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Potensi Neoagaro-oligosakarida Terhadap Perbaikan Kerusakan Hepar Mencit (Mus musculus Linnaeus, 1758) Diabetes Mellitus Tipe 2
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

Abdelhalim, M.A.K. and Jarrar, B.M. (2011). Gold nanoparticles induced cloudy swelling to hydropic degeneration, cytoplasmic hyaline vacuolation, polymorphism, binucleation, karyopyknosis, karyolysis, karyorrhexis and necrosis in the liver. *Lipids in Health and Disease*, [online] 10(2), p.166. doi:https://doi.org/10.1186/1476-511X-10-166.

Anderson, C.M. and Stahl, A. (2013). SLC27 fatty acid transport proteins. *Molecular Aspects of Medicine*, 34(2-3), pp.516–528. doi:https://doi.org/10.1016/j.mam.2012.07.010.

Angulo, P., Kleiner, D.E., Dam-Larsen, S., Adams, L.A., Bjornsson, E.S., Charatcharoenwitthaya, P., Mills, P.R., Keach, J.C., Lafferty, H.D., Stahler, A., Haflidadottir, S. and Bendtsen, F. (2015). Liver Fibrosis, but No Other Histologic Features, Is Associated With Long-term Outcomes of Patients With Nonalcoholic Fatty Liver Disease. *Gastroenterology*, 149(2), pp.389-397.e10. doi:https://doi.org/10.1053/j.gastro.2015.04.043.

Bae, J., Han, E., Lee, H.W., Park, C.-Y., Chung, C.H., Lee, D.H., Cho, E.-H., Rhee, E.-J., Yu, J.H., Park, J.H., Bae, J.-C., Park, J.H., Choi, K.M., Kim, K.-S., Seo, M.H., Lee, M., Kim, N.-H., Kim, S.H., Lee, W.-Y. and Lee, W.J. (2024). Metabolic Dysfunction-Associated Steatotic Liver Disease in Type 2 Diabetes Mellitus: A Review and Position Statement of the Fatty Liver Research Group of the Korean Diabetes Association. *Diabetes & Metabolism Journal*, 48(6), pp.1015–1028. doi:https://doi.org/10.4093/dmj.2024.0541.

Bae, S., Lee, J.H., Kim, S.J., Yun, J.H., Park, J. and Jun, W. (2025). Neoagarooligosaccharides improve non-alcoholic fatty liver disease by modulating lipid metabolism and Nrf2-related pathways. *Journal of*

UNIVERSITAS
GADJAH MADA
Potensi Neoagaro-oligosakarida Terhadap Perbaikan Kerusakan Hepar Mencit (Mus musculus Linnaeus, 1758) Diabetes Mellitus Tipe 2
Achmad Chehab Abubakar, Dr. biol.hom. Nastiti Wijayanti,S.Si., M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Functional Foods, 127(12), p.106737. doi:https://doi.org/10.1016/j.jff.2025.106737.

Baek, H.-I., Ha, K.-C., Park, Y.K., Lee, J.H., Kim, E.J., Ko, H.-J. and Joo, J.C. (2023). Anti-obesity effect of Neoagaro-oligosaccharides with overweight and obese subjects: a 16-week, randomized, double-blind, placebo-controlled clinical trial. *BMC Complementary Medicine and Therapies*, 23(1). doi:https://doi.org/10.1186/s12906-023-04206-2.

Bekkelund, S.I. and Jorde, R. (2019). Alanine Aminotransferase and Body Composition in Obese Men and Women. *Disease Markers*, 2019(1), pp.1–9. doi:https://doi.org/10.1155/2019/1695874.

Chalasani, N., Younossi, Z., Lavine, J.E., Charlton, M., Cusi, K., Rinella, M., Harrison, S.A., Brunt, E.M. and Sanyal, A.J. (2017). The diagnosis and management of nonalcoholic fatty liver disease: Practice guidance from the American Association for the Study of Liver Diseases. *Hepatology*, 67(1), pp.328–357.

Chen, Z., Tian, R., She, Z., Cai, J. and Li, H. (2020). Role of oxidative stress in the pathogenesis of nonalcoholic fatty liver disease. *Free Radical Biology and Medicine*, [online] 152(1), pp.116–141. doi:https://doi.org/10.1016/j.freeradbiomed.2020.02.025.

