

DAFTAR PUSTAKA

- Abdollahi, S., Meshkini, F., Clark, C.C.T., Heshmati, J. and Soltani, S. (2022), "The effect of probiotics/synbiotics supplementation on renal and liver biomarkers in patients with type 2 diabetes: A systematic review and meta-analysis of randomised controlled trials", *British Journal of Nutrition*, Cambridge University Press, Vol. 128 No. 4, pp. 625–635, doi: 10.1017/S0007114521003780,.
- Al-Sayyar, A., Hammad, M.M., Williams, M.R., Al-Onaizi, M., Abubaker, J. and Alzaid, F. (2023), "Neurotransmitters in Type 2 Diabetes and the Control of Systemic and Central Energy Balance", *Metabolites*, MDPI, Vol. 13 No. 3, doi: 10.3390/METABO13030384,.
- Alqahtani, Q.H., Alshehri, S., Alhusaini, A.M., Sarawi, W.S., Alqarni, S.S., Mohamed, R., Kumar, M.N., *et al.* (2023), "Protective Effects of Sitagliptin on Streptozotocin-Induced Hepatic Injury in Diabetic Rats: A Possible Mechanisms", *Diseases*, Multidisciplinary Digital Publishing Institute (MDPI), Vol. 11 No. 4, doi: 10.3390/DISEASES11040184,.
- American Diabetes Association. (2020), "Classification and diagnosis of diabetes: Standards of Medical Care in Diabetes-2020", *Diabetes Care*, American Diabetes Association Inc., Vol. 43 No. Suppl 1, pp. S14–S31, doi: 10.2337/DC20-S002,.
- American Diabetes Association. (2021), "2. Classification and diagnosis of diabetes: Standards of medical care in diabetes-2021", *Diabetes Care*, American Diabetes Association Inc., 1 January, doi: 10.2337/DC21-S002,.
- Arai, T., Takahashi, H., Seko, Y., Toyoda, H., Hayashi, H., Yamaguchi, K., Iwaki, M., *et al.* (2024), "Accuracy of the Enhanced Liver Fibrosis Test in Patients With Type 2 Diabetes Mellitus and Its Clinical Implications", *Clinical Gastroenterology and Hepatology*, W.B. Saunders, Vol. 22 No. 4, pp. 789–797.e8, doi: 10.1016/J.CGH.2023.11.022.
- Arifin, W.N. and Zahiruddin, W.M. (2017), "Sample Size Calculation in Animal Studies Using Resource Equation Approach", *The Malaysian Journal of Medical Sciences : MJMS*, Malays J Med Sci, Vol. 24 No. 5, pp. 101–105, doi: 10.21315/MJMS2017.24.5.11.
- Aryanta, I.W.R. (2021), "Kefir dan Manfaatnya Bagi Kesehatan", *Widya Kesehatan*, Universitas Hindu Indonesia, Vol. 3 No. 1, pp. 35–38, doi: 10.32795/WIDYAKESEHATAN.V3I1.1657.
- Azizi, N.F., Kumar, M.R., Yeap, S.K., Abdullah, J.O., Khalid, M., Omar, A.R., Osman, M.A., *et al.* (2021), "Kefir and Its Biological Activities", *Foods 2021*, Vol. 10, Page 1210, Multidisciplinary Digital Publishing Institute, Vol. 10 No. 6, p. 1210, doi: 10.3390/FOODS10061210.

- Bajinka, O., Tan, Y., Darboe, A., Ighaede-Edwards, I.G. and Abdelhalim, K.A. (2023), "The gut microbiota pathway mechanisms of diabetes", *AMB Express*, Springer Science and Business Media Deutschland GmbH, Vol. 13 No. 1, pp. 1–10, doi: 10.1186/S13568-023-01520-3/FIGURES/1.
- Banday, M.Z., Sameer, A.S. and Nissar, S. (2020), "Pathophysiology of diabetes: An overview", *Avicenna Journal of Medicine*, Georg Thieme Verlag KG, Vol. 10 No. 4, p. 174, doi: 10.4103/AJM.AJM_53_20.
- Benjamin-van Aalst, O., Dupont, C., van der Zee, L., Garssen, J. and Knipping, K. (2024), "Goat Milk Allergy and a Potential Role for Goat Milk in Cow's Milk Allergy", *Nutrients*, Multidisciplinary Digital Publishing Institute (MDPI), Vol. 16 No. 15, doi: 10.3390/NU16152402,.
- Bilal, H.M., Riaz, F., Munir, K., Saqib, A., Muhammad, & Sarwar, R. (2016), "Histological changes in the liver of diabetic rats: A review of pathogenesis of nonalcoholic fatty liver disease in type 1 diabetes mellitus", *Cogent Medicine*, Cogent, Vol. 3 No. 1, p. 1275415, doi: 10.1080/2331205X.2016.1275415.
- Botros, M. and Sikaris, K.A. (2013), "The De Ritis Ratio: The Test of Time", *The Clinical Biochemist Reviews*, Australasian Association of Clinical Biochemists, Vol. 34 No. 3, p. 117.
- Brito, A.K. da S., Mendes, A.V. da S., Timah Acha, B., Santos Oliveira, A.S. da S., Lopes Macedo, J., Suzuki Cruzio, A., Prianti, M. das G., *et al.* (2025), "Experimental Models of Type 2 Diabetes Mellitus Induced by Combining Hyperlipidemic Diet (HFD) and Streptozotocin Administration in Rats: An Integrative Review", *Biomedicines* 2025, Vol. 13, Page 1158, Multidisciplinary Digital Publishing Institute, Vol. 13 No. 5, p. 1158, doi: 10.3390/BIOMEDICINES13051158.
- Burcelin, R., Knauf, C. and Cani, P.D. (2008), "Pancreatic α -cell dysfunction in diabetes", *Diabetes & Metabolism*, Elsevier Masson, Vol. 34 No. SUPPL. 2, pp. S49–S55, doi: 10.1016/S1262-3636(08)73395-0.
- Cais-Sokolińska, D., Wójtowski, J., Pikul, J., Danków, R., Majcher, M., Teichert, J. and Bagnicka, E. (2015), "Formation of volatile compounds in kefir made of goat and sheep milk with high polyunsaturated fatty acid content", *Journal of Dairy Science*, Elsevier Inc., Vol. 98 No. 10, pp. 6692–6705, doi: 10.3168/JDS.2015-9441,.
- Caussy, C., Aubin, A. and Loomba, R. (2021), "The Relationship Between Type 2 Diabetes, NAFLD, and Cardiovascular Risk", *Current Diabetes Reports*, Springer, Vol. 21 No. 5, doi: 10.1007/S11892-021-01383-7,.
- Chen, X., Zhang, Z., Niu, H., Tian, X., Tian, H., Yao, W., He, H., *et al.* (2024), "Goat Milk Improves Glucose Metabolism in Type 2 Diabetic Mice and Protects Pancreatic β -Cell Functions", *Molecular Nutrition and Food Research*, John Wiley and Sons Inc, Vol. 68 No. 1, p. 2200842, doi:

10.1002/MNFR.202200842;JOURNAL:JOURNAL:15213803;PAGEGROUP:STRING:PUBLICATION.

- Cheung, A. and Ahmed, A. (2021), “Nonalcoholic Fatty Liver Disease and Chronic Kidney Disease: A Review of Links and Risks”, *Clinical and Experimental Gastroenterology*, Dove Medical Press Ltd, Vol. 14, p. 457, doi: 10.2147/CEG.S226130.
- Cui, Y., Jing, C., Yue, Y., Ning, M., Chen, H., Yuan, Y. and Yue, T. (2024), “Kefir Ameliorates Alcohol-Induced Liver Injury Through Modulating Gut Microbiota and Fecal Bile Acid Profile in Mice”, *Molecular Nutrition & Food Research*, Mol Nutr Food Res, Vol. 68 No. 1, doi: 10.1002/MNFR.202300301.
- Decroli, E. (2019), *Diabetes Melitus Tipe 2*, Pusat Penerbitan Bagian Ilmu Penyakit Dalam Fakultas Kedokteran Universitas Andalas, Padang.
- Delwatta, S.L., Gunatilake, M., Baumans, V., Seneviratne, M.D., Dissanayaka, M.L.B., Batagoda, S.S., Udagedara, A.H., *et al.* (2018), “Reference values for selected hematological, biochemical and physiological parameters of Sprague-Dawley rats at the Animal House, Faculty of Medicine, University of Colombo, Sri Lanka”, *Animal Models and Experimental Medicine*, John Wiley and Sons Inc, Vol. 1 No. 4, p. 250, doi: 10.1002/AME2.12041.
- Dinarvand, N., Cheraghian, B., Rahimi, Z., Salehipour Bavarsad, S., Bavarsad, A. and Mohammadtaghvaei, N. (2023), “Examining dyslipidaemia, metabolic syndrome and liver enzyme levels in patients with prediabetes and type 2 diabetes in population from Hoveyzeh cohort study: A case-control study in Iran”, *Endocrinology, Diabetes and Metabolism*, John Wiley and Sons Inc, Vol. 6 No. 2, p. e401, doi: 10.1002/EDM2.401.
- Duncan, B.B. and Schmidt, M.I. (2001), “Chronic activation of the innate immune system may underlie the metabolic syndrome”, *Sao Paulo Medical Journal*, Associação Paulista de Medicina - APM, Vol. 119 No. 3, pp. 122–127, doi: 10.1590/S1516-31802001000300008.
- Eidi, A., Mortazavi, P., Tehrani, M.E. and Rohani, A.H. (2012), “Hepatoprotective Effects Of Panthothenic Acid On Carbon Tetrachloride-induced Toxicity In Rats”, *EXCLI Journal*, Vol. 11, pp. 748–759.
- Firdaus, F., Rimbawan, R., Marliyati, S.A. and Roosita, K. (2016), “Media Kesehatan Masyarakat Indonesia MODEL TIKUS DIABETES YANG DIINDUKSI STREPTOZOTOCIN- SUKROSA UNTUK PENDEKATAN PENELITIAN DIABETES”, *Media Kesehatan Masyarakat Indonesia*, Vol. 12 No. 1, doi: 10.30597/mkmi.v12i1.550.
- Folasade Omobolanle, A., Marcus Olaoye, I., Oluwatosin, A., Noheem Olaolu, K., Ayobami Lydia, A. and Luqmon Adekunle, A. (2023), “Anti-oxidative, Anti-inflammatory and Anti-apoptotic Efficacy of *Anacardium occidentale* Nuts Methanolic Extract in Pancreas of High-Fat

