

DAFTAR PUSTAKA

- Abdul Khalek, E. A., Dowidar, Y., El-Nagar, H., Wafa, W., El-Ratel, I. T., Mousbah, A., & Authors, C. 2022. A review on various antioxidants utilized in bovine sperma extenders. *Journal of Applied Veterinary Sciences*, 7(2), 13–24. <https://doi.org/10.21608/javs.20> .
- Agarwal, A., Cho, C. L., & Esteves, S. C. 2016. Should we evaluate and treat sperm DNA fragmentation? *Current Opinion in Obstetrics & Gynecology*, 28(3), 164–171. <https://doi.org/10.1097/GCO.0000000000000271>.
- Ahmed, H., Shah, S. A. H., & Jahan, S. 2019. Effect of cryopreservation on CASA characteristics, mitochondrial transmembrane potential, plasma and acrosome integrities, morphology and in vivo fertility of buffalo bull spermatozoa. *CryoLetters*, 40(3), 173–180.
- Aitken, R. J., Muscio, L., Whiting, S., Connaughton, H. S., Fraser, B. A., Nixon, B., Smith, N. D., & de Iuliis, G. N. 2016. Analysis of the effects of polyfenols on human spermatozoa reveals unexpected impacts on mitochondrial membrane potential, oxidative stress and DNA integrity; implications for assisted reproductive technology. *Biochemical Pharmacology*, 121, 78–96. <https://doi.org/10.1016/j.bcp.2016.09.015>
- Aitken, R. J., & Drevet, J. R. 2020. The Importance of Oxidative Stress in Determining the Functionality of Mammalian Spermatozoa: A Two-Edged Sword. *Antioxidants*, 9(2), 111. <https://doi.org/10.3390/antiox9020111>
- Akbar, S. A., & Hasan, M. 2024. Evaluation of bioactive composition and phytochemical profile of macroalgae *Gracilaria edulis* and *Acanthophora spicifera* from the Banda Aceh coast, Indonesia. *Science & Technology Asia*, 29(1), 1–10. <https://ph02.tci-thaijo.org/index.php/SciTechAsia/article/view/251590/170325>
- Almubarak, A., Kim, E., Yu, I.-J., Park, H., & Jeon, Y. 2024. The effect of κ -carrageenan on porcine sperm cryo-survival. *Animals*, 14(9), 1387 <https://doi.org/10.3390/ani14091387>.
- Al-Mutary, M. G. (2021). Use of antioxidants to augment sperma efficiency during liquid storage and cryopreservation in livestock animals: A review. *Journal of King Saud University - Science*, 33(1). <https://doi.org/10.1016/j.jksus.2020.10.023>.
- Alov, P., Tsakovska, I., & Pajeva, I. 2015. Computational studies of free radical-scavenging properties of fenolic compounds. *Current topics in medicinal chemistry*, 15(2), 85–104. <https://doi.org/10.2174/1568026615666141209143702>.

- Alves, M. B. R., Celeghini, E. C. C., & Belleannée, C. 2020. From sperm Motilitas to sperm-borne microRNA signatures: New approaches to predict male fertility potential. *Frontiers in Cell and Developmental Biology*, 8, 791. doi: 10.3389/fcell.2020.00791.
- Andrabi, S. M. H. 2007. Fundamental principles of cryopreservation of *Bos taurus* and *Bos indicus* bull spermatozoa. *International Journal of Agriculture and Biology* (Pakistan), 9(2), 367–369.
- Andrés, C. M. C., Pérez de la Lastra, J. M., Juan, C. A., Plou, F. J., & Pérez-Lebeña, E. 2023. Polyfenols as antioxidant/pro-oxidant compounds and donors of reducing species: Relationship with human antioxidant metabolism. *Processes*, 11(9). <https://doi.org/10.3390/pr11092771>
- Anzar, M., Kroetsch, T., & Buhr, M. M. 2009. Comparison of different methods for assessment of sperm concentration and membrane integrity with bull sperma. *Journal of Andrology*, 30, 661–668. <https://doi.org/10.2164/jandrol.108.007500>
- Arslan, N. P., Albayrak, S., Budak-Savas, A., Hacimuftuoglu, A., Orak, T., Ozdemir, A., Karadagoglu, O., Yildirim, S., Cinar-Yilmaz, H., & Taskin, M. 2025. Algal and Fungal Antioxidants Alleviate Oxidative Stress-Induced Reproductive Defects. *In Food Science and Nutrition* (Vol. 13, Issue 5). John Wiley and Sons Inc. <https://doi.org/10.1002/fsn3.70301>
- Badan Standarisasi Nasional. 2017. *SNI 4869-1:2017. Sperma beku – Bagian 1: Sapi*. Jakarta : BSN.
- Badan Standardisasi Nasional. 2021. *SNI 4869-1:2021. Sperma beku – Bagian 1: Sapi*. Jakarta: BSN.
- Badan Standarisasi Nasional . 2024. *RSNI3 4869-1:2024. Sperma beku – Bagian 1: Sapi*. Jakarta : BSN.
- Banerjee Mustafi, S., Chakraborty, P. K., Dey, R. S., & Raha, S. 2009. Heat stress upregulates chaperone *heat shock protein 70* and antioxidant manganese superoxide dismutase through reactive oxygen species (ROS), p38MAPK, and Akt. *Cell stress & chaperones*, 14(6), 579–589. <https://doi.org/10.1007/s12192-009-0109-x>
- Benedetti, S., Catalani, S., De Stefani, S., Primiterra, M., Fraternali, A., Palma, F., & Palini, S. 2022. A microplate-based DCFH-DA assay for the evaluation of oxidative stress in whole sperma. *Heliyon*, 8(9), e10642. <https://doi.org/10.1016/j.heliyon.2022.e10642>
- Benitez Mora, M.P., Del Prete, C., Longobardi, V., Cocchia, N., Esposito, R., Piscopo, F., Sicari, A., Vinale, F., Carbonari, A., Gasparrini, B. 2024.

