



DAFTAR PUSTAKA

- Abe, F., Nagafuji, S., Okawa, M., Kinjo, J. 2006. Trypanocidal constituents in plants 6. 1) Minor withanolides from the aerial parts of *Physalis angulata*. *Chem Pharm Bull.* 54(8):1226-1228.
- Abramowitz, J., Birnbaumer, L. 2009. Physiology and pathophysiology of canonical transient receptor potential channels. *FASEB J.* 23(2):297-328.
- Adewoye, E.O., Oguntola, M.A., Ige, A.O. 2016. Anti-oxidative and renoprotective effects of *physalis angulata* (whole plant extract) in alloxan-induced diabetic male Wistar rats. *Afr J Med Med Sci.* 45(1):99-108.
- Agarwal R. 2021. Pathogenesis of Diabetic Nephropathy. In: Chronic Kidney Disease and Type 2 Diabetes. Arlington (VA): American Diabetes Association. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK571720/> doi: 10.2337/db20211-2
- Agra, M., Baracho, G., Nurit, K., Basílio, I., Coelho, V. 2007. Medicinal and poisonous diversity of the flora of “Cariri Paraibano”, Brazil. *J Ethnopharmacol.* 111: 383 - 395.
- Aitman, T.J., Critser, J.K., Cuppen, E., Dominiczak, A., Fernandez-Suarez, X.M., Flint, J., et al. 2008. Progress and prospects in rat genetics: a community view. *Nat Genet.* 40(5): 516-522.
- Akbarzadeh, A., Norouzian, D., Mehrabi, M.R., Jamshidi, S., Farhangi, A., Verdi, A.A., et al. 2007. Induction of diabetes by Streptozotocin in rats. *Indian J Clin Biochem.* 22: 60-64.
- Alonso-Titos, J., Martinez-Esteban, M.D., López, V., León, M., Martin-Reyes, G., Ruiz-Esteban, P., et al. 2021. Monoclonal gammopathy of renal significance: Early diagnosis is key. *Nefrologia.* 41(5): 502-513.
- American Association Diabetes. 2010. Diagnosis and classification of diabetes mellitus. *Diabetes care.* 33(1): 562-569.
- American Association Diabetes. 2022. Chronic kidney disease and risk management: Standards of medical care in diabetes-2022. *Diabetes care.* 45(1): S175-S184.b
- Anggraini, D. 2002. Aspek klinis dan pemeriksaan laboratorium penyakit ginjal kronik. *Jurnal Kesehatan Masyarakat.* 9(2): 236-239.
- Anh, T.H.L., Le B.V., Do, T.T., Phan, V.K., Pham Thi, H.Y., Bach, L.G., et al. 2021. Bioactive compounds from *Physalis angulata* and their anti-inflammatory and cytotoxic activities. *J Asian Nat Prod Res.* 8: 809-817.



Anh, H.L.T., Dung, D.T., Tuan, D.T., Tai, B.H., Nhem, N.X., Yen, P.H., et al. 2016. New Phenolic Glycosides from *Physalis angulata*. *Nat Prod Commun.* 11(12):1859-1860.

Arfian, N., Setyaningsih, W.A.W., Romi, M.M., Sari, D.C.R. 2019. Heparanase upregulation from adipocyte associates with inflammation and endothelial injury in diabetic condition. *BMC Proc.* 13(Suppl 11): 1-8.

Awad, A.R., Dkhil, M.A., Danfour, M.A. 2007. Structural alterations of the glomerular wall and vessels in early stages of diabetes mellitus: (light and transmission electron microscopic study). *Libyan J Med.* 2(3): 135-138.

Azushima, K., Gurley, S.B., Coffman, T.M. 2018. Modelling diabetic nephropathy in mice. *Nat Rev Nephrol.* 14(1): 48-56.

Babu, S., Krishnan, M., Rajagopal, P., Periyasamy, V., Veeraraghavan, V., Govindan, R., et al. 2020. Beta-sitosterol attenuates insulin resistance in adipose tissue via IRS-1/Akt mediated insulin signaling in high fat diet and sucrose induced type-2 diabetic rats. *Eur J Pharmacol.* 873: 1-13.

Bastos, T., Silveira, A., Salgado, G., Picanco, W., Nascimento, M. 2008. *Physalis angulata* extracts exerts anti-inflammatory effects in rats inhibiting different pathways. *J Ethnopharmacol.* 118:251-264.

Bastos, G.N., Santos, A.R., Ferreira, V.M., Costa, A.M., Bispo, C.I., Silveira AJ., et al. 2006. Antinociceptive effect of the aqueous extract obtained from roots of *Physalis angulata* L. on mice. *J Ethnopharmacol.* 16;103(2):241-245.

Bertani, T., Abbate, M., Zoja, C., Corna, C., Perico, N., Ghezzi, P., et al. 1989. Tumor necrosis factor-induced glomerular 590 damage in the rabbit. *Am J Pathol* 134(2): 419-430.

Bessa, S.S., Hussein, T.A., Morad, M.A., Amer, A.M. 2012. Urinary platelet-derived growth factor-BB as an early marker of nephropathy in patients with type 2 diabetes: an Egyptian study. *Ren Fail.* 34(6): 670-675.

Bihun, C., Bauck, L. 2004. Basic anatomy, physiology, husbandry and clinical techniques. In: Ferrets, rabbits and rodents: Clinical medicine and surgery, 2nd Ed. Quesenberry, K.E., Carpenter, J.W., editors. Elsevier Inc., Philadelphia, Pennsylvania, 286–298

Bonegio, R., Susztak,K. 2012. Notch signaling in diabetic nephropathy. *Exp Cell Res.* 318(9): 986–992.

Bottinger, E.P. 2007. TGF-beta in renal injury and disease. *Semin Nephrol.* 27: 309–320.



- Bourdy, G., DeWalt, S., Chávez, L., Roca, A., Deharo, E., Muñoz, V., et al. 2000. Medicinal plants uses of the Tacana, an Amazonian Bolivian ethnic group. *J Ethnopharmacol.* 70: 87 - 109.
- Bjornstad, P., Cherney, D.Z. 2018. Renal hyperfiltration in adolescents with type 2 diabetes: physiology, sex differences, and implications for diabetic kidney disease. *Curr Diab Rep.* 18: 1-15.
- Brown, A.L. 1966. The structure of the nephron. *Med Clin North Am.* 50(4):927-935.
- Brownlee, M. 2001. Biochemistry and molecular cell biology of diabetic complications. *Nature.* 414(6865): 813-820.
- Brownlee. M. 2005. The pathobiology of diabetic complications: a unifying mechanism. *Diabetes.* 54(6): 1615-1625.
- Brunton, L., Parker, K., Blumenthal, D., Buxton, L. 2007. Goodman and Gilman's manual of pharmacology and therapeutics. The McGraw-Hill Companies, Inc. San diego, CA.
- Budi, E.H., Schaub, J.R., Decaris, M., Turner, S., Derynck, R. 2021. TGF- β as a driver of fibrosis: physiological roles and therapeutic opportunities. *J Pathol.* 254: 358-373.
- Bülow, R. D., and Boor, P. 2019. Extracellular matrix in kidney fibrosis: more than just a scaffold. *J Histochem Cytochem.* 67: 643–661.
- Cao, X., Wei, R., Zhou, J., Zhang, J., Gong, W., Jin, T., et al. 2019. Wenshen Jianpi recipe, a blended traditional Chinese medicine, ameliorates proteinuria and renal injury in a rat model of diabetic nephropathy. *BMC Compl.* 19: 1-9.
- Cao, Z., Cooper, M.E. 2011. Pathogenesis of diabetic nephropathy. *J diabetes Investig.* 2(4): 243-247.
- Cardoso, V.G., Gonçalves, G.L., Costa-Pessoa, J.M., Thieme, K., Lins, B.B., Casare, F.A.M., et al. 2018. Angiotensin II-induced podocyte apoptosis is mediated by endoplasmic reticulum stress/PKC- δ /p38 MAPK pathway activation and trough increased Na $^{+}$ /H $^{+}$ exchanger isoform 1 activity. *BMC Nephrol.* 19(179): 1-12.
- Casey, R.G., Joyce, M., Roche-Nagle, G., Chen, G., Bouchier-Hayes, D. 2005 Pravastatin modulates early diabetic nephropathy in an experimental model of diabetic renal disease. *J Surg Res.* 123:176-181.



- Che, G., Gao, H., Hu, Q., Xie, H., Zhang, Y. 2020. Angiotensin II promotes podocyte injury by activating Arf6-Erk1/2-Nox4 signaling pathway. *PLoS ONE*. 15(3): 1-15.
- Chen, S., Meng, X.F., Zhang, C. 2013. Role of NADPH oxidase-mediated reactive oxygen species in podocyte injury. *BioMed Res Int*. 2013: 1-7.
- Chen, H.Y., Huang, X.R., Wang, W., Li, J.H., Heuchel, R.L., Chung, A.C., et al. 2011. The protective role of Smad7 in diabetic kidney disease: mechanism and therapeutic potential. *Diabetes*. 60(2): 590-601.
- Chen, H.L., Wan, Y.G., Zhao, Q., Huang, Y.R., Shi, X.M., et al. 2013. Regulative mechanism of renal inflammatory-related p38MAPK signaling pathway in diabetic nephropathy and interventional effects of Chinese herbal medicine. *Zhongguo Zhong Yao Za Zhi*. 38(14):2268-2272.
- Chen, J., Gui, D., Chen, Y., Mou, L., Liu, Y., Huang, J. 2008. Astragaloside IV improves high glucose-induced podocyte adhesion dysfunction via alpha3beta1 integrin upregulation and integrin-linked kinase inhibition. *Biochem Pharmacol*. 76(6): 796-804.
- Chen, H.C., Chen, C.A., Guh, J.Y., Chang, J.M., Shin, S.J., Lai, Y.H. 2000. Altering expression of alpha3beta1 integrin on podocytes of human and rats with diabetes. *Life Sci*. 67(19): 2345-2353.
- Chen, S., Gui, S., Yan, Y. 2020. Diabetic Nephropathy: Patogenesis. Available at <https://calgaryguide.ucalgary.ca/diabetic-nephropathy-pathogenesis/>.
- Chiarelli, F., Santilli, F., Mohn, A. 2000. Role of Growth Factors in the Development of Diabetic Complications. *Horm Res*. 53(2): 53-67.
- Choi, M. E., Ding, Y., Kim, S. I. 2012. TGF- β signaling via TAK1 pathway: role in kidney fibrosis. *Semin Nephrol*. 32: 244-252.
- Chuang, P.Y., Yu, Q., Fang, W., Uribarri, J., He, JC. 2007. Advanced glycation endproducts induce podocyte apoptosis by activation of the FOXO4 transcription factor. *Kidney Int*. 72(8):965-976.
- Chuang, P.Y., Dai, Y., Liu, R., He, H., Kretzler, M., Jim, B., et al. 2011. Alteration of Forkhead Box O (Foxo4) Acetylation Mediates Apoptosis of Podocytes in Diabetes Mellitus. *PLoS ONE*. 6(8): 1-10.
- Cooper, M.E., Cao, Z. 2021. Pathogenesis of diabetic nephropathy. *J Diabetes Investig*. 2(4): 243-247.
- Coelho-Ferreira, M. 2009. Medicinal knowledge and plant utilization in an Amazonian coastal community of Marudá, Pará State (Brazil). *J Ethnopharmacol*. 126: 159 - 175.



