

DAFTAR PUSTAKA

- Agresti, A. (2018). *An Introduction to Categorical Data Analysis*. Hoboken, NJ: John Wiley & Sons.
- Ajao, M.S., Okesina, A. dan Nwadiugwu, M.C., (2018). Trimethyltin-induced cerebellar damage on adult male Wistar rats. Trimetil estaño induce daño cerebral en ratas machos adultas Wistar. *Bionatura*, Vol: 3. No: 4. hh 23-30. DOI: <http://dx.doi.org/10.21931/RB/2018.03.04.6>
- Akirav, E. M., Ruddle, N. H., dan Herold, K. C. (2011). The role of AIRE in human autoimmune disease. *Nature Reviews Endocrinology*, Vol: 7. No: 1, hh: 25-33. DOI: <https://doi.org/10.1038/nrendo.2010.200>
- Akiyama, T., *et al.* (2008). The tumor necrosis factor family receptors RANK and CD40 cooperatively establish the thymic medullary microenvironment and self-tolerance. *Immunity*, Vol: 29. No: 3, hh: 423-437. DOI: <https://doi.org/10.1016/j.immuni.2008.06.015>
- Allen *et al.*, (2020). Understanding immunosenescence and its impact on vaccination of older adults. *Vaccine*, Vol: 38. No: 52, hh: 8264-8272. DOI: <https://doi.org/10.1016/j.vaccine.2020.11.002>
- Anderson., *et al.* (2002). Projection of an immunological self shadow within the thymus by the aire protein. *Science*, Vol: 298. No: 5597, hh: 1395-1401. DOI: <http://dx.doi.org/10.1126/science.1075958>
- Aspinall, R., dan Andrew, D. (2000). Thymic involution in aging. *Journal of clinical immunology*, Vol: 20. No: 4, hh: 250-256. DOI: 10.1023/a:1006611518223
- Barrera, G., et al. 2018. Lipid peroxidation-derived aldehydes, 4-hydroxynonenal and malondialdehyde in aging-related disorders. *Antioxidants*, Vol: 7. No: 8, hh.102 - 106. DOI: <https://doi.org/10.3390/antiox7080102>
- Berdoy, M. (2002). *The Laboratory Rat: A Natural History*. University of Oxford, Department of Zoology. <http://www.ratlife.org>
- Billingsley, M.L., *et al.* 2006. Functional and structural properties of stannin: roles in cellular growth, selective toxicity, and mitochondrial responses to injury. *Journal of cellular biochemistry*, Vol: 98. No: 2, hh.243-250. DOI: <https://doi.org/10.1002/jcb.20809>
- Bruserud, Ø., *et al.* (2016). AIRE-mutations and autoimmune disease. *Current Opinion in Immunology*, Vol: 43. No 2, hh: 8-15. DOI: <https://doi.org/10.1016/j.coi.2016.07.003>
- Busse, P.J. dan Mathur, S.K., (2010). Age-related changes in immune function: effect on airway inflammation. *Journal of Allergy and Clinical Immunology*, Vol: 126. No: 4, hh: 690-699. DOI: <https://doi.org/10.1016/j.jaci.2010.08.011>
- Bozzetta, E., *et al.* (2011). Development of an enhanced histopathological approach to detect low-dose dexamethasone illicit treatment in veal calves. *Food Additives & Contaminants: Part A*, Vol: 28. No: 9, hh.1187-1192. DOI: <https://doi.org/10.1080/19440049.2011.584909>

- Boyer, I. J. (1989). Toxicity of dibutyltin, tributyltin and other organotin compounds to humans and to experimental animals. *Toxicology*, Vol: 55. No: 3, hh: 253-298. DOI: [https://doi.org/10.1016/0300-483X\(89\)90018-8](https://doi.org/10.1016/0300-483X(89)90018-8)
- Campisi J. (2005). Senescent cells, tumor suppression, and organismal aging: good citizens, bad neighbors. *Cell*. Vol: 120. No: 4, hh: 513–522. DOI: 10.1016/j.cell.2005.02.003.
