

DAFTAR PUSTAKA

- Abdu S.B. 2018. ‘Ameliorative influence of ajwa dates on ochratoxin a-induced testis toxicity’. *Journal of Microscopy and Ultrastructure*. 6: 134-138.
- Adibmoradi M., H. Morovvati., H.R. Moradi., M.T. Sheybani., J.S. Amoli., R.M.N. Fard., and A.K. Hesari. 2015. ‘Protective effects of wheat sprout on testicular toxicity in male rats exposed to lead’. *Reproductive System and Sexual Disorders*. 4 (4): 1-9.
- Aitken R.J. and S.D. Roman. 2008. ‘Antioxidant system and oxidative stress in the testes’. *Oxidative Medicine and Cellular Longevity*. 1 (1): 15-24.
- Al-Omary H.L., Z.M. Alawad., and I.F. Jaafar. 2016. ‘Environmental lead exposure and male infertility’. *IOSR Journal of Dental and Medical Sciences*. 15 (9): 49-54.
- Apak R., M. Özyürek., K. Güçlü., and E. Çapanoğlu. 2016. ‘Antioxidant activity/capacity measurement 2 hydrogen atom transfer (HAT)-based, mixed-mode (electron transfer (ET)/ HAT), and lipid peroxidation assays’. *Journal of Agricultural and Food Chemistry*. 64 (5): 1028-1045.
- Ardillah Y. 2016. ‘Faktor risiko kandungan timbal di dalam darah’. *Jurnal Kesehatan Masyarakat*. 7 (3): 150-155.
- Asih I.A.R., N.M. Puspawati., and W.S. Rita. 2017. ‘In vitro evaluation of antioxidant activity of flavonoid compounds from terong belanda (*Solanum betaceum*, Cav.)’. *Journal of Health Sciences and Medicine*. 1 (2): 23-26.
- Atiqah N., A.A.K. Maisarah., and R. Asmah. 2014. ‘Comparison of antioxidant properties of tamarillo (*Cyphomandra betacea*), cherry tomato (*Solanum copersicum* var. *cerasiform*) and tomato (*Lycopersicon esculentum*)’. *International Food Research Journal*. 21 (6): 2355-2362.
- Bahriul P., N. Rahman., dan A.W.M. Diah. 2014. ‘Uji aktivitas antioksidan ekstrak daun salam (*Syzygium polyanthum*) dengan menggunakan 1,1-difenil-2-pikrilhidrazil’. *Jurnal Akademika Kimia*. 3 (3): 143-149.
- Boskabady M., N. Marefati., T. Farkhondeh., F. Shakeri., A. Farshbaf., M. H. Boskabady. 2018. ‘The effect of environmental lead exposure on human health and the contribution of inflammatory mechanisms, a review’. *Environment International*. 120: 404-420.
- Bouayed J. and T. Bohn. 2010. ‘Exogenous antioxidants-double-edged swords in cellular redox state: health beneficial effects at physiologic doses versus

