

DAFTAR PUSTAKA

- Bode, W., Fernandez-Catalan, C., Tschesche, H., Grams, F., Nagase, H., Maskos, K., 1999, Structural properties of matrix metalloproteinases, *Cellular and Molecular Life Sciences (CMLS)*, **55**(4), 639–652.
- Bourguignon, L.Y.W., Xia, W., Wong, G., 2009, Hyaluronan-mediated CD44 Interaction with p300 and SIRT1 Regulates Beta-Catenin Signaling and NFkappaB-Specific Transcription Activity Leading to MDR1 and Bcl-xL Gene Expression and Chemoresistance in Breast Tumor Cells, *J.Biol.Chem.*, **284**(5), 2657-2671.
- Brown, F. K., 1998, Chemoinformatics: What is it and How does it Impact Drug Discovery, *Annual Reports in Medicinal Chemistry*, 375–384.
- Chen, C.C., Sureshabul, M., Chen, H.W., Lin, Y.S., Lee, J.Y., Hong, Q.S., Yang, Y.C., Yu, S.L., 2013, Curcumin Suppresses Metastasis via Sp-1, FAK Inhibition, and E-Cadherin Upregulation in Colorectal Cancer, *Evidence-Based Complementary and Alternative Medicine*, **2013**, 1–17.
- Ciardiello, F. dan Tortora, G., 2003, Epidermal growth factor receptor (EGFR) as a target in cancer therapy: understanding the role of receptor expression and other molecular determinants that could influence the response to anti-EGFR drugs, *European Journal of Cancer*, **39**(10), 1348–1354.
- Da'i, M., Jenie, U.A., AM, Supardjan, Meiyanto, E., Kawaichi, M., 2012, The Effect of PGV-1, PGV-0 and Curcumin on Protein Involve in G2-M Phase of Cell Cycle and Apoptosis on T47D Breast Cancer Cell Line, *Jurnal Ilmu Kefarmasian Indonesia*, **10**(2), 99-110.
- Egeblad, M. dan Werb, Z., 2002, New functions for the matrix metalloproteinases in cancer progression, *Nature Reviews Cancer*, **2**(3), 161–174.
- Engel, T., 2006, Basic Overview of Chemoinformatics, *Journal of Chemical Information and Modeling*, **46**(6), 2267–2277.
- Gimeno, A., Beltrán-Debón, R., Mulero, M., Pujadas, G., Garcia-Vallvé, S., 2020, Understanding the variability of the S1' pocket to improve matrix metalloproteinase inhibitor selectivity profiles, *Drug Discovery Today*, **25**(1), 38-57.
- Globocan, 2020, Cancer Today (Indonesian Fact Sheets 2020), Global Cancer Observatory, <https://gco.iarc.fr/today/data/factsheets/populations/360-indonesia-fact-sheets.pdf>, 24 April 2021.
- Halgren, T.A., Murphy, R.B., Friesner, R.A., Beard, H.S., Frye, L.L., Pollard, W.T., Banks, J.L., 2004, Glide: a New Approach for Rapid, Accurate Docking and Scoring. 2. Enrichment Factors in Database Screening, *J. Med. Chem.*, **47**, 1750-1759.

- Hanahan, D. dan Weinberg, R. A., 2000, The Hallmarks of Cancer, *Cell*, **100**(1), 57–70.
- Hermawan, A., Fitriyanti, A., Junedi, S., Ikawati, M., Haryanti, S., Widaryanti, B., Da'i, M., Meiyanto, E., 2011, PGV-0 and PGV-1 Increased Apoptosis Induction of Doxorubicin on MCF-7 Breast Cancer Cells, *Pharmakon*, **12**(2), 55-59.
- Hejmadi, M., 2010, *Introduction to Cancer Biology*, Momna Hejmadi and Ventus Publishing Aps, Denmark.
- Hunter, K. W., Crawford, N. P., Alsarraj, J., 2008, Mechanisms of metastasis, *Breast Cancer Research*, **10**(Suppl 1), S2.
- Ikawati, M. dan Septisetyani, E., 2018, Pentagamavunone-0 (PGV-0), a Curcumin Analog, Enhances Cytotoxicity of 5-Fluorouracil and Modulates Cell Cycle in WiDr Colon Cancer Cells, *Indonesian Journal of Cancer Chemoprevention*, **9**, 23-31.
- Kessenbrock, K., Plaks, V., Werb, Z., 2010, Matrix Metalloproteinases: Regulators of the Tumor Microenvironment, *Cell*, **141**(1), 52–67.
- Leber, M. F. dan Efferth, T., 2009, Molecular principles of cancer invasion and metastasis (Review), *International Journal of Oncology*, **34**(4), 881-895
- Lengauer, T., dan Rarey, M., 1996, Computational methods for biomolecular docking, *Current Opinion in Structural Biology*, **6**(3), 402–406.
- Martin, T.A., Ye, L., Sanders, A.J., Lane, J., Jiang, W.G., 2013, Cancer Invasion and Metastasis: Molecular and Cellular Perspective, ed. *Metastatic Cancer Clinical and Biological Perspectives*, Austin, TX: Landes Bioscience, 135-168.
- McCawley, L. J. dan Matrisian, L. M., 2000, Matrix metalloproteinases: multifunctional contributors to tumor progression, *Molecular Medicine Today*, **6**(4), 149–156.
- McInnes, C., 2007, Virtual Screening Strategies in Drug Discovery, *Curr. Opin. Chem. Biol.*, **11**, 494-502.
- Meiyanto, E., Septisetyani, E. P., Larasati, Y. A., Kawaichi, M., 2018, Curcumin Analog Pentagamavunon-1 (PGV-1) Sensitizes WiDr Cells to 5-Fluorouracil through Inhibition of NF-κB Activation, *Asian Pacific journal of cancer prevention : APJCP*, **19**(1), 49–56.
- Meiyanto, E., Husnaa, U., Kastian, R. F., Putri, H., Larasati, Y., Khumaira, A., Putri, D., Jenie, R., Kawaichi, M., Lestari, B., Yokoyama, T., Kato, J., 2020, The Target Differences of Anti-Tumorigenesis Potential of Curcumin and its Analogues Against HER-2 Positive and Triple-Negative Breast Cancer Cells, *Advanced Pharmaceutical Bulletin*, **11**, 188-196.

