

## DAFTAR PUSTAKA

- Abidin, S.Z., Liew, W.L., Ismail, S., Chan, K.L., dan Mahmud, R., 2014. Inhibitory Effects Of Active Constituents And Extracts Of *Andrographis Paniculata* On UGT1A1, UGT1A4, And UGT2B7 Enzyme Activities **6**: 9.
- Al-awar, A., Kupai, K., Veszeka, M., Szűcs, G., Attieh, Z., Murlasits, Z., dkk., 2016. Experimental Diabetes Mellitus in Different Animal Models. *Journal of Diabetes Research*, **2016**: .
- Anonim, 2017. *Farmakope Herbal Indonesia*, 2nd ed. Departemen Kesehatan Republik Indonesia.
- Atif, M., Ahmad, M., Qamar-uz-zaman, M., Asif, M., Sulaiman, S., Shafie, A., dkk., 2011. Glipizide Pharmacokinetics in Healthy and Diabetic Volunteers. *Tropical Journal of Pharmaceutical Research*, **10**: .
- Atif, M., Khalid, S.H., Onn Kit, G.L., Sulaiman, S.A.S., Asif, M., dan Chandrasekaran, A., 2013. Development and validation of RP-HPLC-UV method for the determination of Glipizide in human plasma. *Journal of Young Pharmacists : JYP*, **5**: 26–29.
- Babos, M.B., Heinan, M., Redmond, L., Moiz, F., Souza-Peres, J.V., Samuels, V., dkk., 2021. Herb–Drug Interactions: Worlds Intersect with the Patient at the Center. *Medicines*, **8**: 44.
- Bae, J.-W., Kim, N.-T., Choi, C.-I., Kim, M.-J., Jang, C.-G., dan Lee, S.-Y., 2009. HPLC Analysis of Plasma Glipizide and its Application to Pharmacokinetic Study. *Journal of Liquid Chromatography & Related Technologies*, **32**: 1969–1977.
- Bai, B., Zou, R., Chan, H.C.S., Li, H., dan Yuan, S., 2021. MolADI: A Web Server for Automatic Analysis of Protein–Small Molecule Dynamic Interactions. *Molecules*, **26**: 4625.
- Balap, A., Atre, B., Lohidasan, S., Sinnathambi, A., dan Mahadik, K., 2016. Pharmacokinetic and pharmacodynamic herb–drug interaction of *Andrographis paniculata* ( Nees ) extract and andrographolide with

etoricoxib after oral administration in rats. *Journal of Ethnopharmacology*, **183**: 9–17.

Balap, A., Lohidasan, S., Sinnathambi, A., dan Mahadik, K., 2017a. Herb-drug interaction of *Andrographis paniculata* (Nees) extract and andrographolide on pharmacokinetic and pharmacodynamic of naproxen in rats. *Journal of Ethnopharmacology*, **195**: 214–221.

Balap, A., Lohidasan, S., Sinnathambi, A., dan Mahadik, K., 2017b. Pharmacokinetic and Pharmacodynamic Interaction of Andrographolide and Standardized Extract of *Andrographis paniculata* (Nees) with Nabumetone in Wistar Rats. *Phytotherapy research: PTR*, **31**: 75–80.

Baldwin, S.J., Clarke, S.E., dan Chenery, R.J., 1999. Characterization of the cytochrome P450 enzymes involved in the in vitro metabolism of rosiglitazone. *British Journal of Clinical Pharmacology*, **48**: 424–432.

Bao, L., Wang, J., dan Xiao, Y., 2019. Molecular dynamics simulation of the binding process of ligands to the add adenine riboswitch aptamer. *Physical Review E*, **100**: 022412.

Barnes, P.M., Bloom, B., dan Nahin, R.L., 2008. Complementary and Alternative Medicine Use Among Adults and Children: United States, 2007: (623942009-001).

Bell, G.I. dan Polonsky, K.S., 2001. Diabetes mellitus and genetically programmed defects in beta-cell function. *Nature*, **414**: 788–791.

Benet, L.Z., Bowman, C.M., Koleske, M.L., Rinaldi, C.L., dan Sodhi, J.K., 2019. Understanding drug-drug interaction and pharmacogenomic changes in pharmacokinetics for metabolized drugs. *Journal of pharmacokinetics and pharmacodynamics*, **46**: 155–163.

Bibi, Z., 2008. Retracted: Role of cytochrome P450 in drug interactions. *Nutrition & Metabolism*, **5**: 10.

Bo, L., Baosheng, Z., Yang, L., Mingmin, T., Beiran, L., Zhiqiang, L., dkk., 2016. Herb-drug enzyme-mediated interactions and the associated experimental methods: a review. *Journal of Traditional Chinese Medicine*, **36**: 392–408.

- Brantley, S.J., Argikar, A.A., Lin, Y.S., Nagar, S., dan Paine, M.F., 2014. Herb–Drug Interactions: Challenges and Opportunities for Improved Predictions. *Drug Metabolism and Disposition*, **42**: 301–317.
- Bruni, G., Ghione, I., Berbenni, V., Cardini, A., Capsoni, D., Girella, A., dkk., 2021. The Physico-Chemical Properties of Glipizide: New Findings. *Molecules*, **26**: 3142.
- Buchman, C.D., Chai, S.C., dan Chen, T., 2018. A current structural perspective on PXR and CAR in drug metabolism. *Expert Opinion on Drug Metabolism & Toxicology*, **14**: 635–647.
- Bushkofsky, J.R., Maguire, M., Larsen, M.C., Fong, Y.H., dan Jefcoate, C.R., 2016. Cyp1b1 affects external control of mouse hepatocytes, fatty acid homeostasis and signaling involving HNF4 $\alpha$  and PPAR $\alpha$ . *Archives of Biochemistry and Biophysics*, **597**: 30–47.
- Chai, X., Zeng, S., dan Xie, W., 2013. Nuclear receptors PXR and CAR: implications for drug metabolism regulation, pharmacogenomics and beyond. *Expert Opinion on Drug Metabolism & Toxicology*, **9**: 253–266.
- Chang, H., Wallis, M., dan Tiralongo, E., 2007. Use of complementary and alternative medicine among people living with diabetes: literature review. *Journal of Advanced Nursing*, **58**: 307–319.
- Chang, T.K.H., 2009. Activation of Pregnane X Receptor (PXR) and Constitutive Androstane Receptor (CAR) by Herbal Medicines. *The AAPS Journal*, **11**: 590.
- Chaudhari, S., Zambad, S., dan Ali, M., 2019a. Effect of Aqueous Extract of *Azadirachta indica* Leaves on Pharmacokinetics and Pharmacodynamics of Glipizide. *Drug Metabolism Letters*, **13**: 19–24.
- Chaudhari, S., Zambad, S., dan Ali, M., 2019b. Pharmacokinetic and Pharmacodynamics Interaction between *Syzygium cumini* and Glipizide: Role of Cytochrome P450 Enzyme. *Indian Journal of Pharmaceutical Education and Research*, **53**: s273–s279.
- Chen, C.-C., Lii, C.-K., Lo, C.-W., Lin, Y.-H., Yang, Y.-C., Huang, C.-S., dkk., 2021. 14-Deoxy-11,12-Didehydroandrographolide Ameliorates Glucose