- deleterious effects at high doses'. *Oxidative Medicine Cellular Longevity.* 3 (4): 228-237.
- Bouazza S., Demmouche A., Toumi-Benali F., Zouba., Bahri M.R., Agher N., Merakchi N., and Ahmar M.E. 2018. 'Effect of bee pollen extract on lead-induced toxicity in rat testis'. *South Asian Journal of Experimental Biology.* 8 (3): 91-102.
- Chen Y., Y. Zhou., J. Wang., L. Wang., Z. Xiang., D. Li., and X. Han. 2016. 'Microcystin-leucine arginine causes cytotoxic effects in sertoli cells resulting in reproductive dysfunction in male mice'. *Scientific Reports.* 2016: 1-18.
- Claudia V., E. de Queljoe., dan L. Tendean. 2013. 'Perbedaan kualitas spermatozoa mencit jantan (*Mus musculus* L) yang diberikan vitamin C setelah pemaparan asap rokok'. *Jurnal e-Biomedik.* 1 (1): 629-634.
- Clay K., M. Portnykyh., and E. Severnini. 2018. *Toxic truth: lead and fertility.* Cambridge: National Bureau of Economic Research.
- Dantas T.A., G. Cancian., D.N.R. Neodini., D.R.S. Mano., C. Capucho., F.S. Predes., R.B. Pulz., A.A. Pigoso., H. Dolder., and G.D.C. Severi-Aguiar. 2015. 'Leydig cell number and sperm production decrease induced by chronic ametryn exposure: a negative impact on animal reproductive health'. *Environmental Science Pollutant Research.* 22 (8): 8526-8535.
- Darbandi M., S. Darbandi., A. Agarwal., P. Sengupta., D. Durairajanayagam., R. Henkel., and M. R. Sadeghi. 2018. 'Reactive oxygen species and male reproductive hormones'. *Reproductive Biology and Endocrinology.* 2018: 1-14.
- Devi N.P.A. 2018. 'Pengaruh penambahan terung belanda (*Solanum betaceum* Cav.) terhadap karakteristik *marshmallow*'. *Jurnal ITEPA.* 7 (1): 23-32.
- Diana A.N., R. I'tishom., and S.A. Sudjarwo. 2017. 'Nigella sativa extract improves seminiferous tubule epithelial thickness in lead acetate-exposed Balb/c mice'. *Folia Medica Indonesiana.* 53 (3): 180-184.
- do Nascimento G.E., L.A. Hamm., C.H. Baggio., M.F.P. Werner., M. Iacomini., and L.M.C. Cordeiro. 2013. 'Structure of a galactoarabinoglucuronoxylan from tamarillo (*Solanum betaceum*), a tropical exotic fruit, and its biological activity'. *Food Chemistry.* 141: 510-516.
- Elnaga A.A.A., A.A. Kassab., G.M. Soliman., A.O. El Shal. 2018. 'Histological and immunohistochemical study of the effect of tramadol on the seminiferous tubules of adult albino rat and the effect of its withdrawal'. *Tanta Medical Journal.* 46: 38-53.

- Ericson B., N. Hariojati., B. Susilorini., L.F. Crampe., R. Fuller., M.P. Taylor., and J. Caravanos. 2019. 'Assessment of the prevalence of lead-based paint exposure risk in Jakarta, Indonesia'. 657: 1382-1388.
- Ettinger A.S., M.L. Leonard., and J. Mason. 2019. 'CDC's lead poisoning prevention program: a long-standing responsibility and commitment to protect children from lead exposure'. *Journal Public Health Management Practice*. 25: 5-12.
- Fastawa R., Nahariah., dan F. Maruddin. 2016. 'Optimasi antioksidan dengan lama fermentasi yang berbeda pada telur infertile sisa hasil penetasan'. *JITP*. 5 (1): 58-65.
- Fithriyah R., Tjandrakirana., and Ducha N. 2014. 'Efek filtrat tauge kacang hijau terhadap jumlah sel Sertoli pada testis mencit yang terpapar MSG'. *LenteraBio*. 3 (3): 192-197.
- Gabrielsen J.S. and C. Tanrikut. 2016. 'Chronic exposures and male fertility: the impacts of environment, diet, and drug use on spermatogenesis.' *Andrology*. 4: 648-661.
- Gandhi J., Hernandez R.J., Chen A., Smith N.L., Sheynkin Y.R., Joshi G., and Khan A. 2017. 'Impaired hypothalamic-pituitary-testicular axis activity, spermatogenesis, and sperm function promote infertility in males with lead poisoning'. *Zygote*. 25: 103-110.
- Garu U., R. Sharma., and I. Barber. 2011. 'Effect of lead toxicity on developing testis of mice'. *International Journal of Pharmaceutical Sciences and Research*. 2 (9): 2403-2407.
- Gidlow D.A. 2015. 'Lead toxicity'. *Occupational Medicine*. 65: 348-356.
- Guerriero G., S. Trocchia., F.K. Abdel-Gawad., and G. Ciarcia. 2014. 'Roles of reactive oxygen species in the spermatogenesis regulation'. *Frontiers in Endocrinology*. 5 (56): 1-4.
- Hamid H.S., J. Darvish., E. Rastegar-Pouyani., and A. Mahmoudi. 2016. 'Subspecies differentiation of the house mouse *Mus musculus* Linnaeus, 1758 in the center and east of the Iranian plateau and Afghanistan'. *Mammalia*. 2016: 1-22.
- Harlis W.O. dan A. Septiana. 2017. 'Gambaran histologi testis mencit (*Mus musculus*, L.) setelah pemberian ekstrak tumbuhan brotowali (*Tinospora crispa*, L.)'. *Biowallacea*. 4 (1): 558-565.
- Haryanto B. 2016. 'Lead exposure from battery recycling in Indonesia'. *Reviews on Environmental Health*. 31 (1): 13-16.

