

REFERENCE

- Alhana, Suptijah, P., & Tarman, K. (2015). Ekstraksi dan karakterisasi kolagen dari daging teripang gamma (*Stichopus variegatus*). *Jurnal Pengolahan Hasil Perikanan Indonesia*, 18(2), 150–161.
- Amelia, V., Subekti, S., & Sulmartiwi, L. (2021). Substitution of patin *Pangasius pangasius* flour in making sticks as an alternative of food high protein and source of calcium for autism patients. *IOP Conference Series: Earth and Environmental Science*, 679(1), 012033. <https://iopscience.iop.org/article/10.1088/1755-1315/679/1/012033/meta>
- Avila Rodríguez, M. I., Rodríguez Barroso, E. G., & Sánchez, M. L. (2018). Collagen: A review on its sources and potential cosmetic applications. *Journal of Cosmetic Dermatology*, 17(1), 20–26. <https://doi.org/10.1111/jocd.12450>
- Ayu, D. F., Diharmi, A., & Ali, A. (2019). Karakteristik minyak ikan dari lemak abdomen hasil samping pengasapan ikan patin (*Pangasius hypophthalmus*). *Jurnal Pengolahan Hasil Perikanan Indonesia*, 22(1), 187–197.
- Badan Kebijakan Pembangunan Kesehatan, -. (2024). *Laporan Tematik Survei Kesehatan Indonesia Tahun 2023: Potret Kesehatan Indonesia*. Badan Kebijakan Pembangunan Kesehatan. <https://repository.badankebijakan.kemkes.go.id/id/eprint/5537/>
- Bakhtiar, S., Shadur, B., & Stepensky, P. (2019). The Evidence for Allogeneic Hematopoietic Stem Cell Transplantation for Congenital Neutrophil Disorders: A Comprehensive Review by the Inborn Errors Working Party Group of the EBMT. *Frontiers in Pediatrics*, 7. <https://doi.org/10.3389/fped.2019.00436>
- Bellelli, V., d'Ettore, G., Celani, L., Borrazzo, C., Ceccarelli, G., & Venditti, M. (2019). Clinical significance of lymphocytopenia in patients hospitalized with pneumonia caused by influenza virus. *Critical Care*, 23(1). <https://doi.org/10.1186/s13054-019-2608-1>
- Bensa, T., Tekkela, S., & Rognoni, E. (2023). Skin fibroblast functional heterogeneity in health and disease. *The Journal of Pathology*, 260(5), 609–620. <https://doi.org/10.1002/path.6159>
- Bolke, L., Schlippe, G., Gerß, J., & Voss, W. (2019). A collagen supplement improves skin hydration, elasticity, roughness, and density: Results of a randomized, placebo-controlled, blind study. *Nutrients*, 11(10), 2494.
- Brown, T. M., & Krishnamurthy, K. (2025). Histology, Hair and Follicle. In *StatPearls*. StatPearls Publishing. <https://www.ncbi.nlm.nih.gov/books/NBK532929/>

