.L., Suprihatih, T. and Sitasiwi, A.J. 2024. Struktur Histologis Pulpa Putih Limpa Tikus Putih (*Rattus norvegicus* L.) setelah Pemberian Sediaan Nanokitosan Ekstrak Etanol Daun Mimba (*Azadirachta indica* A. Juss). *Jurnal Sain Veteriner*. 42(3): 448-456.
- Nooraei, S., Bahrulolum, H., Hoseini, Z.S., Katalani, C., Hajizade, A., Easton, A.J. and Ahmadian, G. 2021. Virus-like particles: preparation, immunogenicity and their roles as nanovaccines and drug nanocarriers. *Journal of nanobiotechnology*. 19(21): 1-27.
- Parvin, N., Joo, S.W. and Mandal, T.K. 2024. Enhancing Vaccine Efficacy and Stability: A Review of the Utilization of Nanoparticles in mRNA Vaccines. *Biomolecules*. 14(8): 1036.
- Pollard, A.J. and Bijker, E.M. 2021. A guide to vaccinology: from basic principles to new developments. *Nature Reviews Immunology*. 21(2): 83-100.
- Rahmayanti, M., Oktavia, R.P., Amalina, F., Fadila, S.A.N., Nastiti, G.P.N. and Syarifuddin, S. 2024. Optimization of Nanoemulsion Hair Serum from Chia Seed Oil Using the Simplex Lattice Design Method. *Pharmaciana*. 14(3): 370-381.
- Ramirez, J.E.V., Sharpe, L.A. and Peppas, N.A. 2017. Current state and challenges in developing oral vaccines. *Advanced drug delivery reviews*. 114(17):116-131.
- Ribeiro, R.C.D.A., Barreto, S.M.A.G., Ostrosky, E.A., Rocha-Filho, P.A.D., Veríssimo, L.M. and Ferrari, M. 2015. Production and characterization of cosmetic nanoemulsions containing *Opuntia ficus-indica* (L.) Mill extract as moisturizing agent. *Molecules*. 20(2): 2492-2509.

- Rousdy, D.W., Rahmawati, R.K. and Kurniadi, E. 2016. Mikroanatomi Limpa Tikus Putih (*Rattus novergicus* L.) Setelah Pemberian Asam Humat Dari Tanah Gambut Kalimantan. *J Peneliti dan Pengembangan Borneo Akcaya*. 4(1):57-62.
- Ruiz, W., McClements, W.L., Jansen, K.U. and Esser, M.T. 2005. Kinetics and isotype profile of antibody responses in rhesus macaques induced following vaccination with HPV 6, 11, 16 and 18 L1-virus-like particles formulated with or without Merck aluminum adjuvant. *Journal of immune based therapies and vaccines*. 3(1), p:1-11.
- Santianingtyas, P.S.A., Dzakwan, M. and Leviana, F., 2024. In Vitro Analysis of Anti-Inflammatory Activity of Lyotropic Liquid Crystal Nanoparticles from Echinacea purpurea Flower Extract. *Jurnal Mandala Pharmacon Indonesia*. 10(2): 356-378.
- Scheiblhofer, S., Laimer, J., Machado, Y., Weiss, R. and Thalhamer, J. 2017. Influence of protein fold stability on immunogenicity and its implications for vaccine design. *Expert review of vaccines*. 16(5): 479-489.
- Strzelec, M., Detka, J., Mieszczak, P., Sobocińska, M.K. and Majka, M. 2023. Immunomodulation—a general review of the current state-of-the-art and new therapeutic strategies for targeting the immune system. *Frontiers in Immunology*. 14(23): 1127704.
- Sujono, T.A., Kusumowati, I.T.D. and Munawaroh, R. 2021. Aktivitas Imunomodulator Ekstrak Metanol dan Fraksi buah Talok (*Muntingia calabura* L.) pada Sel RAW 264.7. *Journal of Pharmaceutical Science and Clinical Research*. 6(2): 82-95.
- Sultana, S. and Mohammed, S. 2018. A Review on Stability Studies of Pharmaceutical Products. *International Journal for Pharmaceutical Research Scholars*. 7(1):28-49.
- Sun, X., Pan, C., Ying, Z., Yu, D., Duan, X., Huang, F., Ling, J., and Ouyang, X. 2020. Stabilization of zein nanoparticles with k-carrageenan and tween 80 for encapsulation of curcumin. *International Journal of Biological Macromolecules*. 146(20): 549–559.