- Comper, W.D. 2008. Resolved: Normal Glomeruli Filter Nephrotic Levels of Albumin. *J Am Soc Nephro.* 19(3): 427-432.
- Contreras-Zentella, M.L., Hernández-Muñoz, R. 2016. Is liver enzyme release really associated with cell necrosis induced by oxidant stress? *Oxid Med Cell Longev.* 2016:1–12.
- Cowart, S.L., Stachura, M.E. 1990. Glucosuria. In: Walker, H.K., Hall, W.D., Hurst, J.W. editors *Clinical Methods: The History, Physical, and Laboratory Examinations*. 3rd edition. Boston: Butterworths. Chapter 139. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK245/>
- Cui, F.Q., Tang, L., Gao, Y.B., Wang, Y.F., Meng, Y., Shen, C., et al. 2019. Effect of Baoshenfang Formula on Podocyte Injury via Inhibiting the NOX-4/ROS/P38 Pathway in Diabetic Nephropathy. *J Diabetes Res.* 2019: 1-16.
- Da, C.J., Damasceno, R.S., Machado, U.F., Beloto-Silva, O., Oliveira-Souza, M. 2014. High glucose concentration stimulates NHE- 1 activity in distal nephron cells: the role of the Mek/Erk1/2/p90 and p38MAPK signaling pathways. *Cell Physiol Biochem.* 33: 333–343.
- Dai, C., Stoltz, D.B., Kiss, L.P., Monga, S.P., Holzman, LB., Liu, Y. 2009. Wnt/beta-catenin signaling promotes podocyte dysfunction and albuminuria. *J Am Soc Nephrol.* 20(9):1997-2008.
- Dai, H., Liu, Q., Liu, B. 2017. Research Progress on Mechanism of Podocyte Depletion in Diabetic Nephropathy. *J Diabetes Res.* 2017: 1-10.
- Dai, H., Liu, F., Qiu, X., Liu, W., Dong, Z., Jia, Y., et al. 2020. Alleviation by Mahuang Fuzi and Shenzhuo Decoction in High Glucose-Induced Podocyte Injury by Inhibiting the Activation of Wnt/β-Catenin Signaling Pathway, Resulting in Activation of Podocyte Autophagy. Evidence-Based Complement. *Altern Med.* 2020: 1–11.
- Danziger, J., Zeidel, M., Parker, M.J. 2012. *Renal Physiology- A clinical approach*. Wolters Kluwers: Lippincott Williams & Wilkins. Philadelphia.
- Das, F., Ghosh-Choudhury, N., Venkatesan, B., Kasinath, B.S., Ghosh Choudhury G. 2017. PDGF receptor- β uses Akt/mTORC1 signaling node to promote high glucose-induced renal proximal tubular cell collagen I (α 2) expression. *Am J Physiol Renal Physiol.* 313(2): F291-F307.
- de Oliveira, A.M., Malunga, L.N., Perussello, C.A., Beta, T., Ribani, R.H. 2020. Phenolic acids from fruits of *Physalis angulata L.* in two stages of maturation. *S Afr J Bot.* 131(2020): 448–453.



- Delwatta, S.L., Gunatilake, M., Baumans, V., Seneviratne, M.D., Dissanayaka, M.L.B., Batagoda, S.S., *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 Model Exp Med.* 1(4):250-254.
- Deshpande, S.D., Putta, S., Wang, M., Lai, J.Y., Bitzer, M., Nelson, R.G., *et al.* 2013. Transforming growth factor- β -induced cross talk between p53 and a microRNA in the pathogenesis of diabetic nephropathy. *Diabetes*. 62(9): 3151-3162.
- Dewi, S., Isbagio, H., Purwaningsih, E.H., Kertia, N., Setiabudy, R., Setiati S. 2019. A Double-blind, randomized controlled trial of ciplukan (Physalis angulata Linn) extract on skin fibrosis, inflammatory, immunology, and fibrosis biomarkers in scleroderma patients. *Acta Med Indones.* 51(4): 303–10.
- Di Vincenzo, A., Tana, C., El Hadi, H., Pagano, C., Vettor, R., Rossato, M. 2019. Antioxidant, Anti-Inflammatory, and Metabolic Properties of Tocopherols and Tocotrienols: Clinical Implications for Vitamin E Supplementation in Diabetic Kidney Disease. *Int J Mol Sci.* 20(20): 1-13.
- Dias, F.G.B., Ferreira, M.J.G., Silva, L.M.R.D., Menezes, R.C.D.S., Figueiredo, E. A.T.D. 2020. Bioaccessibility of the bioactive compounds and antimicrobial activity of aqueous extracts of *Physalis angulata* L. *Rev Cienc Agron.* 51(3): 1-9.
- Ding, E.L., Song, Y., Malik, V.S., Liu, S. 2006. Sex differences of endogenous sex hormones and risk of type 2 diabetes: a systematic review and meta-analysis. *JAMA*. 295: 1288-1299.
- Dirar, A.H.M., Doupis, J. 2017. Gestational diabetes from A to Z. *World J Diabetes*. 8(12):489-511.
- Donnahoo, K.K., Shames, B.D., Harken, A.H. 1999. Meldrum, D.R. Review article: The role of tumor necrosis factor in renal ischemia-reperfusion injury. *J Urol.* 162(1): 196-203.
- Doublier, S., Salvidio, G., Lupia, E., Ruotsalainen, V., Verzola, D., Deferrati, G., *et al.* 2003. Nephron expression is reduced in human diabetic nephropathy:evidence for a distinct role for glycated albumin and angiotensin II. *Diabetes*. 52(4):1023–1030.
- Drummond, K., Mauer, M. 2022. International Diabetic Nephropathy Study Group. The early natural history of nephropathy in type 1 diabetes: II.



Early renal structural changes in type 1 diabetes. *Diabetes*. 51(5):1580-1587.

Duan, S.B., Liu, G.L., Wang, Y.H., Zhang, J.J. 2012. Epithelial-to-mesenchymal transdifferentiation of renal tubular epithelial cell mediated by oxidative stress and intervention effect of probucol in diabetic nephropathy rats. *Ren Fail*. 34(10): 1244-1251.

Duke, J.A., Vásquez, R. 1994. Amazonian Ethnobotanical Dictionary. CRC Press, Inc. Boca Raton, Florida, USA.

Earle, K.A., Ng, L., White, S., Zitouni, K. 2017. Sex differences in vascular stiffness and relationship to the risk of renal functional decline in patients with type 2 diabetes. *Diab Vasc Dis Res*. 14: 304–309.

Eaton, D.C., Pooler, J.P. 2009. Vander's Renal Physiology. 7th Edition, Lange Medical Books/McGraw-Hill, Medical Pub. Division, New York.

Eid, A.A., Gorin, Y., Fagg, B.M., Maalouf, R., Barnes, J.L., Block, K., Abboud H.E. 2009. Mechanisms of podocyte injury in diabetes: role of cytochrome P450 and NADPH oxidases. *Diabetes*. 58(5):1201-1211.

Emilien, G. 2000. The dose-response relationship in Phase I clinical trials and beyond use, meaning, and assessment. *Pharmacol Ther*. 88(1): 33-58.

Eroschenko, V. 2017. Atlas Histology with functional correlation thirteenth edition. Wolter Kluwer. Moscow.

Fadhli, H., Ruska, S.L., Furi, M., Suhery, W.N., Susanti, E., Nasution, M.R. 2023. Ciplukan (*Physalis angulata L*): Review tanaman liar yang berpotensi sebagai tanaman obat. *Jurnal Farmasi Indonesia*. 15(2): 134-141.

Fagerudd, J.A., Groop, P.H., Honkanen, E., Teppo, A.M., Grönhagen-Riska, C. 1997. Urinary excretion of TGF-beta 1, PDGF-BB and fibronectin in insulin-dependent diabetes mellitus patients. *Kidney Int Suppl*. 63:S195-197.

Farris, A.B., Colvin, R.B. 2012. Renal interstitial fibrosis: mechanisms and evaluation. *Curr Opin Nephrol Hypertens*. 21(3): 289-300.

Fawas, S., Alonso, A.M., Qiu, Y., Ramnath, R., Stowell-Connolly, H., Gamez, M., et al. 2024. Adiponectin Reduces Glomerular Endothelial Glycocalyx Disruption and Restores Glomerular Barrier Function in a Mouse Model of Type 2 Diabetes. *Diabetes*. 73(6): 964–976.

Febianti, Z., Permatasari, N., Soearto, S. 2019. Vasoprotective Effect of *Physalis angulata L*. Leaf Water Extract on Kidney of NΩ-Nitro-L-Arginine Methyl



Ester-induced Endothelial Dysfunction Rat Model. *Asian J Pharm and Clin Res.* 12(1): 432-437.

Feng, J., Lu, C., Dai, Q., Sheng, J., Xu, M. 2018. Sirt3 facilitates amniotic fluid stem cells to repair diabetic nephropathy through protecting mitochondrial homeostasis by modulation of mitophagy. *Cell Physiol Biochem.* 46(4): 1508-1524.

Farquhar, M.G. 2006. The glomerular basement membrane: not gone, just forgotten. *J Clin Invest.* 116(8): 2090–2093.

Ferenbach, D., Kluth, D., Hughes, J. 2007. Inflammatory cells in renal injury and repair. *Semin Nephrol.* 27: 250–259.

Francois, H., Chatziantoniou, C. 2018. Renal fibrosis: recent translational aspects. *Matrix Biol.* 68–69: 318–332.

Fukasawa, H., Bornheimer, S., Kudlicka, K., Farquhar, M.G. 2009. Slit diaphragms contain tight junction proteins. *J Am Soc Nephrol.* 20(7):1491-1503.

Fujimoto, M., Maezawa, Y., Yokote, K., Joh, K., Kobayashi, K., Kawamura, H., et al. 2003. Mice lacking Smad3 are protected against streptozotocin-induced diabetic glomerulopathy. *Biochem Biophys Res Commun.* 305(4):1002-1007.