Ciardullo, S., Michela Vergani and Gianluca Perseghin (2023). Nonalcoholic Fatty Liver Disease in Patients with Type 2 Diabetes: Screening, Diagnosis, and Treatment. *Journal of Clinical Medicine*, 12(17), pp.5597–5597. doi:https://doi.org/10.3390/jcm12175597.

Dhabhar, F.S. (2014). Effects of Stress on Immune Function: The Good, the Bad, and the Beautiful. *Immunologic Research*, 58(2-3), pp.193–210. doi:https://doi.org/10.1007/s12026-014-8517-0.

UNIVERSITAS
GADJAH MADA
Potensi Neoagaro-oligosakarida Terhadap Perbaikan Kerusakan Hepar Mencit (Mus musculus Linnaeus, 1758) Diabetes Mellitus Tipe 2
Achmad Chehab Abubakar, Dr. biol.hom. Nastiti Wijayanti,S.Si., M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Fang, C., Pan, J., Qu, N., Lei, Y., Han, J., Zhang, J. and Han, D. (2022). The AMPK pathway in fatty liver disease. *Frontiers in Physiology*, 13(1). doi:https://doi.org/10.3389/fphys.2022.970292.

Ferré, P., Phan, F. and Foufelle, F. (2021). SREBP-1c and lipogenesis in the liver: an update. *Biochemical Journal*, 478(20), pp.3723–3739. doi:https://doi.org/10.1042/bcj20210071.

Flamment, M., Kammoun, H.L., Hainault, I., Ferré, P. and Foufelle, F. (2010). Endoplasmic reticulum stress: a new actor in the development of hepatic steatosis. *Current Opinion in Lipidology*, 21(3), pp.239–246. doi:https://doi.org/10.1097/mol.0b013e3283395e5c.

Foretz, M., Guigas, B. and Viollet, B. (2019). Understanding the glucoregulatory mechanisms of metformin in type 2 diabetes mellitus. *Nature Reviews Endocrinology*, 15(10), pp.569–589. doi:https://doi.org/10.1038/s41574-019-0242-2.

Fullerton, J.N. and Gilroy, D.W. (2016). Resolution of inflammation: a new therapeutic frontier. *Nature Reviews Drug Discovery*, 15(8), pp.551–567. doi:https://doi.org/10.1038/nrd.2016.39.

Giannini, E.G., Testa, R. and Savarino, V. (2005). Liver enzyme alteration: a guide for clinicians. *Canadian Medical Association Journal*, [online] 172(3), pp.367–379. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC545762/.

Galicia-Garcia, U., Benito-Vicente, A., Jebari, S., Larrea-Sebal, A., Siddiqi, H., Uribe, K.B., Ostolaza, H. and Martin, C. (2020). Pathophysiology of type 2 diabetes mellitus. *International Journal of Molecular Sciences*, [online] 21(17), pp.1–34. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC7503727/ [Accessed 9 July 2026].

UNIVERSITAS
GADJAH MADA
Potensi Neoagaro-oligosakarida Terhadap Perbaikan Kerusakan Hepar Mencit (Mus musculus Linnaeus, 1758) Diabetes Mellitus Tipe 2
Achmad Chehab Abubakar, Dr. biol.hom. Nastiti Wijayanti,S.Si., M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Goh, G.B.-B., Pan, A., Chow, W.-C., Yuan, J.-M. and Koh, W.-P. (2016). Association between diabetes mellitus and cirrhosis mortality: the Singapore Chinese Health Study. *Liver International*, 37(2), pp.251–258. doi:https://doi.org/10.1111/liv.13241.

Gurina, T.S. and Simms, L. (2023). *Histology, Staining*. [online] PubMed. Available at: https://www.ncbi.nlm.nih.gov/books/NBK557663/.

Geng, J., Wei, M., Chiamvimonvat, N. and Zhang, Y., 2020. Metformin shortens prolonged QT interval in diabetic mice by inhibiting L-type calcium current. *Frontiers in Pharmacology*, 11, p.607. Available at: https://doi.org/10.3389/fphar.2020.00607.

Hong, S.J., Lee, J.-H., Kim, E.J., Yang, H.J., Park, J.-S. and Hong, S.-K. (2017). Anti-Obesity and Anti-Diabetic Effect of Neoagarooligosaccharides on High-Fat Diet-Induced Obesity in Mice. *Marine Drugs*, 15(4), p.90. doi:https://doi.org/10.3390/md15040090.