Intolerance Enhancing the LKB1/AMPK $\alpha$ /TBC1D1/GLUT4 Signaling Pathway and Inducing GLUT4 Expression in Myotubes and Skeletal Muscle of Obese Mice. *The American Journal of Chinese Medicine*, **49**: 1473–1491.

Chen, H.-W., Huang, C.-S., Liu, P.-F., Li, C.-C., Chen, C.-T., Liu, C.-T., dkk., 2013. *Andrographis paniculata* Extract and Andrographolide Modulate the Hepatic Drug Metabolism System and Plasma Tolbutamide Concentrations in Rats. *Evidence-Based Complementary and Alternative Medicine*, **2013**: 1–11.

Chen, J. dan Raymond, K., 2006. Roles of rifampicin in drug-drug interactions: underlying molecular mechanisms involving the nuclear pregnane X receptor. *Annals of Clinical Microbiology and Antimicrobials*, **5**: 3.

Chien, C.-F., Wu, Y.-T., Lee, W.-C., Lin, L.-C., dan Tsai, T.-H., 2010a. Herb–drug interaction of *Andrographis paniculata* extract and andrographolide on the pharmacokinetics of theophylline in rats. *Chemico-Biological Interactions*, **184**: 458–465.

Chien, C.-F., Wu, Y.-T., Lee, W.-C., Lin, L.-C., dan Tsai, T.-H., 2010b. Herb–drug interaction of *Andrographis paniculata* extract and andrographolide on the pharmacokinetics of theophylline in rats. *Chemico-Biological Interactions*, **184**: 458–465.

Choi, M.-K. dan Song, I.-S., 2021. Pharmacokinetic Drug–Drug Interactions and Herb–Drug Interactions. *Pharmaceutics*, **13**: 610.

Choudhury, H., Pandey, M., Hua, C.K., Mun, C.S., Jing, J.K., Kong, L., dkk., 2017. An update on natural compounds in the remedy of diabetes mellitus: A systematic review. *Journal of Traditional and Complementary Medicine*, **8**: 361–376.

Chrencik, J.E., Orans, J., Moore, L.B., Xue, Y., Peng, L., Collins, J.L., dkk., 2005. Structural Disorder in the Complex of Human Pregnane X Receptor and the Macrolide Antibiotic Rifampicin. *Molecular Endocrinology*, **19**: 1125–1134.

- Correa, R., Rodriguez, B.S.Q., dan Nappe, T.M., 2022. *Glipizide*, StatPearls [Internet]. StatPearls Publishing.
- Corrie, K. dan Hardman, J.G., 2014. Mechanisms of drug interactions: pharmacodynamics and pharmacokinetics. *Anaesthesia & Intensive Care Medicine*, , Physics **15**: 305–308.
- Dai, Y., Chen, S.-R., Chai, L., Zhao, J., Wang, Yitao, dan Wang, Ying, 2019. Overview of pharmacological activities of *Andrographis paniculata* and its major compound andrographolide. *Critical Reviews in Food Science and Nutrition*, **59**: S17–S29.
- Daly, A.K., Rettie, A.E., Fowler, D.M., dan Miners, J.O., 2017. Pharmacogenomics of CYP2C9: Functional and Clinical Considerations†. *Journal of Personalized Medicine*, **8**: .
- Damayanti, S., Martak, N.A.S., Permana, B., Suwandi, A., Hartati, R., dan Wibowo, I., 2020. *In Silico* Study on Interaction and Preliminary Toxicity Prediction of *Eleutherine americana* Components as an Antifungal and Antitoxoplasmosis Candidate. *Indonesian Journal of Chemistry*, **20**: 899.
- Dash, R., Ali, Md.C., Dash, N., Azad, Md.A.K., Hosen, S.M.Z., Hannan, Md.A., dkk., 2019. Structural and Dynamic Characterizations Highlight the Deleterious Role of SULT1A1 R213H Polymorphism in Substrate Binding. *International Journal of Molecular Sciences*, **20**: 6256.
- Daujat-Chavanieu, M. dan Gerbal-Chaloin, S., 2020. Regulation of CAR and PXR Expression in Health and Disease. *Cells*, **9**: 2395.
- Deodhar, M., Al Rihani, S.B., Arwood, M.J., Darakjian, L., Dow, P., Turgeon, J., dkk., 2020. Mechanisms of CYP450 Inhibition: Understanding Drug-Drug Interactions Due to Mechanism-Based Inhibition in Clinical Practice. *Pharmaceutics*, **12**: 846.
- Deshpande, M.M., Kasture, V.S., dan Chavan, M.M. and M.J., 2019. *Bioanalytical Method Development and Validation: A Review*, Recent Advances in Analytical Chemistry. IntechOpen.