Gaarkeuken, H., Siezenga, M.A., Zuidwijk, K., van Kooten, C., Rabelink, T.J., Daha, M.R., Berger, S.P. 2008. Complement activation by tubular cells is mediated by properdin binding. *Am J Physiol Renal Physiol.* 295: F1397–F1403.

Gale, E.A., Gillespie, K.M. 2001. Diabetes and gender. *Diabetologia.* 44: 3-15.

Gao, F., Yao, M., Cao, Y., Liu, S., Liu, Q., Duan, H. 2016. Valsartan ameliorates podocyte loss in diabetic mice through the Notch pathway. *Int J Mol Med.* 37(5):1328-1336.

Gao, F., Zhou, Y., Yu, B., Xie, H., Shi, Y., Zhang, X., et al. 2023. QiDiTangShen granules alleviates diabetic nephropathy podocyte injury: A network pharmacology study and experimental validation in vivo and vitro. *Heliyon.* 10(1): 1-16.

Garg, P., Holzman, L.B. 2012. Podocytes: gaining a foothold. *Exp Cell Res.* 318: 955–963.

Geissler, P., Harris, S., Prince, R., Olsen, A., Odhiambo, R., Oketch-Rabah, H., et al. 2002. Medicinal plants used by Luo mothers and children in Bondo district, Kenya. *J Ethnopharmacol.* 83: 39-54.



Gelberg, H., Healy, L., Whiteley, H., Miller, L.A., Vimr, E. 1996. In vivo enzymatic removal of alpha 2-->6-linked sialic acid from the glomerular filtration barrier results in podocyte charge alteration and glomerular injury. *Lab Invest.* 74(5): 907-920.

George, B., Holzman, L.B. 2012. Signaling from the podocyte intercellular junction to the actin cytoskeleton. *Semin Nephrol.* 32(4): 307–318.

Ghasemi, A., Khalifi, S., Jedi, S. 2014. Streptozotocin-nicotinamide- induced rat model of type 2 diabetes (review). *Hung Acta Physiol.* 101(4): 408-420.

Ghafouri-Fard, S., Askari, A., Shoorei, H., Seify, M., Koohestanidehaghi, Y., Hussen, B.M., et al. 2024. Antioxidant therapy against TGF- β /SMAD pathway involved in organ fibrosis. *J Cell Mol Med.* 28(2): 1-21.

Giandalia, A., Giuffrida, A.E., Gembillo, G., Cucinotta, D., Squadrito, G., Santoro, D., Russo, G.T. 2021. Gender Differences in Diabetic Kidney Disease: Focus on Hormonal, Genetic and Clinical Factors. *Int J Mol Sci.* 22(11): 1-24.

Gill, P.S., Christopher, W.S. 2006. NADPH Oxidases in the Kidney. *Antioxid Redox Signal.* 8(9): 1597–1607.

Giacco, F., Brownlee, M. 2010. Oxidative stress and diabetic complications. *Circ Res.* 107(9):1058-70.

Gojo, A., Utsunomiya, K., Taniguchi, K., Yokota, T., Ishizawa, S., Kanazawa, et al. 2007. The Rho-kinase inhibitor, fasudil, attenuates diabetic nephropathy in streptozotocin-induced diabetic rats. *Eur J Pharmacol.* 568: 242-247.

Gopalakrishnan, L., Doriya, K., Kumar, D.S. 2016. Moringa oleifera: A review on nutritive importance and its medicinal application. *Food Sci Hum Well.* 5(2):49-56.

Gounden, V., Bhatt, H., Jialal, I. 2023. Renal Function Tests. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing.

Grahammer, F., Schell, C., Huber, T.B. 2013. The podocyte slit diaphragm--from a thin grey line to a complex signalling hub. *Nat Rev Nephrol.* 9(10): 587–598.

Guan, N., Ding, J., Zhang ,J., Yang, J. 2003. Expression of nephrin, podocin, a-actinin, and WT1 in children with nephrotic syndrome. *Pediatr Nephrol.* 18:1122-1127.

Guo, Q., Zhong, W., Duan, A., Sun, G., Cui, W., Zhuang, X., et al. 2019. Protective or Deleterious Role of Wnt/beta-Catenin Signaling in Diabetic Nephropathy: An Unresolved Issue. *Pharmacol Res.* 144: 151–157.



- Guo, L., Jiang, B., Li, D., Xiao, X. 2021. Nephroprotective Effect of Adropinin Against Streptozotocin-Induced Diabetic Nephropathy in Rats: Inflammatory Mechanism and YAP/TAZ Factor. *Drug Des Devel Ther.* 15:589-600.
- Gupta, R., Sharma, A.K., Dobhal, M.P., Sharma, M.C., Gupta, R.S. 2011. Antidiabetic and antioxidant potential of β -sitosterol in streptozotocin-induced experimental hyperglycemia. *J Diabetes.* 3: 29–37.
- Guyton, A.C., Hall, J.E. 2014. Buku Ajar Fisiologi Kedokteran. Edisi 12. Jakarta : EGC, 1022 305(4):1002-1007.
- Ha, T.S. 2013. Roles of adaptor proteins in podocyte biology. *World J Nephrol.* 2(1): 1-10.
- Hamm, L., Nakhoul, N., Hering-smith, K.S. 2015. Acid-Base Homeostasis. *Clin J Am Soc Nephrol.* 10: 2232-2242.
- Haraldsson, B., Nyström, J., Deen, W.M. 2008. Properties of the glomerular barrier and mechanisms of proteinuria. *Physiol Rev.* 88(2): 451–487.
- Hamm, L.L., Nakhoul, N., Hering-Smith, K.S. 2015. Acid-Base Homeostasis. *Clin J Am Soc Nephrol.* 10(12):2232-2242.
- Haque, S., Morris, J.C. 2017. Transforming growth factor- β : A therapeutic target for cancer. *Hum Vaccin Immunother.* 13(8): 1741-1750.
- Hertig, A., Anglicheau, D., Verine, J., Pallet, N., Touzot, M., Ancel, P.Y., et al. 2008. Early epithelial phenotypic changes predict graft fibrosis. *J Am Soc Nephrol.* 19(8): 1584–1591.
- Hills, C.E., Squires, PE. 2011. The role of TGF- β and epithelial-to-mesenchymal transition in diabetic nephropathy. *Cytokine Growth Factor Rev.* 22: 131-139.
- Hogan, J.J., Mocanu, M., Berns, J.S. 2016. The native kidney biopsy: update and evidence for best practice. *Clin J Am Soc Nephrol.* 11(2):354-362.
- Holzman, L.B., St. John, P.L., Kovari, I.A., Verma, R., Holthofer, H., Abrahamson, D.R. 1999. Nephrin localizes to the slit pore of the glomerular epithelial cell. *Kidney Int.* 56:1481-1491.
- Hong, J., Stubbins, R.E., Smith, R.R., Harvey, A.E., Núñez, N.P. 2009. Differential susceptibility to obesity between male, female and ovariectomized female mice. *Nutr J.* 8: 1-5.
- Huber, T.B., Benzing, T. 2005. The slit diaphragm: a signaling platform to regulate podocyte function. *Curr Opin Nephrol Hypertens.* 14(3): 211–216.



Humphreys, B.D. 2018. Mechanisms of Renal Fibrosis. *Annu Rev Physiol.* 80: 309–326.

Hussain, F., Rana, Z., Shafique, H., Malik, A., Hussain, Z. 2017. Phytopharmacological potential of different species of *Morus alba* and their bioactive phytochemicals: A review. *Asian Pac J Trop Biomed.* 7(10): 950-956.

Iglesias-de la Cruz, M.C., Ziyadeh, F.N., Isono, M., Kouahou, M., Han, D.C., Kalluri, R., et al. 2002. Effects of high glucose and TGF-beta1 on the expression of collagen IV and vascular endothelial growth factor in mouse podocytes. *Kidney Int.* 62(3): 901-913.

International Diabetes Federation. 2021. IDF Diabetes atlas 10th edition. Available at: www.diabetesatlas.org.

Inoue, T., Yaoita, E., Kurihara, H., Shimizu, F., Sakai, T., Kobayashi, T., et al. 2001. FAT is a component of glomerular slit diaphragms. *Kidney Int.* 59(3): 1003-1012.

Iwansyah, A.C., Luthfiyanti, R., Ardiansyah, R.C.E., Rahman, N., Andriana, Y., Hamid, H.A. 2022. Antidiabetic activity of *Physalis angulata L.* fruit juice on streptozotocin-induced diabetic rats. *S Afr J Bot.* 145: 313-319.

Ito, Y., Goldschmeding, R., Kasuga, H., Claessen, N., Nakayama, M., Yuzawa, Y., et al. 2010. Expression patterns of connective tissue growth factor and of TGF-β isoforms during glomerular injury recapitulate glomerulogenesis. *Am J Physiol Renal Physiol.* 299: 545–558.

Iwansyah, A.C., Luthfiyanti, R., Ardiansyah, R.C.E., Rahman, N., Andriana, Y., Hamid, H.A. 2022. Antidiabetic activity of *Physalis angulata L.* fruit juice on streptozotocin-induced diabetic rats. *S Afr J Bot.* 145: 313-319.

Ilatovskaya, D.V., Levchenko, V., Lowing, A., Shuyskiy, L.S., Palygin, O., Staruschenko, A. 2015. Podocyte injury in diabetic nephropathy: implications of angiotensin II-dependent activation of TRPC channels. *Sci Rep.* 5(17637): 1-10.

Indonesian Renal Registry. 2018. 11th Report Of Indonesian Renal Registry. 1-46. <https://www.indonesianrenalregistry.org/>.

Jalanko H. 2003. Pathogenesis of proteinuria: lessons learned from nephrin and podocin. *Pediatr Nephrol.* 18:487-91.

Jaenudin. 2019. Uji aktivitas kacang gude (*Cajanus cajan* (Linn.) Huth) sebagai nefroprotektor pada tikus jantan putih galur wistar (*Rattus norvegicus*). STIKes Bakti Tunas Husada. Tasikmalaya.