- Burn, G. L., Foti, A., Marsman, G., Patel, D. F., & Zychlinsky, A. (2021). The Neutrophil. *Immunity*, 54(7), 1377–1391. <https://doi.org/10.1016/j.immuni.2021.06.006>
- Byun, K.-A., Lee, J. H., Lee, S. Y., Oh, S., Batsukh, S., Cheon, G., Lee, D., Hong, J. H., Son, K. H., & Byun, K. (2024). Piezo1 Activation Drives Enhanced Collagen Synthesis in Aged Animal Skin Induced by Poly L-Lactic Acid Fillers. *International Journal of Molecular Sciences*, 25(13), 7232. <https://doi.org/10.3390/ijms25137232>
- Calder, P. C. (2017). Omega-3 fatty acids and inflammatory processes: From molecules to man. *Biochemical Society Transactions*, 45(5), 1105–1115.
- Cappello, A., Mancini, M., Madonna, S., Rinaldo, S., Paone, A., Scarponi, C., Belardo, A., Zolla, L., Zuccotti, A., Panatta, E., Pallotta, S., Annicchiarico-Petruzzelli, M., Albanesi, C., Cutruzzolà, F., Wang, L., Jia, W., Melino, G., & Candi, E. (2022). Extracellular serine empowers epidermal proliferation and psoriasis-like symptoms. *Science Advances*, 8(50). <https://doi.org/10.1126/sciadv.abm7902>
- Cardoso, V. S., Quelemes, P. V., Amorin, A., Primo, F. L., Gobo, G. G., Tedesco, A. C., Mafud, A. C., Mascarenhas, Y. P., Corrêa, J. R., Kuckelhaus, S. A., Eiras, C., Leite, J. R. S., Silva, D., & Dos Santos Júnior, J. R. (2014). Collagen-based silver nanoparticles for biological applications: Synthesis and characterization. *Journal of Nanobiotechnology*, 12(1). <https://doi.org/10.1186/s12951-014-0036-6>
- Cederholm, T., Jensen, G. L., Correia, M. I. T. D., Gonzalez, M. C., Fukushima, R., Higashiguchi, T., Baptista, G., Barazzoni, R., Blaauw, R., Coats, A. J. S., Crivelli, A. N., Evans, D. C., Gramlich, L., Fuchs-Tarlovsky, V., Keller, H., Llido, L., Malone, A., Mogensen, K. M., Morley, J. E., ... GLIM Core Leadership Committee, GLIM Working Group. (2019). GLIM criteria for the diagnosis of malnutrition – A consensus report from the global clinical nutrition community. *Journal of Cachexia, Sarcopenia and Muscle*, 10(1), 207–217. <https://doi.org/10.1002/jcsm.12383>
- Chakma, S., Rahman, Md. A., Siddik, M. A. B., Hoque, Md. S., Islam, S. M., & Vatsos, I. N. (2022). Nutritional Profiling of Wild (*Pangasius pangasius*) and Farmed (*Pangasius hypophthalmus*) Pangasius Catfish with Implications to Human Health. *Fishes*, 7(6), 309. <https://doi.org/10.3390/fishes7060309>
- Chandra, R. K. (1992). Protein-energy malnutrition and immunological responses. *The Journal of Nutrition*, 122, 597–600.
- Chavoshnejad, P., Foroughi, A. H., Dhandapani, N., German, G. K., & Razavi, M. J. (2021). Effect of collagen degradation on the mechanical behavior and wrinkling of skin. *Physical Review E*, 104(3), 034406. <https://doi.org/10.1103/PhysRevE.104.034406>

- Coelho-Junior, H. J., Marzetti, E., Picca, A., Cesari, M., Uchida, M. C., & Calvani, R. (2020). Protein intake and frailty: A matter of quantity, quality, and timing. *Nutrients*, 12(10), 2915.
- Dapson, R., Fagan, C., Kiernan, J., & Wickersham, T. (2011). Certification procedures for sirius red F3B (CI 35780, Direct red 80). *Biotechnic & Histochemistry*, 86(3), 133–139. <https://doi.org/10.3109/10520295.2011.570277>
- De Onis, M., & Blössner, M. (2003). The World Health Organization global database on child growth and malnutrition: Methodology and applications. *International Journal of Epidemiology*, 32(4), 518–526.
- Demarest-Litchford, M., Munoz, N., Strange, N., Casirati, A., & Cereda, E. (2024). The Impact of Malnutrition on Skin Integrity and Wound Healing. *Advances in Skin & Wound Care*, 37(3), 126–135. <https://doi.org/10.1097/asw.0000000000000107>
- Diniyah, N., Alam, M. B., & Lee, S.-H. (2020). Antioxidant potential of non-oil seed legumes of Indonesian's ethnobotanical extracts. *Arabian Journal of Chemistry*, 13(5), 5208–5217.
- Diniyah, N., & Hastuti, F. T. (2015). Karakteristik fisikokimia dan fungsional teknis tepung koro kratok (*Phaseolus lunatus* L.) termodifikasi yang diproduksi secara fermentasi spontan. *Agrointek: Jurnal Teknologi Industri Pertanian*, 9(1), 24–32.
- Elia, M. (2017). Defining, Recognizing, and Reporting Malnutrition. *The International Journal of Lower Extremity Wounds*, 16(4), 230–237. <https://doi.org/10.1177/1534734617733902>
- Evans, M., Lewis, E. D., Zakaria, N., Pelipyagina, T., & Guthrie, N. (2021). A randomized, triple-blind, placebo-controlled, parallel study to evaluate the efficacy of a freshwater marine collagen on skin wrinkles and elasticity. *Journal of Cosmetic Dermatology*, 20(3), 825–834. <https://doi.org/10.1111/jocd.13676>
- Gauza-Włodarczyk, M., Kubisz, L., & Włodarczyk, D. (2017). Amino acid composition in determination of collagen origin and assessment of physical factors effects. *International Journal of Biological Macromolecules*, 104, 987–991.
- Griffiths, D., Van Khanh, P., & Trong, T. Q. (2010). Cultured aquatic species information programme: *Pangasius hypophthalmus*. Fisheries and Aquaculture Department, Rome. Available at: [Http://Www. Fao. Org/Fishery/Culturedspecies/Pangasius_ Hypophthalmus/En](http://www.Fao.Org/Fishery/Culturedspecies/Pangasius_Hypophthalmus/En). (Accessed 28 April 2015).