- Diet/Streptozotocin-Induced Diabetic Rats”, *International Journal of Diabetes and Clinical Research*, ClinMed International Library, Vol. 10 No. 4, p. 177, doi: 10.23937/2377-3634/1410177.
- Furman, B.L. (2021), “Streptozotocin-Induced Diabetic Models in Mice and Rats”, *Current Protocols*, Blackwell Publishing Inc., Vol. 1 No. 4, doi: 10.1002/CPZ1.78,.
- Galicia-Garcia, U., Benito-Vicente, A., Jebari, S., Larrea-Sebal, A., Siddiqi, H., Uribe, K.B., Ostolaza, H., *et al.* (2020), “Pathophysiology of Type 2 Diabetes Mellitus”, *International Journal of Molecular Sciences*, MDPI AG, Vol. 21 No. 17, p. 6275, doi: 10.3390/IJMS21176275.
- Ghasemi, A. and Jeddi, S. (2023), “Streptozotocin as a tool for induction of rat models of diabetes: a practical guide”, *EXCLI Journal*, Leibniz Research Centre for Working Environment and Human Factors, Vol. 22, p. 274, doi: 10.17179/EXCLI2022-5720.
- Gheibi, S., Kashfi, K. and Ghasemi, A. (2017), “A practical guide for induction of type-2 diabetes in rat: Incorporating a high-fat diet and streptozotocin”, *Biomedicine & Pharmacotherapy*, Elsevier Masson, Vol. 95, pp. 605–613, doi: 10.1016/J.BIOPHA.2017.08.098.
- Giknis, M.L.A. and Clifford, C.B. (2008), *Clinical Laboratory Parameters for Crl: WI(Han) Rats*, Charles River Laboratories.
- Ginting D, Angie E and Natali O. (2024), “Gambaran Fungsi Hati Pada Pasien Diabetes Melitus Tipe 2 di RSU Royal Prima Medan Tahun 2022”, *Jurnal Kesehatan Tambusai*, Vol. 5.
- Goyal, R., Singhal, M. and Jialal, I. (2023), “Type 2 Diabetes”, *StatPearls*, StatPearls Publishing, 23 June, available at: <https://www.ncbi.nlm.nih.gov/books/NBK513253/> (accessed 15 May 2025).
- Guan, H., Tian, J., Wang, Y., Niu, P., Zhang, Y., Zhang, Y., Fang, X., *et al.* (2024), “Advances in secondary prevention mechanisms of macrovascular complications in type 2 diabetes mellitus patients: a comprehensive review”, *European Journal of Medical Research* 2024 29:1, BioMed Central, Vol. 29 No. 1, pp. 1–34, doi: 10.1186/S40001-024-01739-1.
- Hariharan, R., Odjidja, E.N., Scott, D., Shivappa, N., Hébert, J.R., Hodge, A. and de Courten, B. (2022), “The dietary inflammatory index, obesity, type 2 diabetes, and cardiovascular risk factors and diseases”, *Obesity Reviews*, John Wiley and Sons Inc, Vol. 23 No. 1, doi: 10.1111/OBR.13349,.
- Harreiter, J. and Roden, M. (2023), “Diabetes mellitus: definition, classification, diagnosis, screening and prevention (Update 2023)”, *Wiener Klinische Wochenschrift*, Springer, Vol. 135 No. Suppl 1, pp. 7–17, doi: 10.1007/S00508-022-02122-Y,.

- Hartman, M.L., Sanyal, A.J., Loomba, R., Wilson, J.M., Nikooienejad, A., Bray, R., Karanikas, C.A., *et al.* (2020), “Effects of Novel Dual GIP and GLP-1 Receptor Agonist Tirzepatide on Biomarkers of Nonalcoholic Steatohepatitis in Patients With Type 2 Diabetes”, *Diabetes Care*, American Diabetes Association, Vol. 43 No. 6, pp. 1352–1355, doi: 10.2337/DC19-1892.
- Harvard Health Publishing. (2024), “Type 2 Diabetes Mellitus - Harvard Health”, 7 May, available at: <https://www.health.harvard.edu/diseases-and-conditions/type-2-diabetes-mellitus-a-to-z> (accessed 29 August 2025).
- Hasan, K.M.M., Tamanna, N. and Haque, M.A. (2018), “Biochemical and histopathological profiling of Wistar rat treated with *Brassica napus* as a supplementary feed”, *Food Science and Human Wellness*, 北京食品科学研究所, Vol. 7 No. 1, pp. 77–82, doi: 10.1016/J.FSHW.2017.12.002.
- Hazni, R., Gustiawan, R., Zulfian, Z., Lestari, S.M.P., Arania, R. and Sudiadnyani, N.P. (2021), “Penyuluhan Diabetes Mellitus Di Puskesmas Rawat Inap Sukaraja Bandar Lampung”, *Jurnal Kreativitas Pengabdian Kepada Masyarakat (PKM)*, Universitas Malahayati Bandar Lampung, Vol. 4 No. 1, pp. 181–187, doi: 10.33024/JKPM.V4I1.3728.
- Hernández, M.A.G., Canfora, E.E., Jocken, J.W.E. and Blaak, E.E. (2019), “The Short-Chain Fatty Acid Acetate in Body Weight Control and Insulin Sensitivity”, *Nutrients*, MDPI AG, Vol. 11 No. 8, p. 1943, doi: 10.3390/NU11081943.
- Hsieh, P.S., Ho, H.H., Tsao, S.P., Hsieh, S.H., Lin, W.Y., Chen, J.F., Kuo, Y.W., *et al.* (2021), “Multi-strain probiotic supplement attenuates streptozotocin-induced type-2 diabetes by reducing inflammation and β -cell death in rats”, *PLoS ONE*, Public Library of Science, Vol. 16 No. 6 June, doi: 10.1371/JOURNAL.PONE.0251646.
- Huang, K.C., Chuang, P.Y., Yang, T.Y., Tsai, Y.H., Li, Y.Y. and Chang, S.F. (2024), “Diabetic Rats Induced Using a High-Fat Diet and Low-Dose Streptozotocin Treatment Exhibit Gut Microbiota Dysbiosis and Osteoporotic Bone Pathologies”, *Nutrients*, Multidisciplinary Digital Publishing Institute (MDPI), Vol. 16 No. 8, p. 1220, doi: 10.3390/NU16081220/S1.
- Husna, F., Suyatna, F.D., Arozal, W. and Purwaningsih, E.H. (2019), “Model Hewan Coba pada Penelitian Diabetes Animal Model in Diabetes Research”, *Mini Review Article Pharmaceutical Sciences and Research (PSR)*, Vol. 6 No. 3, pp. 131–141.
- International Diabetes Federation. (2024), “IDF Diabetes Atlas 11th”, *IDF DIABETES ATLAS [Internet]*. Brussels, available at: <https://diabetesatlas.org/> (accessed 8 June 2025).
- Jeon, C.Y., Roberts, C.K., Crespi, C.M. and Zhang, Z.F. (2013), “Elevated liver enzymes in individuals with undiagnosed diabetes in the U.S”, *Journal of*

Diabetes and Its Complications, Vol. 27 No. 4, p. 333, doi: 10.1016/J.JDIACOMP.2013.04.005.

