

DAFTAR PUSTAKA

- Agarwal, A., and Allamaneni, S.S. 2005. Sperm DNA damage assessment: a test whose time has come. *Fertil Steril*; 84: 850–853.
- Agarwal, A., Nallella K. P., Allamaneni, S. S. R., and Said, T. M. 2004. Role of antioxidants in treatment of male infertility: an overview of the literature. *Reproductive Biology Medicine Online*. 8 (6) : 616–627.
- Agarwal, A., and Zini, A., (eds). 2016. Sperm Chromatin (Biological and Clinical Applications in Male Infertility and Assisted Reproduction). Springer. Kanada.
- Aitken, R. J., Bronson, R., Smith, T. B., De Iuliis, G. N. 2013. The source and significance of DNA damage in human spermatozoa; a commentary on diagnostic strategies and straw man fallacies. *Mol. Hum. Reprod*. 19, 475–485. <https://doi.org/10.1093/molehr/gat025>
- Aitken, R. J., M.A. Baker. 1995. Free Radicals, Lipid Peroxidation and Sperm Function. *Reprod Fertil Dev*. 7: 659-668.
- Aitken, R. J., M.A. Baker. 2006. Oxidative stress, sperm survival and fertility control *J. Mol. Endocrinol.* 250: 66–69. <https://doi:10.1016/j.mce.2005.12.026>
- Aitken, R.J., Buckingham D.W., Carreras A. and Irvine D.S. 1996. Superoxide dismutase in human sperm suspensions: relationships with cellular composition, oxidative stress and sperm function. *Free Radical Biology and Medicine*. 21 : 495–504.
- Almadaly, E., Foad F., Mostafa S., and Tetsuma M. 2014. Plasma Membrane Integrity and Morphology of Frozen-Thawed Bull Spermatozoa Supplemented with Desalted and Lyophilized Seminal Plasma. *Global Veterinaria* 13 (5): 753-766
- Alvarez, J.K., Storey, B.T., 1993. Evidence that membrane stress contributes more than lipid peroxidation to sublethal cryodamage in cryopreserved human sperm: glycerol and other polyols as sole cryoprotectant. *J. Androl.* 14, 199–209. <https://doi.org/10.1002/j.1939-4640.1993.tb00383.x>
- Amaral, A., Ramalho-Santos, J. and St John, J. C. 2007. The expression of polymerase gamma and mitochondrial transcription factor A and the regulation of mitochondrial DNA content in mature human sperm. *Human Reproduction* 22: 1585–1596.

- Ana, M., Salicioni, Mark, D., Platt, Eva V., Wertheimer, Enid, A., Alicia, A., Julian S, Pablo E, Visconti. 2007. Signalling Pathways Involved in Sperm Capacitation. *Spermatology* 65: 245-259.
- Ansari, M.S., Rakha B.A., Ullah, N., Andrabi, S.M.H., Iqbal, S., Khalid, M. And Akhter, S., 2010. Effect of exogenous glutathione in extender on the freezability of Nili-Ravi buffalo (*Bubalus bubalis*) bull spermatozoa. *Animal Science Paper and Reports*. 28: 235-244.
- Aoki, V.W., Liu, L., Carrel, D.T. 2006. A novel mechanism of protamine abnormality expression deregulation high lighted by abnormal protamine transcript retention in infertile human males with sperm protamine deficiency. *Mol Hum Reprod* 12(1): 41-51
- Aravindan, G.R., Bjordah, I.J., Jost, L.K., Evenson, D.P., 1997. Susceptibility of human sperm to in situ DNA denaturation is strongly correlated with DNA strand breaks identified by singly cell electrophoresis. *Exp. Cell Res*. 236, 231–237.
- Astuti M. 2004. Potensi Dan Keragaman Sumberdaya Genetik Sapi Peranakan Ongole (PO). Lokakarya Nasional Sapi Potong 2004.
- Awda, Basim, J., Meghan Mackenzie-Bell and Marry, M., Buhr. 2009. Reactive oxygen species and Boar Sper Function. *Journal Biology Reproduction*. 81 : 553 – 561.
- Ayla, S., Gülden, T, Bülent, E., Bilgiçb, Kenan ,S., A.Arman, Ö., Gamze, T., Semra Ö., B.Cem S., Bahar Ö., Serçin K., Esra G. A., Ismail S. 2018. Antioxidant activity of CAPE (caffeic acid phenethyl ester) in vitro can protect human sperm deoxyribonucleic acid from oxidative damage. *Acta Histochemica* 120 : 117–121
- Bailey, J., Morrier, A. and Cormier, N. 2003. Semen cryopreservation: Successes and persistent problems in farm species. *Canadian Journal of Animal Science*. 83: 393-401.
- Bajpai, M., Asin, S., Doncel, G., 2003. Effect of tyrosine kinase inhibitors on tyrosine phosphorylation and motility parameters in human sperm. *Arch. Androl*. 49, 229–246.
- Bansal, A.K., and Bilaspuri, G.S., 2011. Impacts of Oxidative Stress and Antioxidants on Semen Functions. *Veterinary Medicine International*. 1 - 7.
- Baracaldo, M.I., Barth, A.D. dan Bertrand, W. 2007. Steps for Freezing Bovine Semen: From Semen Collection to the Liquid Nitrogen Tank. *IVIS Reviews in Veterinary Medicine* 30 : 7.