- Desta, Z., Zhao, X., Shin, J.-G., dan Flockhart, D.A., 2002. Clinical significance of the cytochrome P450 2C19 genetic polymorphism. *Clinical Pharmacokinetics*, **41**: 913–958.
- Dewi, M.L., Fakih, T.M., dan Sofyan, R.I., 2021. The Discovery of Tyrosinase Enzyme Inhibitors Activity from Polyphenolic Compounds in Red Grape Seeds through In Silico Study. *The Journal of Pure and Applied Chemistry Research*, **10**: 104–112.
- Dhawan, S. dan Singla, A.K., 2003. Performance Liquid Chromatographic Analysis of Glipizide: Application to In Vitro and In Vivo Studies. *Journal of Chromatographic Science*, **41**: 295–300.
- Dhuria, R.S., Singh, G., Kaur, A., Kaur, R., dan Kaur, T., 2015. Current status and patent prospective of animal models in diabetic research. *Advanced Biomedical Research*, **4**: .
- Douros, A., Yin, H., Yu, O.H.Y., Filion, K.B., Azoulay, L., dan Suissa, S., 2017. Pharmacologic Differences of Sulfonylureas and the Risk of Adverse Cardiovascular and Hypoglycemic Events. *Diabetes Care*, **40**: 1506–1513.
- Drug Bank, 2005. 'Glipizide'. URL: <https://www.drugbank.ca/drugs/DB01067> (diakses tanggal 30/1/2020).
- Emilsson, H., 1987. High-performance liquid chromatographic determination of glipizide in human plasma and urine. *Journal of Chromatography B: Biomedical Sciences and Applications*, **421**: 319–326.
- Fasinu, P.S., Bouic, P.J., dan Rosenkranz, B., 2012. An Overview of the Evidence and Mechanisms of Herb–Drug Interactions. *Frontiers in Pharmacology*, **3**: 69.
- Fjær, E.L., Landet, E.R., McNamara, C.L., dan Eikemo, T.A., 2020. The use of complementary and alternative medicine (CAM) in Europe. *BMC Complementary Medicine and Therapies*, **20**: 108.
- Fouquier, J. dan Guedj, M., 2015. Analysis of drug combinations: current methodological landscape. *Pharmacology Research & Perspectives*, **3**: e00149.

- Fu, Z., Gilbert, E.R., dan Liu, D., 2013. Regulation of Insulin Synthesis and Secretion and Pancreatic Beta-Cell Dysfunction in Diabetes. *Current diabetes reviews*, **9**: 25–53.
- Furman, B.L., 2015. Streptozotocin-Induced Diabetic Models in Mice and Rats. *Current Protocols in Pharmacology*, **70**: .
- Gao, J. dan Xie, W., 2012. Targeting xenobiotic receptors PXR and CAR for metabolic diseases. *Trends in pharmacological sciences*, **33**: 552–558.
- Gedawy, A., Al-Salami, H., dan Dass, C.R., 2020. Advanced and multifaceted stability profiling of the first-line antidiabetic drugs metformin, gliclazide and glipizide under various controlled stress conditions. *Saudi Pharmaceutical Journal*, **28**: 362–368.
- Ghasemi, A., Khalifi, S., dan Jedi, S., 2014. Streptozotocin-nicotinamide-induced rat model of type 2 diabetes (review). *Acta Physiologica Hungarica*, **101**: 408–420.
- Gitawati, R., 2008. Interaksi Obat Dan Beberapa Implikasinya. *Media Penelitian dan Pengembangan Kesehatan*, **18**: .
- Gondaliya Vaishali, V.L., Patel, J.H., Varia, R.D., Bhavsar, S.K., Vihol Priti, P.D., Modi Falguni, F.D., dkk., 2017. Effect of Andrographolide Co-Administration on Pharmacokinetics of Meloxicam in Rats. *International Journal of Current Microbiology and Applied Sciences*, **6**: 2147–2153.
- Goodwin, B., Gauthier, K.C., Umetani, M., Watson, M.A., Lochansky, M.I., Collins, J.L., dkk., 2003. Identification of bile acid precursors as endogenous ligands for the nuclear xenobiotic pregnane X receptor. *Proceedings of the National Academy of Sciences of the United States of America*, **100**: 223–228.
- Goon, C.P., Wang, L.Z., Wong, F.C., Thuya, W.L., Ho, P.C.-L., dan Goh, B.C., 2016. UGT1A1 Mediated Drug Interactions and its Clinical Relevance. *Current Drug Metabolism*, **17**: 100–106.
- Graves, J.P., Gruzdev, A., Bradbury, J.A., DeGraff, L.M., Edin, M.L., dan Zeldin, D.C., 2017. Characterization of the Tissue Distribution of the Mouse Cyp2c

Subfamily by Quantitative PCR Analysis. *Drug Metabolism and Disposition*, **45**: 807–816.

Gupta, R.C., Chang, D., Nammi, S., Bensoussan, A., Bilinski, K., dan Roufogalis, B.D., 2017. Interactions between antidiabetic drugs and herbs: an overview of mechanisms of action and clinical implications. *Diabetology & Metabolic Syndrome*, **9**: .

Gupta, S. dan Bansal, G., 2011. Validated Stability-Indicating HPLC-UV Method for Simultaneous Determination of Glipizide and Four Impurities. *Journal of AOAC INTERNATIONAL*, **94**: 523–530.

Hafid, A.F., Rifai, B., Tumewu, L., Widiastuti, E., Primaharinastiti, R., dan Widyawaruyanti, A., 2015. Andrographolide determination of *Andrographis paniculata* extracts, ethyl acetate fractions and tablets by thin layer chromatography 5.

Hernandez, J., Mota, L., dan Baldwin, W., 2009. Activation of CAR and PXR by Dietary, Environmental and Occupational Chemicals Alters Drug Metabolism, Intermediary Metabolism, and Cell Proliferation. *Current Pharmacogenomics and Personalized Medicine*, **7**: 81–105.

Hinder, M., 2011. Pharmacodynamic Drug–Drug Interactions, dalam: Vogel, H.G., Maas, J., Gebauer, A. (Eds.), *Drug Discovery and Evaluation: Methods in Clinical Pharmacology*. Springer, Berlin, Heidelberg, hal. 367–376.

Hollingsworth, S.A. dan Dror, R.O., 2018. Molecular dynamics simulation for all. *Neuron*, **99**: 1129–1143.

Holstein, A. dan Beil, W., 2009a. Oral antidiabetic drug metabolism: pharmacogenomics and drug interactions. *Expert Opin. Drug Metab. Toxicol.*, **17**.