- Haff, R. F., & Swim, H. E. (1957). The amino acid requirements of rabbit fibroblasts, strain RM3-56. *The Journal of General Physiology*, 41(1), 91–100.
- Harissya, Z., Setiorini, A., Rahayu, M., Supriyanta, B., Asbath, Mahata, L. E., Anida, Mitra, D., Rahmawati, Panjaitan, A. O., Novelyn, S., Abdul, N. A., Nurlina, W. O., Putri, D. N., & Batubara, F. R. (2023). *ILMU BIOMEDIK UNTUK PERAWAT* (Malang) [Text]. EUREKA MEDIA AKSARA. https://library.stikeskesdamudayana.ac.id/index.php?p=show_detail&id=2599
- Harmain, R. M., & Dali, F. A. (2017). *Buku Ajar Ilabulo Ikan Patin*. UNG Press. Gorontalo.
- He, T., Fisher, G. J., Kim, A. J., & Quan, T. (2023). Age-related changes in dermal collagen physical properties in human skin. *PLoS One*, 18(12), e0292791.
- Heilskov, S., Vestergaard, C., Babirekere, E., Ritz, C., Namusoke, H., Rytter, M., & Deleuran, M. (2015). Characterization and scoring of skin changes in severe acute malnutrition in children between 6 months and 5 years of age. *Journal of the European Academy of Dermatology and Venereology*, 29(12), 2463–2469. <https://doi.org/10.1111/jdv.13328>
- Hew, J., Solon-Biet, S. M., McMahon, A. C., Ruohonen, K., Raubenheimer, D., Ballard, J. W. O., Le Couteur, D. G., Nicholls, C., Li, Z., Maitz, P. K. M., Wang, Y., & Simpson, S. J. (2016). The Effects of Dietary Macronutrient Balance on Skin Structure in Aging Male and Female Mice. *PLOS ONE*, 11(11), e0166175. <https://doi.org/10.1371/journal.pone.0166175>
- Hoesl, C., Röhl, J. M., Schneider, M. R., & Dahlhoff, M. (2018). The receptor tyrosine kinase ERBB4 is expressed in skin keratinocytes and influences epidermal proliferation. *Biochimica et Biophysica Acta (BBA)-General Subjects*, 1862(4), 958–966.
- Hui, T. H., Peng, K. L. K., Huan, L. J., Wei, L. B., Hing, R. L. B., & Beng, J. K. T. (2020). The non-native freshwater fishes of Singapore: An annotated compilation. *Raffles Bulletin of Zoology*, 68. https://www.researchgate.net/profile/Heok-Tan/publication/341868681_The_non-native_freshwater_fishes_of_Singapore_an_annotated_compilation/links/5ed77506299bf1c67d350172/The-non-native-freshwater-fishes-of-Singapore-an-annotated-compilation.pdf
- Huldani, H. (2014). Imunitas Selular – Netrofil. *Berkala Kedokteran*, 10(2), 165–174. <https://doi.org/10.20527/jbk.v10i12.969>
- Ibeabuchi, J. C., Okafor, D. C., Ahaotu, N. N., Eluchie, C. N., Agunwah, I. M., Chukwu, M. N., & Amandikwa, C. (2019). *Effect of dehulling on proximate composition and functional properties of lima bean (Phaseolus lunatus) grown in Enugu State*. <https://www.academia.edu/download/97160038/39593.pdf>