- Barratt, C. L. (2010). Sperm DNA: organization, protection and vulnerability: from basic science to clinical applications-a position report. *Hum. Reprod.* 25, 824–838.
- Bazer, F.W., R.D. Geisert and M.T. Zavy. 1993. Fertilization, cleavage and implantation In: *Reproduction in Farm Animals*, Hafez, E.S.E. Lea and febiger, Philadelphia. 188-213
- Bearden, H.J., Fuquay, J.W. and Willard, ST. 2004. *Applied Animal Reproduction Sixth Edition*. Pearson. United States of America. 173.
- Bedford, J.M. 1990. Fertilization. In: *Reproduction in Mammals. Book 1: Germs cells and Fertilization*. Austin, C.R. and R.V. Short. Cambridge University Press. Cambridge, New York. 128-164.
- Breitbart, H.and Z. Naor. 1999. Protein kinases in mammalian sperm capacitation and the acrosome reaction. *Rev Reprod.* 4(3):151-9.
- Brouwers, J.U.M., Gadella, B.M., 2005. New assays for detection and localization of endogenous lipid peroxidation products in living boar sperm after BTS dilution after freeze-thawing. *Theriogenology* 63, 458–469. <https://doi.org/10.1016/j.theriogenology.2004.09.046>
- Buyukleblebici, S., Purhan B, T., Mustafa H, B., Ayre E., Serpil S., Umut T., Burcu U, E. 2014. Cryopreservation of bull sperm : effect of extender supplemented with different cryoprotectant and antioxidants on sperm motility, antioxidant capacity, and fertility results. *Animal Reproduction Science* 150 : 77 - 83
- Celeghini, E.C.C., Nascimento, J., Raphael, C.F.A., Andrade, A.F.C., Arruda, P.R. 2010. Simultaneous assessment of plasmatic, acrosomal, and mitochondrial membranes in ram sperm by fluorescent probes. *Arquivo Brasileiro de Medicina Veterináriae Zootecnia* 62 (3): 536-543.
- Chatterjee, S., Gagnon, C., 2001. Production of reactive oxygen species by spermatozoa undergoing cooling, freezing and thawing. *Mol. Reprod. Dev.* 59, 451–458. <https://doi.org/10.1002/mrd.1052>
- Chelucci, S., Pasciu, V., Succu, S., Addis, D., Leoni, G.G., Manca, M.E., Naitana S., Berlinguer, F. 2015. Soybean Lecithin-Based Extender Preserves Spermatozoa Membrane Integrity and Fertilizing Potential During Goat Semen Cryopreservation. *Journal of theriogenology*.14 : 1 -12.
- Chenoweth, P.J., and Lorton, S.P., (eds). 2014. *Animal Andrology Theories and Application*. NCBI : 139-140.
- Cordova, A., Perez-Gutierrez, J.F., Lleo, B.,GarcíaArtiga, C., Alvarez, A., Drobchak, V.,MartínRillo, S. 2002. In vitro fertilizing capacity and

chromatin condensation of deep frozen semen packaged in 0.5 ml and 5 ml straws. *Theriogenology* 57 : 2119–2128.

Corzett, M., Mazrimas, J., Balhorn, R. 2002. Protamine 1 protamine 2 stoichiometry in the sperm in of eutherian mammals. *Mol Reprod Dev* 61:519-527.

Cunningham, J.G., and Klein, B.G. 2007. Textbook of Veterinary Physiology Fourth Edition. Saunders Elsevier. Missouri. USA. 520-521.

de Lamirande, E. and Gagnon, C. (1992) Reactive oxygen species and human spermatozoa. II Depletion of adenosine triphosphate plays an important role in the inhibition of sperm motility. *Journal of Andrology*, 13, 379-386

De Oliveira, V.P., Marques, M.G., Simoes, R., Assumpcao, M.E.O.D., Visintin, J.A. 2011. Influence of caffeine and chondroitin sulfate on swine sperm capacitation and in vitro embryo production. *Acta Science Veteriner* 39(2): 960.