Holstein, A. dan Beil, W., 2009b. Oral antidiabetic drug metabolism: pharmacogenomics and drug interactions. *Expert Opinion on Drug Metabolism & Toxicology*, **5**: 225–241.

Holstein, A., Beil, W., dan Kovacs, P., 2012. CYP2C metabolism of oral antidiabetic drugs--impact on pharmacokinetics, drug interactions and

pharmacogenetic aspects. *Expert Opinion on Drug Metabolism & Toxicology*, **8**: 1549–1563.

Honkakoski, A.P. and P., 2006. 'Ligand Recognition by Drug-Activated Nuclear Receptors PXR and CAR: Structural, Site-Directed Mutagenesis and Molecular Modeling Studies' *Mini-Reviews in Medicinal Chemistry*. URL: <https://www.eurekaselect.com/57513/article> (diakses tanggal 19/10/2020).

Honkakoski, P., Sueyoshi, T., dan Negishi, M., 2003. Drug-activated nuclear receptors CAR and PXR. *Annals of Medicine*, **35**: 172–182.

Hossain, Md.S., Urbi, Z., Sule, A., dan Rahman, K.M.H., 2014. *Andrographis paniculata* (Burm. f.) Wall. ex Nees: A Review of Ethnobotany, Phytochemistry, and Pharmacology. *The Scientific World Journal*, **2014**: .

Imre, S., Tero-Vescan, A., Dogaru, M.T., Kelemen, L., Muntean, D.-L., Curticapean, A., dkk., 2019. With or Without Internal Standard in HPLC Bioanalysis. A Case Study. *Journal of Chromatographic Science*, **57**: 243–248.

Ismail, S., Aziah Hanapi, N., Ab Halim, M.R., Uchaipichat, V., dan Mackenzie, P., 2010. Effects of *Andrographis paniculata* and *Orthosiphon stamineus* Extracts on the Glucuronidation of 4-Methylumbelliferone in Human UGT Isoforms. *Molecules*, **15**: 3578–3592.

ISO, 2009. 'ISO 10993-5:2009' ISO. URL: <https://www.iso.org/standard/36406.html> (diakses tanggal 3/2/2023).

Jarrar, Y.B., Al-Essa, L., Kilani, A., Hasan, M., dan Al-Qerem, W., 2018. Alterations in the gene expression of drug and arachidonic acid-metabolizing Cyp450 in the livers of controlled and uncontrolled insulin-dependent diabetic mice. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, **11**: 483–492.

Jayakumar, T., Hsieh, C.-Y., Lee, J.-J., dan Sheu, J.-R., 2013. Experimental and Clinical Pharmacology of *Andrographis paniculata* and Its Major Bioactive Phytoconstituent Andrographolide. *Evidence-Based Complementary and Alternative Medicine*, **2013**: 1–16.

- Kaku, K., 2010. Pathophysiology of Type 2 Diabetes and Its Treatment Policy. *JMAJ*, **53**: 6.
- Kandanur, S.G.S., Tamang, N., Golakoti, N.R., dan Nanduri, S., 2019. Andrographolide: A natural product template for the generation of structurally and biologically diverse diterpenes. *European Journal of Medicinal Chemistry*, **176**: 513–533.
- Katzung, G., 2015. *Farmakologi Dasar Dan Klinik Edisi 10*. EGC, Jakarta.
- Khanal, S.P., Koirala, R.P., Mishra, E., dan Adhikari, N.P., 2021. Molecular dynamics study of structural properties of  $\gamma$ -aminobutyric acid (GABA). *BIBECHANA*, **18**: 67–74.
- Komalasari, T. dan Harimurti, S., 2015. A Review on the Anti-diabetic Activity of *Andrographis paniculata* (Burm. f.) Nees based In-vivo Study **4**: 8.
- Lahoti, S.R., Puranik, P.K., Heda, A.A., dan Navale, R.B., 2010. Development and Validation of RP-HPLC Method for Analysis of Glipizide in Guinea Pig Plasma and its Application to Pharmacokinetic Study **2**: 1649–1654.
- Lee, J.H., Yang, S.H., Oh, J.M., dan Lee, M.G., 2010. Pharmacokinetics of drugs in rats with diabetes mellitus induced by alloxan or streptozocin: comparison with those in patients with type I diabetes mellitus. *Journal of Pharmacy and Pharmacology*, **62**: 1–23.
- Levine, B.G., Stone, J.E., dan Kohlmeyer, A., 2011. Fast Analysis of Molecular Dynamics Trajectories with Graphics Processing Units—Radial Distribution Function Histogramming. *Journal of computational physics*, **230**: 3556–3569.
- Li, X., Wang, Z., dan Klaunig, J.E., 2018. Modulation of xenobiotic nuclear receptors in high-fat diet induced non-alcoholic fatty liver disease. *Toxicology*, **410**: 199–213.
- Li, X.P., Zhang, C.L., Gao, P., Gao, J., dan Liu, D., 2013. Effects of andrographolide on the pharmacokinetics of aminophylline and doxofylline in rats. *Drug Research*, **63**: 258–262.

