

## DAFTAR PUSTAKA

- Alaei, H., Moloudi, R. & Sarkaki, A.R. 2008. Effects of treadmill running on mid-term memory and swim speed in the rat with Morris water maze test. *J Bodyw Mov Ther*, 12, 72-75. <https://doi.org/10.1016/j.jbmt.2007.05.004>
- Al-Harbi, A.N., Khan, K.M., & Rahman, A. 2017. Developmental Vitamin D Deficiency Affects Spatial Learning in Wistar Rats. *J Nutr*, 147(9), 1795–1805. <https://doi.org/10.3945/jn.117.249953>
- Al-Zahrani, Y.A., A. Sattar, M.A.A., Al-Harthi, S.E., & Alkreathy, H.M. 2019. Neuroprotective Effect of Different Doses of Vitamine D3 in Diabetic-Induced Alzheimer Rat Model. *JPRI*. 26(2), 1–11. <https://doi.org/10.9734/jpri/2019/v26i230132>
- Anand, K.S. & Dhikav, V. 2012. Hippocampus in helath and disease: An Overview. *Ann Indian Acad Neurol*, 15(4), 239-246. <https://doi.org/10.4103/0972-2327.104323>
- Barry, D.N. & Commins, S. 2019. A novel control condition for spatial learning in the Morris water maze. *J Neurosc Meth*, 318, 1-5. <https://doi.org/10.1016/j.jneumeth.2019.02.015>
- Baydas, G., Nedzvetskii, V.S., Tuzcu, M., Yasar, A., & Kirichenko, S.v. 2003. Increase of glial fibrillary acidic protein and S-100B in hippocampus and cortex of diabetic rats: Effects of Vitamin E. *Eur. J. Pharmacol.*, 462(1–3), 67–71. [https://doi.org/10.1016/S0014-2999\(03\)01294-9](https://doi.org/10.1016/S0014-2999(03)01294-9)
- Bhusal, A., Rahman, M. H., Lee, I. K., & Suk, K. 2019. Role of hippocampal lipocalin-2 in experimental diabetic encephalopathy. *Front. Endocrinol.*, 10(25), 1–14. <https://doi.org/10.3389/fendo.2019.00025>
- Bilous, R. & Donnelly, R. 2015. Buku Pegangan Diabetes. Edisi Ke-4. Jakarta: Bumi Medika.
- Bogush, M., Heldt, N.A., & Persidsky, Y. 2017. Blood Brain Barrier Injury in Diabetes: Unrecognized Effects on Brain and Cognition. *J Neuroimmune Pharmacol*, 12(4): 593–601. <https://doi.org/10.1007/s11481-017-9752-7>
- Bondan, E.F., Cardoso, C.V., Martins, M.D.F.M., & Otton, R. 2019. Memory impairments and increased GFAP expression in hippocampal astrocytes following hypercaloric diet in rats. *Arq Neuropsiquiatr*, 77(9), 601–608. <https://doi.org/10.1590/0004-282X20190091>
- Brenner, M. 2014. Role of GFAP in CNS injuries. *Neurosci Lett*, 565, 7–13. <https://doi.org/10.1016/j.neulet.2014.01.055>
- Bromley-Brits, K., Deng, Y., & Song, W. 2011. *Morris Water Maze* test for learning and memory deficits in Alzheimer's disease model mice. *J. Vis. Exp.*, 53. <https://doi.org/10.3791/2920>
- Cristelo, C., Machado, A., Sarmiento, B., & Gama, F.M. 2021. The roles of vitamin D and cathelicidin in type 1 diabetes susceptibility. *Endocrine Connections*, 10, R1-R2. <https://doi.org/10.1530/EC-20-0484>
- Crossman, A.R. & Neary, D. 2015. Neuroanatomi: Buku Ajar Ilustrasi Berwarna. Edisi Ke-5. Singapura: Elsevier.