- Joseph, J.J., Deedwania, P., Acharya, T., Aguilar, D., Bhatt, D.L., Chyun, D.A., Di Palo, K.E., *et al.* (2022), “Comprehensive Management of Cardiovascular Risk Factors for Adults with Type 2 Diabetes: A Scientific Statement from the American Heart Association”, *Circulation*, Lippincott Williams and Wilkins, Vol. 145 No. 9, pp. 722–759, doi: 10.1161/CIR.0000000000001040,.
- Kälsch, J., Bechmann, L.P., Heider, D., Best, J., Manka, P., Kälsch, H., Sowa, J.P., *et al.* (2015), “Normal liver enzymes are correlated with severity of metabolic syndrome in a large population based cohort”, *Scientific Reports* 2015 5:1, Nature Publishing Group, Vol. 5 No. 1, pp. 13058-, doi: 10.1038/srep13058.
- Kaneto, H., Kimura, T., Shimoda, M., Obata, A., Sanada, J., Fushimi, Y., Matsuoka, T.A., *et al.* (2022), “Molecular Mechanism of Pancreatic β -Cell Failure in Type 2 Diabetes Mellitus”, *Biomedicines*, MDPI, Vol. 10 No. 4, p. 818, doi: 10.3390/BIMEDICINES10040818.
- Kaser, S., Hofer, S.E., Kazemi-Shirazi, L., Festa, A., Winhofer, Y., Sourij, H., Brath, H., *et al.* (2023), “Other specific types of diabetes and exocrine pancreatic insufficiency (update 2023)”, *Wiener Klinische Wochenschrift*, Springer, Vol. 135 No. Suppl 1, pp. 18–31, doi: 10.1007/S00508-022-02123-X,.
- Kathak, R.R., Sumon, A.H., Molla, N.H., Hasan, M., Miah, R., Tuba, H.R., Habib, A., *et al.* (2022), “The association between elevated lipid profile and liver enzymes: a study on Bangladeshi adults”, *Scientific Reports*, Nature Research, Vol. 12 No. 1, doi: 10.1038/S41598-022-05766-Y,.
- Kementrian Kesehatan RI. (2023), *Survei Kesehatan Indonesia 2023*, Jakarta.
- Khan, M.A.B., Hashim, M.J., King, J.K., Govender, R.D., Mustafa, H. and Kaabi, J. Al. (2020), “Epidemiology of Type 2 diabetes - Global burden of disease and forecasted trends”, *Journal of Epidemiology and Global Health*, Atlantis Press International, Vol. 10 No. 1, pp. 107–111, doi: 10.2991/JEGH.K.191028.001/METRICS.
- Kim, J.V. and Wu, G.Y. (2020), “Body Building and Aminotransferase Elevations: A Review”, *Journal of Clinical and Translational Hepatology*, Xia and He Publishing Inc., Vol. 8 No. 2, p. 161, doi: 10.14218/JCTH.2020.00005.
- Kök-Taş, T., Seydim, A.C., Özer, B. and Guzel-Seydim, Z.B. (2013), “Effects of different fermentation parameters on quality characteristics of kefir”, *Journal of Dairy Science*, Elsevier, Vol. 96 No. 2, pp. 780–789, doi: 10.3168/jds.2012-5753.
- Kongmalai, T., Srinonprasert, V., Anothaisintawee, T., Kongmalai, P., McKay, G., Attia, J. and Thakkestian, A. (2023), “New anti-diabetic agents for the

treatment of non-alcoholic fatty liver disease: a systematic review and network meta-analysis of randomized controlled trials”, *Frontiers in Endocrinology*, Frontiers Media SA, Vol. 14, p. 1182037, doi: 10.3389/FENDO.2023.1182037/BIBTEX.

Kotronen, A., Juurinen, L., Hakkarainen, A., Westerbacka, J., Cornér, A., Bergholm, R. and Yki-Järvinen, H. (2008), “Liver fat is increased in type 2 diabetic patients and underestimated by serum alanine aminotransferase compared with equally obese nondiabetic subjects”, *Diabetes Care*, Diabetes Care, Vol. 31 No. 1, pp. 165–169, doi: 10.2337/DC07-1463,.

Kučera, O., Garnol, T., Lotková, H., Staňková, P., Mazurová, Y., Hroch, M., Bolehovská, R., *et al.* (2011), “The Effect of Rat Strain , Diet Composition and Feeding Period on the Development of a Nutritional Model of Non-Alcoholic Fatty Liver Disease in Rats”, *Physiol. Res.*, Vol. 60, pp. 317–328, doi: <https://doi.org/10.33549/physiolres.932022>.

Kusnadi, Y. and Saleh, M.M.I. (2023), *Abnormalitas Mikrobiota Usus Pada Diabetes Melitus Tipe 2*, Bening Media Publishing, Palembang.

Lee, J., Kim, M., Jang, J.-Y. and Oh, C.-M. (2023), “Assessment HOMA as a predictor for new onset diabetes mellitus and diabetic complications in non-diabetic adults: a KoGES prospective cohort study”, *Clinical Diabetes and Endocrinology*, Springer Science and Business Media LLC, Vol. 9 No. 1, p. 7, doi: 10.1186/S40842-023-00156-3.

Lennikov, A., ElZaridi, F. and Yang, M. (2024), “Modified streptozotocin-induced diabetic model in rodents”, *Animal Models and Experimental Medicine*, John Wiley and Sons Inc, Vol. 7 No. 5, pp. 777–780, doi: 10.1002/AME2.12497.

Liu, Z., Que, S., Xu, J. and Peng, T. (2014), “Alanine Aminotransferase-Old Biomarker and New Concept: A Review”, *International Journal of Medical Sciences*, Ivyspring International Publisher, Vol. 11 No. 9, pp. 925–935, doi: 10.7150/IJMS.8951.

M’hir, S., Ayed, L., De Pasquale, I., Fanizza, E., Tlais, A.Z.A., Comparelli, R., Verni, M., *et al.* (2024), “Comparison of Milk Kefirs Obtained from Cow’s, Ewe’s and Goat’s Milk: Antioxidant Role of Microbial-Derived Exopolysaccharides”, *Antioxidants*, Multidisciplinary Digital Publishing Institute (MDPI), Vol. 13 No. 3, p. 335, doi: 10.3390/ANTIOX13030335.

De Magalhães, D.A., Kume, W.T., Correia, F.S., Queiroz, T.S., Allebrandt Neto, E.W., Dos Santos, M.P., Kawashita, N.H., *et al.* (2019), “High-fat diet and streptozotocin in the induction of type 2 diabetes mellitus: A new proposal”, *Anais Da Academia Brasileira de Ciencias*, Academia Brasileira de Ciencias, Vol. 91 No. 1, doi: 10.1590/0001-3765201920180314,.