- Chi, Y. S., Lim, H., Park, H., dan Kim, H. P. (2003). Effects of wogonin, a plant flavone from *Scutellaria radix*, on skin inflammation: in vivo regulation of inflammation-associated gene expression. *Biochemical pharmacology*, Vol. 66. No: 7, hh: 1271-1278. DOI: [https://doi.org/10.1016/S0006-2952\(03\)00463-5](https://doi.org/10.1016/S0006-2952(03)00463-5)
- Childs, *et al.*, (2014). Senescence and apoptosis: dueling or complementary cell fates?. *EMBO reports*, Vol: 15. No: 11, hh:1139-1153. DOI: <https://doi.org/10.15252/embr.201439245>
- Childs, B.G., *et al.* (2015). Cellular senescence in aging and age-related disease: from mechanisms to therapy. *Nature medicine*, Vol: 21. No: 12, hh:1424-1435. DOI: <https://doi.org/10.1038/nm.4000>
- Coppé, J.P., *et al.* (2011). Tumor suppressor and aging biomarker p16INK4a induces cellular senescence without the associated inflammatory secretory phenotype. *Journal of Biological Chemistry*, Vol: 286. No: 42, hh: 36396-36403. DOI: <https://doi.org/10.1074/jbc.M111.257071>
- Constantinides Jeyapalan dan Sedivy, J. M. (2008). Cellular senescence and organismal aging. *Mechanisms of ageing and development*, Vol: 129. No: 7, hh: 467-474. DOI: 10.1016/j.mad.2008.04.001
- Corder, G. W., Foreman, D. I. (2014). *Nonparametric Statistics: A Step-by-Step Approach*. Hoboken, NJ: John Wiley & Sons.
- Cui, X., *et al.* (2006). Chronic systemic D-galactose exposure induces memory loss, neurodegeneration, and oxidative damage in mice: Protective effects of R- α -lipoic acid. *Journal of neuroscience research*, Vol: 83. No: 8, hh: 1584-1590. DOI: 10.1002/jnr.20845
- Danielle Aw, Silva, A. B., dan Palmer, D. B. (2007). Immunosenescence: emerging challenges for an ageing population. *Immunology*, Vol: 120. No: 4, hh: 435-446. DOI: <https://doi.org/10.1111/j.1365-2567.2007.02555.x>
- Dharmayanti, I., (2003). Kajian biologi molekuler gen supressor tumor (p53) sebagai target gen dalam pengobatan kanker. *Wartazoa*, Vol: 13. No: 3, hh: 99-107.
- Dixit, V. D. (2010). Thymic fatness and approaches to enhance thymopoietic fitness in aging. *Current opinion in immunology*, Vol: 22. No: 4, hh: 521-528. DOI: <https://doi.org/10.1016/j.coi.2010.06.010>
- Dos Santos, R.S., *et al.* 2020. Involvement of the Hsp70/TLR4/IL-6 and TNF- α pathways in delayed-onset muscle soreness. *Journal of Neurochemistry*, Vol: 155, No: 1, hh: 29-44. DOI: <https://doi.org/10.1111/jnc.15006>

- Eggestøl, H.Ø., Lunde, H.S. and Haugland, G.T., 2020. The proinflammatory cytokines TNF- α and IL-6 in lumpfish (*Cyclopterus lumpus* L.)-identification, molecular characterization, phylogeny and gene expression analyses. *Developmental & Comparative Immunology*, Vol: 105. No: 1, hh:103608. DOI: <https://doi.org/10.1016/j.dci.2020.103608>
- Fan, Yet al., (2021). Effect of Trimethyltin chloride on proliferation and cell cycle of intestinal porcine epithelial cells. *Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology*, Vol: 249. No: 1, hh: 109-131. DOI: <https://doi.org/10.1016/j.cbpc.2021.109131>
- Ferraz da Silva et al., (2018). Organotins in neuronal damage, brain function, and behavior: a short review. *Frontiers in Endocrinology*, Vol: 8. No: 1, hh: 366-345. DOI: <https://doi.org/10.3389/fendo.2017.00366>