- Li, Y., Wei, Y., Zhang, F., Wang, D., dan Wu, X., 2012. Changes in the pharmacokinetics of glibenclamide in rats with streptozotocin-induced diabetes mellitus. *Acta Pharmaceutica Sinica B*, **2**: 198–204.
- Li, Y., Yan, H., Zhang, Z., Zhang, G., Sun, Y., Yu, P., dkk., 2015. Andrographolide derivative AL-1 improves insulin resistance through down-regulation of NF- $\kappa$ B signalling pathway. *British Journal of Pharmacology*, **172**: 3151–3158.
- Liem, S., Yuliet, Y., dan Khumaidi, A., 2015. Uji Aktivitas Antidiabetes Kombinasi Glibenklamid Dan Ekstrak Daun Salam (*Syzygium polyanthum* Wight.) Terhadap Mencit (*Mus musculus*) Yang Diinduksi Aloksan. *Jurnal Farmasi Galenika (Galenika Journal of Pharmacy)*, **1**: 42–47.
- Ma, H.-Y., Sun, D.-X., Cao, Y.-F., Ai, C.-Z., Qu, Y.-Q., Hu, C.-M., dkk., 2014. Herb–drug interaction prediction based on the high specific inhibition of andrographolide derivatives towards UDP-glucuronosyltransferase (UGT) 2B7. *Toxicology and Applied Pharmacology*, **277**: 86–94.
- Maglich, J.M., Parks, D.J., Moore, L.B., Collins, J.L., Goodwin, B., Billin, A.N., dkk., 2003. Identification of a Novel Human Constitutive Androstane Receptor (CAR) Agonist and Its Use in the Identification of CAR Target Genes. *Journal of Biological Chemistry*, **278**: 17277–17283.
- Maideen, N.M.P. dan Balasubramaniam, R., 2018. Pharmacologically relevant drug interactions of sulfonylurea antidiabetics with common herbs. *Journal of Herbmed Pharmacology*, **7**: 200–210.
- Manya, K., Champion, B., dan Dunning, T., 2012. The use of complementary and alternative medicine among people living with diabetes in Sydney. *BMC Complementary and Alternative Medicine*, **12**: 2.
- Markowitz, J.S., Donovan, J.L., DeVane, C.L., Taylor, R.M., Ruan, Y., Wang, J.-S., dkk., 2003. Effect of St John's Wort on Drug Metabolism by Induction of Cytochrome P450 3A4 Enzyme. *JAMA*, **290**: 1500–1504.
- Marques, S.C. dan Ikediobi, O.N., 2010. The clinical application of UGT1A1 pharmacogenetic testing: Gene-environment interactions. *Human Genomics*, **4**: 238–249.

- Mohamed, M.-E.F., Tseng, T., dan Frye, R.F., 2010. Inhibitory effects of commonly used herbal extracts on UGT1A1 enzyme activity. *Xenobiotica; the Fate of Foreign Compounds in Biological Systems*, **40**: 663–669.
- Moradi, B., Abbaszadeh, S., Shahsavari, S., Alizadeh, M., dan Beyranvand, F., 2018. The most useful medicinal herbs to treat diabetes. *Biomedical Research and Therapy*, **5**: 2538–2551.
- Mouid, M.G., 2015. Effect of Ethanolic Extract of Aerial Parts of *Andrographis paniculata* on the Pharmacokinetics of Gliclazide in Rats. *Asian Journal of Biomedical and Pharmaceutical Sciences*, **5**: .
- Nasrin, S., Watson, C.J.W., Bardhi, K., Fort, G., Chen, G., dan Lazarus, P., 2021. Inhibition of UDP-Glucuronosyltransferase Enzymes by Major Cannabinoids and Their Metabolites. *Drug Metabolism and Disposition*, **49**: 1081–1089.
- Neyshaburinezhad, N., Rouini, M., Shirzad, N., Esteghamati, A., Nakhjavani, M., Namazi, S., dkk., 2020. Evaluating the effect of type 2 diabetes mellitus on CYP450 enzymes and P-gp activities, before and after glycemic control: A protocol for a case–control pharmacokinetic study. *MethodsX*, **7**: 100853.
- Nikolin, B., Imamović, B., Medanhodžić-Vuk, S., dan Sober, M., 2004. High performance liquid chromatography in pharmaceutical analyses. *Bosnian Journal of Basic Medical Sciences*, **4**: 5–9.
- Niu, J., Straubinger, R.M., dan Mager, D.E., 2019. Pharmacodynamic Drug-Drug Interactions. *Clinical pharmacology and therapeutics*, **105**: 1395–1406.
- Nugroho, A.E., Andrie, M., Warditiani, N.K., Siswanto, E., Pramono, S., dan Lukitaningsih, E., 2012. Antidiabetic and antihyperlipidemic effect of *Andrographis paniculata* (Burm. f.) Nees and andrographolide in high-fructose-fat-fed rats. *Indian Journal of Pharmacology*, **44**: 377–381.
- Nugroho, A.E., Rais, I.R., Setiawan, I., Pratiwi, P.Y., Hadibarata, T., Tegar, M., dkk., 2014. Pancreatic effect of andrographolide isolated from *Andrographis paniculata* (Burm. f.) Nees. *Pakistan journal of biological sciences: PJBS*, **17**: 22–31.

- Nurinda, E., Kusumawardani, N., Wulandari, A.S., dan Fatmawati, A., 2023. Pharmacological Study: Synergistic Antidiabetic Activity of Cinnamon Bark and Zingiber Extract in Streptozotocin-Induced Diabetic Rats. *Macedonian Journal of Medical Sciences*, .
- Ooi, J.P., Kuroyanagi, M., Sulaiman, S.F., Muhammad, T.S.T., dan Tan, M.L., 2011. Andrographolide and 14-Deoxy-11, 12-Didehydroandrographolide inhibit cytochrome P450s in HepG2 hepatoma cells. *Life Sciences*, **88**: 447–454.
- P, A., R, M., dan W, Y., 2011. Analisis Kuantitatif Andrografolid dalam Ekstrak Sambiloto (*Andrographis paniculata* Ness) Secara KLTKT-Densitometri. *Jurnal Ilmu Farmasi dan Farmasi Klinik*, 90–97.
- Pahwa, R., Bohra, P., Sharma, P.C., Kumar, V., dan Dureja, H., 2010. Glipizide : Some Analytical, Clinical And Therapeutic Vistas. *Int. J. Chem. Sci*, 59–80.
- Palatini, P. dan De Martin, S., 2016. Pharmacokinetic drug interactions in liver disease: An update. *World Journal of Gastroenterology*, **22**: 1260–1278.
- Palleria, C., Di Paolo, A., Giofrè, C., Caglioti, C., Leuzzi, G., Siniscalchi, A., dkk., 2013. Pharmacokinetic drug-drug interaction and their implication in clinical management. *Journal of Research in Medical Sciences: The Official Journal of Isfahan University of Medical Sciences*, **18**: 601–610.
- Pan, Y., Abd-Rashid, B.A., Ismail, Z., Ismail, R., Mak, J.W., Pook, P.C.K., dkk., 2011. In vitro determination of the effect of *Andrographis paniculata* extracts and andrographolide on human hepatic cytochrome P450 activities. *Journal of Natural Medicines*, **65**: 440–447.
- Pathak, R. dan Bridgeman, M.B., 2010. Dipeptidyl Peptidase-4 (DPP-4) Inhibitors In the Management of Diabetes. *Pharmacy and Therapeutics*, **35**: 509–513.
- Pekthong, D., Blanchard, N., Abadie, C., Bonet, A., Heyd, B., Manton, G., dkk., 2009. Effects of *Andrographis paniculata* extract and Andrographolide on hepatic cytochrome P450 mRNA expression and monooxygenase activities after in vivo administration to rats and in vitro in rat and human hepatocyte cultures. *Chemico-Biological Interactions*, **179**: 247–255.