- Meng, D., Lv, D.D., Fang, J., 2008, Insulin-like growth factor-I induces reactive oxygen species production and cell migration through Nox4 and Rac1 in vascular smooth muscle cells, *Cardiovascular Research*, **80**(2), 299–308.
- MOE (Molecular Operating Environment), 2022, software available from Chemical Group Inc. 1010 Sherbrooke Street West, Suite 910 Montreal, Canada.
- Murwanti, R., Rahmadani, A., Ritmaleni, Hermawan, A., Sudarmanto, B.S.A., 2020, Curcumin Analogs Induce Apoptosis and G2/M Arrest In 4T1 Murine Triple-Negative Breast Cancer Cells, *Indonesian Journal of Pharmacy*, **31**(1), 11–18.
- Nagendraprabhu, P. dan Sudhandiran, G., 2011, Astaxanthin inhibits tumor invasion by decreasing extracellular matrix production and induces apoptosis in experimental rat colon carcinogenesis by modulating the expressions of ERK-2, NFkB and COX-2, *Investigational New Drugs*, **29**(2), 207–224.
- Nguyen, D. dan Massagué, J., 2007, Genetic determinants of cancer metastasis, *Nat Rev Genet*, **8**, 341–352.
- Nicolescu, A. C., Holt, A., Kandasamy, A. D., Pacher, P., Schulz, R., 2009, Inhibition of matrix metalloproteinase-2 by PARP inhibitors, *Biochemical and Biophysical Research Communications*, **387**(4), 646–650.
- Nosrati, R., Kheirouri, S., Ghodsi, R., 2019, The effects of zinc treatment on matrix metalloproteinases: a systematic review, *Journal of Trace Elements in Medicine and Biology*, **56**, 107–115.
- Nurrochmad, 2001, Sintesis Kurkumin, Bisdemetoksikurkumin, Bisdemetoksidehidroksi-kurkumin, dan Pentagamavunon-0 serta Uji Kesitotoksikannya Terhadap Sel Mieloma dan Sel Mononuklear Normal Secara In Vitro, *Tesis*, Fakultas Farmasi Universitas Gadjah Mada, Yogyakarta.
- Ou-Yang, S., Lu, J., Kong, X., Liang, Z., Luo, C., Jiang, H., 2012, Computational drug discovery, *Acta Pharmacologica Sinica*, **33**(9), 1131–1140.
- Paolillo, M. dan Schinelli, S., 2019, Extracellular Matrix Alterations in Metastatic Processes, *International Journal of Molecular Sciences*, **20**(19), 4947.
- Park, W., Amin, A.R.M.R., Chen, Z.G., Shin, D.M., 2013, New Perspectives of Curcumin in Cancer Prevention, *Cancer Prevention Research*, **6**(5), 387–400.
- Pudjono, Supardjan, dan Irawati, T., 2006, Sintesis 2,5-dibenzilidinsiklopentanone dari benzaldehid dan siklopentanone dengan variasi pelarut, *Majalah Farmasi Indonesia*, **17**(1), 45–49.