- Fierabracci, A., (2011). Recent insights into the role and molecular mechanisms of the autoimmune regulator (AIRE) gene in autoimmunity. *Autoimmunity reviews*, Vol: 10. No: 3, hh: 137-143. DOI: <https://doi.org/10.1016/j.autrev.2010.08.019>
- Fiedorowicz, A., *et al.* (2008). The ameboid phenotype of NG2 (+) cells in the region of apoptotic dentate granule neurons in trimethyltin intoxicated mice shares antigen properties with microglia/macrophages. *Glia*, Vol: 56. No: 2, hh: 209-222. DOI: <https://doi.org/10.1002/glia.20605>
- Fulop *et al.*, (2018). Immunosenescence and inflamm-aging as two sides of the same coin: friends or foes?. *Frontiers in immunology*, Vol: 8. No: 2. hh: 19-60. DOI: <https://doi.org/10.3389/fimmu.2017.01960>
- Fujita, K., Lazarovici, P., dan Guroff, G. (1989). Regulation of the differentiation of PC12 pheochromocytoma cells. *Environmental health perspectives*, Vol: 80. No: 5, hh: 127-142. DOI: <https://doi.org/10.1289/ehp.8980127>
- Funk, J.A., Gohlke, J., Kraft, A.D., McPherson, C.A., Collins, J.B. dan Harry, G.J., (2011). Voluntary exercise protects hippocampal neurons from trimethyltin injury: possible role of interleukin-6 to modulate tumor necrosis factor receptor-mediated neurotoxicity. *Brain, behavior, and immunity*, Vol: 25. No: 6, hh:1063-1077. DOI: <https://doi.org/10.1016/j.bbi.2011.03.012>
- Ganguly, B.B., (1993). Cell division, chromosomal damage and micronucleus formation in peripheral lymphocytes of healthy donors: related to donor's age. *Mutation Research/DNAging*, Vol: 295. No: 3, hh: 135-148. DOI: [https://doi.org/10.1016/0921-8734\(93\)90015-U](https://doi.org/10.1016/0921-8734(93)90015-U)
- Ganguly, B.B., (1995). Age-related alterations in cell division and cell cycle kinetics in control and trimethyltin-treated lymphocytes of human individuals. *Biometals*, Vol: 8. No: 3, hh: 263-269. DOI: <https://doi.org/10.1007/BF00143386>
- Gardner, J. M., Fletcher, A. L., Anderson, M. S., dan Turley, S. J. (2009). AIRE in the thymus and beyond. *Current Opinion in Immunology*, Vol: 21. No: 6, hh: 582–589. DOI: <https://doi.org/10.1016/j.coi.2009.08.007>

- Geloso, et al., (2011). Trimethyltin-induced hippocampal degeneration as a tool to investigate neurodegenerative processes. *Neurochemistry international*, Vol: 58. No: 7, hh: 729-738. DOI: <https://doi.org/10.1016/j.neuint.2011.03.009>
- Ghosh *et al.*, (1990). Frequency of micronuclei induced in peripheral lymphocytes by trimethyltin chloride. *Mutation Research Letters*, Vol: 245. No: 1, hh: 33-39. DOI: [https://doi.org/10.1016/0165-7992\(90\)90022-C](https://doi.org/10.1016/0165-7992(90)90022-C)
- Ghosh, S et al., (1998). NF- κ B and Rel proteins: evolutionarily conserved mediators of immune responses. *Annual review of immunology*, Vol: 16. No: 1, hh: 225-260. DOI: <https://doi.org/10.1146/annurev.immunol.16.1.225>
- Gruver *et al.*, (2007). Immunosenescence of ageing. *The Journal of Pathology: A Journal of the Pathological Society of Great Britain and Ireland*, Vol: 211. No: 2, hh: 144-156. DOI: <https://doi.org/10.1002/path.2104>
- Gui, J., Mustachio, L. M., Su, D. M., dan Craig, R. W. (2012). Thymus size and age-related thymic involution: early programming, sexual dimorphism, progenitors and stroma. *Aging and disease*, Vol: 3. No: 3, hh: 280-290.