- Pekthong, D., Martin, H., Abadie, C., Bonet, A., Heyd, B., Mantion, G., dkk., 2008. Differential inhibition of rat and human hepatic cytochrome P450 by *Andrographis paniculata* extract and andrographolide. *Journal of Ethnopharmacology*, **115**: 432–440.
- Phutrakool, P. dan Pongpirul, K., 2022. Acceptance and use of complementary and alternative medicine among medical specialists: a 15-year systematic review and data synthesis. *Systematic Reviews*, **11**: 10.
- Pickar, J.H., Bon, C., Amadio, J.M., Mirkin, S., dan Bernick, B., 2015. Pharmacokinetics of the first combination 17 $\beta$ -estradiol/progesterone capsule in clinical development for menopausal hormone therapy. *Menopause*, **22**: 1308–1316.
- Pitaloka, D.A.E., Damayanti, S., Artarini, A.A., dan Sukandar, E.Y., 2019. Molecular Docking, Dynamics Simulation, and Scanning Electron Microscopy (SEM) Examination of Clinically Isolated *Mycobacterium tuberculosis* by Ursolic Acid: A Pentacyclic Triterpenes. *Indonesian Journal of Chemistry*, **19**: 328.
- Pitaloka, D.A.E., Ramadhan, D.S.F., Arfan, Chaidir, L., dan Fakih, T.M., 2021. Docking-Based Virtual Screening and Molecular Dynamics Simulations of Quercetin Analogs as Enoyl-Acyl Carrier Protein Reductase (InhA) Inhibitors of *Mycobacterium tuberculosis*. *Scientia Pharmaceutica*, **89**: 20.
- Price, G. dan Patel, D.A., 2022. *Drug Bioavailability*, StatPearls [Internet]. StatPearls Publishing.
- Price, S.A. dan Wilson, L.M., 2006. *Patofisiologi Konsep Klinis Proses-Proses Penyakit*. EGC, Jakarta.
- Qiu, F., Hou, X.-L., Takahashi, K., Chen, L.-X., Azuma, J., dan Kang, N., 2012. Andrographolide inhibits the expression and metabolic activity of cytochrome P450 3A4 in the modified Caco-2 cells. *Journal of Ethnopharmacology*, **141**: 709–713.
- Rani, R., Dahiya, S., Dhingra, D., Dilbaghi, N., Kaushik, A., Kim, K.-H., dkk., 2019. Antidiabetic activity enhancement in streptozotocin + nicotinamide–

induced diabetic rats through combinational polymeric nanoformulation.

*International Journal of Nanomedicine*, **14**: 4383–4395.

Ravi, S., Priya, B., Dubey, P., Thiruvenkatam, V., dan Kirubakaran, S., 2021.

Molecular Docking and Molecular Dynamics Simulation Studies of Quinoline-3-Carboxamide Derivatives with DDR Kinases–Selectivity Studies towards ATM Kinase. *Chemistry*, **3**: 511–524.

Rezazadeh, M. dan Emami, J., 2016. A simple and sensitive HPLC method for analysis of imipramine in human plasma with UV detection and liquid-liquid extraction: Application in bioequivalence studies. *Research in Pharmaceutical Sciences*, **11**: 168–176.

Rorsman, P. dan Renström, E., 2003. Insulin granule dynamics in pancreatic beta cells. *Diabetologia*, **46**: 1029–1045.

Royani, J.I., Hardianto, D., dan Wahyuni, S., 2014. Analisis Kandungan Andrographolide Pada Tanaman Smabiloto (*Andrographis paniculata*) dari 12 lokasi di Pulau Jawa. *Jurnal Bioteknologi & Biosains Indonesia (JBBi)*, **1**: 15.

Samala, S. dan Veeresham, C., 2015. Andrographolide Pretreatment Enhances the Bioavailability and Hypoglycemic Action of Glimepiride and Metformin. *International Journal of Phytomedicine*, **7**: 254–264.

Samala, S. dan Veeresham, C., 2016. Pharmacokinetic and Pharmacodynamic Interaction of Boswellic Acids and Andrographolide with Glyburide in Diabetic Rats: Including Its PK/PD Modeling: PK/PD Interactions With Glyburide. *Phytotherapy Research*, **30**: 496–502.

Sasongko, H., Nugroho, A.E., Nurrochmad, A., dan Rohman, A., 2022. Characteristic of Streptozotocin-Nicotinamide-Induced Inflammation in A Rat Model of Diabetes-Associated Renal Injury | Open Access Macedonian Journal of Medical Sciences.

Sebaiy, M.M., Abdellatef, H.E., Elmosallamy, M.A., Alshuwaili, M.K., Sebaiy, M.M., Abdellatef, H.E., dkk., 2020. Identification of Antioxidative Ingredients from Feverfew (*Tanacetum Parthenium*) Extract Substantially

free of Parthenolide and other Alpha-Unsaturated Gamma-Lactones. *Open Journal of Analytical and Bioanalytical Chemistry*, **4**: 001–006.

Sekretarska, J., Szczepaniak, J., Sosnowska, M., Grodzik, M., Kutwin, M., Wierzbicki, M., dkk., 2019. Influence of Selected Carbon Nanostructures on the CYP2C9 Enzyme of the P450 Cytochrome. *Materials*, **12**: 4149.

Setiawan, I., 2013. 'Efek Anti Diabetes Kombinasi Ekstrak Terpurifikasi Herba Sambiloto (*Andrographis paniculata* (Burm.f.)Nees) dan Glibenklamid Pada Tikus DM Tipe 2 Defisiensi Insulin'. Universitas Gadjah Mada.

Setiawati, A., 2008. *Farmakologi Dan Terapi: Pengantar Farmakologi, Edisi Kelima*. Balai Penerbit FKUI, Jakarta.