- Curdt, N., Schmitt, F.W., Bouter, C., Iseni, T., Weile, H.C., Altunok, B., et al. 2022. Search strategy analysis of Tg4-42 Alzheimer Mice in the Morris Water Maze reveals early spatial navigation deficits. *Nature*, 12, 5451. <https://doi.org/10.1038/s41598-022-09270-1>
- Dauncey, M.J., & Bicknell, R.J. 1999. Nutrition and neurodevelopment: mechanisms of developmental dysfunction and disease in later life. *Nutr. Res. Rev*, 12, 231-253. <https://doi.org/10.1079/095442299108728947>
- Doncheva, N., Mihaylova, A., Zlatanova, H., Ivanovska, M., Delev, D., Murdjeva, M., & Kostadinov, I. 2022. Vitamin D3 exerts immunomodulatory and memory improving properties in rats with lipopolysaccharide-induced inflammation. *Folia Med (Plovdiv)*, 64(5), 770-781. <https://doi.org/10.3897/folmed.64.e67739>
- El Falougy, H., Kubikova, E., & Benuska, J. 2008. The microscopical structure of the hippocampus in the rat. *Bratisl Lek Listy*, 109(3), 106-110.
- Faheem, N.M. & Askary, A.E. 2017. Neuroprotective role of curcumin on the hippocampus against the structural and serological alterations of streptozotocin-induced diabetes in Sprague Dawely rats. *Iran J Basic Med Sci*, 20(6), 690-699. <https://doi.org/10.22038/IJBMS.2017.8839>
- Gallivan, L.M., & Schmitzer-Torbert, N. 2018. A Low-Cost Morris Water Maze for Undergraduate Research: Construction and Demonstration in a Rat Model of Obesity-Induced Diabetes. *JUNE*, 16(2), A143-A151. <http://www.ncbi.nlm.nih.gov/pmc/articles/pmc6057760>
- Gáll, Z., & Székely, O. 2021. Role of vitamin d in cognitive dysfunction: New molecular concepts and discrepancies between animal and human findings. *Nutr*, 13(3672). <https://doi.org/10.3390/nu13113672>
- Garg, R., Chaudhuri, A., Munschauer, F., & Dandona, P. 2006. Hyperglycemia, insulin, and acute ischemic stroke: A mechanistic justification for a trial of insulin infusion therapy. *Stroke*, 37(1), 267-273. <https://doi.org/10.1161/01.STR.0000195175.29487.30>
- Gulinello, M., Gertner, M., Mendoza, G., Schoenfeld, B.P., Oddo, S., LaFerla, F., et al. 2009. Validation of a 2-day water maze protocol in mice. *Behav Brain Res*, 196(2), 220-227. <https://doi.org/10.1016/j.bbr.2008.09.002>
- Guo, F., Yue, H., Wang, L., Ding, C., Wu, L., Wu, Y., et al. 2017. Vitamin D supplement ameliorates hippocampal metabolism in diabetic rats. *Biochem. Biophys. Res. Commun*, 490(2), 239-246. <https://doi.org/10.1016/j.bbrc.2017.06.028>
- Hayman, L.A., Fuller, G.N., Cavazos, J.E., Pflieger, M.J., Meyers, C.A., & Jackson, E.F. 1998. The Hippocampus: Normal Anatomy and Pathology. *AJR*, 171, 1139-1146. <https://doi.org/10.2214/ajr.171.4.9763010>
- Ho, N., Sommers, M.S., dan Lucki, I. 2013. Effects of Diabetes on Hippocampal Neurogenesis: Links to Cognition and Depression. *Neurosci Biobehav Rev*, 37(8), 1346-1362. <https://doi.org/10.1016/j.neubiorev.2013.03.010>
- Hu, P., Thinschmidt, J. S., Caballero, S., Adamson, S., Cole, L., Chan-Ling, T., et al. 2015. Loss of survival factors and activation of inflammatory cascades in brain sympathetic centers in type 1 diabetic mice. *Am J Physiol Endocrinol Metab*, 308(8), E688-E698. <https://doi.org/10.1152/ajpendo.00504.2014>