Jensen, T., Kiersgaard, M., Sørensen, D. and Mikkelsen, L. (2013). Fasting of mice: a review. *Laboratory Animals*, 47(4), pp.225–240. doi:https://doi.org/10.1177/0023677213501659.

Kleiner, D.E., Brunt, E.M., Van Natta, M., Behling, C., Contos, M.J., Cummings, O.W., Ferrell, L.D., Liu, Y.-C., Torbenson, M.S., Unalp-Arida, A., Yeh, M., McCullough, A.J. and Sanyal, A.J. (2005). Design and validation of a histological scoring system for nonalcoholic fatty liver disease. *Hepatology*, 41(6), pp.1313–1321. doi:https://doi.org/10.1002/hep.20701.

Leibowitz, A., Klin, Y., Gruenbaum, B.F., Gruenbaum, S.E., Ruslan Kuts, Dubilet, M., Ohayon, S., Boyko, M., Sheiner, E., Shapira, Y. and Zlotnik, A. (2012).

UNIVERSITAS
GADJAH MADA
Potensi Neoagaro-oligosakarida Terhadap Perbaikan Kerusakan Hepar Mencit (Mus musculus Linnaeus, 1758) Diabetes Mellitus Tipe 2
Achmad Chehab Abubakar, Dr. biol.hom. Nastiti Wijayanti,S.Si., M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Effects of strong physical exercise on blood glutamate and its metabolite 2-ketoglutarate levels in healthy volunteers. *Acta Neurobiologiae Experimentalis*, 72(4), pp.385–396. doi:https://doi.org/10.55782/ane-2012-1910.

Liang, W., Menke, A.L., Driessen, A., Koek, G.H., Lindeman, J.H., Stoop, R., Havekes, L.M., Kleemann, R. and van den Hoek, A.M. (2014). Establishment of a General NAFLD Scoring System for Rodent Models and Comparison to Human Liver Pathology. *PLoS ONE*, 9(12), p.e115922. doi:https://doi.org/10.1371/journal.pone.0115922.

Lin, F., Yang, D., Huang, Y., Zhao, Y., Ye, J. and Xiao, M. (2019a). The Potential of Neoagaro-Oligosaccharides as a Treatment of Type II Diabetes in Mice. *Marine Drugs*, [online] 17(10), pp.541–541. doi:https://doi.org/10.3390/md17100541.

Lin, S., Zhang, D.D., Gao, Y., Zhu, Y. and Hou, B. (2019b). Letter to Editor: The Synergistic Effect of Albumin on Terlipressin in Acute-on-Chronic Liver Failure With Acute Kidney Injury. *Hepatology*, 69(4), pp.1845–1845. doi:https://doi.org/10.1002/hep.30539.

Liu, Q., Bengmark, S. and Qu, S. (2010). The role of hepatic fat accumulation in pathogenesis of non-alcoholic fatty liver disease (NAFLD). *Lipids in Health and Disease*, 9(1), p.42. doi:https://doi.org/10.1186/1476-511x-9-42.

Loomba, R. and Sanyal, A.J. (2013). The global NAFLD epidemic. *Nature Reviews Gastroenterology & Hepatology*, 10(11), pp.686–690. doi:https://doi.org/10.1038/nrgastro.2013.171.

Lundqvist, M.H., Pereira, M.J., Almby, K., Hetty, S. and Eriksson, J.W. (2023). Regulation of the Cortisol Axis, Glucagon, and Growth Hormone by Glucose Is Altered in Prediabetes and Type 2 Diabetes. *˜The œJournal of clinical*

UNIVERSITAS
GADJAH MADA
Potensi Neoagaro-oligosakarida Terhadap Perbaikan Kerusakan Hepar Mencit (Mus musculus Linnaeus, 1758) Diabetes Mellitus Tipe 2
Achmad Chehab Abubakar, Dr. biol.hom. Nastiti Wijayanti,S.Si., M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

endocrinology and metabolism/Journal of clinical endocrinology & metabolism, 109(2), pp.e675–e688. doi:https://doi.org/10.1210/clinem/dgad549.

Moriles, K.E., Zubair, M. and Azer, S.A. (2020). *Alanine Amino Transferase*. [online] *www.ncbi.nlm.nih.gov*. StatPearls Publishing. Available at: https://www.ncbi.nlm.nih.gov/books/NBK559278/.

Ozer, J., Ratner, M., Shaw, M., Bailey, W. and Schomaker, S. (2008). The current state of serum biomarkers of hepatotoxicity. *Toxicology*, [online] 245(3), pp.194–205. doi:https://doi.org/10.1016/j.tox.2007.11.021.