- Hassan S.H. and M.F.A. Bakar. 2013. ‘Antioxidative and anticholinesterase activity of *Cyphomandra betacea* fruit’. *The ScientificWorld Journal*. 2013: 1-7.
- Haw K.Y., S. Chakravarthi., N. Haleagrahara., and M. Rao. 2012. ‘Effect of *Etlingera elatior* extracts on lead acetate-induced testicular damage: A morphological and biochemical study’. *Experimental and Therapeutic Medicine*. 3: 99-104.
- Hemalatha S. and R. Hari. 2015. ‘Fertility enhancing effect of saponin rich butanol extracts of *Tribulus terrestris* fruits in male albino rats’. *International Journal of Pharmaceutical and Clinical Research*. 7 (1): 36-43.
- Jahromi V.H., K. Parivar., and M. Forozanfar. ‘The effect of cinnamon extract on spermatogenesis hormonal axis of pituitary gonad in mice’. *Iranian Journal of Applied Animal Science*. 1 (2): 99-103.
- Ji X., Z. Li., H. Chen., J. Li., H. Tian., Z. Li., X. Gao., Q. Xiang., Z. Su., Y. Huang., and Q. Zhang. 2015. ‘Cytotoxic mechanism related to dihydrolipoamide dehydrogenase in Leydig cells exposed to heavy metals’. *Toxicology*. 334: 22-32.
- Khaerunnisa S. 2018. ‘Mekanisme preventif ekstrak etanol *Solanum betaceum* terhadap penurunan memori, jumlah sel neuron dan glia, NMDAR, CREB, BDNF pada hipokampus *Rattus norvegicus* yang dipapar asap rokok’. [Disertasi]. Surabaya. Fakultas Kedokteran Universitas Airlangga Surabaya.
- Khaerunnisa S., K. Kusumastuti., A. Mustika., N.S. Aminah., and S. Suhartati. 2019. ‘Mechanism of *Solanum betaceum* to prevent memory impairment in cigarette smoke-exposed rat’. *International Journal of Applied Pharmaceutics*. 11 (3): 25-29.
- Kooti W., Mansouri E., Ghasemiboroon M., Harizi M., Ashtary-Larky D., and Afrisham R. 2014. ‘The effects of hydroalcoholic extract of *Apium graveolens* leaf on the number of sexual cells and testicular structure in rat’. *Jundishapur Journal of Natural Pharmaceutical Products*. 9 (4): 1-6.
- Krishnamoorthy G., K. Selvakumar., P. Venkataraman., P. Elumalai., J. Arunakaran. 2013. ‘Lycopene supplementation prevents reactive oxygen species mediated apoptosis in Sertoli cells of adult albino rats exposed to polychlorinated biphenyls’. *Interdisciplinary Toxicology*. 6 (2): 83-92.
- Kumar R.S. and S.A. Devi. 2018. ‘Lead toxicity on male reproductive system and its mechanism: a review’. *Research Journal of Pharmacy and Technology*. 11 (3): 1228-1232.