- Ito, N., Seki, S., & Ueda, F. (2018). Effects of composite supplement containing collagen peptide and ornithine on skin conditions and plasma IGF-1 levels—A randomized, double-blind, placebo-controlled trial. *Marine Drugs*, 16(12), 482.
- Jayalaxmi, B., Vijayalakshmi, D., Usha, R., Revanna, M. L., Chandru, R., & Gowda, P. H. (2016). Effect of different processing methods on proximate, mineral and antinutrient content of lima bean (*Phaseolus lunatus*) seeds. *Legume Research-An International Journal*, 39(4), 543–549.
- Ji, J., Xu, Y., Zheng, M., Luo, C., Lei, H., Qu, H., & Shu, D. (2019). Methionine Attenuates Lipopolysaccharide-Induced Inflammatory Responses via DNA Methylation in Macrophages. *ACS Omega*, 4(1), 2331–2336. <https://doi.org/10.1021/acsomega.8b03571>
- Kalangi, S. J. (2013). Histofisiologi kulit. *Jurnal Biomedik: JBM*, 5(3). <https://ejournal.unsrat.ac.id/index.php/biomedik/article/view/4344>
- Karna, E., Szoka, L., Huynh, T. Y. L., & Palka, J. A. (2020). Proline-dependent regulation of collagen metabolism. *Cellular and Molecular Life Sciences*, 77(10), 1911–1918. <https://doi.org/10.1007/s00018-019-03363-3>
- Kavyani, Z., Musazadeh, V., Fathi, S., Faghfour, A. H., Dehghan, P., & Sarmadi, B. (2022). Efficacy of the omega-3 fatty acids supplementation on inflammatory biomarkers: An umbrella meta-analysis. *International Immunopharmacology*, 111, 109104.
- Keller, U. (2019). Nutritional Laboratory Markers in Malnutrition. *Journal of Clinical Medicine*, 8(6), 775. <https://doi.org/10.3390/jcm8060775>
- Kemenkes RI. (2018). *Laporan Riset Kesehatan Dasar (Riskesdas) 2018*. <http://archive.org/details/LaporanRiskesdas2018NasionalPromkes.net>
- Kezic, S., & Jakasa, I. (2016). *Filaggrin and Skin Barrier Function*. <https://karger.com/books/book/162/chapter/5099131/Filaggrin-and-Skin-Barrier-Function>
- Koizumi, S., Okada, Y., Miura, S., Imai, Y., Igase, K., Ohyagi, Y., & Igase, M. (2023). Ingestion of a collagen peptide containing high concentrations of prolyl-hydroxyproline and hydroxyprolyl-glycine reduces advanced glycation end products levels in the skin and subcutaneous blood vessel walls: A randomized, double-blind, placebo-controlled study. *Bioscience, Biotechnology, and Biochemistry*, 87(8), 883–889.
- Komuro, T. (1990). Re-evaluation of fibroblasts and fibroblast-like cells. *Anatomy and Embryology*, 182(2). <https://doi.org/10.1007/bf00174011>