Incubating frozenthawed buffalo sperm with olive fruit extracts counteracts thawing-induced oxidative stress and improves sperma quality. *Theriogenology* 229, 118–126. <https://doi.org/10.1016/j.theriogenology.2024.08.024>.

Berby, B., Bichara, C., Rives-Feraille, A., Jumeau, F., Pizio, P. D., Sétif, V., Sibert, L., Dumont, L., Rondanino, C., & Rives, N. 2021. Oxidative Stress Is Associated with Telomere Interaction Impairment and Chromatin Condensation Defects in Spermatozoa of Infertile Males. *Antioxidants*, 10(4), 593. <https://doi.org/10.3390/antiox10040593>

Bilodeau JF, Chatterjee S, Sirard MA, Gagnon C. 2000. Levels of antioxidant defenses are decreased in bovine spermatozoa after a cycle of freezing and thawing. *Mol Reprod Dev* 2000; 55:282-288.

Bollwein, H., & Bittner, L. 2018. Impacts of oxidative stress on bovine sperm function and subsequent *in vitro* embryo development. *Animal reproduction*, 15(Suppl 1), 703–710. <https://doi.org/10.21451/1984-3143-AR2018-0041>

Bollwein, H., & Malama, E. 2023. Review: Evaluation of bull fertility. Functional and molecular approaches. *Animal* (Vol. 17). Elsevier B.V. <https://doi.org/10.1016/j.animal.2023.100795>

Brito da Matta CB, De Souza ET, De Queiroz AC, De Lira DP, De Araújo MV, Cavalcante-Silva LHA. 2011. Antinociceptive and anti-inflammatory activity from algae of the genus *Caulerpa*. *Marine Drugs* 2011; 9:307-318.

Burch, F. C., Leung, P. Y., McDonald, E., Jensen, J., Mishler, E., Piekarski, N., Mendes, C. M., Sylwester, A., & Hanna, C. B. 2023. Establishing the normal range of sperm DNA fragmentation index (% DFI) for rhesus macaques. *Scientific reports*, 13(1), 20016. <https://doi.org/10.1038/s41598-023-46928-w>

Bustani, G. S., & Baiee, F. H. 2021. Sperma extenders: An evaluative overview of preservative mechanisms of sperma and sperma extenders. *Veterinary world*, 14(5), 1220–1233. <https://doi.org/10.14202/vetworld.2021.1220-1233>

Caroppo, E., & Dattilo, M. 2022. Sperm redox biology challenges the role of antioxidants as a Ekstrak Alga Merah for male factor infertility. In F and S Reviews (Vol. 3, Issue 1, pp. 90–104). Elsevier Inc. <https://doi.org/10.1016/j.xfnr.2021.12.001>

Castleton, P.E.; Deluao, J.C.; Sharkey, D.J.; McPherson, N.O. 2022. Measuring *Reactive oxygen species* in Sperma for Male Preconception Care: A

Scientist Perspective. *Antioxidants*. 11, 264. <https://doi.org/10.3390/antiox11020264>

Cha, J.W.; Piao, M.J.; Kim, K.C.; Zheng, J.; Yao, C.W.; Hyun, C.L.; Kang, H.K.; Yoo, E.S.; Young, S.K.; Lee, N.H. 2014. Protective effect of 3,4-dihydroxybenzoic acid isolated from *Cladophora wrightiana* Harvey against ultraviolet B radiation-induced cell damage in human HaCaT keratinocytes. *Appl. Biochem. Biotechnol*, 2014, 172, 2582–2592.

Chatterjee, A., Saha, D., Niemann, H., Gryshkov, O., Glasmacher, B., & Hofmann, N. 2017. Effects of cryopreservation on the epigenetic profile of cells. *Cryobiology*, 74, 1–7.

Chung, E. L. T., Nayan, N., Nasir, N. S. M., Hing, P. S. A., Ramli, S., Rahman, M. H. A., & Kamalludin, M. H. 2019. Effect of honey as an additive for cryopreservation on bull sperma quality from different cattle breeds under tropical condition. *Journal of Animal Health and Production*, 7(4), 171–178. <https://doi.org/10.17582/journal.jahp/2019/7.4.171.178>

Cooper, T. G., and Yeung, C.-H. 2003. Acquisition of volume regulatory response of sperm upon maturation in the epididymis and the role of the cytoplasmic droplet. *Microsc. Res. Tech.* 61, 28–38. doi: 10.1002/jemt.10314.

Darmawan Abstrak, H. 2007. Production of ROS and its effects on mitochondrial and nuclear DNA, human spermatozoa, and sperm function. *Med J Indones* (Vol. 16, Issue 2).

Dutta, S., Sengupta, P., Roychoudhury, S., Chakravarthi, S., Wang, C. W., & Slama, P. 2022. Antioxidant Paradox in Male Infertility: 'A Blind Eye' on Inflammation. *Antioxidants* (Basel, Switzerland), 11(1), 167. <https://doi.org/10.3390/antiox11010167>.

Eisenberg, H., Hütker, S., Berger, F., & Lang, I. 2025. Native proteins from *Galdieria sulphuraria* to replace fetal bovine serum in mammalian cell culture. *Applied Microbiology and Biotechnology*, 109(1). <https://doi.org/10.1007/s00253-025-13507-0>

El-Sheshtawy, R. I., & El-Nattat, W. S. 2018. Effect of tris-extender supplemented with various concentrations of *strawberry* (*Fragaria* spp.) on bull sperma preservability. *Asian Pacific Journal of Reproduction*, 7(2), 93-96. <http://doi.org/10.4103/2305-0500.228019>.

Eskandari, F., & Reza Momeni, H. 2016. Protective effect of silymarin on viability, Motilitas and mitochondrial membrane potential of ram sperm treated with sodium arsenite. *In Int J Reprod BioMed* (Vol. 14, Issue 6).