Dejarnette, J. M. and Marshall, C. E. 2005. Straw-thawing method interacts with sire and extender to influence sperm motility and conception rates of dairy cows. *Journal of Dairy Science* 88 (11) : 3868 – 3875.

Desai, N. R., Mahfouz R., Sharma R., Gupta S., and Agarwal A. 2010. Reactive oxygen species levels are independent of sperm concentration, motility, and abstinence in a normal, healthy, proven fertile man: a longitudinal study. *Fertility and Sterility*. 94 (4) : 1541–1543.

Devireddy, R. V., Swanlund, D. J., Alghamdi, A. S., Duoos, L. A., Troedsson, M. H., Bischof, J. C. and Roberts K. P. 2002. Measured effect of collection and cooling conditions on the motility and the water transport parameters at subzero temperatures of equine spermatozoa. *Reproduction* 124 : 643-648.

Dutta, S., Majzoub, A., Agarwal, A. 2019. Oxidative stress and sperm function: A systematic review on evaluation and management. *Arab J Urol*. 17: 87-97.

Elsayed, D.H., Shamy, A.A., Abdelrazek, H.M.A., El-Badry, D.A. 2019. Effect of genistein on semen quality, antioxidant capacity, caspase-3 expression and DNA integrity in cryopreserved ram spermatozoa. *Small Ruminant Research* 177: 50-55

El-Sisy, G. A., El- Nattat, W. S., El- Sheshtawy, R.I. and El- Maaty, A. M. A. 2016. Substitution of egg yolk with different concentrations of soybean lecithin in tris- based extender during bulls' semen preservability, *Asian Pacific Journal of Reproduction* 5(6): 514-518.

- Erenpreisa, J., Freivalds, T., Slaidina, M., Erenpreiss, J., Krampe, R., Butikova, J., Ivanov, A., Pjanova, D. 2003. Toluidine blue test for sperm DNA integrity and elaboration of image cytometry algorithm. *Cytometry* 52(1):19-27.
- Estrada, E., Rodríguez-Gil, J.E., Rivera Del Álamo, M.M., Peña, A., Yeste, M., 2015. Effects of reduced glutathione on acrosin activity in frozen-thawed boar spermatozoa. *Reprod. Fertil.* <http://dx.doi.org/10.1071/RD15118>.
- Evenson, D.P., Jost, L.K., Marshall, D., Zinaman, M.J., Clegg, E., Purvis, K. 1999. Utility of the sperm chromatin structure assay as a diagnostic and prognostic tool in the human fertility clinic. *Hum Reprod*;14:1039–49.
- Evenson, D. P., Darzynkiewicz, Z. & Melamed, M. R. 1982. Simultaneous measurement by flow cytometry of sperm cell viability and mitochondrial membrane potential related to cell motility. *Journal of Histochemistry and Cytochemistry* 30: 279–280.
- 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. *Anim Reprod Sci* 169:56-75.
- Feradis. 2010. Bioteknologi Reproduksi pada Ternak. Alfabeta. Bandung: 90-95.
- Flesh, F.M. and Gadella, B.M. 2000. Dynamics of the mammalian sperm membrane in the process of fertilization. *Biochimia et Biophysica Acta* 1469 : 197–235.
- Frandsen, R.D., Lee Wilke, W. and Fails, A.D. 2009. Anatomy and Physiology of Farm Animals Seventh Edition, Wiley- Blackwell. Colorado. 416-417.
- Fraser, L.R. 2010. The switching on of mammalian spermatozoa: molecular events involved in promotion and regulation of capacitation. *J. Mol of Reprod and Dev.* 77(3):197-208.
- Funahashi, H., Sano, T., 2005. Select antioxidants improve the function of extender boar semen at 10 °C. *Theriogenology* 63, 1605–1616. <https://doi.org/10.1016/j.theriogenology.2004.06.016>
- Gadea, J., García-Vazquez, F., Mat, C., Gardon, J.C., C. anovas ,S., Gumbao, D. 2005. Cooling and freezing of boar spermatozoa: supplementation of the freezing media with reduced glutathione preserves sperm function. *J Androl* 2005;26: 396-404
- Gadella, M., Flesch F. M., van Golde, L. M., Colenbrander, B. 1999. Dynamics in the membrane organization of the mammalian sperm cell and functionality in fertilization. *Veterinary Quarterly* 21 (14) : 2– 6.