- Li Guo, L., *et al.* (2020). Gallic acid attenuates thymic involution in the d-galactose induced accelerated aging mice. *Immunobiology*, Vol: 225, No: 1, hh: 151-170. DOI: <https://doi.org/10.1016/j.imbio.2019.11.005>
- Harry, G. J., ., *et al.* (2002). Morphological alterations and elevations in tumor necrosis factor- α , interleukin (IL)-1 α , and IL-6 in mixed glia cultures following exposure to trimethyltin: modulation by proinflammatory cytokine recombinant proteins and neutralizing antibodies. *Toxicology and applied pharmacology*, Vol: 180. No: 3, hh: 205-218. DOI: <https://doi.org/10.1006/taap.2002.9390>
- Hasegawa *et al.*, (2000). Developmental roles of the steroidogenic acute regulatory protein (StAR) as revealed by StAR knockout mice. *Molecular Endocrinology*, Vol: 14. No: 9, 1462-1471. DOI: <https://doi.org/10.1210/mend.14.9.0515>
- Hioe, K.M. dan Jones, J.M., (1984). Effects of trimethyltin on the immune system of rats. *Toxicology letters*, Vol: 20. No: 3, hh: 317-323. DOI: [https://doi.org/10.1016/0378-4274\(84\)90166-8](https://doi.org/10.1016/0378-4274(84)90166-8)
- Husna, U., Sujuti, H. dan Dalhar, M., (2017). Pengaruh Pemberian Ekstrak Propolis terhadap Eksresi Bcl2 dan Apoptosis pada Sel Otak Tikus Model Cedera Otak Traumatik. *Jurnal Kedokteran Brawijaya*, Vol: 29. No: 3, hh: 190-195. DOI: <https://doi.org/10.21776/ub.jkb.2017.029.03.3>
- Irianti, T.T. dan Pramono, S., (2022). Penuaan Dan Pencegahannya: Proses Faali Biokimiawi dan Molekuler. UGM PRESS.
- Ismail, et al., (1999). Is there a Gulf War syndrome?. *The Lancet*, Vol: 353. No: 9148, hh: 179-182. DOI: [https://doi.org/10.1016/S0140-6736\(98\)11339-9](https://doi.org/10.1016/S0140-6736(98)11339-9)

- JacJacob, H. J., dan Kwitek, A. E. (2002). Rat genetics: attachign physiology and pharmacology to the genome. *Nature reviews genetics*, Vol: 3. No: 1, hh: 33-42. DOI: <https://doi.org/10.1038/nrg702>
- Jia, N., Li, T., Diao, X. dan Kong, B., (2014). Protective effects of black currant (*Ribes nigrum* L.) extract on hydrogen peroxide-induced damage in lung fibroblast MRC-5 cells in relation to the antioxidant activity. *Journal of Functional Foods*, Vol: 11. No: 1. hh: 142-151. DOI: <https://doi.org/10.1016/j.jff.2014.09.011>
- Jie Han Li, J.H., *et al.* (2021). Curcumin protects thymus against D-galactose-induced senescence in mice. *Naunyn-Schmiedeberg's Archives of Pharmacology*, Vol: 394. No: 2, hh: 411-420. DOI: <https://doi.org/10.1007/s00210-020-01945-8>
- K.Taraszka Hastings, K.T., *et al.* (2017). Nab2 maintains thymus cellularity with aging and stress. *Molecular immunology*, Vol: 85. No: 1, hh: 185-195. DOI: <http://dx.doi.org/10.1016/j.molimm.2017.02.019>
- Kalhor, N. dan Moran, C., (2019). The thymus: Practical anatomy and histology. In *Mediastinal Pathology*. hh. 1-12. Springer, Cham. DOI: https://doi.org/10.1007/978-3-319-98980-8_1
- Kandhaya-Pillai, R., *et al.* (2017). TNF α -senescence initiates a STAT-dependent positive feedback loop, leading to a sustained interferon signature, DNA damage, and cytokine secretion. *Aging (Albany NY)*, Vol: 9. No: 11, hh: 24-31. DOI: <https://doi.org/10.18632/aging.101328>
- Kim, J., *et al.*, (2019). Trimethyltin chloride induces reactive oxygen species-mediated apoptosis in retinal cells during zebrafish eye development. *Science of the Total Environment*, Vol: 653. No: 4, hh: 36-44. DOI: <https://doi.org/10.1016/j.scitotenv.2018.10.317>
- Kristianingrum *et al.*, (2016). Gambaran Histopatologi Otak Tikus Akibat Injeksi Trimethyltin sebagai Model Penyakit Alzheimer. *Jurnal Sain Veteriner*, Vol: 34, No: 1, hh: 84-91. DOI: <https://doi.org/10.22146/jsv.22819>
- Kyewski B, Klein L. (2006). A central role for central tolerance. *Annu Rev Immunol*. Vol: 24. No: 5, hh: 571-606. DOI: [10.1146/annurev.immunol.23.021704.115601](https://doi.org/10.1146/annurev.immunol.23.021704.115601).