Papachristoforou, E., Lambadiari, V., Maratou, E. and Makrilakis, K. (2020). Association of Glycemic Indices (Hyperglycemia, Glucose Variability, and Hypoglycemia) with Oxidative Stress and Diabetic Complications. *Journal of Diabetes Research*, 2020(1), pp.1–17. doi:https://doi.org/10.1155/2020/7489795.

Qiu, S., Liang, Z., Wu, Q., Wang, M., Yang, M., Chen, C., Zheng, H., Zhu, Z., Li, L. and Yang, G. (2022). Hepatic lipid accumulation induced by a high-fat diet is regulated by Nrf2 through multiple pathways. *The FASEB Journal*, 36(5). doi:https://doi.org/10.1096/fj.202101456r.

Rampengan, D.D.C.H., Lele, J.A.J.M.N., Romano, R., Taslim, N.A., Tjandrawinata, R.R., Santini, A., Nurkolis, F., (2025). Harnessing the power of marine terpenoids against diabetes-associated oxidative stress. Front. Nutr. https://doi.org/10.3389/fnut.2025.1651804

Rockenfeller, P., Ring, J., Muschett, V., Beranek, A., Büttner, S., Carmona-Gutierrez, D., Eisenberg, T., Khoury, C., Rechberger, G., Kohlwein, S.D., Kroemer, G. and Madeo, F. (2010). Fatty acids trigger mitochondrion-

UNIVERSITAS
GADJAH MADA
Potensi Neoagaro-oligosakarida Terhadap Perbaikan Kerusakan Hepar Mencit (Mus musculus Linnaeus, 1758) Diabetes Mellitus Tipe 2
Achmad Chehab Abubakar, Dr. biol.hom. Nastiti Wijayanti,S.Si., M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

dependent necrosis. *Cell Cycle*, 9(14), pp.2908–2914. doi:https://doi.org/10.4161/cc.9.14.12346.

Roy, B., Gupta, M. and Goswami, B.K., (2024). Serial section histopathology image dataset of colon and pancreas tissue captured through light microscope. *Data in Brief*, 54, p.110429. https://doi.org/10.1016/j.dib.2024.110429.

Ruiqi Baiyun, Li, S., Liu, B., Lu, J., Yueying Lv, Xu, J., Wu, J., Li, J., Zhanjun Lv and Zhang, Z. (2018). Luteolin-mediated PI3K/AKT/Nrf2 signaling pathway ameliorates inorganic mercury-induced cardiac injury. *Ecotoxicology and Environmental Safety*, 161(1), pp.655–661. doi:https://doi.org/10.1016/j.ecoenv.2018.06.046.

Sahu, P., Chhabra, P. and Mehendale, A.M. (2023). A Comprehensive Review on Non-Alcoholic Fatty Liver Disease. *Curēus*, [online] 1(2). doi:https://doi.org/10.7759/cureus.50159.

Su, L.-J., Zhang, J.-H., Gomez, H., Murugan, R., Hong, X., Xu, D., Jiang, F. and Peng, Z.-Y. (2019). Reactive Oxygen Species-Induced Lipid Peroxidation in Apoptosis, Autophagy, and Ferroptosis. *Oxidative Medicine and Cellular Longevity*, 2019(1), pp.1–13. doi:https://doi.org/10.1155/2019/5080843.

Svegliati-Baroni, G., Pierantonelli, I., Torquato, P., Marinelli, R., Ferreri, C., Chatgilialoglu, C., Bartolini, D. and Galli, F. (2019). Lipidomic biomarkers and mechanisms of lipotoxicity in non-alcoholic fatty liver disease. *Free Radical Biology and Medicine*, [online] 144, pp.293–309. doi:https://doi.org/10.1016/j.freeradbiomed.2019.05.029.

Tanase, D.M., Gosav, E.M., Costea, C.F., Ciocoiu, M., Lacatusu, C.M., Maranduca, M.A., Ouatu, A. and Floria, M. (2020). The Intricate Relationship between Type 2 Diabetes Mellitus (T2DM), Insulin Resistance (IR), and Nonalcoholic

UNIVERSITAS
GADJAH MADA
Potensi Neoagaro-oligosakarida Terhadap Perbaikan Kerusakan Hepar Mencit (Mus musculus Linnaeus, 1758) Diabetes Mellitus Tipe 2
Achmad Chehab Abubakar, Dr. biol.hom. Nastiti Wijayanti,S.Si., M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Fatty Liver Disease (NAFLD). *Journal of Diabetes Research*, 2020(1), pp.1–16. doi:https://doi.org/10.1155/2020/3920196.