- Evenson, D. P. 2016. The Sperm Chromatin Structure Assay (SCSA®) and other sperm DNA fragmentation tests for evaluation of sperm nuclear DNA integrity as related to fertility. *Animal Reproduction Science*, 169, 56–75. <https://doi.org/https://doi.org/10.1016/j.anireprosci.2016.01.017>.
- Fan, L., Zhang, H., Li, J., Wang, Y., Leng, L., Li, J., Yao, Y., Lu, Q., Yuan, W., & Zhou, W. 2020. Algal biorefinery to value-added products by using combined processes based on thermochemical conversion: A review. In *Algal Research* (Vol. 47). Elsevier B.V. <https://doi.org/10.1016/j.algal.2020.101819>
- Fiorani, M., Guidarelli, A., & Cantoni, O. 2020. Mitochondrial Reactive Oxygen Species: The effects of Mitochondrial Ascorbic Acid vs untargeted and Mitochondria-targeted antioxidants. *International Journal of Radiation Biology*, 1–25. doi:10.1080/09553002.2020.1721604.
- Francenia Santos-Sánchez, N., Salas-Coronado, R., Villanueva-Cañongo, C., & Hernández-Carlos, B. 2019. Antioxidant Compounds and Their Antioxidant Mechanism. In *Antioxidants*. IntechOpen. <https://doi.org/10.5772/intechopen.85270>.
- G.N. Ahn, K.N. Kim, S.H. Cha, C.B. Song, M.S. Heo, Y.J. Jeon. 2007. Antioxidant activities of phlorotannins purified from *Ekoklonia cava* on free radicals scavenging using ESR and H₂O₂ mediated DNA damage, *Eur. Food Res. Technol.* 226 (2) (2007) 71–79.
- Gadea J, Parrington J, Kashir J, Coward K. 2013. The male reproductive tract and spermatogenesis. In: Coward K, Wells D, eds. *Textbook of Clinical Embryology*. Cambridge University Press; 2013:18-26.
- Ganeshpurkar, A., & Saluja, A. K. 2017. The Pharmacological Potential of Rutin. Saudi pharmaceutical journal : SPJ : the official publication of the *Saudi Pharmaceutical Society*, 25(2), 149–164. <https://doi.org/10.1016/j.jsps.2016.04.025>
- Gao, Y., Zhao, G., Song, Y., Haire, A., Yang, A., Zhao, X., & Wusiman, A. 2022. Presence of leptin and its receptor in the ram reproductive system and *in vitro* effect of leptin on sperm quality. *PeerJ*, 10. <https://doi.org/10.7717/peerj.13982>.
- Garriga, F., Maside, C., Padilla, L., Recuero, S., Rodríguez-Gil, J. E., & Yeste, M. 2024. Heat shock protein 70 kDa (HSP70) is involved in the maintenance of pig sperm function throughout liquid storage at 17 °C. *Scientific Reports*, 14(1). <https://doi.org/10.1038/s41598-024-64488-5>
- Ghareeb, D. A., Abd-Elgwad, A., El-Guindy, N., Yacout, G., & Zaatout, H. H. 2019. *Ulva lactuca* methanolic extract improves oxidative stress-related

- male infertility induced in experimental animals. *Archives of Physiology and Biochemistry*, 127(5), 397–405. <https://doi.org/10.1080/13813455.2019.1645698>.
- Goshme, S., Asfaw, T., Demiss, C., & Besufekad, S. 2021. Evaluation of Motilitas and morphology of frozen bull sperma under different thawing methods used for artificial insemination in North Shewa zone, Ethiopia. *Heliyon*, 7(10), e08183. <https://doi.org/10.1016/j.heliyon.2021.81-83>.
- Guillén, P. O., Motti, P., Mangelinckx, S., de Clerck, O., Bossier, P., & van den Hende, S. 2022. Valorization of the chemical diversity of the tropical red seaweeds *Acanthophora* and *Kappaphycus* and their applications in aquaculture: A review. In *Frontiers in Marine Science* (Vol. 9). *Frontiers Media S.A.* <https://doi.org/10.3389/fmars.2022.957290>
- Guo, M., Xu, W., Yamamoto, Y., & Suzuki, T. 2021. Curcumin increases *heat shock protein 70* expression via different signaling pathways in intestinal epithelial cells. *Archives of Biochemistry and Biophysics*, 707. <https://doi.org/10.1016/j.abb.2021.108938>
- Gupta, S., Kumar, A., Mahajan, A., Sharma, P., Sachan, V., Aggrawal, J., Yadav, S., Saxena, A., & Kumar Swain, D. 2022. Curcumin in a tris-based sperma extender improves cryosurvival of Haryana bull spermatozoa. *Andrologia*, 54(1), e14255. <https://doi.org/10.1111/and.14255>.
- Hamrun, N., Djamaluddin, N., & Dahri, I. N. A. 2022. Antioxidant activity of red algae extract (Rhodophyta) *Eucheuma spinosum* measured by 2,2-diphenyl-1-picrylhydrazyl method. *Journal of Dentomaxillofacial Science*, 7(1), 14–19. https://doi.org/10.15562/jdmfs.v7i1_1304.
- Hassan, M.A.; Khalil, W.A.; Abdelnour, S.A.; Aman, R.M. 2022. Supplementation of alpha-lipoic acid-loaded nanoliposomes in sperma extender improves freezability of buffalo spermatozoa. *Sci. Rep.* 2022, 12, 22464.
- Holdt, S.L. & Kraan, S. 2011. Bioactive compounds in seaweed: Functional food applications and legislation. *J. Appl. Phycol.*, 23: 543–597.
- Holt WV. 2000. Basic aspects of frozen storage of sperma. *Anim Reprod Sci* 2000; 62: 3e22.
- Hossen, S., Sukhan, Z. P., Cho, Y., Lee, W. K., & Kho, K. H. 2022. Antioxidant Activity and Oxidative Stress-Oriented Apoptosis Pathway in Saccharides Supplemented Cryopreserved Sperm of Pacific Abalone, *Haliotis discus hannai*. *Antioxidants* (Basel, Switzerland), 11(7), 1303. <https://doi.org/10.3390/antiox11071303>