- Suyal, J. and Bhatt, G., 2017. An introductory review article on nanoemulsion. *Journal Of Pharmaceutical Science*. 2(17): 35-40.
- Taciak, B., Białasek, M., Braniewska, A., Sas, Z., Sawicka, P., Kiraga, Ł., Rygiel, T. and Król, M. 2018. Evaluation of phenotypic and functional stability of RAW 264.7 cell line through serial passages. *PloS one*. 13(6): e0198943.
- Taher, S., Al-Kinani, K., Hammoudi, Z. and Ghareeb, M.. 2022. Co-surfactant effect of polyethylene glycol 400 on microemulsion using BCS class II model drug. *Journal of Advanced Pharmacy Education & Research| Jan–Mar*. 12(1): 63-69.
- Turner, V.M. and Mabbott, N.A. 2017. Influence of ageing on the microarchitecture of the spleen and lymph nodes. *Biogerontology*. 18(5):723-738.
- Utami, K.P., Wasityastuti, W. and Soesatyo, M.H. 2021. The Involvement of Lipids in Immune System Regulation: A Mini-Review. *JKKI: Jurnal Kedokteran dan Kesehatan Indonesia*. 21(1): 68-78
- Wael, S., Mahulette, F., Watuguly, T.W. and Wahyudi, D. 2018. Pengaruh ekstrak daun cengkeh (*Syzygium aromaticum*) terhadap limfosit dan makrofag mencit Balb/c. *Jalan Yos Sudarso*. 338: 79-83.
- Wang, H., Huang, Y., Xiao, Q., Chen, Y., Wang, Y., Tian, J., Cai, Y., Tang, L., Ding, S. and Duan, S. 2025. A Novel Colorimetric Immunosensor Based On Silk Cocoon Membrane-Integrated ELISA For Treponemal Antibody Detection. *Microbiology Spectrum*. 13(9):1-15.
- Wardiyah, J.M., Sutriyo, M.I.A., Zulfakar, M.H. and Sari, S.P. 2026. Stability and determination of asiaticoside from dry nanoemulsion in rat plasma by LC–MS/MS and its application in a pharmacokinetics study. *Pharmacia*. 73(26): 1–13.
- Yahya, N.A., Wahab, R.A., Attan, N., Hashim, S.E., Abdul Hamid, M., Mohamed Noor, N. and Abdul Rahman, A. 2022. Optimization of oil-in-water nanoemulsion system of Ananas comosus peels extract by D-optimal mixture design and its physicochemical properties. *Journal of Dispersion Science and Technology*. 43(2): 302-315.

- Yu, L., Majerciak, V. and Zheng, Z.M. 2022. HPV16 and HPV18 genome structure, expression, and post-transcriptional regulation. *International journal of molecular sciences*. 23(9): 1-30.
- Zahra, U.F.A., Hindryawati, N. and Panggabean, A.S. 2024. Sintesis dan Karakterisasi Nanopartikel Perak Termodifikasi Kitosan menggunakan Reduktor NaBH₄. *Jurnal Atomik*. 9(2): 120-127.
- Zbacnik, T.J., Holcomb, R.E., Katayama, D.S., Murphy, B.M., Payne, R.W., Coccaro, R.C., Evans, G.J., Matsuura, J.E., Henry, C.S. and Manning, M.C. 2017. Role of buffers in protein formulations. *Journal of pharmaceutical sciences*. 106(3): 713-733.