Targher, G., Byrne, C.D. and Tilg, H. (2020). NAFLD and increased risk of cardiovascular disease: clinical associations, pathophysiological mechanisms and pharmacological implications. *Gut*, 69(9), pp.1691–1705. doi:https://doi.org/10.1136/gutjnl-2020-320622.

Tappy, L. (2021). Metabolism of sugars: A window to the regulation of glucose and lipid homeostasis by splanchnic organs. *Clinical Nutrition*, 40(4), pp.1691–1698. doi:10.1016/j.clnu.2020.12.022.

Teng, M., Cheng Han Ng, Huang, D.Q., En Chan, K., Jun, D., Wen Kwang Lim, Ju Dong Yang, Xiang, E. and Muthiah, M.D. (2022). Global incidence and prevalence of nonalcoholic fatty liver disease. *Clinical and molecular hepatology*, [online] 29(Suppl), pp.S32–S42. doi:https://doi.org/10.3350/cmh.2022.0365.

Tolman, K.G., Fonseca, V., Dalpiaz, A. and Tan, M.H. (2007). Spectrum of Liver Disease in Type 2 Diabetes and Management of Patients With Diabetes and Liver Disease. *Diabetes Care*, [online] 30(3), pp.734–743. doi:https://doi.org/10.2337/dc06-1539.

Trebicka, J., von Heydebrand, M., Lehmann, J., Tofteng, F., Busk, T., Jensen, H.L., Rohde, J., Reiberger, T., Mortensen, C., Schierwagen, R., Klein, S., Møller, S., Bendtsen, F. and Krag, A. (2016). Assessment of response to beta-blockers by expression of βArr2 and RhoA/ROCK2 in antrum mucosa in cirrhotic patients. *Journal of Hepatology*, 64(6), pp.1265–1273. doi:https://doi.org/10.1016/j.jhep.2016.01.022.

UNIVERSITAS
GADJAH MADA
Potensi Neoagaro-oligosakarida Terhadap Perbaikan Kerusakan Hepar Mencit (Mus musculus Linnaeus, 1758) Diabetes Mellitus Tipe 2
Achmad Chehab Abubakar, Dr. biol.hom. Nastiti Wijayanti,S.Si., M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Trefts, E., Gannon, M. and Wasserman, D.H. (2017). The Liver. *Current Biology*, [online]27(21),pp.R1147R1151.doi:https://doi.org/10.1016/j.cub.2017.09.019.

van Sluijs, L., Pijlman, G. and Kammenga, J. (2017). Why do Individuals Differ in Viral Susceptibility? A Story Told by Model Organisms. *Viruses*, 9(10), p.284. doi:https://doi.org/10.3390/v9100284.

Veteläinen, R.L., Bennink, R.J., de Bruin, K., van Vliet, A. and van Gulik, T.M. (2006). Hepatobiliary function assessed by 99mTc-mebrofenin cholescintigraphy in the evaluation of severity of steatosis in a rat model. *European Journal of Nuclear Medicine and Molecular Imaging*, 33(10), pp.1107–1114. doi:https://doi.org/10.1007/s00259-006-0125-3.

Wang, Q., Liu, S., Zhai, A., Zhang, B. and Tian, G. (2018). AMPK-Mediated Regulation of Lipid Metabolism by Phosphorylation. *Biological & pharmaceutical bulletin*, [online] 41(7), pp.985–993. doi:https://doi.org/10.1248/bpb.b17-00724.

Wang, W., Liu, P., Hao, C., Wu, L., Wan, W. and Mao, X. (2017). Neoagaro-oligosaccharide monomers inhibit inflammation in LPS-stimulated macrophages through suppression of MAPK and NF-κB pathways. *Scientific Reports*, [online] 7(1). doi:https://doi.org/10.1038/srep44252.

Younossi, Z.M., Koenig, A.B., Abdelatif, D., Fazel, Y., Henry, L. and Wymer, M. (2016). Global Epidemiology of Nonalcoholic Fatty Liver disease-Meta-analytic Assessment of prevalence, incidence, and Outcomes. *Hepatology*, 64(1), pp.73–84. doi:https://doi.org/10.1002/hep.28431.