- Huang, X., Shi, X., Zhou, J., Li, S., Zhang, L., Zhao, H., Kuang, X., & Li, J. 2020. The activation of antioxidant and apoptosis pathways involved in damage of human proximal tubule epithelial cells by PM2.5 exposure. *Environmental Sciences Europe*, 32(1). <https://doi.org/10.1186/s12302-019-0284-z>
- Ibrahim, N. M., Ibrahim, S. R., Ashour, O. H., Abdel-Kader, T. G., Hassan, M. M., & Ali, R. S. 2021. The effect of Red Seaweed (*Chondrus crispus*) on the fertility of male albino rats. *Saudi Journal of Biological Sciences*, 28(7), 3864–3869. <https://doi.org/10.1016/j.sjbs.2021.03.059>
- Inaba, K. 2003. Molecular architecture of the sperm flagella: molecules for Motilitas and signaling. *Zool. Sci.* 20, 1043–1056. doi: 10.2108/zsj.20.1043
- Izquiedo Narvaez, J., Fonseca-De La Hoz, J., Kannan, G., & Bohorquez-Herrera, J. 2024. Use of macroalgae as a nutritional supplement for sustainable production of ruminants: A systematic review and an insight on the Colombian Caribbean region. *Algal Research*, 77. <https://doi.org/10.1016/j.algal.2023.103359>
- J.A.G.F. Vega, L. Güenaga, F.L. Figueroa, J.L. 2020. Gomez-Pinchetti Antioxidant activity of extracts from marine macroalgae, wild-collected and cultivated, in an integrated multi-trophic aquaculture system. *Aquaculture* 522 pp. 1-10
- Jalal, M. P., Mehdipour, M., Sharifi, S. D., & Farhadi, R. 2025. Thymus vulgaris extract as a potent cryoprotectant enhancing antioxidant defense and sperm quality in roosters. *Poultry Science*, 105345. <https://doi.org/10.1016/j.psj.2025.105345>
- Jomova, K., Alomar, S. Y., Alwasel, S. H., Nepovimova, E., Kuca, K., & Valko, M. 2024. Several lines of antioxidant defense against oxidative stress: antioxidant enzymes, nanomaterials with multiple enzyme-mimicking activities, and low-molecular-weight antioxidants. *Archives of toxicology*, 98(5), 1323–1367. <https://doi.org/10.1007/s00204-024-03696-4>
- Kaltsas A. 2023. Oxidative Stress and Male Infertility: The Protective Role of Antioxidants. *Medicina* (Kaunas, Lithuania), 59(10), 1769. <https://doi.org/10.3390/medicina59101769>
- Katamang, A. v, C Rumampuk, N. D., Gerung, G. S. 2016. Studi Ilmu Kelautan, P., Perikanan dan Ilmu Kelautan, F., & Sam Ratulangi, U. Telaah Bentuk Sel *Acanthophora Spicifera* Dari Pantai Beton Panjang Mokupa Sulawesi Utara. *In Jurnal Pesisir dan Laut Tropis* (Vol. 1).
- Khalil, W. A., El-Harairy, M. A., Zeidan, A. E. B., Hassan, M. A. E., & Mohey-Elsaeed, O. 2017. Evaluation of bull spermatozoa during and after

- cryopreservation: Structural and ultrastructural insights. *International journal of veterinary science and medicine*, 6(Suppl), S49–S56. <https://doi.org/10.1016/j.ijvsm.2017.11.001>
- Khalil, W. A., El-Harairy, M. A., Zeidan, A. E. B., Hassan, M. A. E., & Mohey-Elsaeed, O. 2018. Evaluation of bull spermatozoa during and after cryopreservation: Structural and ultrastructural insights. *International Journal of Veterinary Science and Medicine*, 6, S49–S56. <https://doi.org/10.1016/j.ijvsm.2017.11.001>
- Kim, E., Almubarak, A., Talha, N., Yu, I. J., & Jeon, Y. 2022. The use of κ-carrageenan in egg yolk free extender improves the efficiency of canine sperma cryopreservation. *Animals*, 12(1). <https://doi.org/10.3390/ani12010088>
- Komariah R, Arifiantini I, Aun M, Sukmawati E. 2020. Kualitas sperma Segar dan produksi sperma beku sapi pejantan madura pada musim yang berbeda. *Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan*, 8(1):15-21.
- Kowalczyk A. 2022. The Role of the Natural Antioxidant Mechanism in Sperm Cells. *Reproductive sciences* (Thousand Oaks, Calif.), 29(5), 1387–1394. <https://doi.org/10.1007/s43032-021-00795-w>.
- Kowsar, R., Ronasi, S., Sadeghi, N., Sadeghi, K., & Miyamoto, A. 2021. Epidermal growth factor alleviates the negative impact of urea on frozen-thawed bovine sperm, but the subsequent developmental competence is compromised. *Scientific Reports*, 11(1). <https://doi.org/10.1038/s41598-021-83929-z>.
- Kumar, A., Prasad, J. K., Srivastava, N., & Ghosh, S. K. 2019. Strategies to minimize various stress-related freeze–thaw damages during conventional cryopreservation of mammalian spermatozoa. *Biopreservation and Biobanking*, 17(6), 603–612. <https://doi.org/10.1089/bio.2019.0037>
- Lee, J.-C., Hou, M.-F., Huang, H.-W., Chang, F.-R., Yeh, C.-C., Tang, J.-Y. & Chang, H.-W. 2013. Marine algal natural products with anti-oxidative, antiinflammatory, and anti-cancer properties. *Cancer Cell Int.*, 13(1): 55. <https://doi.org/10.1186/1475-2867-13-55>
- Li, W., Appiah, M. O., Zhao, J., Liu, H., Wang, J., & Lu, W. 2020. Effects of κ-carrageenan supplementation or in combination with cholesterol-loaded cyclodextrin following freezing-thawing process of rooster spermatozoa. *Cryobiology*, 95, 36–43. <https://doi.org/10.1016/j.cryobiol.2020.06.009>.
- Lü, J. M., Lin, P. H., Yao, Q., & Chen, C. 2010. Chemical and molecular mechanisms of antioxidants: experimental approaches and model systems.