- Jayaraman, S., Roy, A., Vengadassalapathy, S., Sekar, R., Veeraraghavan, V.P., Rajagopal, P., *et al.* 2021. An Overview on the Therapeutic Function of Foods Enriched with Plant Sterols in Diabetes Management. *Antioxidants*. 10(12): 1-19.
- Jha, JC., Banal, C., Chow, BS., Cooper, ME., Jandeleit-Dahm, K. 2016. Diabetes and Kidney Disease: Role of Oxidative Stress. *Antioxid Redox Signal*, 25: 657-684.
- Jiang, J.H., Deng, P. 2019. Discovery of New Inhibitors of Transforming Growth Factor-Beta Type 1 Receptor by Utilizing Docking and Structure-Activity Relationship Analysis. *Int J Mol Sci*. 20(17): 1-12.
- Jiang, H., Guan, G., Zhang, R., Liu, G., Cheng, J., Hou, X., *et al.* 2009. Identification of Urinary Soluble E-Cadherin as a Novel Biomarker for Diabetic Nephropathy. *Diabetes Metab Res Rev*. 25(3): 232-241.
- Jim, B., Ghanta, M., Qipo, A., Fan, Y., Chuang, P.Y., Cohen, H.W., *et al.* 2012. Dysregulated nephrin in diabetic nephropathy of type 2 diabetes: a cross sectional study. *PLoS One*. 7(5): 1-7.
- Johnstone, D.B., Holzman, L.B. 2006. Clinical impact of research on the podocyte slit diaphragm. *Nat Clin Pract Nephrol*. 2: 271–282.
- Johansen, K.L., Chertow, G.M., Foley, R.N., Gilbertson, D.T., Herzog, C.A., Ishani, *et al.* 2021. US Renal Data System 2020 Annual Data Report: Epidemiology of Kidney Disease in the United States. *Am J Kidney Dis*. 77(4):A7-A8.
- Jones, T.W., Chorpa, S., Kaufman, J.S., Flamenbaum, W., Trump, B.F. 1985. Cis-diamminedichloroplatinum (II)-induced acute renal failure in the rat: enzyme histochemical studies. *Toxicol Pathol*. 13(4): 296–305.
- Jovel, E., Towers, G., Cabanillas, J. 1996. An ethnobotanical study of the tradicional medicine of the Mestizo people of Suni Miraño, Loreto, Peru. *J Ethnopharmacol*. 53:149 - 153.
- Junior, L.D.A., Quaglio, A.E.V., de Almeida Costa ,C.A.R., Di Stasi, L.C. 2017. Intestinal anti-inflammatory activity of Ground Cherry (*Physalis angulata* L.) standardized CO₂ phytopharmaceutical preparation. *World J Gastroenterol*. 23(24): 4369–4380.
- Kang, Z., Zeng, J., Zhang, T., Lin, S., Gao, J., Jiang, C., *et al.* 2019. Hyperglycemia induces NF-κB activation and MCP-1 expression via downregulating GLP-1R expression in rat mesangial cells: inhibition by metformin. *Cell Biol Int*. 43(8): 940-953.



Kriz, W., Hackenthal, E., Nobiling, R., Sakai, T., Elger, M., Hähnel, B. 1994. A role for podocytes to counteract capillary wall distension. *Kidney Int.* 45: 369-376.

Kanasaki, K., Taduri, G., and Koya, D. 2013. Diabetic nephropathy: the role of inflammation in fibroblast activation and kidney fibrosis. *Front Endocrinol.* 4: 1-15.

Kandasamy, Y., Smith, R., Lumbers, E.R., Rudd, D. 2014. Nephrin - a biomarker of early glomerular injury. *Biomark Res.* 2(21): 1-8.

Kato, H., Gruenwald, A., Suh, J. H., Miner, J. H., Barisoni-Thomas, L., Taketo, M. M., et al. 2011. Wnt/β-Catenin Pathway in Podocytes Integrates Cell Adhesion, Differentiation, and Survival. *J Biol Chem.* 286(29): 26003–26015.

Kaur, M., Bedi, O., Sachdeva, S., Reddy, B.V., Kumar, P. 2014. Rodent animal models: from mild to advanced stages of diabetic nephropathy. *Inflammopharmacology.* 22(5): 279-293.

Kaneto, H., Katakami, N., Kawamori, D., Miyatsuka, T., Sakamoto, K., Matsuoka, T.A., et al. 2007. Involvement of oxidative stress in the pathogenesis of diabetes. *Antioxid Redox Signal.* 3: 355-66.

Kang, S.W., Adler, S.G., Lapage, J., Natarajan, R. 2001. p38 MAPK and MAPK kinase 3/6 mRNA and activities are increased in early diabetic glomeruli. *Kidney Int.* 60: 543–552.

Kashihara, N., Haruna, Y., Kondeti, V.K., Kanwar, Y.S. 2010. Oxidative stress in diabetic nephropathy. *Curr Med Chem.* 17(34):4256-69.

Katsarou, A., Gudbjornsdottir, S., Rawshani, A., Dabelea, D., Bonifacio, E., Anderson, B.J., et al. 2017. Type 1 diabetes mellitus. *Nat Rev Dis Primers.* 3:1-17.

Khairari, J.D.D. 2023. Biomarker terkini sebagai alat diagnosis dan prognosis gagal ginjal akut pada anak: sebuah review. *Jurnal Kesehatan Tambusai.* 4(2): 1271-1278.

Kim, J., Seok ,Y.M., Jung, K.J., Park, K.M. 2009. Reactive oxygen species/ oxidative stress contributes to progression of kidney fibrosis following transient ischemic injury in mice. *Am J Physiol Renal Physiol.* 297: F461–F470.

Kitada, M., Ogura, Y., Koya, D. 2016. Rodent models of diabetic nephropathy: their utility and limitations. *Int J Nephrol Renovasc Dis.* 9: 279-290.



- Kodera, R., Shikata, K., Takatsuka, T., Oda, K., Miyamoto, S., et al. 2014. Dipeptidyl peptidase-4 inhibitor ameliorates early renal injury through its anti-inflammatory action in a rat model of type 1 diabetes. *Biochem Biophys Res Commun.* 443(3): 828-33.
- Kooptiwut, S., Hanchang, W., Semprasert, N., Junking, M., Limjindaporn, T., Yenchitsomanus, P.T. 2015. Testosterone reduces AGTR1 expression to prevent β -cell and islet apoptosis from glucotoxicity. *J Endocrinol.* 224: 215-224.
- Kousar, S. 2019. Type 1 Diabetes: Causes, Symptoms and Treatments, Review with Personal Experience. *Curr Res Diabetes Obes J.* 11(4): 1-7.
- Kranstuber, A., del Rio, C., Biesiadecki, B., Hamlin, R., Ottobre, J., Gyorke, S., et al. 2012. Advanced glycation end product cross-link breaker attenuates diabetes-induced cardiac dysfunction by improving sarcoplasmic reticulum calcium handling. *Front Physiol.* 3(292): 1-10.
- Kretzler, M. 2002. Regulation of adhesive interaction between podocytes and glomerular basement membrane. *Microsc Res Tech.* 57(4): 247–253.
- Kriz, W., LeHir, M. 2005. Pathways to nephron loss starting from glomerular diseases—insights from animal models. *Kidney Int.* 67: 404–419.
- Kusumaningtyas, R., Laily, N., Limanda, P. 2015. Potential of *P. angulata* (*Physalis Angulata L.*) as Source of Functional Ingredient. *Procedia Chem.* 14:367-372.
- Laia, I.S. 2022. Pemanfaatan ciplukan (*Physalis angulata*) sebagai tanaman obat hipertensi di desa Mohili Kecamatan Amandraya Kabupaten Nias Selatan. *Jurnal Ilmiah Mahasiswa Keguruan.* 1(2): 1-9.
- Langham, R.G., Kelly, D.J., Maguire, J., Dowling, J.P., Gilbert, R.E., Thomson, N.M. 2003. Over-expression of platelet-derived growth factor in human diabetic nephropathy. *Nephrol Dial Transplant.* 18(7): 1392-1396.
- Lawal, I., Uzokwe, N., Igboanugo, A., Adio, A., Awosan, E., Nwogwugwu, J., et al. 2010. Ethno medicinal information on collation and identification of some medicinal plants in Research Institutes of South-west Nigeria. *Afr J Pharm Pharmacol.* 4: 1 - 7.
- Lee, S.B., Kalluri, R. 2010. Mechanistic connection between inflammation and fibrosis. *Kidney Int.* 78 (119): S22–S26.
- Lee, S.Y., Han, S.M., Kim, J.E., Chung, K.Y., Han, K.H. 2013. Expression of E-cadherin in pig kidney. *J Vet Sci.* 14(4): 381-386.



- LeBleu V. S., Taduri G., O'Connell J., Teng Y., Cooke V. G., Woda C., *et al.* 2013. Origin and function of myofibroblasts in kidney fibrosis. *Nat Med.* 19(8): 1047-1053.
- Lenz, O., Fornoni, A., Ijaz, A., Tejada, T. 2008. Role of inflammation in diabetic nephropathy. *Curr Diabetes Rev.* 4: 10-17.
- Lenzen, S. 2008. The mechanisms of alloxan- and streptozotocin-induced diabetes. *Diabetologia.* 51(2), 216–226.
- Liguori, I., Russo, G., Curcio, F., Bulli, G., Aran, L., Della-Morte, D., *et al.* 2018. Oxidative stress, aging, and diseases. *Clin Interv Aging.* 13: 757-772.
- Li, Y., Kang, Y.S., Dai, C., Kiss, L.P., Wen, X., Liu, Y. 2008. Epithelial-to-mesenchymal transition is a potential pathway leading to podocyte dysfunction and proteinuria. *Am J Pathol.* 172(2): 299-308.
- Li, J., Qu, X., Bertram, J. F. 2009. Endothelial-Myofibroblast transition contributes to the early development of diabetic renal interstitial fibrosis in streptozotocin-induced diabetic mice. *Am J Pathol.* 175(4): 1380–1388.
- Li, C., Siragy, H.M. 2014. High Glucose Induces Podocyte Injury via Enhanced (Pro)renin Receptor-Wnt- β -Catenin-Snail Signaling Pathway. *PLoS One.* 9(2): 1-8.
- Li, W., Wang, G., Lu, X., Jiang, Y., Xu, L., Zhao, X. 2014. Lycopene ameliorates renal function in rats with streptozotocin-induced diabetes. *Int J Clin Exp Pathol.* 7(8): 5008-5015.
- Li, J.H., Huang, X.R., Zhu, H.J., Oldfield, M., Cooper, M., Truong, L.D., *et al.* 2004. Advanced glycation end products activate Smad signaling via TGF-beta-dependent and independent mechanisms: implications for diabetic renal and vascular disease. *Faseb J.* 18(1):176-178.
- Li, X., Chuang, P.Y., D'Agati, V.D., Dai, Y., Yacoub, R., Fu, J., *et al.* 2015. Nephrin preserves podocyte viability and glomerular structure and function in adult kidneys. *J Am Soc Nephrol.* 26(10):2361–2377.
- Li, B., Rui, J., Ding, X., Yang, X. 2019. Exploring the multicomponent synergy mechanism of Banxia Xiexin Decoction on irritable bowel syndrome by a systems pharmacology strategy. *J Ethnopharmacol.* 233: 158-168.
- Liao, P.C., Lai, M.H., Hsu, K.P., Kuo, Y.H., Chen, J., Tsai, M.C., *et al.* 2018. Identification of beta-Sitosterol as in vitro anti-inflammatory constituent in Moringa oleifera. *J Agric Food Chem.* 66: 10748–10759.
- Liu, Y. 2006. Renal fibrosis: New insights into the pathogenesis and therapeutics. *Kidney Int.* 69: 213-217.