- Hussein, H.M., Elyamany, M.F., Rashed, L.A., & Sallam, N.A. 2022. Vitamin D mitigates diabetes-associated metabolic and cognitive dysfunction by modulating gut microbiota and colonic cannabinoid receptor 1. *Eur J Pharm Sci*, 170(106105). <https://doi.org/10.1016/j.ejps.2021.106105>
- Jing, Y.H., Chen, K.H., Kuo, P.C., Pao, C.C., & Chen, J.K. 2013. Neurodegeneration in streptozotocin-induced diabetic rats is attenuated by treatment with resveratrol. *Neuroendocrinol*, 98(2), 116–127. <https://doi.org/10.1159/000350435>
- Jurga, A.M., Paleczna, M., Kadluczka, J., & Kuter, K.Z. 2021. Beyond the GFAP-astrocyte protein markers in the brain. *Biomolecules*, 11(9). <https://doi.org/10.3390/biom11091361>
- KEMENKES RI. 2012. Gambaran Penyakit Tidak Menular di Rumah Sakit di Indonesia Tahun 2009 dan 2010. Jakarta. <http://www.depkes.go.id/download.php?file=download/pusdatin/buletin/buletin-ptm.pdf>
- KEMENKES RI. 2016. Panduan Pelaksanaan Hari Diabetes Sedunia 2016 EYES ON.
- Kusrohmaniah, S. 2017. Apakah Pengkayaan Lingkungan Berpengaruh terhadap Ingatan Spasial pada Tikus Jantan dan Betina?. *Jurnal Psikologi*, 44(2), 126. <https://doi.org/10.22146/jpsi.27405>
- Lacy, M.E., Moran, C., Gilsanz, P., Beeri, M.S., Karter, A.J. & Whitmer, R.A. 2022. Comparison of cognitive function in older adults with type 1 diabetes, type 2 diabetes, and no diabetes: results from the Study of Longevity in Diabetes (SOLID). *BMJ Open Diab Res Care*, 10. <https://doi.org/10.1136/bmjdr-2021-002557>
- Latimer, C.S., Brewer, L.D., Searcy, J.L., Chen, K.C., Popovic, J., Kraner, S.D., et al. 2014. Vitamin D prevents cognitive decline and enhances hippocampal synaptic function in aging rats. *PNAS*, 111(1), 1–8. <https://doi.org/10.1073/pnas.1404477111>
- Li, D., Liu, X., Liu, T., Liu, H., Tong, L., Jia, S., et al. 2020. Neurochemical regulation of the expression and function of glial fibrillary acidic protein in astrocytes. *Glia*, 68(5), 878–897. <https://doi.org/10.1002/glia.23734>
- Li, X., Cai, Y., Zhang, Z., & Zhou, J. 2022. Glial and Vascular Cell Regulation of the Blood-Brain Barrier in Diabetes. *Diabetes Metab J*, 46, 222–238. <https://doi.org/10.4093/dmj.2021.0146>
- Moghadamnia, A.A., Hakimnia, S., Baradaran, M., Kazemi, S., & Ashrafpour, M. 2015. Vitamin D Improves Learning and Memory Impairment in Streptozotocin-Induced Diabetic Mice. *Arch Iran Med*, 18(6), 362–366.
- Moretti, R., Morelli, M.E., & Caruso, P. 2018. Vitamin D in neurological diseases: A rationale for a pathogenic impact. *Int. J. Mol. Sci.*, 19(2245). <https://doi.org/10.3390/ijms19082245>
- Murray, M., Stanley, M., Lugar, H.M., & Hershey, T. 2014. Hippocampal volume in type 1 diabetes. *Eur Endocrinol*, 10(1), 14–17. <https://doi.org/10.17925/ee.2014.10.01.14>
- Navarro, J.F. & Mora, C. 2005. Role of inflammation in diabetic complications. *Nephrol Dial Transplant*, 20, 2601–2604 <https://doi.org/10.1093/ndt/gfi155>

- Nguyen, D.V., Shaw, L.C., & Grant, M.B. 2012. Inflammation in the pathogenesis of microvascular complications in diabetes. *Front Endocrinol*, 3(170), 1-7. <https://doi.org/10.3389/fendo.2012.00170>
- Nunez, J. 2008. *Morris Water Maze* experiment. *JOVE*, 19. <https://doi.org/10.3791/897>
- Paramita & Louisa, M. 2017. Berbagai Manfaat Vitamin D. *CDK*, 44(10), 736-740.