Shargel, L. dan Yu, A., 2012. *Applied Biopharmaceutics and Pharmacokinetics, 7th Edition (1).Pdf*. McGraw Hill Professional.

Shi, J., Hu, H., Harnett, J., Zheng, X., Liang, Z., Wang, Y.-T., dkk., 2019. An evaluation of randomized controlled trials on nutraceuticals containing traditional Chinese medicines for diabetes management: a systematic review. *Chinese Medicine*, **14**: 54.

Skyler, J.S., Bakris, G.L., Bonifacio, E., Darsow, T., Eckel, R.H., Groop, L., dkk., 2017. Differentiation of Diabetes by Pathophysiology, Natural History, and Prognosis. *Diabetes*, **66**: 241–255.

Straub, S.G. dan Sharp, G.W.G., 2002. Glucose-stimulated signaling pathways in biphasic insulin secretion. *Diabetes/Metabolism Research and Reviews*, **18**: 451–463.

Sun, H., Saeedi, P., Karuranga, S., Pinkepank, M., Ogurtsova, K., Duncan, B.B., dkk., 2022. IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Research and Clinical Practice*, **183**: 109119.

Suriyo, T., Chotirat, S., Rangkadilok, N., Pholphana, N., dan Satayavivad, J., 2021. Interactive effects of *Andrographis paniculata* extracts and cancer chemotherapeutic 5-Fluorouracil on cytochrome P450s expression in human hepatocellular carcinoma HepG2 cells. *Journal of Herbal Medicine*, **26**: 100421.

- Syamsul, E.S., Nugroho, A.E., dan Pramono, S., 2011. The Antidiabetics Of Combination Metformin And Purified Extract Of *Andrographis paniculata* (Burn).F.Ness In High Fructose-Fat Fed Rats. *Majalah Obat Tradisional*, 8.
- Szkudelski, T., 2012. Streptozotocin–nicotinamide-induced diabetes in the rat. Characteristics of the experimental model. *Experimental Biology and Medicine*, **237**: 481–490.
- Tan, B., Yang, A., Yuan, W., Li, Y., Jiang, L., Jiang, J., dkk., 2017. Simultaneous determination of glipizide and its four hydroxylated metabolites in human urine using LC-MS/MS and its application in urinary phenotype study. *Journal of Pharmaceutical and Biomedical Analysis*, **139**: 179–186.
- Tan, B., Zhang, Y.-F., Chen, X.-Y., Zhao, X.-H., Li, G.-X., dan Zhong, D.-F., 2010. The effects of CYP2C9 and CYP2C19 genetic polymorphisms on the pharmacokinetics and pharmacodynamics of glipizide in Chinese subjects. *European Journal of Clinical Pharmacology*, **66**: 145–151.
- Thakur, A.K., Rai, G., Chatterjee, S.S., dan Kumar, V., 2016. Beneficial effects of an *Andrographis paniculata* extract and andrographolide on cognitive functions in streptozotocin-induced diabetic rats. *Pharmaceutical Biology*, **54**: 1528–1538.
- Thippani, R., Pothuraju, N.R., Ramiseti, N.R., dan Shaik, S., 2013. Optimization and validation of a fast RP–HPLC method for the determination of dobutamine in rat plasma: Pharmacokinetic studies in healthy rat subjects. *Journal of Pharmaceutical Analysis*, **3**: 434–439.
- Thulé, P.M. dan Umpierrez, G., 2014. Sulfonylureas: A New Look at Old Therapy. *Current Diabetes Reports*, **14**: 473.
- Timsit, Y.E. dan Negishi, M., 2007. CAR and PXR: The xenobiotic-sensing receptors☆. *Steroids*, **72**: 231–246.
- Tirkkonen, T., Heikkilä, P., Huupponen, R., dan Laine, K., 2010. Potential CYP2C9-mediated drug–drug interactions in hospitalized type 2 diabetes mellitus patients treated with the sulphonylureas glibenclamide, glimepiride or glipizide. *Journal of Internal Medicine*, **268**: 359–366.

- Tolson, A.H. dan Wang, H., 2010. Regulation of drug-metabolizing enzymes by xenobiotic receptors: PXR and CAR. *Advanced Drug Delivery Reviews*, **62**: 1238–1249.
- Tornio, A., Niemi, M., Neuvonen, P.J., dan Backman, J.T., 2012. Drug interactions with oral antidiabetic agents: pharmacokinetic mechanisms and clinical implications. *Trends in Pharmacological Sciences*, **33**: 312–322.
- Torri, M., 2013. Knowledge and Risk Perceptions of Traditional Jamu Medicine among Urban Consumers. *European Journal of Medicinal Plants*, **3**: 25–39.
- Vaishali, V.G., Patel, J.H., Varia, R.D., Bhavsar, S.K., Priti, P.V., Falguni, F.M., dkk., 2017. Effect of andrographolide co-administration on pharmacokinetics of meloxicam in Rats. *Int. J. Curr. Microbiol. App. Sci*, **6**: 2147–2153.
- Van Booven, D., Marsh, S., McLeod, H., Carrillo, M.W., Sangkuhl, K., Klein, T.E., dkk., 2010. Cytochrome P450 2C9-CYP2C9. *Pharmacogenetics and genomics*, **20**: 277–281.
- Wada, T., Gao, J., dan Xie, W., 2009. PXR and CAR in energy metabolism. *Trends in Endocrinology & Metabolism*, **20**: 273–279.
- Wahyono, D., Nugroho, A.E., dan Hakim, 2007. Profil farmakokinetika sulfasetamid pada tikus gagal ginjal karena diinduksi uranil nitrat.
- Wang, J., Yang, W., Wang, G., Tang, P., dan Sai, Y., 2014. Determination of six components of *Andrographis paniculata* extract and one major metabolite of andrographolide in rat plasma by liquid chromatography–tandem mass spectrometry. *Journal of Chromatography B*, **951–952**: 78–88.
- Wang, J., Zhang, H., Wang, R., dan Cai, Y., 2021. Pharmacokinetics, Bioequivalence and Safety Evaluation of Two Ticagrelor Tablets Under Fasting and Fed Conditions in Healthy Chinese Subjects. *Drug Design, Development and Therapy*, **Volume 15**: 1181–1193.
- Wang, P., Shao, X., Bao, Y., Zhu, J., Chen, L., Zhang, L., dkk., 2020. Impact of obese levels on the hepatic expression of nuclear receptors and drug-metabolizing enzymes in adult and offspring mice. *Acta Pharmaceutica Sinica. B*, **10**: 171–185.