Mahdavi, A., Greffard, K., Trottier, J., Barbier, O., Bilodeau, J.-F., Lebel, M. and Rudkowska, I. (2025), “Dairy product intake alters the correlations between

circulating bile acids and short-chain fatty acids with the bacterial taxa *Roseburia*, *Faecalibacterium*, *Flavonifractor* and *Verrucomicrobia*”, *Lifestyle Genomics*, pp. 1–24, doi: 10.1159/000550224.

- Mandal, A., Bhattarai, B., Kafle, P., Khalid, M., Jonnadula, S.K., Lamicchane, J., Kanth, R., *et al.* (2018), “Elevated Liver Enzymes in Patients with Type 2 Diabetes Mellitus and Non-alcoholic Fatty Liver Disease”, *Cureus*, Springer Science and Business Media LLC, Vol. 10 No. 11, p. e3626, doi: 10.7759/CUREUS.3626.
- McGovern, C.J., González-Orozco, B.D. and Jiménez-Flores, R. (2024), “Evaluation of kefir grain microbiota, grain viability, and bioactivity from fermenting dairy processing by-products”, *Journal of Dairy Science*, Elsevier, Vol. 107 No. 7, pp. 4259–4276, doi: 10.3168/JDS.2023-24364.
- Mellemkjær, A., Kjær, M.B., Haldrup, D., Grønbæk, H. and Thomsen, K.L. (2024), “Management of cardiovascular risk in patients with metabolic dysfunction-associated steatotic liver disease”, *European Journal of Internal Medicine*, Elsevier B.V., Vol. 122, pp. 28–34, doi: 10.1016/j.ejim.2023.11.012.
- Minato-Inokawa, S., Tsuboi-Kaji, A., Honda, M., Takeuchi, M., Kitaoka, K., Kurata, M., Wu, B., *et al.* (2023), “Associations of Alanine Aminotransferase/Aspartate Aminotransferase, a Marker of Hepatosteatosis, with Adipose Tissue Insulin Resistance Index and Leptin/Adiponectin Ratio in Japanese Women”, *Metabolic Syndrome and Related Disorders*, Mary Ann Liebert Inc., Vol. 21 No. 10, pp. 590–595, doi: 10.1089/MET.2023.0118.
- Młynarska, E., Czarnik, W., Dzieża, N., Jędraszak, W., Majchrowicz, G., Prusinowski, F., Stabrawa, M., *et al.* (2025), “Type 2 Diabetes Mellitus: New Pathogenetic Mechanisms, Treatment and the Most Important Complications”, *International Journal of Molecular Sciences* 2025, Vol. 26, Page 1094, Multidisciplinary Digital Publishing Institute, Vol. 26 No. 3, p. 1094, doi: 10.3390/IJMS26031094.
- Mohammadi, F., Razmjooei, N., Mohsenpour, M.A., Nejati, M.A., Eftekhari, M.H. and Hejazi, N. (2025), “The effects of kefir drink on liver aminotransferases and metabolic indicators in patients with nonalcoholic fatty liver disease: a randomized controlled trial”, *BMC Nutrition* 2024 11:1, BioMed Central, Vol. 11 No. 1, pp. 3-, doi: 10.1186/S40795-024-00989-W.
- Moriles, K.E., Zubair, M. and Azer, S.A. (2024), “Alanine Aminotransferase (ALT) Test”, *StatPearls*, StatPearls Publishing.
- Mostafavinia, A., Amini, A., Ghorishi, S.K., Pouriran, R. and Bayat, M. (2016), “The effects of dosage and the routes of administrations of streptozotocin and alloxan on induction rate of type 2 diabetes mellitus and mortality rate in rats”, *Laboratory Animal Research*, BioMed Central Ltd, Vol. 32 No. 3, pp. 160–165, doi: 10.5625/LAR.2016.32.3.160,.

- Moyana, T.N. (2024), “Metabolic dysfunction-associated steatotic liver disease: The question of long-term high-normal alanine aminotransferase as a screening test”, *World Journal of Gastroenterology*, Baishideng Publishing Group Inc, Vol. 30 No. 42, pp. 4576–4582, doi: 10.3748/wjg.v30.i42.4576.
- Music, M., Dervisevic, A., Pepic, E., Lepara, O., Fajkic, A., Ascic-Buturovic, B. and Tuna, E. (2015), “Metabolic Syndrome and Serum Liver Enzymes Level at Patients with Type 2 Diabetes Mellitus”, *Medical Archives*, Vol. 69 No. 4, p. 251, doi: 10.5455/MEDARH.2015.69.251-255.
- Naseri, K., Saadati, S., Ashtary-Larky, D., Asbaghi, O., Ghaemi, F., Pashayee-Khamene, F., Yari, Z., *et al.* (2022), “Probiotics and synbiotics supplementation improve glycemic control parameters in subjects with prediabetes and type 2 diabetes mellitus: A GRADE-assessed systematic review, meta-analysis, and meta-regression of randomized clinical trials”, *Pharmacological Research*, Academic Press, Vol. 184, doi: 10.1016/J.PHRS.2022.106399,.
- NIH OACU. (2022), *Guidelines for Survival Blood Collection in Mice and Rats*.
- Nsiah, K., Dzogbefia, V.P., Ansong, D., Akoto, A.O., Boateng, H. and Ocloo, D. (2011), “Pattern of AST and ALT changes in relation to hemolysis in sickle cell disease”, *Clinical Medicine Insights: Blood Disorders*, Libertas Academica Ltd., Vol. 4, pp. 1–9, doi: 10.4137/CMBD.S3969;ISSUE:ISSUE:DOI.
- Nurliyani, Harmayani, E. and Sunarti. (2015), “Antidiabetic Potential of Kefir Combination from Goat Milk and Soy Milk in Rats Induced with Streptozotocin-Nicotinamide”, *Korean Journal for Food Science of Animal Resources*, Korean Society for Food Science of Animal Resources, Vol. 35 No. 6, p. 847, doi: 10.5851/KOSFA.2015.35.6.847.
- Nurliyani, N., Harmayani, E. and Sunarti, S. (2022), “Synbiotic goat milk kefir improves health status in rats fed a high-fat and high-fructose diet”, *Veterinary World*, Veterinary World, Vol. 15 No. 1, pp. 173–181, doi: 10.14202/VETWORLD.2022.173-181.
- Ojo, O.A., Ibrahim, H.S., Rotimi, D.E., Ogunlakin, A.D. and Ojo, A.B. (2023), “Diabetes mellitus: From molecular mechanism to pathophysiology and pharmacology”, *Medicine in Novel Technology and Devices*, Elsevier, Vol. 19, p. 100247, doi: 10.1016/J.MEDNTD.2023.100247.
- Onyango, A.N. (2020), “Mechanisms of the Regulation and Dysregulation of Glucagon Secretion”, *Oxidative Medicine and Cellular Longevity*, John Wiley & Sons, Ltd, Vol. 2020 No. 1, p. 3089139, doi: 10.1155/2020/3089139.
- Ouyang, G., Wang, N., Tong, J., Sun, W., Yang, J. and Wu, G. (2024), “Alleviation of taurine on liver injury of type 2 diabetic rats by improving antioxidant and anti-inflammatory capacity”, *Heliyon*, Elsevier, Vol. 10 No. 7, p. e28400, doi:

10.1016/J.HELIYON.2024.E28400.

Patel, S., Patel, S., Kotadiya, A., Patel, S., Shrimali, B., Joshi, N., Patel, T., *et al.* (2024), “Age-related changes in hematological and biochemical profiles of Wistar rats”, *Laboratory Animal Research*, BioMed Central Ltd, Vol. 40 No. 1, p. 7, doi: 10.1186/S42826-024-00194-7.

PERKENI. (2021), *Pedoman Pengelolaan Diabetes Melitus Tipe 2 Dewasa Tahun 2021*.

Ponto, C.V.I., Rambert, G.I. and Wowor, M.F. (2022), “Description of SGOT and SGPT Levels in Pregnant Women with Confirmed COVID-19”, *Medical Scope Journal*, Vol. 3 No. 2, p. 134, doi: 10.35790/msj.v3i2.37836.

Putri, I.R. (2019), *Pengaruh Pemberian Yoghurt Susu Kambing Dengan Fortifikasi Tepung Bekatul Beras Merah Terhadap Kadar Sgpt Dan Sgot Pada Tikus Putih (Rattus Norvegicus) Model Diabetes Mellitus Induksi Streptozotocin*, Brawijaya University, Malang, 12 August.

Qinna, N.A. and Badwan, A.A. (2015), “Impact of streptozotocin on altering normal glucose homeostasis during insulin testing in diabetic rats compared to normoglycemic rats”, *Drug Design, Development and Therapy*, Dove Medical Press Ltd., Vol. 9, p. 2515, doi: 10.2147/DDDT.S79885.

Qomari, I.N., Pradana, M.S. and Herawati, D. (2022), “Perbandingan Aktivitas Enzim Aspartat Aminotransferase Antara Serum Yang Hemolisis Dan Serum Normal Dengan Metode Kinetik-Ifcc”, *Jurnal SainHealth*, Vol. 6 No. 2, pp. 45–51, doi: 10.51804/jsh.v6i2.1887.45-51.

Rabbani, N. and Thornalley, P.J. (2024), “Unraveling the impaired incretin effect in obesity and type 2 diabetes: Key role of hyperglycemia-induced unscheduled glycolysis and glycolytic overload”, *Diabetes Research and Clinical Practice*, Elsevier Ireland Ltd, Vol. 217, doi: 10.1016/j.diabres.2024.111905.

Rajamanickam, A., Venkataraman, A., Kumar, N.P., Sasidaran, R., Pandiarajan, A.N., Selvaraj, N., Mittal, R., *et al.* (2023), “Alterations of adipokines, pancreatic hormones and incretins in acute and convalescent COVID-19 children”, *BMC Pediatrics*, BioMed Central Ltd, Vol. 23 No. 1, doi: 10.1186/S12887-023-03971-W,.

Rampa, E., Sinaga, H., Putri, N., Prodi Analis Kesehatan, D., Sains dan Teknologi Jayapura, U. and Wamana Papua, R. (2021), “Pemeriksaan SGOT, SGPT dan Jumlah Leukosit Pada Penderita DM Di RSUD Wamena Kabupaten Jayawijaya Papua”, *Jurnal Analis Medika Biosains (JAMBS)*, Poltekkes Kemenkes Mataram, Vol. 8 No. 1, pp. 17–21, doi: 10.32807/JAMBS.V8I1.204.

Rasmussen, L., Poulsen, C.W., Kampmann, U., Smedegaard, S.B., Ovesen, P.G.