- Liu, Y. 2011. Cellular and molecular mechanisms of renal fibrosis. *Nat Rev Nephrol.* 7(12): 684–696.
- Lim, A. 2014. Diabetic nephropathy - complications and treatment. *Int J Nephrol Renovasc Dis.* 7: 361-381.
- Lin, J.S., Susztak, K. 2016. Podocytes: the weakest link in diabetic kidney disease? *Curr Diab Rep.* 16(5):1-17.
- Liu, Y. 2004. Epithelial to mesenchymal transition in renal fibrogenesis: pathologic significance, molecular mechanism, and therapeutic intervention. *J Am Soc Nephrol.* 15(1): 1-12.
- Liu, J., Zhao, Z., Willcox, M.D., Xu, B., Shi, B. 2010. Multiplex bead analysis of urinary cytokines of type 2 diabetic patients with normo-and microalbuminuria. *J Immunoassay Immunochem.* 31: 279–289.
- Liu, Y. 2011. Cellular and molecular mechanisms of renal fibrosis. *Nat Rev Nephrol.* 7: 684–696.
- Liu, B-C., Tang, T-T., Lv, L-L., Lan, H-Y. 2018. Renal tubule injury: a driving force toward chronic kidney disease. *Kidney Int.* 93: 568–579.
- Liu, T., Chen, X.M., Sun, J.Y., Jiang, X.S., Wu, Y., Yang, S., et al. 2018. Palmitic Acid-Induced Podocyte Apoptosis via the Reactive Oxygen Species-Dependent Mitochondrial Pathway. *Kidney Blood Press Res.* 43: 206-219.
- Lovshin, J.A., Škrtić, M., Bjornstad, P., Moineddin, R., Daneman, D., Dunger, D., et al. 2018. Hyperfiltration, urinary albumin excretion, and ambulatory blood pressure in adolescents with type 1 diabetes mellitus. *Am J Physiol Renal Physiol.* 314: F667–F674.
- Loeffler, I., Wolf, G. 2015. Epithelial-to-Mesenchymal Transition in Diabetic Nephropathy: Fact or Fiction? *Cells.* 4(4): 631-652.
- Lone, A.H., Behl, T., Kumar, A., Makkar, R., Nijhawan, P., Redhu, S., et al. 2020. Renoprotective potential of dimethyl fumarate in streptozotocin induced diabetic nephropathy in Wistar rats. *Obes Med.* 18: 1-8.
- Lu, Q., Ji, X.J., Zhou, Y.X., Yao, X.Q., Liu, Y.Q., Zhang, F., et al. 2015. Quercetin inhibits the mTORC1/p70S6K signaling-mediated renal tubular epithelial-mesenchymal transition and renal fibrosis in diabetic nephropathy. *Pharmacol Res.* 99: 237-247.
- Luciano, R.L., Moeckel, G.W. 2019. Update on the native kidney biopsy: core curriculum 2019. *Am J Kidney Dis.* 73(3):404-415.



- Mack, M., Yanagita, M. 2015. Origin of myofibroblasts and cellular events triggering fibrosis. *Kidney Int.* 87, 297–307.
- Madrazo-Ibarra A, Vaitla P. 2022. Histology, Nephron. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK554411/>
- Maezawa, Y., Takemoto, M., Yokote, K. 2015. Cell biology of diabetic nephropathy: Roles of endothelial cells, tubulointerstitial cells and podocytes. *J Diabetes Investig.* 6(1): 3-15.
- Mafuyai, C.E., Luka, C.D., Jiyil, M.K., Okon. 2020. Antidiabetic Activity of *Physalis angulata* in Streptozotocin Induced Diabetic Wistar Albino Rats. *JABB.* 23(11): 33-43.
- Mahalakshami, A., Nidavani, R. 2014. *Physalis angulata* L.: An ethanoparmacological review. *Indo Am J Pharm Res.* 4(3):1479-1486.
- Marieb, E.N., Hoehn, K. 2015. Human anatomy & physiology. Edisi kesepuluh. Pearson Education, Inc. Boston.
- Mejía, K., Rengifo, E. 2000. Plantas medicinales de uso popular en la Amazonía peruana. 2^a ed. Instituto de Investigaciones de la Amazonía Peruana, Iquitos, Perú.
- Meng, X. M., Tang, P. M. K., Li, J., Lan, H. Y. 2015. TGF- β /Smad signaling in renal fibrosis. *Front Physiol.* 6: 1-8.
- Miranda-Díaz, A.G., Pazarín-Villaseñor, L., Yanowsky-Escatell, F.G., Andrade-Sierra, J. 2016. Oxidative Stress in Diabetic Nephropathy with Early Chronic Kidney Disease. *J Diabetes Res.* 2016: 1-7.
- Misawa, E., Tanaka, M., Nomaguchi, K., Yamada, M., Toida, T., Takase, M., et al. 2008. Administration of fitosterols isolated from *Aloe vera* gel reduce visceral fat mass and improve hyperglycemia in Zucker diabetic fatty (ZDF) rats. *Obes Res Clin Pract.* 2(4): 239-245.
- Miyazawa, K., Miyazono, K. 2017. Regulation of TGF- β Family Signaling by Inhibitory Smads. *Cold Spring Harb Perspect Biol.* 9(3): 1-25.
- Menon, M.C., Chuang, P.Y., He, C.J. 2012. The glomerular filtration barrier: components and crosstalk. *Int J Nephrol.* 2012: 1-9.
- Menzel, S., Moeller, M.J. 2011. Role of the podocyte in proteinuria. *Pediatr Nephrol.* 26: 1775–1780.
- Mescher, A. L. 2012. Histologi Dasar Junqueira edisi 12. Penerbit Buku Kedokteran EGC. Jakarta.



- Modur, V., Zimmerman, G.A., Prescott, S.M., McIntyre, T.M. 1996. Endothelial cell inflammatory responses to tumor necrosis factor alpha. Ceramide-dependent and -independent mitogen-activated protein kinase cascades. *J Biol Chem.* 271(22): 13094-13102.
- Mohammad, H.M.F., Galal Gouda, S., Eladl, M.A., Elkazaz, A.Y., Elbayoumi, K.S., Farag, N.E., *et al.* 2023. Metformin suppresses LRG1 and TGF β 1/ALK1-induced angiogenesis and protects against ultrastructural changes in rat diabetic nephropathy. *Biomed Pharmacother.* 158: 1-16.
- Mundel, P., Shankland, S.J. 2002. Podocyte biology and response to injury. *J Am Soc Nephrol.* 13(12): 3005–3015.
- Mundel, P., Reiser, J. 2010. Proteinuria: an enzymatic disease of the podocyte? *Kidney Int.* 77: 571–580.
- Nakagawa, H., Sasahara, M., Haneda, M., Koya, D., Hazama, F., Kikkawa, R. 2000. Immunohistochemical characterization of glomerular PDGF B-chain and PDGF beta-receptor expression in diabetic rats. *Diabetes Res Clin Pract.* 48(2): 87-98.
- Nakai, K., Umehara, M., Minamida, A., Yamauchi-Sawada, H., Sunahara, Y., Matoba, Y., *et al.* 2023. Streptozotocin induces renal proximal tubular injury through p53 signaling activation. *Sci Rep.* 13(1): 1-14.
- Nangaku, M. 2004. Mechanisms of tubulointerstitial injury in the kidney: final common pathways to end-stage renal failure. *Intern Med.* 43: 9–17.
- Natarajan, R., Amarender, R.M. 2003. HETEs/EETs in renal glomerular and epithelial cell function. *Curr Opin Pharmacol.* 3:198 –203.
- Nassar, M. K., Khedr, D., Abu-Elfadl, H. G., Abdulgalil, E. A., Abdalbary, M., Moustafa, F. E.-H., *et al.* 2021. Diffusion tensor imaging in early prediction of renal fibrosis in patients with renal disease: functional and histopathological correlations. *Int J Clin Pract.* 75:e13918.
- Navarro-Gonzalez, J.F., Mora-Fernández, C. 2006. The role of TNF- α in diabetic nephropathy: Pathogenic and therapeutic implications. *Cytokine Growth Factor Rev.* 17(6): 441-450.
- Navarro-Gonzalez, J.F., Mora-Fernandez, C. 2008. The role of inflammatory cytokines in diabetic nephropathy. *J Am Soc Nephrol.* 19: 433–442.
- Nguyen, T., Nioi, P., Pickett, C.B. 2009. The Nrf2-antioxidant response element signaling pathway and its activation by oxidative stress. *J Biol Chem.* 284: 13291–13295.



- Niranjan, T., Bielesz, B., Gruenwald, A., Ponda, M.P., Kopp, J.B., Thomas, D.B., *et al.* 2008. The Notch pathway in podocytes plays a role in the development of glomerular disease. *Nat Med.* 14(3):290-298.
- Ni, W.J., Tang, .LQ., Wei, W. 2015. Research progress in signalling pathway in diabetic nephropathy. *Diabetes Metab Res Rev.* 31(3):221-233.
- Nikolaidou, B., Gkaliagkousi, E., Anyfanti, P., Gavriilaki, E., Lazaridis, A., Triantafyllou, A., *et al.* 2020. The impact of hyperglycemia on urinary albumin excretion in recent onset diabetes mellitus type II. *BMC Nephrol.* 21(1): 1-6.
- Noh, H., King, G.L. 2007. The role of protein kinase C activation in diabetic nephropathy. *Kidney Int Suppl.* 106:S49-53.
- Noshahr, Z.S., Salmani, H., Khajavi Rad, A., Sahebkar, A. 2020. Animal Models of Diabetes-Associated Renal Injury. *J Diabetes Res.* 2020: 1-16.
- Novitasari, A., Rohmawaty, E., Rosdianto, A.M. 2024. *Physalis angulata* Linn. as a medicinal plant (Review). *Biomed Rep.* 20(3): 1-16.
- Ogobuiro, I., Tuma, F. 2022. Physiology, Renal. Treasure Island (FL): StatPearls Publishing.
- Ouyang, C., Nie, L., Gu, M., Wu, A., Han, X., Wang, X., *et al.* 2014. Transforming growth factor (TGF)- β -activated kinase 1 (TAK1) activation requires phosphorylation of serine 412 by protein kinase A catalytic subunit α (PKAC α) and X-linked protein kinase (PRKX). *J Biol Chem.* 289(35): 24226-24237.
- Palicz, A., Foubert, T.R., Jesaitis, A.J., Marodi, L., McPhail, L.C. 2001. Phosphatidic acid and diacylglycerol directly activate NADPH oxidase by interacting with enzyme components. *J Biol Chem.* 276(5): 3090-3097.
- Pan, Y., Zhang, X., Wang, Y., Cai, L., Ren, L., Tang, L., *et al.* 2013. Targeting JNK by a new curcumin analog to inhibit NF- κ B-mediated expression of NF- κ B and Diabetic Complications adhesion molecules attenuates renal macrophage infiltration and injury in diabetic mice. *PLOS ONE.* 8(11): 1-10.
- Pavenstädt, H., Kriz, W., Kretzler, M. 2003. Cell biology of the glomerular podocyte. *Physiol Rev.* 83(1): 253–307.
- Peinado, H., Olmeda, D., Cano, A. 2007. Snail, Zeb and bHLH factors in tumour progression: an alliance against the epithelial phenotype? *Nat Rev Cancer.* 7: 415-428.