- Lecot, P., Alimirah, F., Desprez, P.Y., Campisi, J. dan Wiley, C., (2016). Context-dependent effects of cellular senescence in cancer development. *British journal of cancer*, Vol: 114. No: 11, hh: 1180-1184. DOI: <https://doi.org/10.1038/bjc.2016.115>
- Lee, S., *et al.*, (2016). Trimethyltin-induced hippocampal neurodegeneration: A mechanism-based review. *Brain research bulletin*, Vol: 125. No: 3, hh: 187-199. DOI: <https://doi.org/10.1016/j.brainresbull.2016.07.010>
- Li, D., *et al.* (2017). Transplantation of Aire-overexpressing bone marrow-derived dendritic cells delays the onset of type 1 diabetes. *International Immunopharmacology*, Vol: 49. No 1, hh: 13-20. DOI: <https://doi.org/10.1016/j.intimp.2017.05.023>

- Lee, S *et al.*, (2016). Trimethyltin-induced hippocampal neurodegeneration: A mechanism-based review. *Brain research bulletin*, Vol: 125. No: 1, hh: 187-199. DOI: DOI: 10.1016/j.brainresbull.2016.07.010.
- Liu, X.J., Wang, Y.Q., Shang, S.Q., Xu, S. dan Guo, M., (2022). TMT induces apoptosis and necroptosis in mouse kidneys through oxidative stress-induced activation of the NLRP3 inflammasome. *Ecotoxicology and environmental safety*, Vol: 230. No: 2, hh: 113-167. DOI: <https://doi.org/10.1016/j.ecoenv.2022.113167>
- Liu, Z., *et al.* (2021). The main mechanisms of trimethyltin chloride-induced neurotoxicity: Energy metabolism disorder and peroxidation damage. *Toxicology Letters*, Vol; 345. No: 2, hh: 67-76. DOI: <https://doi.org/10.1016/j.toxlet.2021.04.008>
- López-Otín C, Blasco MA, Partridge L, Serrano M, Kroemer G. (2013). The Hallmarks of Aging. *Cell*. Vol; 153. No: 6, hh: 1194–1217. DOI: 10.1016/j.cell.2013.05.039.
- Lynch, H.E., *et al.*, (2009). Thymic involution and immune reconstitution. *Trends in immunology*, Vol: 30. No: 7, hh: 366-373. DOI: <https://doi.org/10.1016/j.it.2009.04.003>
- McHugh, M. L. (2012). Interrater reliability: the kappa statistic. *Biochemia medica*, Vol: 22. No: 3, hh: 276-282.
- Mescher, A. L. (2018). *Junqueira's basic histology: text and atlas*. New York: McGraw Hill.
- Murphy, K., Weaver, C., Janeway, C. (2022). *Janeway's Immunobiology*. 10th ed. New York: Garland Science.
- Muñoz-Espín, D. dan Serrano, M., (2014). Cellular senescence: from physiology to pathology. *Nature reviews Molecular cell biology*, Vol: 15, No: 7, hh: 482-496. DOI: <https://doi.org/10.1038/nrm3823>
- Nadia, Y.F., *et al.*, (2021). Effect of Cell Culture Medium on the Proliferation and Stemness of CD24-/CD44+ Human Breast Cancer Stem Cells. *The Indonesian Biomedical Journal*, Vol: 13. No: 4, hh: 355-63. DOI: <https://doi.org/10.18585/inabj.v13i4.1674>
- Nance, D.M. dan Sanders, V.M., (2007). Autonomic innervation and regulation of the immune system (1987–2007). *Brain, behavior, and immunity*, Vol: 21. No: 6, hh: 736-745. DOI: <https://doi.org/10.1016/j.bbi.2007.03.008>
- Nishijima, *et al.* (2022). Aire controls heterogeneity of medullary thymic epithelial cells for the expression of self-antigens. *The Journal of Immunology*, Vol: 208. No: 2, hh: 303-320. DOI: <https://doi.org/10.4049/jimmunol.2100692>
- Oishi, Y. dan Manabe, I., (2016). Macrophages in age-related chronic inflammatory diseases. *NPJ aging and mechanisms of disease*, Vol: 2. No: 1, hh: 1-8. DOI: <https://doi.org/10.1038/npjamd.2016.18>
- Palacio *et al.*, (2019). Restored immune cell functions upon clearance of senescence in the irradiated splenic environment. *Aging Cell*, Vol: 18. No: 4, hh: 129-141. DOI: <https://doi.org/10.1111/accel.12971>

- Pangkahila, W., (2007). *Anti-aging Medicine: Memperlambat Penuaan Meningkatkan Hidup*. Penerbit Buku Kompas.