- Kurutas E.B. 2016. 'The importance of antioxidants which play the role in cellular response against oxidative/ nitrosative stress: current state'. *Nutrition Journal*. 2016: 1-22.
- Lemeshow S. 1990. *Adequacy of sample size in health studies*. England: WHO.
- Li C., K. Zhao., H. Zhang., L. Liu., F. Xiong., K. Wang., and B. Chen. 2018. 'Lead exposure reduces sperm quality and DNA integrity in mice'. *Environmental Toxicology*. 33: 594-602.
- Liu Q., Z. Lei., M. Dai., X. Wang., and Z. Yuan. 2017. 'Toxic metabolites, Sertoli cells and Y chromosome related genes are potentially linked to the reproductive toxicity induced by mequindox'. *Oncotarget*. 8 (50): 87512-87528.
- Masbiontoro A., S.M. Agustini., dan T. Djauhari. 2016. 'Pengaruh ekstrak buah terong belanda (*Solanum betaceum*) sebagai antioksidan terhadap kadar malondialdehida pada tikus putih (*Rattus novergicus*) yang diinduksi CCL₄'. *Jurnal Universitas Muhammadiyah Malang*. 12 (1): 38-42.
- Mathur P.P., L. Huang., A. Kashou., S. Vaithinathan., and A. Agarwal. 2011. 'Environmental toxicants and testicular apoptosis'. *The Open Reproductive Science Journal*. 3: 114-124.
- Mulyadi., H.J. Mukono., dan H. Notopuro. 2015. 'Paparan timbal udara terhadap timbal darah, hemoglobin, Cystatin C serum pekerja pengecatan mobil'. *Jurnal Kesehatan Masyarakat*. 11 (1): 87-95.
- Mustafa H.N. 2015. 'Potential alleviation of *Chlorella vulgaris* and *Zingiber officinale* on lead-induced testicular toxicity: an ultrastructural study'. *Folia Biologica*. 63 (4): 269-278.
- Nallakurumban P., N. Suja., A. Vijayakumar., P.S. Geetha., and L. Karpagapandi. 2015. 'Estimation of phytochemicals and antioxidant property of tamarillo (*Solanum betaceum*) and a value added product tamarillo sauce'. *International Journal of Scientific Progress and Research (IJSR)*. 9 (2): 61-65.
- Nkechi F., C. Bright., and Rose. 2015. 'The effect of lead acetate on the testes of male albino rats'. *Advances in Life Science and Technology*. 38: 70-74.
- Nakarimah D.A., E.P. Hestianah., R.S. Wahjuni., M. Hariadi., S. Kuncorojakti., and H.A. Hermadi. 2017. 'Effect of propolis on spermatogenic cells number and diameter of seminiferous tubules in male mice (*Mus musculus*)'. *The Veterinary Medicine International Conference 2017*. VMIC 2017: 677-683.