Journal of cellular and molecular medicine, 14(4), 840–860.
<https://doi.org/10.1111/j.1582-4934.2009.00897.x>

- Malik, A. 2019. Effects of honey supplementation into the extender on the Motilitas, abnormality and viability of frozen-thawed of Bali bull spermatozoa. *Asian Journal of Animal and Veterinary Advances*, 13(2), 109-113. <https://doi.org/10.1016/j.anireprosci.2014.11.015>
- M. S. Uddin and A. B. Upaganlawar. 2019. *Oxidative Stress and Antioxidant Defense: Biomedical Value in Health and Diseases*. Nova Science Publishers, USA.
- Masudul Hoque, S. A., Selim, A. S. M., Islam, M. M., Islam, M. R., Meem, I. J., & Rahman, M. M. 2024. Impact of seaweed on growth performance, sperm quality, and testicular histomorphology of ram. *Journal of Advanced Biotechnology and Experimental Therapeutics*, 7(2), 420–432. <https://doi.org/10.5455/jabet.2024.d36>
- Moran, S. P., Chi, T., Prucha, M. S., Agca, Y., & Chan, A. W. 2016. Cryotolerance of Sperm from Transgenic Rhesus Macaques (*Macaca mulatta*). *Journal of the American Association for Laboratory Animal Science: JAALAS*, 55(5), 520–524.
- Muthuraman, M. S., Sivasubramanian, A., Sundaram Muthuraman, M., Mani, S., Thangaraj, U., & Sivasubramanian, A. 2014. *In vitro* cytotoxicity and molecular docking studies on *Acanthophora spicifera*. *In Scholars Research Library Der Pharma Chemica* (Vol. 6, Issue 1). www.derpharmachemica.com
- Nagata MPB, Egashira J, Katafuchi N, Endo K, Ogata K, Yamanaka K, Yamanouchi T, Matsuda H, Hashiyada Y, Yamashita K. 2019. Bovine sperm selection procedure prior to cryopreservation for improvement of post-thawed sperma quality and fertility. *Journal of Animal Science and Biotechnology*, Doi.10.1186/s40104-019-0395-9.
- Nguyen, N. T. T., & Tran, T. M. 2024. A Review: Classification, Chemical Compositions and Antioxidant Properties of Red, Brown and Green Macroalgae. *In Ilmu Kelautan: Indonesian Journal of Marine Sciences* (Vol. 29, Issue 3, pp. 340–350). Diponegoro University. <https://doi.org/10.14710/ik.ijms.29.3.340-350>
- Osawe, S.O & Farombi, E.O. 2018. Quercetin and rutin ameliorates sulphasalazine-induced spermotoxicity, alterations in reproductive hormones and steroidogenic enzyme imbalance in rats. *Andrologia*, 50, e12981. <https://doi.org/10.1111/and.12981>.

- Osuna-Ruiz I, Lopez-Saiz CM, Burgos-Hernandez A, Velazquez C, Nieves- Soto M, Hurtado-Oliva MA. 2016. Antioxidant, antimutagenic and antiproliferative activities in selected seaweed species from Sinaloa, Mexico. *Pharm Biol* 2016; 54:2196210.
- Ounjai, P., Kim, K. D., Lishko, P. v., & Downing, K. H. 2012. Three-dimensional structure of the bovine sperm connecting piece revealed by electron cryotomography. *Biology of Reproduction*, 87(3). <https://doi.org/10.1095/biolreprod.112.101980>
- Ozimic, S., Ban-Frangez, H., & Stimpfel, M. 2023. Sperm Cryopreservation Today: Approaches, Efficiency, and Pitfalls. *Current Issues in Molecular Biology*, 45(6), 4716-4734. <https://doi.org/10.3390/cimb45060300>
- Pardede, B. P., Kusumawati, A., Pangestu, M., & Purwantara, B. 2023. Bovine sperm HSP-70 molecules: a potential cryo-tolerance marker associated with sperma quality and fertility rate. *Frontiers in Veterinary Science*, Volume 10-2023. <https://www.frontiersin.org/journals/veterinary-science/articles/10.3389/fvets.2023.1167594>
- Peris-Frau, P., Soler, A. J., Iniesta-Cuerda, M., Martín-Maestro, A., Sánchez-Ajofrín, I., Medina-Chávez, D. A., Fernández-Santos, M. R., García-Álvarez, O., Maroto-Morales, A., Montoro, V., & Garde, J. J. 2020. Sperm Cryodamage in Ruminants: Understanding the Molecular Changes Induced by the Cryopreservation Process to Optimize Sperm Quality. *International journal of molecular sciences*, 21(8), 2781. <https://doi.org/10.3390/ijms21082781>
- Pereira, R., Sá, R., Barros, A., & Sousa, M. 2017. Major regulatory mechanisms involved in sperm Motilitas. *Asian journal of andrology*, 19(1), 5–14. <https://doi.org/10.4103/1008-682X.167716>
- Pesch, S., & Hoffmann, B. 2007. Cryopreservation of spermatozoa in veterinary medicine. *Journal für Reproduktionsmedizin und Endokrinologie-Journal of Reproductive Medicine and Endocrinology*, 4(2), 101–105.
- Platzer, M., Kiese, S., Tybussek, T., Herfellner, T., Schneider, F., Schweiggert-Weisz, U., & Eisner, P. 2022. Radical Scavenging Mechanisms of Fenolic Compounds: A Quantitative Structure-Property Relationship (QSPR) Study. *Frontiers in Nutrition*, 9. <https://doi.org/10.3389/fnut.2022.882458>
- Prabowo, T. A., Bintara, S., Yusiati, L. M., Sitaresmi, P. I., & Widayati, D. T. 2023. Evaluation Deoxyribonucleic acid (DNA) fragmentation of local Indonesian cattle frozen sperm using HalomaxÒ method. *Biodiversitas*, 24(4), 2225–2230. <https://doi.org/10.13057/biodiv/d240435>