- Landén, N. X., Li, D., & Ståhle, M. (2016). Transition from inflammation to proliferation: A critical step during wound healing. *Cellular and Molecular Life Sciences: CMLS*, 73(20), 3861–3885. <https://doi.org/10.1007/s00018-016-2268-0>
- Leite, S. N., Jordão Júnior, A. A., Andrade, T. A. M. D., Masson, D. D. S., & Frade, M. A. C. (2011). Modelos experimentais de desnutrição e sua influência no trofismo cutâneo. *Anais Brasileiros de Dermatologia*, 86(4), 681–688. <https://doi.org/10.1590/s0365-05962011000400009>
- Li, P., & Wu, G. (2018). Roles of dietary glycine, proline, and hydroxyproline in collagen synthesis and animal growth. *Amino Acids*, 50(1), 29–38. <https://doi.org/10.1007/s00726-017-2490-6>
- Li, P., Yin, Y.-L., Li, D., Woo Kim, S., & Wu, G. (2007). Amino acids and immune function. *British Journal of Nutrition*, 98(2), 237–252. <https://doi.org/10.1017/s000711450769936x>
- Lynam, E. C., Xie, Y., Dawson, R., McGovern, J., Upton, Z., & Wang, X. (2015). Severe hypoxia and malnutrition collectively contribute to scar fibroblast inhibition and cell apoptosis. *Wound Repair and Regeneration*, 23(5), 664–671. <https://doi.org/10.1111/wrr.12343>
- Madhura, R. J., Varsha, A., Mohana Kumar, B., & Veena Shetty, A. (2023). Protein malnutrition in BALB/C mice: A model mimicking clinical scenario of marasmic-kwashiorkor malnutrition. *Journal of Pharmacological and Toxicological Methods*, 119, 107231.
- Maesen, V. D., & Somaadmadja, S. (1993). PROSEA Sumber Daya Nabati Asia Tenggara 1 Kacang-Kacangan. *Jakarta: PT Gramedia Pustaka Utama*.
- Maliza, R., Syaidah, R., Rosdianto, A. M., Tofrizal, A., Santoso, P., Lesmana, R., Arya, B., & Rafi, M. (2024). Lima bean (*Phaseolus lunatus* L.) powder ameliorates pituitary-liver-axis regulation and anti-inflammatory activity in malnourished rats. *Food Production, Processing and Nutrition*, 6(1). <https://doi.org/10.1186/s43014-024-00269-x>
- Maliza, R., Tofrizal, A., & Fadillah, F. (2024). Effect of Low Protein Diet Treatment for Six Weeks on The Brain Histopathological and Cognitive Function in The Wistar Rat. *International Journal of Progressive Sciences and Technologies*, 44(1), Article 1. <https://doi.org/10.52155/ijpsat.v44.1.6134>
- Mathus-Vliegen, E. M. (2004). Old age, malnutrition, and pressure sores: An ill-fated alliance. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 59(4), M355–M360.
- Mescher, A. L. (2018). *Junqueira's basic histology: Text and atlas*. New York: McGraw Hill. <http://thuvienso.thanglong.edu.vn/handle/TLU/6117>

- Miniaci, M. C., Irace, C., Capuozzo, A., Piccolo, M., Di Pascale, A., Russo, A., Lippiello, P., Lepre, F., Russo, G., & Santamaria, R. (2016). Cysteine Prevents the Reduction in Keratin Synthesis Induced by Iron Deficiency in Human Keratinocytes. *Journal of Cellular Biochemistry*, 117(2), 402–412. <https://doi.org/10.1002/jcb.25286>
- Morales, F., Montserrat-de La Paz, S., Leon, M. J., & Rivero-Pino, F. (2023). Effects of Malnutrition on the Immune System and Infection and the Role of Nutritional Strategies Regarding Improvements in Children's Health Status: A Literature Review. *Nutrients*, 16(1), 1. <https://doi.org/10.3390/nu16010001>
- Munro, E. L., Hickling, D. F., Williams, D. M., & Bell, J. J. (2018). Malnutrition is independently associated with skin tears in hospital inpatient setting—Findings of a 6-year point prevalence audit. *International Wound Journal*, 15(4), 527–533. <https://doi.org/10.1111/iwj.12893>
- Murakami, H., Shimbo, K., Takino, Y., & Kobayashi, H. (2013). Combination of BCAAs and glutamine enhances dermal collagen protein synthesis in protein-malnourished rats. *Amino Acids*, 44(3), 969–976. <https://doi.org/10.1007/s00726-012-1426-4>
- Murphrey, M. B., Miao, J. H., & Zito, P. M. (2025). Histology, Stratum Corneum. In *StatPearls*. StatPearls Publishing. <http://www.ncbi.nlm.nih.gov/books/NBK513299/>
- Murray, P. J., & Wynn, T. A. (2011). Protective and pathogenic functions of macrophage subsets. *Nature Reviews Immunology*, 11(11), 723–737. <https://doi.org/10.1038/nri3073>
- Neumann, E., & Tarner, I. H. (2023). [Inflammation in the blood: What's behind it?]. *Innere Medizin (Heidelberg, Germany)*, 64(4), 304–312. <https://doi.org/10.1007/s00108-023-01472-7>
- Noor, S., Piscopo, S., & Gasmi, A. (2021). Nutrients interaction with the immune system. *Archives of Razi Institute*, 76(6), 1579.
- Novaes, R. D., Cupertino, M. C., Sarandy, M. M., Souza, A., Soares, E. A., & Gonçalves, R. V. (2015). Time-dependent resolution of collagen deposition during skin repair in rats: A correlative morphological and biochemical study. *Microscopy and Microanalysis*, 21(6), 1482–1490.
- Oishi, Y., Fu, Z., Ohnuki, Y., Kato, H., & Noguchi, T. (2002). Effects of protein deprivation on $\alpha 1$ (I) and $\alpha 1$ (III) collagen and its degrading system in rat skin. *Bioscience, Biotechnology, and Biochemistry*, 66(1), 117–126.
- Osorio, E. Y., Uscanga-Palomeque, A., Patterson, G. T., Cordova, E., Travi, B. L., Soong, L., & Melby, P. C. (2023). Malnutrition-related parasite dissemination from the skin in visceral leishmaniasis is driven by PGE2-mediated