Pillai, J.R., Wali, A. F., Menezes, G. A., Rehman, M. U., Wani, T. A., Arafah, A., *et al.* 2022. Chemical Composition Analysis, Cytotoxic, Antimicrobial and Antioxidant Activities of Physalis angulata L.: A Comparative Study of Leaves and Fruit. *Molecules*. 27(5): 1-20.

Prasad, M., Jayaraman, S., Eladl, M.A., El-Sherbiny, M., Abdelrahman, M.A.E., Veeraraghavan, V.P., *et al.* 2022. A Comprehensive Review on Therapeutic Perspectives of Phytosterols in Insulin Resistance: A Mechanistic Approach. *Molecules*. 27(5): 1-17.

Price S.A., Wilson L.M., 2003, Patofisiologi Konsep Klinik Proses-proses Penyakit, Ed ke-6, volume 2. EGC Penerbit Buku Kedokteran, Jakarta.

Pollak, M.R., Quaggin, S.E., Hoenig, M.P., Dworkin, L.D. 2014. The glomerulus: the sphere of influence. *Clin J Am Soc Nephrol*. 9(8): 1461-1469.

Polzer, K., Soleiman, A., Baum, W., Axmann, R., Distler, J., Redlich, K., *et al.* 2008. Selective p38MAPK isoform expression and activation in antineutrophil cytoplasmatic antibody-associated crescentic glomerulonephritis: role of p38MAPKalpha. *Ann Rheum Dis*. 67(5): 602-608.

Pourghasem, M., Shafi, H., Babazadeh, Z. 2015. Histological changes of kidney in diabetic nephropathy. *Caspian J Intern Med Summer*. 6(3): 120-127.

Prodjosuadjadi, W. 2006. Incidence, prevalence, treatment and cost of end-stage renal disease in Indonesia. *Ethn Dis*. 16(2): 14-16.

Quaggin, S.E., Kapus, A. 2011. Scar wars: mapping the fate of epithelial-mesenchymal-myofibroblast transition. *Kidney Int*. 80: 41-50.

Racusen, L.C., Solez, K., Colvin, R. B., Bonsib, S. M., Castro, M. C., Cavallo, T., *et al.* 1999. The Banff 97 working classification of renal allograft pathology. *Kidney Int*. 55(2): 713–723.

Radisky, D. C., Kenny, P. A., Bissell, M.J. 2007. Fibrosis and cancer: do myofibroblasts come also from epithelial cells via EMT? *J Cell Biochem*. 101: 830-839.

Rafika, M., Sulistyowati, Y., Setiyobroto, I. 2022. Pengaruh pemberian ekstrak ciplukan (Physalis Angulata L.) terhadap profil lipid tikus jantan galur sprague dawley diberi suntikan streptozotocin dan lipopolisaccaride. *Jurnal Ilmiah Respati*. 13(1): 1-7.

Rajendiran, D., Packirisamy, S., Gunasekaran, K. 2018. A Review on Role of Antioxidants in Diabetes. *Asian J Pharm Clin Res*. 11(2): 48-53.



Raju, P., Mamidala, E. 2015. Anti diabetic activity of compound isolated from *Physalis angulata* fruit extracts in alloxan induced diabetic rats. *Am J Sci Res.* 1(1): 40-43.

Ramachandran, V., Saravanan, R. 2013. Asiatic acid prevents lipid peroxidation and improves antioxidant status in rats with streptozotocin-induced diabetes. *J Funct Foods.* 5(3): 1077–1087.

Ramasamy, R., Vannucci, S.J., Yan, S.S.D., Herold, K., Yan, S.F., Schmidt, A.M., 2005. Advanced glycation end products and RAGE: a common thread in aging, diabetes, neurodegeneration, and inflammation. *Glycobiology.* 15(7): 16R–28R.

Rangan, G.K., Wang, Y., Tay, Y-C., Harris, D.C.H. 2005. Differential effects of albumin on cytokine gene expression in proximal tubular epithelial cells. *Nephrol Dial Transplant.* 20: 1013–1014.

Rayanagoudar, G., Hashi, A.A., Zamora, J., Khan, K.S., Hitman, G.A., Thangaratinam, S. 2016. Quantification of the type 2 diabetes risk in women with gestational diabetes: a systematic review and meta-analysis of 95,750 women. *Diabetologia.* 59(7):1403-1411.

Rayner, H., Thomas, M., Milford, D. 2020. Understanding kidney diseases (2nd ed.). Springer.

Reiser, J., Altintas, M.M. 2016. Podocytes. 5(114): 1-19.

Reiser, J., Kriz, W., Kretzler, M., Mundel, P. 2000. The glomerular slit diaphragm is a modified adherens junction. *J Am Soc Nephrol.* 11(1):1-8.

Reiser, J., Altintas, M.M., Ulgen, K.O., Palmer-Toy, D.E., Shih, V.E., Kompala, D.S. 2008. Emerging Roles for Metabolic Engineering - Understanding Primitive and Complex Metabolic Models and Their Relevance to Healthy and Diseased Kidney Podocytes. *Cur Chem Biol.* 2: 68-82.

Riad, A., Unger, D., Du, J., Westermann, D., Mohr, Z., Sobirey, M., et al. Chronic inhibition of p38MAPK improves cardiac and endothelial function in experimental diabetes mellitus. *Eur J Pharmacol.* 554(1):40-45.

Roosita, K., Kusharto, C., Sekiyama, M., Fachrurozi, Y., Ohtsuka, R. 2008. Medicinal plants used by the villagers of a Sundanese community in West Java, Indonesia. *J Ethnopharmacol.* 115: 72-81.

Rohmawaty, E., Rosdianto, A.M., Usman, H.A., Saragih, W.A.M., Zuhrotun, A., Hendriani, R., et al. 2021. Antifibrotic effect of the ethyl acetate fraction of ciplukan (*Physalis angulata* Linn.) in rat liver fibrosis induced by CCI4 . *J Appl Pharm Sci.*11: 175-182.



Romi, M.M., Arfian, N., Tranggono, U., Setyaningsih, W.A.W., Sari, D.C.R. 2017. Uric acid *causes* kidney injury through inducing fibroblast expansion, Endothelin-1 expression, and inflammation. *BMC Nephrol.* 18(1):326.

Ruiz, L., Ruiz, L., Maco, M., Cobos, M., Gutiérrez-Choquevilca, A., Roumy, V. 2011. Plants used by native Amazonian groups from the Nanay River (Perú) for the treatment of malaria. *J Ethnopharmacol.* 133: 917 - 921.

Russo, L.M., Sandoval, R.M., McKee, M., Osicka, T.M., Collins, A.B., Brown, D., *et al.* 2007. The *normal* kidney filters nephrotic levels of albumin retrieved by proximal tubule cells: retrieval is disrupted in nephrotic states. *Kidney Int.* 71(6): 504-513.

Russo, L.M., Sandoval, R.M., Campos, S.B., Molitoris, B.A., Comper, W.D., Brown D. 2009. Impaired tubular uptake explains albuminuria in early diabetic nephropathy. *J Am Soc Nephrol.* 20(3): 489-494.

Sanai, T., Sobka, T., Johnson, T., el-Essawy, M., Muchaneta-Kubara, E.C., Ben Gharbia, O., *et al.* 2000. Expression of cytoskeletal proteins during the course of experimental diabetic nephropathy. *Diabetologia.* 43(1): 91-100.

Sakai, N., Wada, T., Furuichi, K., Iwata, Y., Yoshimoto, K., Kitagawa, K., *et al.* 2005. Involvement of extracellular signal-regulated kinase and p38 in human diabetic nephropathy. *Am J Kidney Dis.* 45: 54-65.

Sairam, M.R., Wang, M., Danilovich, N., Javeshghani, D., Maysinger, D. 2006. Early obesity and age-related mimicry of metabolic syndrome in female mice with sex hormonal imbalances. *Obesity (Silver Spring).* 14: 1142-1154.

Safitri, U.H., Nawangsih, E.F., Noviyanti, N.D., Nur'aini, F., Apiani, D., Haniastuti., T. 2016. Studi in vitro ekstrak etanolik *P. angulata* (*Physalis angulata*) dalam meningkatkan apoptosis sel kanker lidah. *Maj Ked Gi Ind.* 2(3): 109-115.

Salehi, B., Quispe, C., Sharifi-Rad, J., Cruz-Martins, N., Nigam, M., Mishra, A.P., *et al.* 2021. Phytosterols: From Preclinical Evidence to Potential Clinical Applications. *Front Pharmacol.* 11: 1-18.

Sanajou, D., Ghorbani Haghjo, A., Argani, H., and Aslani, S. 2018. Age-Rage axis blockade in diabetic nephropathy: Current status and future directions. *Eur J Pharmacol.* 833, 158–164.

Satchell, S.C., Tooke, J.E. 2008. What is the mechanism of microalbuminuria in diabetes: a role for the glomerular endothelium? *Diabetologia.* 51(5): 714-725.