- Prastiya, R. A., Suprayogi, T. W., Debora, A. E., Wijayanti, A., Amalia, A., Sulistyowati, D., & Nugroho A. P. 2023. Green tea extract addition into a Tris-based egg yolk extender improves Bali bull sperm quality. *Animal Bioscience*, 36(2), 209-217 <http://doi.org/10.5713/ab.22.0184>.
- Prihantoko, K. D., Kusumawati, A., Pangestu, M., Widayati, D. T., & Budiyanto, A. 2022. Influence of Intracellular *Reactive oxygen species* in Several Spermatozoa Activity in Indonesian Ongole Bull Cryopreserved Sperm. *American Journal of Animal and Veterinary Sciences*, 17(1), 11–18. <https://doi.org/10.3844/ajavsp.2022.11.18>.
- Prihantoko, K. D., Kusumawati, A., Widayati, D. T., & Pangestu, M. 2020. Effects Of Storage Duration On Mitochondrial Activity And Dna Fragmentation Of Post-Thawed Spermatozoa From Several Ongole Grade Bull In Indonesia. *Veterinary Practitioner*, 21(2), 264-268.
- Prihantoko, K. D., Yuliasuti, F., Haniarti, H., Kusumawati, A., Widayati, D. T., & Budiyanto, A. 2020. The Acrosome Integrity Examination of Post-thawed Spermatozoa of Several Ongole Grade Bull in Indonesia Using Giemsa Staining Method. *IOP Conference Series: Earth and Environmental Science*, 478(1). <https://doi.org/10.1088/1755-1315/478/1/012042>
- Qamar, A. Y., Naveed, M. I., Raza, S., Fang, X., Roy, P. K., Bang, S., Tanga, B. M., Saadeldin, I. M., Lee, S., & Cho, J. 2023. Role of antioxidants in fertility preservation of sperm - A narrative review. *Animal bioscience*, 36(3), 385–403. <https://doi.org/10.5713/ab.22.0325>
- Rahayu Johana Dian dan Nur Ducha. 2022. Pengaruh Air Tebu sebagai Kandidat Pengganti Fruktosa dalam Pengencer CEP terhadap Kualitas Spermatozoa Sapi Friesian Holstein selama Penyimpanan Beku. *Jurnal Ilmiah Peternakan Terpadu* 10(2):209-231
- Raheja, N., Grewal, S., Sharma, N., Kumar, N., & Choudhary, S. 2018. A review on sperma extenders and additives used in cattle and buffalo bull sperma preservation. ~ 239 ~ *Journal of Entomology and Zoology Studies*, 6(3), 239–245.
- Reddy, V. S., Yadav, B., Yadav, C. L., Anand, M., Swain, D. K., Kumar, D., Kritania, D., Madan, A. K., Kumar, J., & Yadav, S. 2018. Effect of sericin supplementation on *heat shock protein 70* (HSP70) expression, redox status and post thaw sperma quality in goat. *Cryobiology*, 84, 33–39. <https://doi.org/10.1016/j.cryobiol.2018.08.005>
- Roqanian, S., Meratan, A. A., Ahmadian, S., Shafizadeh, M., Ghasemi, A., & Karami, L. 2017. Polyfenols protect mitochondrial membrane against permeabilization induced by HEWL oligomers: Possible mechanism of

- action. *International Journal of Biological Macromolecules*, 103, 709–720. <https://doi.org/https://doi.org/10.1016/j.ijbiomac.2017.05.130>
- Escamilla Rosales, M. F., Rosales, L., Gutiérrez, C., Jaimez, J., Santana, P., & González-Olivares, L. 2023. Proteins of Milk, Egg and Fish as a Source of Antioxidant Peptides: Production, Mechanism of Action and Health Benefits. *Food Reviews International*, 40, 1–21. <https://doi.org/10.1080/87559129.2023.2227974>
- Ros-Santaella, J. L., & Pintus, E. 2021. Plant extracts as alternative additives for sperm preservation. *Antioxidants* (Vol. 10, Issue 5). MDPI. <https://doi.org/10.3390/antiox10050772>
- Rosyada, Z. N. A., Pardede, B. P., Kaiin, E. M., Tumbelaka, L. I. T. A., Solihin, D. D., Purwantara, B., & Ulum, M. F. 2023. Identification of *heat shock protein70-2* and *protamine-1* mRNA, proteins, and analyses of their association with fertility using frozen-thawed sperm in Madura bulls. *Animal bioscience*, 36(12), 1796–1805. <https://doi.org/10.5713/ab.23.0142>
- Rosyada, Z. N. A., Tumbelaka, L. I., Ulum, M. F., Harsi, T., Herwiyati, E., Memili, E., & Purwantara, B. 2020. Evaluation of Friesian Holstein Bulls Fertility in Lembang and Singosari Artificial Insemination Center using West Java ISIKHNAS Data. *IOP Conference Series: Earth and Environmental Science*, 478(1). <https://doi.org/10.1088/1755-1315/478/1/012005>
- Ruthrakumar, R., Sabarinathan, M., Dhanush, M., Kalaiyarasan, V., Gopikrishnan, D., Palanisamy, M., & Selvaraju, M. 2024. Effectiveness of Giemsa and Modified Trypan Blue-Giemsa Staining for the Assessment of Acrosome Integrity in Bull and Buck sperma. *Indian Journal of Animal Reproduction*, 45(1), 53–57. <https://doi.org/10.48165/ijar.2024.45.01.12>
- Ryu, Y.S.; Fernando, P.D.S.M.; Kang, K.A.; Piao, M.J.; Zhen, A.X.; Kang, H.K.; Koh, Y.S.; Hyun, J.W. 2019. Marine compound 3-bromo4,5-dihydroxybenzaldehyde protects skin cells against oxidative damage via the Nrf2/HO-1 pathway. *Marine Drugs* 2019, 17, 234.
- Saberivand, A., Sarvarzadeh, F., Peighambarzadeh, S. Z., Saberivand, M., Pakizehvand, H., Rashidi, S., Rahbar, M., & Khoshniyat, M. 2022. The effect of *Caulerpa sertularioides* extract on bull sperm freezability and subsequent embryo development. *Theriogenology*, 189, 167–176. <https://doi.org/10.1016/J.THERIOGENOLOGY.2022.06.017>
- Sapian, S., Taib, I. S., Latip, J., Katas, H., Chin, K.-Y., Mohd Nor, N. A., Jubaidi, F. F., & Budin, S. B. 2021. Therapeutic Approach of Flavonoid in Ameliorating Diabetic Cardiomyopathy by Targeting Mitochondrial-Induced Oxidative Stress. *International Journal of Molecular Sciences*, 22(21), 11616. <https://doi.org/10.3390/ijms222111616>