amplification of CCR7-related trafficking of infected inflammatory monocytes. *PLOS Neglected Tropical Diseases*, 17(1), e0011040. <https://doi.org/10.1371/journal.pntd.0011040>

Palupi, H. T., Estiasih, T., & Sutrisno, A. (2021). Characterization of nutritional and functional properties of Lima bean flour (*Phaseolus Lunatus* L.). *IOP Conference Series: Earth and Environmental Science*, 924(1), 012033. <https://iopscience.iop.org/article/10.1088/1755-1315/924/1/012033/meta>

Palupi, H. T., Estiasih, T., Yunianta, & Sutrisno, A. (2022). Physicochemical and protein characterization of lima bean (*Phaseolus lunatus* L) seed. *Food Research*, 6(1), 168–177. [https://doi.org/10.26656/fr.2017.6\(1\).107](https://doi.org/10.26656/fr.2017.6(1).107)

Pandiangan, M. (2021). Penentuan komposisi asam lemak pada minyak ikan patin. *Jurnal Riset Teknologi Pangan Dan Hasil Pertanian (RETIPA)* p-ISSN, 2745, 4096.

Parke, M. A., Perez-Sanchez, A., Zamil, D. H., & Katta, R. (2021). Diet and Skin Barrier: The Role of Dietary Interventions on Skin Barrier Function. *Dermatology Practical & Conceptual*, 11(1), e2021132. <https://doi.org/10.5826/dpc.1101a132>

Pasonen-Seppänen, S., Karvinen, S., Törrönen, K., Hyttinen, J. M., Jokela, T., Lammi, M. J., Tammi, M. I., & Tammi, R. (2003). EGF upregulates, whereas TGF- β downregulates, the hyaluronan synthases Has2 and Has3 in organotypic keratinocyte cultures: Correlations with epidermal proliferation and differentiation. *Journal of Investigative Dermatology*, 120(6), 1038–1044.

Patterson, G. T., Osorio, E. Y., Peniche, A., Dann, S. M., Cordova, E., Preidis, G. A., Suh, J. H., Ito, I., Saldarriaga, O. A., & Loeffelholz, M. (2022). Pathologic inflammation in malnutrition is driven by proinflammatory intestinal microbiota, large intestine barrier dysfunction, and translocation of bacterial lipopolysaccharide. *Frontiers in Immunology*, 13, 846155.

Pertiwi, M. G. P., Marsono, Y., & Indrati, R. (2020). In vitro gastrointestinal simulation of tempe prepared from koro kratok (*Phaseolus lunatus* L.) as an angiotensin-converting enzyme inhibitor. *Journal of Food Science and Technology*, 57(5), 1847–1855. <https://doi.org/10.1007/s13197-019-04219-1>

Piipponen, M., Li, D., & Landén, N. X. (2020). The Immune Functions of Keratinocytes in Skin Wound Healing. *International Journal of Molecular Sciences*, 21(22), 8790. <https://doi.org/10.3390/ijms21228790>

Prakoewa, F. R. (2020). Peranan sel limfosit dalam imunologi: Artikel review. *Jurnal Sains Dan Kesehatan*, 2(4), 525–537.