- Sari, D.C.R., Budiharjo, S., Afifah, H., Jasmin, D., Kokasih, O., Putri, T.G., *et al.* 2021. *Centella asiatica* extract attenuates kidney fibrosis through reducing mesencymal transition and inflammation in ureteral ligation model in mice. *Front Pharmacol.* 12: 1-9.
- Schaffer, S.W., Jong, C.J., Mozaffari, M. 2012. Role of oxidative stress in diabetes-mediated vascular dysfunction: unifying hypothesis of diabetes revisited. *Vascul Pharmacol.* 57(5-6):139-49.
- Schleicher, E.D., Weigert, C. 2000. Role of the hexosamine biosynthetic pathway in diabetic nephropathy. *Kidney Int Suppl.* 77: S13–S18.
- Schiffer, M., Bitzer, M., Roberts, I.S., Kopp, J.B., ten Dijke, P., Mundel, P., *et al.* 2001. Apoptosis in podocytes induced by TGF-beta and Smad7. *J Clin Invest.* 108(6): 807-816.
- Scott, R.P., Quaggin, S.E. 2015. The cell biology of renal filtration. *J Cell Biol.* 209: 199–210.
- Scholz, H., Boivin, F.J., Schmidt-Ott, K.M. Bachmann, S., Eckardt, KU., Scholl, U.I., *et al.* 2021. Kidney physiology and susceptibility to acute kidney injury: implications for renoprotection. *Nat Rev Nephrol.* 17: 335–349.
- Schrijvers, B.F., De Vries, A.S., Flyvbjerg, A. 2004. From hyperglycemia to diabetic kidney disease: the role of metabolic, hemodynamic, intracellular factors and growth factors/cytokines. *Endocr Rev.* 25(6):971-1010.
- Sediarno, S., Sunaryo, H., Amalia, N. 2011. Efek antidiabetes dan identifikasi senyawa dominan fraksi kloroform herba ciplukan (*Physalis angulata L.*). *Majalah Ilmu Kefarmasian.* 8(1): 1-13.
- Setyaningsih, WAW., Arfian, N., Fitriawan, AS., Yuniartha, R., Sari, DCR. 2021. Ethanolic Extract of *Centella asiatica* Treatment in the Early Stage of Hyperglycemia Condition Inhibits Glomerular Injury and Vascular Remodeling in Diabetic Rat Model. *Evid Based Complement Alternat Med.* 2021: 1-11.
- Sharma, R., Sharma, M., Vamos, S., Savin, V. J., Wiegmann, T. B. 2001. Both subtype 1 and 2 receptors of angiotensin II participate in regulation of intracellular calcium in glomerular epithelial cells. *J Lab Clin Med.* 138: 40–49.
- Sharma, N., Bano, A., Dhaliwal, H.S., Sharma, V. 2015. A pharmacological comprehensive review on ‘Rassbhary’ *Physalis angulata L.* *Int J Pharm Pharm Sci.* 7(8): 30-34.
- Sherwood, L.Z. 2014. Fisiologi Manusia dari Sel ke Sistem. Edisi 8. EGC. Jakarta 595-677.



Sheng, L., Zhuang, S. 2020. New Insights Into the Role and Mechanism of Partial Epithelial-Mesenchymal Transition in Kidney Fibrosis. *Front Physiol.* 11: 1-11.

Simons, M., Schwarz, K., Kriz, W., Miettinen, A., Reiser, J., Mundel, P., et al. 2001. Involvement of lipid rafts in nephrin phosphorylation and organization of the glomerular slit diaphragm. *Am J Pathol.* 159(3):1069-77.

Spurney, R.F., Coffman, T.M. 2008. Stressed-out podocytes in diabetes? *J Am Soc Nephrol.* 19: 2035–2037.

Sunaryo, H., Kusmardi, Trianingsih, W. 2012. Uji aktivitas antidiabetes senyawa aktif dari fraksi kloroform herba ciplukan (*Physalis angulata L.*) terhadap penurunan kadar glukosa darah dan perbaikan sel lagerhans pankreas pada mencit yang diinduksi aloksan. *Farmasains.* 1(5): 1-6.

Suneja, M. 2021. Diabetic Nephropathy and Diabetic Kidney Disease. *Int J Diabetes Mellit.* 11(5): 359-377.

Suryavanshi, S.V., Kulkarni, Y.A. 2017. NF-κβ: A Potential Target in the Management of Vascular Complications of 592 Diabetes. *Front Pharmacol.* 8: 1-12.

Sun, S.C. 2017. The non-canonical NF-kappaB pathway in immunity and inflammation. *Nat Rev Immunol.* 17: 545-558.

Song, J., Kost, C.K.Jr., Martin, D.S. 2006. Androgens potentiate renal vascular responses to angiotensin II via amplification of the Rho kinase signaling pathway. *Cardiovasc Res.* 72: 456-463.

Staruschenko, A., Spires, D., Palygin, O. 2019. Role of TRPC6 in Progression of Diabetic Kidney Disease. *Curr Hypertens Rep.* 21(7): 1-19.

Sun, Y.B.Y., Qu,X., Caruana, G., Li, J. 2016. The origin of renal Fibroblasts/Myofibroblasts and the signals that trigger fibrosis. *Differentiation.* 92(3):102-107.

Susztak, K., Raff, A.C., Schiffer, M., Böttiger, E.P. 2006. Glucose-induced reactive oxygen species cause apoptosis of podocytes and podocyte depletion at the onset of diabetic nephropathy. *Diabetes.* 55(1):225-233.

Suhardjono, A. 2008. The development of a continuous ambulatory peritoneal dialysis program in Indonesia. *Perit Dial Int.* 28(3):S59–S62.

Sutariya, B., Jhonsa, D., Saraf, M.N. 2016. TGF-β: the connecting link between nephropathy and fibrosis. *Immunopharmacol Immunotoxicol.* 38: 39-49.



- Sun, Y., Jin, D., Zhang, Z., Zhang, Y., Zhang, Y., Kang, X., et al. 2023. Effects of antioxidants on diabetic kidney diseases: mechanistic interpretations and clinical assessment. *Chin Med.* 18(1): 1-21.
- Sweetwyne, M.T., Gruenwald, A., Niranjan, T., Nishinakamura R, Strobl, L.J., Susztak, K. 2015. Notch1 and Notch2 in podocytes play differential roles during diabetic nephropathy development. *Diabetes*. 64(12): 4099–4111.
- Szkudelski, T. 2001. The mechanism of alloxan and streptozotocin action in B cells of the rat pancreas. *Physiol Res.* 50(6): 537-546.
- Tang, W.W., Ulich, T.R., Lacey, D.L., Hill, D.C., Qi, M., Kaufman, S.A., et al. 1996. Platelet-derived growth factor-BB induces renal tubulointerstitial myofibroblast formation and tubulointerstitial fibrosis. *Am J Pathol.* 148(4):1169-1180.
- Tan, A.L., Forbes, J.M., Cooper, M.E. 2007. AGE, RAGE, and ROS in diabetic nephropathy. *Semin Nephrol.* 27(2):130-43.
- Tang, S., Leung, J.C., Abe, K., Chan, K.W., Chan, L.Y., Chan, T.M., et al. 2003. Albumin stimulates interleukin-8 expression in proximal tubular epithelial cells in vitro and in vivo. *J Clin Invest.* 111: 515–527.
- Tanner, G.A. 2013. Kidney Function. In: Medical Physiology: principles for clinical medicine. Roades, R., Bell., D. Wolter Kluwer Health,Lippincott Williams&Wilkins. Philadelpia.
- Thiery, J. P., Acloque, H., Huang, R. Y., and Nieto, M. A. 2009. Epithelialmesenchymal transitions in development and disease. *Cell.* 139: 871-890.
- Thiery, J.P., Sleeman, J.P. 2006. Complex networks orchestrate epithelial-mesenchymal transitions. *Nat Rev Mol Cell Biol.* 7(2):131-142.
- Thomas, M.C., Brownlee, M., Susztak, K., Sharma, K., Jandeleit-Dahm, K.A., Zoungas, S., et al. 2015. Diabetic kidney disease. *Nat Rev Dis Primers.* 1(15018): 1-46.
- Thomas, M.C., Brownlee, M., Susztak, K., Sharma, K., Jandeleit-Dahm, K.A., Zoungas, S., et al. 2015. Diabetic kidney disease. *Nat Rev Dis Primers.* 1: 1-20.
- Tjajaindra, A., Sari, A.K., Simamora, A., Timotius, K.H. 2021. The stem infusate and ethanol extract of *Physalis angulata*. *Mol Cell Biomed Sci.* 5(3): 115-120.



- Troncone, E., Marafini, I., Stolfi, C., Monteleone, G. 2018. Transforming Growth Factor- β 1/Smad7 in Intestinal Immunity, Inflammation, and Cancer. *Front Immunol.* 9: 1-9.
- Tryggvason, K., Wartiovaara, J. 2001. Molecular basis of glomerular permselectivity. *Curr Opin Nephrol Hypertens.* 10: 543-549.
- Tuleta, I., Frangogiannis, N.G. 2021. Diabetic fibrosis. *Biochim Biophys Acta Mol Basis Dis.* 1867(4): 1-49.
- Tryggvason, K., Wartiovaara, J. 2005. How does the kidney filter plasma? *Physiology (Bethesda)*. 20(2): 96–101.
- Tryggvason, K., Pikkarainen, T., Patrakka, J. 2006. Nck links nephrin to actin in kidney podocytes. *Cell.* 125(2): 221–224.
- Toyoda, M., Najafian, B., Kim, Y., Caramori, M.L., Mauer, M. 2007. Podocyte detachment and reduced glomerular capillary endothelial fenestration in human type 1 diabetic nephropathy. *Diabetes.* 56(8): 2155-2160.
- Tonneijck, L., Muskiet, M.H.A., Smits, M.M., van Bommel, E.J., Heerspink, H. J.L., van Raalte, D.H., et al. 2017. Glomerular Hyperfiltration in Diabetes: Mechanisms, Clinical Significance, and Treatment. *JASN.* 28(4): 1023-1039.
- Tuttle, KR., Bakris, GL., Bilous, RW., Chiang, JL., De Boer, IH., Goldstein-Fuchs, J., et al. 2014. Diabetic kidney disease: a report from an ADA Consensus Conference. *Diabetes Care.* 37: 2864-2683.
- Uehara, G., Suzuki, D., Toyoda, M., Umezono, T., Sakai, H. 2004. Glomerular expression of platelet-derived growth factor (PDGF)-A,-B chain and PDGF receptor- α , β in human diabetic nephropathy. *Clin Exp Nephrol.* 8(1): 36-42.
- Verma, R., Kovari, I., Soofi, A., Nihalani, D., Patrie, K., Holzman, L.B. 2006. Nephrin ectodomain engagement results in Src kinase activation, nephrin phosphorylation, Nck recruitment, and actin polymerization. *J Clin Invest.* 116(5): 1346–1359.
- Vestra, D.M., Masiero, A., Roiter, A.M., Saller, A., Crepaldi, G., Fioretto, P. 2003. Is podocyte injury relevant in diabetic nephropathy? Studies in patients with type 2 diabetes. *Diabetes.* 52(4): 1031-5.
- Vivancos, M., Moreno, J.J. 2005. β -Sitosterol modulates antioxidant enzyme response in RAW 264.7 macrophages. *Free Radic Biol Med.* 39: 91–97.