- and Fuglsang, J. (2020), “Diet and healthy lifestyle in the management of gestational diabetes mellitus”, *Nutrients*, MDPI AG, Vol. 12 No. 10, pp. 1–24, doi: 10.3390/NU12103050.
- Rodriguez, B.S.Q., Vadakekut, E.S. and Mahdy, H. (2024), “Gestational Diabetes”, StatPearls Publishing.
- Roy, J.R., Janaki, C.S., Jayaraman, S., Veeraraghavan, V.P., Periyasamy, V., Balaji, T., Vijayamalathi, M., *et al.* (2023), “Hypoglycemic Potential of Carica papaya in Liver Is Mediated through IRS-2/PI3K/SREBP-1c/GLUT2 Signaling in High-Fat-Diet-Induced Type-2 Diabetic Male Rats”, *Toxics* 2023, Vol. 11, Page 240, Multidisciplinary Digital Publishing Institute, Vol. 11 No. 3, p. 240, doi: 10.3390/TOXICS11030240.
- Safitri, G.R., Saktiani, F. and Saktini, F. (2015), “Pengaruh Pemberian Susu Kambing Terhadap Gambaran Mikroskopis Hepar dan Kadar SGPT Tikus Wistar Yang Terpapar Asap Kendaraan Bermotor”, *Media Medika Muda*, Vol. 4 No. 4, pp. 834–848.
- Saha, A., Kumari, A., Kumar, S., Kumar, A. and Munni, C. (2025), “Decoding the role of serum cholinesterase among type 2 diabetes mellitus patients at RIMS, Ranchi – A hospital-based study”, *Journal of Family Medicine and Primary Care*, Ovid Technologies (Wolters Kluwer Health), Vol. 14 No. 2, pp. 769–778, doi: 10.4103/JFMPC.JFMPC_1375_24.
- Sánchez-Rodríguez, R., Terriente-Palacios, C., García-Olmo, J., Osorio, S. and Rodríguez-Ortega, M.J. (2024), “Combined Metabolomic and NIRS Analyses Reveal Biochemical and Metabolite Changes in Goat Milk Kefir under Different Heat Treatments and Fermentation Times”, *Biomolecules*, Multidisciplinary Digital Publishing Institute (MDPI), Vol. 14 No. 7, p. 816, doi: 10.3390/BIOM14070816/S1.
- Sankarganesh, P., Bhunia, A., Ganesh Kumar, A., Babu, A.S., Gopukumar, S.T. and Lokesh, E. (2025), “Short-chain fatty acids (SCFAs) in gut health: Implications for drug metabolism and therapeutics”, *Medicine in Microecology*, Elsevier, Vol. 25, p. 100139, doi: 10.1016/J.MEDMIC.2025.100139.
- Sarwono, A.E. and Handayani, A. (2021), *Metode Kuantitatif*, edited by Prasetyowati, N., UNISRI Press.
- Schwartz, S.S., Epstein, S., Corkey, B.E., Grant, S.F.A., Gavin, J.R. and Aguilar, R.B. (2016), “The time is right for a new classification system for diabetes: Rationale and implications of the β -cell-centric classification schema”, *Diabetes Care*, American Diabetes Association Inc., Vol. 39 No. 2, pp. 179–186, doi: 10.2337/DC15-1585,.
- Skovsø, S. (2014), “Modeling type 2 diabetes in rats using high fat diet and streptozotocin”, *Journal of Diabetes Investigation*, Blackwell Publishing, Vol.

5 No. 4, p. 349, doi: 10.1111/JDI.12235.

- Steininger, M., Winter, M.P., Reiberger, T., Koller, L., El-Hamid, F., Forster, S., Schnaubelt, S., *et al.* (2018), “De-Ritis Ratio Improves Long-Term Risk Prediction after Acute Myocardial Infarction”, *Journal of Clinical Medicine* 2018, Vol. 7, Page 474, Multidisciplinary Digital Publishing Institute, Vol. 7 No. 12, p. 474, doi: 10.3390/JCM7120474.
- Sudrajat, A., Saputri, D.R., Dewi, S.H.C., Rahayu, E.R. V and Christi, R.F. (2025), “Kualitas kefir yang berasal dari susu kambing peranakan etawah dan sapera”, *Zootec*, Vol. 45 No. 1, pp. 66–73.
- Syukri, D. (2016), *Pengaruh Suplementasi Kefir Susu Kedelai Terhadap Kadar Sgpt (Serum Glutamic Pyruvic Transaminase) Dan Sgot (Serum Glutamic Oxaloacetic Transaminase) Pada Tikus Putih (Rattus Norvegicus) Yang Dipapar*, Brawijaya University, Malang, 30 August.
- Taghiyar, S., Pourrajab, F. and Aarabi, M.H. (2023), “Astaxanthin improves fatty acid dysregulation in diabetes by controlling the AMPK-SIRT1 pathway”, *EXCLI Journal*, Leibniz Research Centre for Working Environment and Human Factors, Vol. 22, pp. 502–515, doi: 10.17179/EXCLI2023-6132.
- Tamber, S.S., Bansal, P., Sharma, S., Singh, R.B. and Sharma, R. (2023), “Biomarkers of liver diseases”, *Molecular Biology Reports*, Springer Science and Business Media B.V., Vol. 50 No. 9, pp. 7815–7823, doi: 10.1007/S11033-023-08666-0,.
- Tanase, D.M., Gosav, E.M., Costea, C.F., Ciocoiu, M., Lacatusu, C.M., Maranduca, M.A., Ouatu, A., *et al.* (2020), “The Intricate Relationship between Type 2 Diabetes Mellitus (T2DM), Insulin Resistance (IR), and Nonalcoholic Fatty Liver Disease (NAFLD)”, *Journal of Diabetes Research*, Hindawi Limited, Vol. 2020, doi: 10.1155/2020/3920196,.
- Tao, Y.W., Gu, Y.L., Mao, X.Q., Zhang, L. and Pei, Y.F. (2020), “Effects of probiotics on type II diabetes mellitus: A meta-analysis”, *Journal of Translational Medicine*, BioMed Central, Vol. 18 No. 1, doi: 10.1186/S12967-020-02213-2,.
- Tinajero, M.G. and Malik, V.S. (2021a), “An Update on the Epidemiology of Type 2 Diabetes: A Global Perspective”, *Endocrinology and Metabolism Clinics of North America*, Elsevier, Vol. 50 No. 3, pp. 337–355, doi: 10.1016/J.ECL.2021.05.013.
- Tinajero, M.G. and Malik, V.S. (2021b), “An Update on the Epidemiology of Type 2 Diabetes: A Global Perspective”, *Endocrinology and Metabolism Clinics of North America*, Vol. 50 No. 3, pp. 337–355, doi: 10.1016/j.ecl.2021.05.013.
- Tjiptoningsih, U.G., Adiba, K., Awaliyah, T., Firdaus, I. and Jordan, B. (2024), “Uji Daya Hambat Minuman Probiotik Kefir Terhadap Pertumbuhan Bakteri