- Nimse S.B. and D. Pal. 2015. ‘Free radicals, natural antioxidants, and their reaction mechanism’. *Royal Society of Chemistry*. 5: 27986-28006.
- Ordonez R.M., M.L. Cardozo., I.C. Zampini., and M.I. Isla. 2010. ‘Evaluation of antioxidant activity and genotoxicity of alcoholic and aqueous beverages and pomace derived from ripe fruits of *Cyphomandra betacea* Sendt.’ *Journal of Agricultural and Food Chemistry*. 58: 331-337.
- Osorio C., N. Hurtado., C. Dawid., T. Hofmann., F.J. Heredia-Mira., and A.L. Morales. 2012. ‘Chemical characterisation of anthocyanins in tamarillo (*Solanum betaceum* Cav.) and Andes berry (*Rubus glaucus* Benth.) fruits’. *Food Chemistry*. 132: 1915-1921.
- Ouldali O., A.H. Nadia., and A. Aek. 2015. ‘Effect of pectin from date (*Phoenix actylifera*) upon lead acetate induced reproductive toxicity in male rats’. *Journal of Chemical and Pharmaceutical Research*. 7 (4): 1536-1543.
- Parekattil S.J. and A. Agarwal. 2012. *Male infertility, contemporary clinical approaches, andrology, ART & antioxidants*. London: Springer.
- Petersen P.M., K. Seierøe., B. Pakkenberg. 2015. ‘The total number of Leydig and Sertoli cells in the testes of men across various age groups – a stereological study’. *Journal of Anatomy*. 226: 175-179.
- Phifer-Rixey M. and M.W. Nachman. 2015. ‘Insights into mammalian biology from the wild house mouse *Mus musculus*’. *eLife*. 2015 (4): 1-13.
- Priska M., N. Peni., L. Carvallo., and Y.D. Ngapa. 2018. ‘Review: antosianin dan pemanfaatannya’. *Cakra Kimia Indonesian e-Journal of Applied Chemistry*. 6 (2): 79-97.
- Qiu L., X. Zhang., X. Zhang., Y. Zhang., J. Gu., M. Chen., Z. Zhang., X. Wang., and S.L. Wang. 2013. ‘Sertoli cell is a potential target for perfluorooctane sulfonate-induced reproductive dysfunction in male mice’. *Toxicological Sciences*. 135 (1): 229-240.
- Raharjo R., S.A. Sudjarwo., and R. I’tishom. 2017. ‘Effects of red dragon fruit (*Hylocereus polyrhizus*) skin extract on lead acetate toxicity in the morphology of Balb/c mice (*Mus musculus*) spermatozoa’. *Folia Medica Indonesiana*. 53 (4): 237-241.
- Ramos-Treviño J., S.Bassol-Mayagoitia., J.A. Hernandez-Ibarra., P. Ruiz-Flores., and M.P. Nava-Hernandez. 2018. ‘Toxic effect of cadmium, lead, and arsenic on the sertoli cell: mechanism of damage involved’. *DNA and Cell Biology*. 37 (7): 600-608.
- Rebourcet D., P.J. O’Shaughnessy., A. Monteiro., L. Milne., L. Cruickshanks., N. Jeffrey., F. Guilou., T.C. Freeman., R.T. Mitchell., and L.B. Smith’. 2014.

- ‘Sertoli cells maintain leydig cell number and peritubular myoid cell activity in the adult mouse testis’. *PLOS One*. 9 (8): 1-13.
- Sachdeva C., K. Thakur., A. Sharma., and K.K. Sharma. 2018. ‘Lead: tiny but mighty poison’. *International Journal Clinical Biochemistry*. 33 (2): 132-146.
- Safitri I., H.B. Hidayati., A. Turchan., Suhartati., and S. Khaerunnisa. 2019. ‘*Solanum betaceum* improves cognitive function by decreasing N-Methyl-D-Aspartate on Alzheimer rats model’. *International Journal of Applied Pharmaceutics*. 11 (5): 167-170.
- Schattman G.L., S.C. Esteves., and A. Agarwal. 2015. *Unexplained infertility, pathophysiology, evaluation and treatment*. New York: Springer.
- Sedes L., C.Desdoits-Lethimonier., B. Rouaisnel., H. Holota., L. Thirouard., L. Lesne., C. Damon-Soubeyrand., E. Martinot., J.Saru., S. Mazaud-Guittot., F.Caira., C. Beaudoin., B. Jegou., and D.H. Volle. 2018. ‘Crosstalk between BPA and FXRa signaling pathways lead to alterations of undifferentiated germ cell homeostasis and male fertility disorders’. *Stem Cell Reports*. 11: 944-958.
- Sengupta P. and R. Banerjee. 2014. ‘Environmental toxins: alarming impacts of pesticides on male fertility’. *Human and Experimental Toxicology*. 33 (10): 1017-1039.
- Sentra Informasi Keracunan Nasional (SiKerNAs). 2012. *Timbal asetat*. Jakarta: Pusat Informasi Obat dan Makanan Badan POM RI.
- Sihombing J.R., A. Dharma., Z. Chadir., Almahdy., E. Fachrial., and E. Munaf. 2015. ‘Phytochemical screening and antioxidant activities of 31 fruit peel extract from Sumatera, Indonesia’. *Journal of Chemical and Pharmaceutical Research*. 7 (11): 190-196.
- Slimen I.B., T. Najar., A. Ghram., H. Dabbei., M. B. Mrad., and M. Abdrabah. 2014. ‘Reactive oxygen species, heat stress and oxidative-induced mitochondrial damage. a review’. *International Journal Hyperthermia*. 30 (7): 513-523.
- Suhendra C.P., I.W.R. Widarta., dan A.A.I.S. Wiadnyani. 2019. ‘Pengaruh konsentrasi etanol terhadap aktivitas antioksidan ekstrak rimpang ilalang (*Imperata cylindrical* (L) Beauv.) pada ekstraksi menggunakan gelombang ultrasonik’. *Jurnal Ilmu dan Teknologi Pangan*. 8 (1): 27-35.
- Teerds K.J. and I.T. Huhtaniemi. 2015. ‘Morphological and functional maturation of Leydig cells: from rodent models to primates’. *Human Reproduction Update*. 21 (3): 310-328.