- Radisky, E. S., Raeeszadeh-Sarmazdeh, M., Radisky, D. C., 2017, Therapeutic Potential of Matrix Metalloproteinase Inhibition in Breast Cancer, *Journal of Cellular Biochemistry*, **118**(11), 3531–3548.
- Rahmadani, A., 2019, Studi In Vitro & In Silico Efek Kurkumin Dan Analognya Terhadap Angiogenesis Pada Jalur Ekspresi VEGF Di Sel Kanker Payudara 4T1, *Tesis*, Fakultas Farmasi Universitas Gadjah Mada, Yogyakarta.
- Redig, A.J. dan McAllister, S.S., 2013, Breast cancer as a systemic disease: a view of metastasis, *J. Intern. Med.*, **274**(2), 113-126.
- Rosenfeld, R.J., 2003, Automated Docking of Ligands to An Artificial Active Site: Augmenting Crystallographic Analysis with Computer Modelling, *J. Comput. Aided. Mol.*, **17**, 525-536.
- Ruddon, R.W., 2007, *Cancer Biology*, 4th ed., Oxford University Press, New York.
- Safitri, C.A., 2017, Aktivitas Sitotoksik Kurkumin, Pentagamavunon-0 (PGV-0) dan Pentagamavunon-1 (PGV-1) pada Sel Kanker Kolon CT26, *Skripsi*, Fakultas Farmasi Universitas Gadjah Mada, Yogyakarta.
- Sakkiah, S., Thangapandian, S., Lee, K.W., 2012, Ligand-Based Virtual Screening and Molecular Docking Studies to Identify the Critical Chemical Features of Potent Cathepsin D Inhibitors, *Chem. Biol. Drug. Des.*, **80**, 64-80.
- Sardjiman, S. S., Reksohadiprodjo, M. S., Hakim, L., van der Goot, H., Timmerman, H., 1997, 1,5-Diphenyl-1,4-pentadiene-3-ones and cyclic analogues as antioxidative agents. Synthesis and structure-activity relationship, *European Journal of Medicinal Chemistry*, **32**(7-8), 625–630.
- Sardjiman, 2000, Synthesis of Some New Series of Curcumin Analogues, Antioxidative, Antiinflammatory, Antibacterial Activities, and Qualitative Structure Activity Relationship, *Disertasi*, Fakultas Farmasi, Universitas Gadjah Mada, Yogyakarta.
- Shaw, T.J. dan Martin, P., 2016, Wound repair: a showase for cell plasticity and migration, *Current Opinion in Cell Biology*, **42**, 29–37.
- Shehzad, A., Lee, J., Lee., Y.S., 2013., Curcumin in Various Cancer, *International Union of Biochemistry and Molecular Biology*, **39**(1), 56-68.
- Sukumar, N., Krein, M., Breneman, C.M., 2008, Bioinformatics and cheminformatics: Where do the twain meet?, *Current opinion in drug discovery & development*, **11**(3), 311-9.
- Talele, T.T, Khedkar, S.A., Rigby, A.C., 2010, Successful Applications of Computer Aided Drug Discovery: Moving Drugs from Concepts to the Clinic, *Current Topics in Medicinal Chemistry*, **10**, 127-141.
- Tallant, C., Marrero, A., Gomis-Rüth, F. X., 2010, Matrix metalloproteinases: Fold and function of their catalytic domains, *Biochimica et Biophysica Acta (BBA) - Molecular Cell Research*, **1803**(1), 20–28.

- Torres, P. H. M., Sodero, A. C. R., Jofily, P., Silva-Jr, F. P., 2019, Key Topics in Molecular Docking for Drug Design, *International Journal of Molecular Sciences*, **20**(18), 4574.
- Verma, R. P. dan Hansch, C., 2007, Matrix metalloproteinases (MMPs): Chemical–biological functions and (Q)SARs, *Bioorganic & Medicinal Chemistry*, **15**(6), 2223–2268.
- Visse, R. dan Nagase, H., 2003, Matrix Metalloproteinases and Tissue Inhibitors of Metalloproteinases: Structure, Function, and Biochemistry, *Circulation Research*, **92**(8), 827–839.
- Warren, S., 1994, *Sintesis Organik, Pendekatan Diskoneksi*, Terjemahan oleh M. Samhoedi, Ed. I., Gadjah Mada University Press, Yogyakarta.
- Weidner, N., 1993, Tumor angiogenesis: review of current applications in tumor prognostication, *Semin. Diagn. Pathol*, **10**(4), 302–313.
- WHO, 2021, Cancer, World Health Organization, <https://www.who.int/news-room/fact-sheets/detail/cancer>, 23 Maret 2021.
- Wu, C.I., Chang, M.M., Su, C.L., Ling, P., Chang, W.T., Cheng, H.C., 2014, Impacts of protease inhibitors on clathrin and fibronectin in cancer metastasis, *Biomarkers and Genomic Medicine*, **6**(1), 23–31.
- Wulandari, F., Ikawati, M., Kiriata, M., Kato, J., Meiyanto, E., 2021, Curcumin Analogs, PGV-1 and CCA-1.1 Exhibit Anti-migratory Effects and Suppress MMP9 Expression on WiDr Cells, *Indones Biomed J.*, **13**(3), 271–80.
- Zhang, Q., Deng, S., Sun, K., Lin, S., Lin, Y., Zhu, B., Cai, X., 2017, MMP-2 and Notch signal pathway regulate migration of adipose-derived stem cells and chondrocytes in co-culture systems, *Cell proliferation*, **50**(6), e12385.