- Sathe, S. 2021. Cryopreservation of Sperma. *Bovine Reproduction* (pp. 986–999). Wiley-Blackwell
<https://doi.org/https://doi.org/10.1002/9781119602484.ch78>
- Satouh, Y., Inoue, N., Ikawa, M., and Okabe, M. 2012. Visualization of the moment of mouse sperm-egg fusion and dynamic localization of IZUMO1. *J. Cell Sci.* 125, 4985–4990.doi: 10.1242/jcs.100867
- Seifi-Jamadi AZSA, Kohram H, Akbari A, Zamen M, Vakhideh A. 2016. The potential of catalase as an enzymatic antioxidant to improve freezability of Turkmen stallion sperm. *Iran J Anim Sci* 2016; 47:215e23.
- Sharafi, M., Borghei-Rad, S. M., Hezavehei, M., Shahverdi, A., & Benson, J. D. 2022. Cryopreservation of Sperma in Domestic Animals: A Review of Current Challenges, Applications, and Prospective Strategies. *Animals*, 12(23), 3271. <https://doi.org/10.3390/ani12233271>
- Shunmugiah Mahendran, Pandiaraj Maheswari, Vanaraj Sasikala, Jeba jaya Rubika, Jeyaraj Pandiarajan. 2021. *In vitro* antioxidant study of polyfenol from red seaweeds dichotomously branched gracilaria *Gracilaria edulis* and robust sea moss *Hypnea valentiae*, *Toxicology Reports*, Volume 8, 2021, Pages 1404-1411, ISSN 2214-7500, <https://doi.org/10.1016/j.toxrep.2021.07.006>.
- Silva-Soto, M. Á., Carrillo-Fernández, P., Saez Lancellotti, E. T., Medina-Jiménez, E., Mogaburo Alba, J. F., Catena-Granados, N., López-Carmona, M. D., Pérez-Belmonte, L. M., Prieto Lain, N., Gómez Hernández, A. I., Gómez-Huelgas, R., & Bernal-López, M.-R. 2025. Extra Virgin Olive Oil Fenolic Compounds: Modulating Mitochondrial Function and Protecting Against Chronic Diseases—A Narrative Review. *Nutrients*, 17(9), 1443. <https://doi.org/10.3390/nu17091443>
- Silvi Nugraheni, T., Setiawan, I., Ardila Putri, A., Wahyu Sukmawati, A., Nur Khasanah, L., Khoirun Nisa, L., Nufus Hanyokro Putri, Iuini, Kisma Wulandari, S., Amelia Riswana, S. 2023. Studi Sarjana Farmasi, P., & Tinggi Ilmu Kesehatan Nasional, S. Article Review: Various Methods for Testing Antioxidant Activity. *In Journal of Pharmacy* (Vol. 13, Issue 1).
- Soares, A. R., Robaina, M. C. S., Mendes, G. S., Silva, T. S. L., Gestinari, L. M. S., Pamplona, O. S., Yoneshigue-Valentin, Y., Kaiser, C. R., Teresa, M., & Romanos, V. 2012. Antiviral activity of extracts from Brazilian seaweeds against herpes simplex virus. *Revista Brasileira de Farmacognosia Brazilian Journal of Pharmacognosy*, 22(4), 714–723. <https://doi.org/10.1590/S0102>
- Srivastava N, Pande M. 2017. *Protocols in Sperma Biology (Comparing Assays)*. Springer Nature Singapore Pte Ltd, Singapore.