- PERKENI. 2021. Pedoman Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia 2021.
- Piatkowska-Chmiel, I., Herbet, M., Gawronska-Grzywacz, M., Ostrowska-Lesko, M., & Dudka, J. 2021. The Role of Molecular and Inflammatory Indicators in the Assessment of Cognitive Dysfunction in a Mouse Model of Diabetes. *Int. J. Mol. Sci*, 22(8), 1-22. <https://doi.org/10.3390/ijms22083878>
- Pilz, S., Zittermann, A., Trummer, C., Theiler-Schwetz, V., Lerchbaum, E., Keppel, M.H., et al. 2019. Vitamin D testing and treatment: a narrative review of current evidence. *Endocrine Connections*, 8, R27-R43. <https://doi.org/10.1530/EC-18-0432>
- Pulungan, A. B., Annisa, D., & Imada, S. 2019. Diabetes Melitus Tipe-1 pada Anak: Situasi di Indonesia dan Tata Laksana. *Sari Pediatri*, 20(6), 392. <https://doi.org/10.14238/sp20.6.2019.392-400>
- Pusparini. 2014. Defisiensi Vitamin D terhadap Penyakit. *Indones. J. Clinical Pathol. Med Laboratory*, 21(1), 90-95.
- Richa, R., Yadawa, A.K., & Chaturvedi, C.M. 2017. Hyperglycemia and high nitric oxide level induced oxidative stress in the brain and molecular alteration in the neurons and glial cells of laboratory mouse, *Mus musculus*. *Neurochem. Int.*, 104, 64-79. <https://doi.org/10.1016/j.neuint.2016.12.008>
- Rom, S., Zuluaga-Ramirez, V., Gajghate, S., Seliga, A., Winfield, M., Heldt, N.A., et al. 2019. Hyperglycemia-Driven Neuroinflammation Compromises BBB Leading to Memory Loss in Both Diabetes Mellitus (DM) Type 1 and Type 2 Mouse Models. *Mol Neurobiol*, 56(3), 1883-1896. <https://doi.org/10.1007/s12035-018-1195-5>
- Sadek, K.M. & Shaheen, H. 2014. Biochemical efficacy of vitamin D in ameliorating endocrine and metabolic disorders in diabetic rats. *Pharm Biol*, 52(5), 591-596, <https://doi.org/10.3109/13880209.2013.854812>
- Sadewa, A.H., Wasityastuti, W., & Zaharo, A.F. 2020. Comprehensive Biomedical Sciences: Sistem Saraf. Yogyakarta: Gadjah Mada University Press.
- Salasia, S.I.O. & Mangkoewidjojo. 2020. Hewan Laboratorium dalam Penelitian Biomedis. Yogyakarta: Gadjah Mada University Press.
- Saravia, F. E., Revsin, Y., Gonzalez Deniselle, M. C., Gonzalez, S. L., Roig, P., Lima, A., et al. 2002. Increased astrocyte reactivity in the hippocampus of murine models of type 1 diabetes: The nonobese diabetic (NOD) and streptozotocin-treated mice. *Brain Res*, 957(2), 345-353. [https://doi.org/10.1016/S0006-8993\(02\)03675-2](https://doi.org/10.1016/S0006-8993(02)03675-2)
- Saraydin, S. Ü., Özdenoglu Kutlu, B., & Saraydin, D. 2021. Effects of diabetes on apoptosis and mitosis in rat hippocampus. *Biotech Histochemist*, 96(6), 460-467. <https://doi.org/10.1080/10520295.2020.1818827>

- Sari, D.C.R., Putri, M.W., Leksono, T.P., Chairunnisa, N., Reynaldi, G.N., Simanjuntak, B.C., et al. 2019. Calcitriol Ameliorates Kidney Injury Through Reducing Podocytopathy, Tubular Injury, Inflammation and Fibrosis in 5/6 Subtotal Nephrectomy Model in Rats. *Kobe J. Med. Sci*, 65(5), E153-E163.