- Passos, *et al.*, (2018). Update on Aire and thymic negative selection. *Immunology*, Vol: 153. No: 1, hh: 10-20. DOI: <https://doi.org/10.1111/imm.12831>
- Pearse, G. (2006). Normal structure, function and histology of the thymus. *Toxicologic pathology*, Vol: 34. No: 5, hh: 504-514. DOI: 10.1080/01926230600865549
- Reis, *et al.* (2015). Decline of FOXP1 gene expression in human thymus correlates with age: possible epigenetic regulation. *Immunity & Ageing*, Vol: 12. No: 1, hh: 1-14. DOI: <https://doi.org/10.1186/s12979-015-0045-9>
- Rezzani, *et al.*, (2014). Thymus and aging: morphological, radiological, and functional overview. *Age*, Vol: 36. No: 1, hh: 313-351. DOI: <https://doi.org/10.1007/s11357-013-9564-5>
- Rodrigues, L.P., *et al.* (2021). Hallmarks of aging and immunosenescence: Connecting the dots. *Cytokine & Growth Factor Reviews*, Vol: 59. No: 4, hh: 9-21. DOI: <https://doi.org/10.1016/j.cytogfr.2021.01.006>
- Schmittgen, T.D. dan Livak, K.J., (2008). Analyzing real-time PCR data by the comparative CT method. *Nature protocols*, Vol: 3. No: 6, hh: 1101-1108. DOI: <https://doi.org/10.1038/nprot.2008.73>
- Sengupta, P. (2013). The laboratory rat: relating its age with human's. *International journal of preventive medicine*, Vol: 4. No: 6, hh: 624-634. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3733029/>
- Singh, J., dan Singh, A. K. (1979). Age-related changes in human thymus. *Clinical and Experimental Immunology*, Vol: 37. No: 3, 507-517.
- Siregar, F.M., (2019). Immunosenescence: Penuaan Pada Sel Makrofag. *Jurnal Ilmu Kedokteran (Journal of Medical Science)*, Vol: 13. No: 1, hh.14-22.
- Sun, Y., Coppé, J. P., dan Lam, E. W. F. (2018). Cellular senescence: the sought or the unwanted?. *Trends in Molecular Medicine*, Vol: 24. No: 10, hh: 871-885. DOI: 10.1016/j.molmed.2018.08.002
- Tang, X *et al.*, (2013). Toxicity of trimethyltin and dimethyltin in rats and mice. *Bulletin of environmental contamination and toxicology*, Vol: 90. No: 5, hh: 626-633. DOI: <https://doi.org/10.1007/s00128-013-0975-x>
- Taub, D. D., dan Longo, D. L. (2005). Insights into thymic aging and regeneration. *Immunological reviews*, Vol: 205. No: 1, hh: 72-93. DOI: <https://doi.org/10.1111/j.0105-2896.2005.00275.x>
- Thomas, R., Wang, W. dan Su, D.M., (2020). Contributions of age-related thymic involution to immunosenescence and inflammaging. *Immunity & Ageing*, Vol: 17. No: 1, hh: 1-17. DOI: <https://doi.org/10.1186/s12979-020-0173-8>
- Ting Ting Wei *et al* (2021). Dosage effects of resveratrol on thymus involution in D-galactose-treated mice. *Journal of Food Biochemistry*, Vol: 45, No: 5, hh: 137-159. DOI: <https://doi.org/10.1111/jfbc.13709>