- Suo, J., Wang, J., Zheng, Y., Xiao, F., Li, R., Huang, F., Niu, P., Zhu, W., Du, X., He, J., Gao, Q., & Khan, A. 2024. Recent advances in cryotolerance biomarkers for sperma preservation in frozen form-A systematic review. *In PLoS ONE* (Vol. 19, Issue 5 May). Public Library of Science. <https://doi.org/10.1371/journal.pone.0303567>
- Susilowati, S., Sardjito, T., Mustofa, I., Widodo, O. S., & Kurnijasanti, R. 2021. Effect of green tea extract in extender of Simmental bull sperma on pregnancy rate of recipients. *Animal Bioscience*, 34(2), 198–204. <https://doi.org/10.5713/ajas.20.0025>
- Susilowati, S., Mustofa, I., Wurlina, W., Hernawati, T., Oktanella, Y., Soeharsono, S., & Purwanto, D. A. 2022. Green Tea Extract in the Extender Improved the Post-Thawed Sperma Quality and Decreased Amino Acid Mutation of Kacang Buck Sperm. *Veterinary sciences*, 9(8), 403. <https://doi.org/10.3390/vetsci9080403>
- Takeda, K., Uchiyama, K., Kinukawa, M., Tagami, T., Kaneda, M., & Watanabe, S. 2015. Evaluation of sperm DNA damage in bulls by TUNEL assay as a parameter of sperma quality. *The Journal of reproduction and development*, 61(3), 185–190. <https://doi.org/10.1262/jrd.2014-140>
- Tamargo, C., Garriga, F., Yeste, M., Pinart, E., Muiño, R., Carbajo, M.T. and Hidalgo, C.O. 2024. Predictive Indicators of Cryotolerance and Fertility in Bovine Sperm: Evaluating Fresh Sperma Quality to Improve AI Outcomes With Frozen–Thawed Sperm. *Reprod Dom Anim*, 59: e14742. <https://doi.org/10.1111/rda.14742>
- Tanga, B. M., Qamar, A. Y., Raza, S., Bang, S., Fang, X., Yoon, K., & Cho, J. 2021. Sperma evaluation: methodological advancements in sperm quality-specific fertility assessment - A review. *Animal bioscience*, 34(8), 1253–1270. <https://doi.org/10.5713/ab.21.0072>
- Teixeira, J., *et al.* 2018. Mitochondria: Targeting Mitochondrial *Reactive oxygen species* with Mitochondriotropic Polyphenolic-Based Antioxidants. *Int J Biochem Cell Biol* 97 (2018): 98-103
- Tuncer, P. B., Sariözkan, S., Bucak, M. N., & Büyükleblebici, S. 2021. Antioxidant supplementation ameliorates bull sperm parameters and fertilizing ability following the freeze-thaw process. *Turkish Journal of Veterinary and Animal Sciences*, 45(3), 457–462. <https://doi.org/10.3906/vet-2004-88>
- Tziveleka, L.-A.; Tammam, M.A.; Tzakou, O.; Roussis, V.; Ioannou, E. 2021. Metabolites with Antioxidant Activity from Marine Macroalgae. *Antioxidants* 2021, 10, 1431. <https://doi.org/10.3390/antiox10091431>

- Ugur, M. R., Saber Abdelrahman, A., Evans, H. C., Gilmore, A. A., Hitit, M., Arifiantini, R. L., Purwantara, B., Kaya, A., & Memili, E. 2019. Advances in cryopreservation of bull sperm. *Frontiers in Veterinary Science*, 6, 268. <https://doi.org/10.3389/fvets.2019.00268>
- Urbaniak, A., Molski, M., & Szeląg, M. 2012. Quantum-chemical Calculations of the Antioxidant Properties of trans-p-coumaric Acid and trans-sinapinic Acid. *Computational Methods in Science and Technology*, 18(2), 117–128. <https://doi.org/10.12921/cmst.2012.18.02.117-128>
- Vijayaraghavan, S. 2003. Sperm Motilitas: patterns and regulation. In: Daulat, Tulsiani, R.P. (Eds.), Introduction to Mammalian Reproduction. *Springer*, US, Boston, MA, pp. 79–91.
- Wang, Y., Fu, X., & Li, H. 2025. Mechanisms of oxidative stress-induced sperm dysfunction. *Frontiers in Endocrinology*, Volume 16-2025. <https://www.frontiersin.org/journals/endocrinology/articles/10.3389/fendo.2025.1520835>
- Yacout, G., Ghareeb, DA., Elguindy, NM., & Elmoneam, AAA. 2011. Phytochemical constituents and bioscreening activities of Alexandria Mediterranean sea green and red algae. *Functional plant science and biotechnology*, 5, 79–82.
- Yelumalai, S., Giribabu, N., Karim, K., Omar, S. Z., & Salleh, N. bin. 2019. In vivo administration of quercetin ameliorates sperm oxidative stress, inflammation, preserves sperm morphology and functions in streptozotocin-nicotinamide induced adult male diabetic rats. *Archives of Medical Science*, 15(1), 240–249. <https://doi.org/10.5114/aoms.2018.81038>
- Yin, B., Lian, R., Li, Z., Liu, Y., Yang, S., Huang, Z., Zhao, Z., Li, Y., Sun, C., Lin, S., Wan, R., & Li, G. 2021. Tea Polyphenols Enhanced the Antioxidant Capacity and Induced Hsps to Relieve Heat Stress Injury. *Oxidative medicine and cellular longevity*, 2021, 9615429. <https://doi.org/10.1155/2021/9615429>
- Yuan YV, Bone DE, Carrington MF. 2005. Antioxidant activity of dulse (*Palmaria palmata*) extract evaluated *in vitro*. *Food Chem* 2005; 91:485e94.
- Gibb, Z., Griffin, R. A., Aitken, R. J., & de Iuliis, G. N. 2020. Functions and effects of reactive oxygen species in male fertility. *Animal Reproduction Science*, 220, 106456. doi.org/10.1016/j.anireprosci.2020.106456
- Zeb, A. 2020. Concept, mechanism, and applications of fenolic antioxidants in foods. In *Journal of Food Biochemistry* (Vol. 44, Issue 9). Blackwell Publishing Ltd. <https://doi.org/10.1111/jfbc.13394>

Zhao, J., J. Yang, and Y. Xie. 2019. Improvement Strategies for the Oral Bioavailability of Poorly Water-Soluble Flavonoids: An Overview. *Int J Pharm* 570. 2019. 118642.

Zubair, M., Ahmad, M., & Jamil, H. 2014. Review on the screening of sperma by hypo-osmotic swelling test. *Andrologia*, 47(7), 744–750. doi:10.1111/and.12335