- Sattayakhom, A. & Koomhin, P. 2020. A Low Cost Analytical Method for the Morris Water Maze Task using ImageJ. *Walailak J Sci & Tech*, 17(11), 1194-1199.
- Schlögl, M., & Holick, M.F. 2014. Vitamin D and neurocognitive function. *Clin Interv Aging*, 9, 559–568. <https://doi.org/10.2147/CIA.S51785>
- Sherwood, L. 2021. Fisiologi Manusia: Dari Sel ke Sistem. Edisi 9. Jakarta: Penerbit Buku Kedokteran EGC.
- Sima, A.A.F., Zhang, W., Kreipke, C.W., Rafols, J.A., & Hoffman, W.H. 2009. Inflammation in diabetic encephalopathy is prevented by C-peptide. *Rev Diabet Stud*, 6(1), 37–42. <https://doi.org/10.1900/RDS.2009.6.37>
- Tan, X., Gao, L., Cai, X., Zhang, M., Huang, D., Dang, Q., et al. 2021. Vitamin D3 alleviates cognitive impairment through regulating inflammatory stress in db/db mice. *Food Sci Nutr*, 9(9), 4803–4814. <https://doi.org/10.1002/fsn3.2397>
- Tortora, G.J. & Derrickson, B. 2017. Principles of Anatomy & Physiology. Edisi ke-15. USA: John Wiley & Sons, Inc.
- Vafei-Nezhad, S., Vafei-Nezhad, M., Shadi, M., & Ezi, S. 2021. The Impact of Diabetes on Hippocampus. <https://www.intechopen.com/chapters/78360>
- Van Dyken, P., & Lacoste, B. 2018. Impact of Metabolic Syndrome on Neuroinflammation and the Blood–Brain Barrier. *Front. Neurosci*. 12:930. . <https://doi.org/10.3389/fnins.2018.00930>
- Vorhees, C.v., & Williams, M.T. 2006. Morris Water Maze: Procedures for assessing spatial and related forms of learning and memory. *Nat Prot*, 1(2), 848–858. <https://doi.org/10.1038/nprot.2006.116>
- Wartchow, K.M., Rodrigues, L., Lissner, L.J., Federhen, B.C., Selistre, N.G., Moreira, A., Gonçalves, C.A., & Sesterheim, P. 2020. Insulin-producing cells from mesenchymal stromal cells: Protection against cognitive impairment in diabetic rats depends upon implant site. *Life Sci*, 251. <https://doi.org/10.1016/j.lfs.2020.117587>
- Yang, Z., & Wang, K. K. W. 2015. Glial fibrillary acidic protein: From intermediate filament assembly and gliosis to neurobiomarker. *Trends Neurosci*, 38(6), 364–374. <https://doi.org/10.1016/j.tins.2015.04.003>
- Yunus, J., Prakosa, D., & Sari, D.C.R. 2012. Neuroprotective effect of vitamin D3 toward apoptosis induced by ethanol in CA1 pyramidal cells of rat hippocampus. *J Med Sci*, 44(1), 1-9.
- Zhang, S., Wu, M., Peng, C., Zhao, G., & Gu, R. 2017. GFAP expression in injured astrocytes in rats. *Exp. Ther. Med.*, 14(3), 1905–1908. <https://doi.org/10.3892/etm.2017.4760>
- Zwirner, J., Lier, J., Franke, H., Hammer, N., Matschke, J., Trautz, F., et al. 2021. GFAP positivity in neurons following traumatic brain injuries. *Int. J. Legal. Med.*, 135, 2323-2333. <https://doi.org/10.1007/s00414-021-02568-1>