- Wells, B.G., DiPiro, J.T., Schwinghammer, T.L., dan DiPiro, C.V., 2015. *Pharmacotherapy Handbook*.
- Williams, J.A., Hyland, R., Jones, B.C., Smith, D.A., Hurst, S., Goosen, T.C., dkk., 2004. Drug-Drug Interactions For Udp-Glucuronosyltransferase Substrates: A Pharmacokinetic Explanation For Typically Observed Low Exposure (AUC/AUC) Ratios. *Drug Metabolism and Disposition*, **32**: 1201–1208.
- Willson, T.M. dan Kliewer, S.A., 2002. Pxr, car and drug metabolism. *Nature Reviews Drug Discovery*, **1**: 259–266.
- Wongnawa, M., Soontaro, P., Ridity, W., Wongpoowarak, P., dan Ruengkittisaku, S., 2012. The effects of *Andrographis paniculata* (Burm. f.) Nees on the pharmacokinetics and pharmacodynamics of midazolam in healthy volunteers. *Songklanakarin Journal of Science & Technology*, **34**: .
- Wright, M.J., Wheller, R., Wallace, G., dan Green, R., 2019. Internal standards in regulated bioanalysis: putting in place a decision-making process during method development. *Bioanalysis*, **11**: 1701–1713.
- Yan, L.-J., 2022. The Nicotinamide/Streptozotocin Rodent Model of Type 2 Diabetes: Renal Pathophysiology and Redox Imbalance Features. *Biomolecules*, **12**: 1225.
- Yang, T., Xu, C., Wang, Z.T., dan Wang, C.H., 2013. Comparative pharmacokinetic studies of andrographolide and its metabolite of 14-deoxy-12-hydroxy-andrographolide in rat by ultra-performance liquid chromatography-mass spectrometry. *Biomedical chromatography: BMC*, **27**: 931–937.
- Yao, H., Gu, J., Shan, Y., Wang, Y., Chen, X., Sun, D., dkk., 2020. Type 2 diabetes mellitus decreases systemic exposure of clopidogrel active metabolite through upregulation of P-glycoprotein in rats. *Biochemical Pharmacology*, **180**: 114142.
- Yao, N., Zeng, C., Zhan, T., He, F., Liu, M., Liu, F., dkk., 2019. Oleanolic Acid and Ursolic Acid Induce UGT1A1 Expression in HepG2 Cells by Activating PXR Rather Than CAR. *Frontiers in Pharmacology*, **10**: .

- Yen, C.-C., Liu, Y.-T., Lin, Y.-J., Yang, Y.-C., Chen, C.-C., Yao, H.-T., dkk., 2019. Bioavailability of the diterpenoid 14-deoxy-11,12-didehydroandrographolide in rats and up-regulation of hepatic drug-metabolizing enzyme and drug transporter expression. *Phytomedicine*, **61**: 152841.
- Yu, B.-C., Hung, C.-R., Chen, W.-C., dan Cheng, J.-T., 2003a. Antihyperglycemic effect of andrographolide in streptozotocin-induced diabetic rats. *Planta Medica*, **69**: 1075–1079.
- Yu, B.-C., Hung, C.-R., Chen, W.-C., dan Cheng, J.-T., 2003b. Antihyperglycemic effect of andrographolide in streptozotocin-induced diabetic rats. *Planta Medica*, **69**: 1075–1079.
- Yu, H., Shao, H., Wu, Q., Sun, X., Li, L., Li, K., dkk., 2017. Altered gene expression of hepatic cytochrome P450 in a rat model of intermittent hypoxia with emphysema. *Molecular Medicine Reports*, **16**: 881–886.
- Yuan, S. dan Chen, H., 2019. Mathematical rules for synergistic, additive, and antagonistic effects of multi-drug combinations and their application in research and development of combinatorial drugs and special medical food combinations. *Food Science and Human Wellness*, **8**: 136–141.
- Zanger, U.M. dan Schwab, M., 2013. Cytochrome P450 enzymes in drug metabolism: Regulation of gene expression, enzyme activities, and impact of genetic variation. *Pharmacology & Therapeutics*, **138**: 103–141.
- Zhang, F., Duan, Y., Wei, Y., Zhang, J., Ma, X., Tian, H., dkk., 2020. The inhibition of hepatic Pxr-Oatp2 pathway mediating decreased hepatic uptake of rosuvastatin in rats with high-fat diet-induced obesity. *Life Sciences*, **257**: 118079.
- Zhang, L., Xu, P., Cheng, Y., Wang, P., Ma, X., Liu, M., dkk., 2019. Diet-induced obese alters the expression and function of hepatic drug-metabolizing enzymes and transporters in rats. *Biochemical Pharmacology*, **164**: 368–376.

- Zhang, X., Liu, X., He, M., Zhang, Y., Sun, Y., dan Lu, X., 2020. A molecular dynamics simulation study of KF and NaF ion pairs in hydrothermal fluids. *Fluid Phase Equilibria*, **518**: 112625.
- Zhang, Xiaoli, Zhang, Xiaosu, Wang, X., dan Zhao, M., 2018. Influence of andrographolide on the pharmacokinetics of warfarin in rats. *Pharmaceutical Biology*, **56**: 351–356.
- Zhang, Z., Jiang, J., Yu, P., Zeng, X., Larrick, J.W., dan Wang, Y., 2009. Hypoglycemic and beta cell protective effects of andrographolide analogue for diabetes treatment. *Journal of Translational Medicine*, **7**: 62.
- Zikri, A.T., Pranowo, H.D., dan Haryadi, W., 2020. Stability, Hydrogen Bond Occupancy Analysis and Binding Free Energy Calculation from Flavonol Docked in DAPK1 Active Site Using Molecular Dynamic Simulation Approaches. *Indonesian Journal of Chemistry*, **21**: 383.