- Prasetya, B. O., Diniyah, N., & Fauziah, R. R. (2020). Karakteristik biskuit dari tepung koro kratok (*Phaseolus lunatus* L.) termodifikasi dan mocaf (modified cassava flour). *Jurnal Pangan Dan Agroindustri*, 8(1), 36–46.
- Purwanti, E., & Fauzi, A. (2019). The morphological characteristics of *Phaseolus lunatus* L. in different areas of East Java, Indonesia. *IOP Conference Series: Earth and Environmental Science*, 276(1), 012017. <https://iopscience.iop.org/article/10.1088/1755-1315/276/1/012017/meta>
- Puspita, R. M., & Wiyono, A. (2014). Budidaya Patin Cepat Panen. *Infra Pustaka. Jakarta*.
- Putri, R. (2022). Efektivitas Metode Penyuluhan dan Konseling Dalam Upaya Perbaikan Status Gizi Pada Anak Malnutrisi. *Ahmar Metastasis Health Journal*, 2(3), 126–143.
- Quan, C., Cho, M. K., Shao, Y., Mianeki, L. E., Liao, E., Perry, D., & Quan, T. (2015). Dermal fibroblast expression of stromal cell-derived factor-1 (SDF-1) promotes epidermal keratinocyte proliferation in normal and diseased skin. *Protein & Cell*, 6(12), 890–903. <https://doi.org/10.1007/s13238-015-0198-5>
- Quan, T., & Fisher, G. J. (2015). Role of age-associated alterations of the dermal extracellular matrix microenvironment in human skin aging: A mini-review. *Gerontology*, 61(5), 427–434.
- Ratnasari, D. (2019). Identifikasi jenis ikan air tawar di pasar masuka sintang kalimantan barat. *Edumedia: Jurnal Keguruan Dan Ilmu Pendidikan*, 3(2). <https://jurnal.unka.ac.id/index.php/fkip/article/download/366/399>
- Rawlings, A. V., & Harding, C. R. (2004). Moisturization and skin barrier function. *Dermatologic Therapy*. <https://onlinelibrary.wiley.com/doi/10.1111/j.1396-0296.2004.04S1005.x>
- Reilly, D. M., & Lozano, J. (2021). Skin collagen through the lifestages: Importance for skin health and beauty. *Plastic and Aesthetic Research*, 8, N-A.
- Rout, P., Reynolds, S. B., & Zito, P. M. (2025). Neutropenia. In *StatPearls*. StatPearls Publishing. <http://www.ncbi.nlm.nih.gov/books/NBK507702/>
- Salman, Md., Suraiya, S., Das, P., Islam, Md. A., & Haq, M. (2021). Variation in the Proximate Composition, Amino Acids Content and Fatty Acids of Thai Pangus (*Pangasianodon hypophthalmus*) Fish Depending on Size. *Asian Food Science Journal*, 35–49. <https://doi.org/10.9734/afsj/2021/v20i630307>
- Sampaio, L. A. S., Costa, J. S., Freire, T. F. C., Reis, S. R. D. A., Deiró, T. C. B. D. J., & Medrado, A. R. A. P. (2018). Influence of protein malnutrition on cutaneous wound healing in rats. *Revista de Nutrição*, 31(5), 433–442. <https://doi.org/10.1590/1678-98652018000500001>