- Vogelmann, S.U., Nelson, W.J., Myers, B.D., Lemley, K.V. 2003. Urinary excretion of viable podocytes in health and renal disease. *Am J Physiol Renal Physiol.* 285(1): F40-48.
- Wahyuningsih, M.S.H., Satya, K.S., Regita, A.P., Nugrahaningsih D.AA., Yuniyanti, A.P. 2023. Bioassay Guided Fractionation of Ciplukan (*Physalis angulata L*) monitored by Glucose Consumption Assay and Thin Layer Chromatography on Myoblast Cell. *Trad Med J.* 28(1); 22-30.
- Wan, L., Bagshaw, S. M., Langenberg, C., Saotome, T., May, C., Bellomo, R. 2008. Pathophysiology of septic acute kidney injury: what do we really know?. *Crit Care Med.* 36(Suppl 4): S198–S203.
- Wang, D., Dai, C., Li, Y., Liu, Y. 2011. Canonical Wnt/β-Catenin Signaling Mediates Transforming Growth Factor-B1-Driven Podocyte Injury and Proteinuria. *Kidney Int.* 80,: 1159–1169.
- Wang, H., Zhang, R., Wu, X., Chen, Y., Ji, W., Wang, J., et al. 2022. The Wnt Signaling Pathway in Diabetic Nephropathy. *Front Cell Dev Biol.* 9: 1-11.
- Wang, L., Wang, H.L., Liu, T.T., Lan, H.Y. 2021. TGF-Beta as a Master Regulator of Diabetic Nephropathy. *Int J Mol Sci.* 22(15): 1-18.
- Wang, Z., Liu, J., Sun, W. 2013. Effects of asiaticoside on levels of podocyte cytoskeletal proteins and renal slit diaphragm proteins in adriamycin-induced rat nephropathy. *Life Sci.* 93(8): 352-358.
- Ward, M.G., Li, G., Barbosa-Lorenzi, V.C., Hao, M. 2017. Stigmasterol prevents glucolipotoxicity induced defects in glucose-stimulated insulin secretion. *Sci Rep.* 7: 1-13.
- Wang, Q.Y., Guan, Q.H., Chen, F.Q. 2009. The changes of platelet-derived growth factor-BB (PDGF-BB) in T2DM and its clinical significance for early diagnosis of diabetic nephropathy. *Diabetes Res Clin Pract.* 85(2): 166-170.
- Wang, Z., Divanyan, A., Jourd'heuil, F.L., Goldman, R.D., Ridge, K.M., Jourd'heuil, D., et al. 2018. Vimentin expression is required for the development of EMT-related renal fibrosis following unilateral ureteral obstruction in mice. *Am J Physiol Renal Physiol.* 315(4): F769-780.
- Wang, F.R., Peng, M.L., Zhu, Q.F., Yu, L.L., Zhang, L.J., Xu, S.Y., et al. Withanolides from the active extract of *Physalis angulata* and their anti-hepatitis effects. *J Ethnopharmacol.* 325: 1-14.
- Ward, M.G., Li, G., Barbosa-Lorenzi, V.C., Hao, M. 2017. Stigmasterol prevents glucolipotoxicity induced defects in glucose-stimulated insulin secretion. *Sci Rep.* 7: 1-13.



Watanabe, K., Sato, E., Mishima, E., Miyazaki, M., Tanaka, T. 2023. What's New in the Molecular Mechanisms of Diabetic Kidney Disease: Recent Advances. *Int J Mol Sci.* 24: 1-18.

Weil, E.J., Lemley, K.V., Mason, C.C., Yee, B., Jones, L.I., Blouch, K., et al. 2012. Podocyte detachment and reduced glomerular capillary endothelial fenestration promote kidney disease in type 2 diabetic nephropathy. *Kidney Int.* 82(9): 1010-1017.

Wei-Jian, N., Li-Qin, T., Wei. W. 2015. Research progress in signalling pathway in diabetic nephropathy. *Diabetes Metab Res Rev.* 31: 221-233.

Wiggins, J.E., Goyal, M., Sanden, S.K., Wharram, B.L., Shedd, K.A., Misek, D.E., et al. 2005. Podocyte hypertrophy, "adaptation," and "decompensation" associated with glomerular enlargement and glomerulosclerosis in the aging rat: prevention by calorie restriction. *J Am Soc Nephrol.* 16(10): 2953-2966.

Wilson, G.L., Leiter, E.H. 1990. Streptozotocin interactions with pancreatic beta cells and the induction of insulin-dependent diabetes. *Curr Top Microbiol Immunol.* 56:27–54.

Wolf, G., Chen, S., Ziyadeh, F.N. 2005. From the periphery of the glomerular capillary wall toward the center of disease: Podocyte injury comes of age in diabetic nephropathy. *Diabetes.* 54:1626–1634.

World Health Organization. 1999. Definition, Diagnosis and Classification of Diabetes Mellitus and its Complications. Report of a WHO Consultation.

Wu, Q., Li, W., Zhao, J., Sun, W., Yang, Q., Chen, C., et al. 2021. Apigenin Ameliorates Doxorubicin-Induced Renal Injury via Inhibition of Oxidative Stress and Inflammation. *Biomed Pharm.* 137(2021): 1-14.

Wynn, T. A. 2008. Cellular and molecular mechanisms of fibrosis. *J Pathol.* 214(2): 199-210.

Xiao, G., Fong, A., Sun, S.C. 2004. Induction of p100 processing by NF-kappaB-inducing kinase involves docking IkappaB kinase alpha (IKKalpha) to p100 and IKKalpha-mediated phosphorylation. *J Biol Chem.* 279(29): 30099-30105.

Xu, Q., Wells, C.C., Garman, J.H., Asico, L., Escano, C.S., Maric C. 2008. Imbalance in sex hormone levels exacerbates diabetic renal disease. *Hypertension.* 51: 1218-1224.

Xu, J., Lamouille, S., Derynck, R. 2009. TGF-beta-induced epithelial to mesenchymal transition. *Cell Res.* 19: 156-172.



- Yang, J. W., Liu, Y. H. 2001. Dissection of key events in tubular epithelial to myofibroblast transition and its implications in renal interstitial fibrosis. *Am J Pathol.* 159(4): 1465–1475.
- Yu, D., Petermann, A., Kunter, U., Rong, S., Shankland, S., Floege, J. 2005. Urinary podocyte loss is a more specific marker of ongoing glomerular damage than proteinuria. *J Am Soc Nephrol.* 16: 1733–1741.
- Yuan, Y., Sun, H., Sun, Z. 2017. Advanced glycation end products (AGEs) increase renal lipid accumulation: a pathogenic factor of diabetic nephropathy (DN). *Lipids Health Dis.* 16(126): 1-9.
- Yuan, Q., Ren, Q., Li, L., Tan, H., Lu, M., Tian, Y. 2022. A Klotho-derived peptide protects against kidney fibrosis by targeting TGF- β signaling. *Nat Commun.* 13: 1-14.
- Zhang, T., Chi, Y., Kang, Y., Lu, H., Niu, H., Liu, W., et al. 2019. Resveratrol Ameliorates Podocyte Damage in Diabetic Mice via SIRT1/PGC-1alpha Mediated Attenuation of Mitochondrial Oxidative Stress. *J Cell Physiol.* 234: 5033–5043.
- Zhang, Q., Liu, F., Qin, L., Liao, Z., Song, J., Liang, H., et al. 2021. Characterization of TGF β -associated molecular features and drug responses in gastrointestinal adenocarcinoma. *BMC Gastroenterol.* 21(1): 1-15.
- Zhang, Y. 2021. MiR-92d-3p suppresses the progression of diabetic nephropathy renal fibrosis by inhibiting the C3/HMGB1/TGF- β 1 pathway. *Biosci Rep.* 41(9): 1-13.
- Zhao, Q., Wan, Y., Wang, C., Wei, Q., Chen, H., Meng, X., et al. 2012. Regulatory mechanism of p38MAPK signaling pathway on renal tissue inflammation in chronic kidney disease and interventional effect of traditional Chinese medicine. *Zhongguo Zhong Yao Za Zhi.* 37(12): 1700-1704.
- Zhao, J.S., Jin, H.X., Gao, J.L., Pu, C., Zhang, P., Huang, J.J., et al. 2018. Serum Extracellular Superoxide Dismutase Is Associated with Diabetic Retinopathy Stage in Chinese Patients with Type 2 Diabetes Mellitus. *Dis Markers.* 2018: 1-8.
- Zhao, M., Wang, L., Wang, M., Zhou, S., Lu, Y., Cui, H., et al. 2022. Targeting fibrosis, mechanisms and clinical trials. *Signal Transduct Target Ther.* 7: 1-21.



UNIVERSITAS
GADJAH MADA

Potensi Fraksi Aktif Ekstrak Herba *Physalis angulata L* terhadap Model Nefropati Diabetes pada

Tikus

: Kajian terhadap Podositopati, Inflamasi, Cedera Tubulus dan Fibrosis

Ika Rahayu, Prof. Dr. Dra. Mae Sri Hartati W., M.Si., Apt; Nur Arfian, Ph.D

Universitas Gadjah Mada, 2024 | Diunduh dari <http://etd.repository.ugm.ac.id/>

- Zheng, S., Carlson, E.C., Yang, L., Kralik, P.M., Huang, Y., Epstein, P.N. 2008. Podocyte-Specific Overexpression of the Antioxidant Metallothionein Reduces Diabetic Nephropathy. *J Am Soc Nephrol.* 19: 2077–2085.
- Zhilong, C., Zheng, F., Ji, M. 2021. Regulatory mechanisms and clinical significance of vimentin in breast cancer. *Biomed Pharmacother.* 133(2021): 1-5.
- Zhou, G., Sun, X., Qin, Q., Lv, J., Cai, Y., Wang, M., et al. 2018. Loss of Smad7 Promotes Inflammation in Rheumatoid Arthritis. *Front Immunol.* 9: 1-13.
- Zhou, L., Liu, Y. 2015. Wnt/β-catenin signalling and podocyte dysfunction in proteinuric kidney disease. *Nat Rev Nephrol.* 11(9): 535–545.
- Zhou, D., Liu, Y. 2016. Understanding the mechanisms of kidney fibrosis. *Nat Rev Nephrol.* 12(2): 68-70.
- Zhu, J., Sun, N., Aoudjit, L., Li, H., Kawachi, H., Lemay, S., Takano, T. 2008. Nephrin mediates actin reorganization via phosphoinositide 3-kinase in podocytes. *Kidney Int.* 73(5): 556-566.
- Zhu, X., Ye, S., Yu, D., Zhang, Y., Li, J., Zhang, M., et al. 2021. Physalin B attenuates liver fibrosis via suppressing LAP2α-HDAC1-mediated deacetylation of the transcription factor GLI1 and hepatic stellate cell activation. *Br J Pharmacol.* 178: 3428-3437.