- Aggregatibacter actinomycetemcomitans Secara In-Vitro”, *Jurnal Ilmiah Dan Teknologi Kedokteran Gigi (JITEKGI)*, Vol. 20 No. 2, pp. 150–158, doi: 10.32509/JITEKGI.V20I2.3246.
- Tomas, M.K., Rot, T., Arnautović, L., Bedenik, M.L. and Šangut, I.J. (2025), “Occurrence and Risk Assessment of Aflatoxin M1 in Fermented Dairy Products from the Croatian Market”, *Foods* 2025, Vol. 14, Page 4354, Multidisciplinary Digital Publishing Institute, Vol. 14 No. 24, p. 4354, doi: 10.3390/FOODS14244354.
- van der Toorn, M.V., Chatziioannou, A.C., Pellis, L., Haandrikman, A., van der Zee, L. and Dijkhuizen, L. (2023), “Biological Relevance of Goat Milk Oligosaccharides to Infant Health”, *Journal of Agricultural and Food Chemistry*, American Chemical Society, Vol. 71 No. 38, pp. 13935–13949, doi: 10.1021/ACS.JAFC.3C02194.
- La Torre, C., Caputo, P., Cione, E. and Fazio, A. (2024), “Comparing Nutritional Values and Bioactivity of Kefir from Different Types of Animal Milk”, *Molecules (Basel, Switzerland)*, Molecules, Vol. 29 No. 11, doi: 10.3390/MOLECULES29112710.
- Tsao, C.H., Shiau, M.Y., Chuang, P.H., Chang, Y.H. and Hwang, J. (2014), “Interleukin-4 regulates lipid metabolism by inhibiting adipogenesis and promoting lipolysis”, *Journal of Lipid Research*, American Society for Biochemistry and Molecular Biology Inc., Vol. 55 No. 3, pp. 385–397, doi: 10.1194/JLR.M041392/ASSET/46667A16-443A-41AE-B418-6758F272CFDD/MAIN.ASSETS/GR6.JPG.
- Ulilalbab, A., Indrasari, O.R. and Sofi, K.F. (2022), “Pelatihan pembuatan minuman kefir susu kambing pada karang taruna ‘pemuda kreatif’ di Desa Bayu Kecamatan Songgon Kabupaten Banyuwangi”, *Jurnal PADE: Pengabdian & Edukasi*, Vol. 4 No. 2, p. 65, doi: 10.30867/pade.v4i2.964.
- Utomo, A.A., Aulia R, A., Rahmah, S. and Amalia, R. (2020), “Faktor Risiko Diabetes Mellitus Tipe 2: A Systematic Review”, *AN-Nur: Jurnal Kajian Dan Pengembangan Kesehatan Masyarakat*, Vol. 01, pp. 44–52.
- Vieira, C.P., Rosario, A.I.L.S., Lelis, C.A., Rekowsky, B.S.S., Carvalho, A.P.A., Rosário, D.K.A., Elias, T.A., *et al.* (2021), “Bioactive Compounds from Kefir and Their Potential Benefits on Health: A Systematic Review and Meta-Analysis”, *Oxidative Medicine and Cellular Longevity*, Hindawi Limited, Vol. 2021, p. 9081738, doi: 10.1155/2021/9081738.
- Wei, S., Ma, X. and Zhao, Y. (2020), “Mechanism of Hydrophobic Bile Acid-Induced Hepatocyte Injury and Drug Discovery”, *Frontiers in Pharmacology*, Frontiers Media S.A., Vol. 11, p. 1084, doi: 10.3389/FPHAR.2020.01084.
- WHO. (2024), “Diabetes”, *World Health Organization*.

- Widiasari, K.R., Made, I., Wijaya, K. and Suputra, P.A. (2021), “Diabetes Melitus Tipe 2: Faktor Risiko, Diagnosis, dan Tatalaksana”, *Ganesha Medicina Journal*, Vol. 1, p. 114.
- Widyanti, T., Rauf, D. and Lessy, L. (2019), “Gambaran Kadar Sgpt (Serum Glutamic Pyruvic Transminase) Dan Sgot (Serum Glutamic Oxaloacetic Transminase) Pada Pasien Tb-Mdr (Tuberculosis Multidrug Resistan) Di Rsud Labuang Baji Makassar”, *Jurnal Medika*, Vol. 4 No. 1, pp. 5–10, doi: 10.53861/jmed.v4i1.159.
- Williams, A.L.B. and Hoofnagle, J.H. (1988), “Ratio of Serum Aspartate to Alanine Aminotransferase in Chronic Hepatitis Relationship to Cirrhosis”, *Gastroenterology*, *Gastroenterology*, Vol. 95 No. 3, pp. 734–739, doi: 10.1016/S0016-5085(88)80022-2.
- Yan, Y., Wu, T., Zhang, M., Li, C., Liu, Q. and Li, F. (2022), “Prevalence, awareness and control of type 2 diabetes mellitus and risk factors in Chinese elderly population”, *BMC Public Health*, BioMed Central Ltd, Vol. 22 No. 1, pp. 1–6, doi: 10.1186/S12889-022-13759-9/PEER-REVIEW.
- Yang, R.Z., Park, S., Reagan, W.J., Goldstein, R., Zhong, S., Lawton, M., Rajamohan, F., *et al.* (2009), “Alanine aminotransferase isoenzymes: molecular cloning and quantitative analysis of tissue expression in rats and serum elevation in liver toxicity”, *Hepatology (Baltimore, Md.)*, Vol. 49 No. 2, p. 598, doi: 10.1002/HEP.22657.
- Yuenyong, I., Potue, P., Maneesai, P., Khamseekaew, J., Manimmanakorn, A., Iampanichakul, M. and Pakdeechote, P. (2025), “Tangeretin Unravels Metabolic Dysfunction-Associated Fatty Liver Disease in Rats by Enhancing the IRS/Akt Pathway”, *Life 2025*, Vol. 15, Page 491, Multidisciplinary Digital Publishing Institute, Vol. 15 No. 3, p. 491, doi: 10.3390/LIFE15030491.
- Zhao, W., Wang, H., Zheng, M. and Ni, Y. (2025), “Bile salt hydrolase: a key player in gut microbiota and its implications for metabolic dysfunction-associated steatotic liver disease”, *Microbiome Research Reports*, OAE Publishing Inc., Vol. 4 No. 3, p. 28, doi: 10.20517/MRR.2025.12.
- Zhou, Z., Sun, B., Yu, D. and Zhu, C. (2022), “Gut Microbiota: An Important Player in Type 2 Diabetes Mellitus”, *Frontiers in Cellular and Infection Microbiology*, Frontiers Media S.A., Vol. 12, doi: 10.3389/FCIMB.2022.834485,.