- Sari, S., JOHAN, V. S., & ALI, A. (2016). Pemanfaatan pati sagu dan tepung ikan patin dalam pembuatan biskuit. *Sagu*, 15(2), 30–39.
- Sibilla, S., Godfrey, M., Brewer, S., Budh-Raja, A., & Genovese, L. (2015). An overview of the beneficial effects of hydrolysed collagen as a nutraceutical on skin properties: Scientific background and clinical studies. *Open Nutraceuticals J*, 8(1), 29–42.
- Slaoui, M., Bauchet, A.-L., & Fiette, L. (2017). Tissue Sampling and Processing for Histopathology Evaluation. *Methods in Molecular Biology (Clifton, N.J.)*, 1641, 101–114. https://doi.org/10.1007/978-1-4939-7172-5_4
- Sobczak-Kupiec, A., Drabczyk, A., Florkiewicz, W., Głab, M., Kudłacik-Kramarczyk, S., Słota, D., Tomala, A., & Tylińczak, B. (2021). Review of the applications of biomedical compositions containing hydroxyapatite and collagen modified by bioactive components. *Materials*, 14(9), 2096.
- Soejanto, A. S. (2017). Pemberian Krim Ekstrak Metanolik Buah Delima Merah (*Punica granatum*) Menghambat Penurunan Jumlah Kolagen Dermis Kulit Mencit (*Mus gusculus*) Yang Dipapar Sinar Ultraviolet B. *E-Jurnal Indonesian Journal of Anti Aging Medicine*, 1(1), 1–9.
- Solano, F. (2020). *Metabolism and Functions of Amino Acids in the Skin* | SpringerLink. https://link.springer.com/chapter/10.1007/978-3-030-45328-2_11
- Sparavigna, A. (2020). Role of the extracellular matrix in skin aging and dedicated treatment-state of the art. *Plastic and Aesthetic Research*, 7, N-A.
- Sugiyama, A., Fujita, Y., Kobayashi, T., Ryu, M., Suzuki, Y., Masuda, A., Ochi, T., & Takeuchi, T. (2011). Effect of Protein Malnutrition on the Skin Epidermis of Hairless Mice. *Journal of Veterinary Medical Science*, 73(6), 831–835. <https://doi.org/10.1292/jvms.10-0399>
- Tanjung, N. U., & Nazara, E. N. (2023). Hubungan Asupan Gizi Makro dan Riwayat Infeksi Dengan Malnutrisi Pada Balita di Puskesmas Lotu. *Jurnal Ilmiah Kesehatan Masyarakat: Media Komunikasi Komunitas Kesehatan Masyarakat*, 15(1), 23–28.
- Tedesco, L., Rossi, F., Ruocco, C., Ragni, M., Carruba, M. O., Valerio, A., & Nisoli, E. (2022). A designer mixture of six amino acids promotes the extracellular matrix gene expression in cultured human fibroblasts. *Bioscience, Biotechnology, and Biochemistry*, 86(9), 1255–1261.
- Temegne, N. C., Tsoata, E., Emmanuel Ngome, A. F., Tonfack, L. B., Agendia, A. P., & Youmbi, E. (2021). Chapter 7—Lima bean. *En A. Pratap & S. Gupta (Eds.), The Beans and the Peas (pp. 133-152)*. Woodhead Publishing. <https://doi.org/10.1016/B978-0-12-821450-3.00001-9>.

- Thind, M. K., Uhlig, H. H., Glogauer, M., Palaniyar, N., Bourdon, C., Gwela, A., Lancioni, C. L., Berkley, J. A., Bandsma, R. H. J., & Farooqui, A. (2024). A metabolic perspective of the neutrophil life cycle: New avenues in immunometabolism. *Frontiers in Immunology*, 14. <https://doi.org/10.3389/fimmu.2023.1334205>
- Varani, J., Dame, M. K., Rittie, L., Fligiel, S. E., Kang, S., Fisher, G. J., & Voorhees, J. J. (2006). Decreased collagen production in chronologically aged skin: Roles of age-dependent alteration in fibroblast function and defective mechanical stimulation. *The American Journal of Pathology*, 168(6), 1861–1868.
- Wynn, T. A., Chawla, A., & Pollard, J. W. (2013). Macrophage biology in development, homeostasis and disease. *Nature*, 496(7446), 445–455.
- Xiong, H., & Pamer, E. G. (2015). Monocytes and infection: Modulator, messenger and effector. *Immunobiology*, 220(2), 210–214.
- Zague, V., De Freitas, V., Rosa, M. D. C., De Castro, G. Á., Jaeger, R. G., & Machado-Santelli, G. M. (2011). Collagen Hydrolysate Intake Increases Skin Collagen Expression and Suppresses Matrix Metalloproteinase 2 Activity. *Journal of Medicinal Food*, 14(6), 618–624. <https://doi.org/10.1089/jmf.2010.0085>
- Zaidi, Z., & Lanigan, S. W. (2010). *Dermatology in clinical practice*. Springer Science & Business Media. <https://books.google.com/books?hl=id&lr=&id=I0GFGJfVeFIC&oi=fnd&pg=PR4&dq=Zaidi,+Z.,+%26+Lanigan,+S.+W.+2010.+Skin+and+Malnutrition.+Dermatology+in+Clinical+Practice,+447-450.&ots=s2S6tbc5Mw&sig=XRRO6hVY7Si08-FdqzwTmBq81SM>
- Zhu, J., & Thompson, C. B. (2019). Metabolic regulation of cell growth and proliferation. *Nature Reviews Molecular Cell Biology*, 20(7), 436–450.