- UNEA. 2017. *Towards a pollution-free planet*. Kenya: United Nations Environment Programme.
- Unitly A.J.A. 2019. 'The study of administration extract kebar's grass on number Leydig cells and Sertoli cells in rat *Rattus norvegicus* that exposed with cigarette smoke'. *Rumphus Pattimura Biological Journal*. 1 (1): 8-11.
- Verdiana M., I.W.R. Widarta., dan I.D.G.M. Permana. 2018. 'Pengaruh jenis pelarut pada ekstraksi menggunakan gelombang ultrasonik terhadap aktivitas antioksidan ekstrak kulit buah lemon (*Citrus limon* (Linn.) Burm F.)'. *Jurnal Ilmu dan Teknologi Pangan*. 7 (4): 213-222.
- Vigeh M., Smith D.R., and Hsu P.C. 2011. 'How does lead induce male infertility?' *Iranian Journal of Reproductive Medicine*. 9 (1): 1-8.
- Wani A.L., A. Ara., and J.A. Usmani. 2015. 'Lead toxicity: a review'. *Interdisciplinary Toxicology*. 8 (2): 55-64.
- Wagner H., J.W. Cheng., and E.Y. Ko. 2018. 'Role of reactive oxygen species in male infertility: an updated review of literature'. *Arab Journal of Urology*. 16: 35-43.
- White and Porterfield. 2013. *Endocrine and reproductive physiology*. Philadelphia: Elsevier Mosby.
- Widawati T., S.A. Sudjarwo., and H.A. Hermadi. 2017. 'Protective effect of propolis extract against lead acetate toxicity in mice (*Mus musculus*) testes'. *The Veterinary Medicine International Conference 2017*. VMIC 2017: 557-565.
- Wulandari E. 2018. 'Potensi ekstrak kulit buah naga merah (*Hylocereus polyrhizus*) untuk memperbaiki tebal epitel tubulus seminiferus, sel leydig, sertoli, spermatogenik, dan kadar testosteron mencit (*Mus musculus*) Balb/C yang dipapar timbal asetat'. [Tesis]. Surabaya. Fakultas Kedokteran Universitas Airlangga Surabaya.
- Wulandari E., R. I'tishom R., and S.A. Sudjarwo. 2019. 'The potency of *Hylocereus polyrhizus* peel extract as protector on lead acetate-induced testicular toxicity in mice'. *The Indian Veterinary Journal*. 96 (9): 49-51.
- Xiao X., D.D. Mruk., E.I. Tang., C.K.C. Wong., W.M. Lee., C.M. John., P.J. Turek., B. Silvestrini., and C.Y. Cheng. 2014. 'Environmental toxicants perturb human Sertoli cell adhesive function via changes in F-actin organization mediated by actin regulatory proteins'. *Reproductive Biology*. 29 (6): 1279-1291.
- Xu D., Y. Li., X. Meng., T. Zhou., Y. Zhou., J. Zheng., J.J. Zhang., and H.Li. 2017. 'Natural antioxidants in foods and medicinal plants: extraction,

assessment and resources'. *International Journal of Molecular Sciences*. 18: 1-32.

Zheng W., S. Pan., G. Wang., Y.J. Wang., Q. Liu., J. Gu., Y. Yuan., X.Z. Liu., Z.P. Liu., and J.C. Bian. 2016. 'Zearalenone impairs the male reproductive system functions via inducing structural and functional alterations of sertoli cells'. *Environmental Toxicology and Pharmacology*. 42: 146-155.