- Galantino-Homer, H., P.E. Visconti, and G.S. Kopf. 1997. Regulation of protein tyrosine phosphorylation during bovine sperm capacitation by a cyclic adenosine. *J Biol of Reprod.* 56:707-719.
- Gangwar, C. Atul S, Akhil P, S P Singhb, Sarvajeet Y, Ravindra K, Vijay S. 2018. Effect of reduced glutathione supplementation on cryopreservation induced sperm cryoinjuries in Murrah bull semen. *Animal Reproduction Science* 192: 171–178
- Garcia, M.B., Guimaraes.T.P., Rocha,A., and Lopes, M. 2015. Effect of Genistein addition to Equine Sperm Freezing Extender. *Journal of the Hellenic Veterinary Medical Society* vol 66 no. 4: 241-248.
- Garner, D.L., Hafez, E.S.E. 2000. Spermatozoa and seminal plasma. In: Hafez B, Hafez ESE. 2000. *Reproduction in Farm Animals*. 7th Ed. Philadelphia (US): Lippincott Williams and Wilkins
- Gazali, M dan S.N. Tambing. 2002. Ulasan : Kriopreservasi Sel Spermatozoa. *Jurnal Hayati* Vol 9 no. 1: 27-32.
- Gibbons, R., S.A. Adeoya-Osiguwa, L.R. Fraser. 2005. A mouse sperm decapacitation factor receptor is phosphatidylethanolamine-binding protein 1. *Reproduction Research*. 130: 497-508.
- Gliozzi, T.M., L. Zaniboni, S. Cerolini 2011. DNA fragmentation in chicken spermatozoa during cryopreservation. *Theriogenology*. 75 1613-1622. <https://doi.org/10.1016/j.theriogenology.2011.01.001>
- Graham, J.K., Foote, R.H. 1987. Effect of several lipids, fatty acyl chain length, and degree of unsaturation on the motility of bull Spermatozoa after cold shock and freezing. *Cryobiology* 24: 42- 52.
- Gravance, G., Garner, D.L., Faumber, J., Ball, B.A., 2000. Assessment of equine sperm mitochondrial function using JC-1. *Theriogenology* 53: 1691–1703. [https://doi.org/10.1016/S0093-691X\(00\)00308-3](https://doi.org/10.1016/S0093-691X(00)00308-3)
- Gunes, S., Al-Sadaan, M., Agarwal, A. 2015. Spermatogenesis, DNA damage and DNA repair mechanisms in male infertility. *Reproductive biomedicine online* 31(3): 309-319.
- Guthrie, H.D., Welch, G.R., 2012. Effects of reactive oxygen species on sperm funtion. *Sci Verse Science Direct. Theriogenology*. 78 : 1700-1708.
- Hafez, E. S. E. and Hafez, B. 2000. *Reproduction in Farm Animals* Seventh Edition. Lippincott Williams and Wilkins. Maryland. 367.
- Hafez, E.S.E. 2000. *Semen Evaluation in Reproduction In Farm Animals* 7th ed. Lippincott Wiliams and Wilkins. Philadelphia.

- Hafez, E.S.E. 2004. X-and Y-ChromosomeBearing Spermatozoa. In Reproduction in Farm Animal. 8th ed. Lea and Febiger Philadelphia. USA.
- Halliwell, B., Gutteridge, J.M.C. 1999. Free radicals in biology and medicine. 3rd ed. Oxford University Press.
- Hartati, T., Muladno, Jakaria, Priyanto R, Gunawan A, Aryogi, Talib C. 2015. Estimasi nilai heritabilitas dan faktor non-genetik yang mempengaruhi sifat-sifat produksi sapi PO. *Jurnal Ilmu Ternak dan Veteriner* 20 (3) : 168-174.
- Hayati, A, Mangkoewidjojo ,S., Hinting A., Moeljopawiro., S. 2006. Hubungan kadar MDA sperma dengan integritas membran sperma tikus (*Rattus nervegicus*) setelah pemaparan 2-Mothoxyethanol. *Hayati*. 11:151-154.
- Henkel, R., Hajimohammad, M., Stalf ,T., Hoogendijk, C., Mehnert, C., Menkveld R, Gips, H., Schill, W.B., Kruger, T.F. 2004. Influence of deoxyribonucleic acid damage on fertilization and pregnancy. *Fertil Steril*; 81: 965–972.
- Hill, M. 2008. Spermatozoa capacitation. UNSW Embryology. University of New South Wales, Sidney, Australia.
- Holt, W.V. 2000. Basic aspects of frozen storage of semen. *Animal Reproduction Science* 62 : 3-22.
- Hu, Ting-xi, Zhu, Hua-bin, Sun, Wei-jun, Hao, Hai-sheng, Zhao, Xue-ming, Du, Wei-hua, Wan, Zong-li, 2016. Sperm pretreatment with glutathione improves IVF embryos development through increasing the viability and antioxidative capacity of sex-sorted and unsorted bull semen. *Journal of Integrative Agriculture*. 15: 2326–2335.
- Insani, K., Sri R., Agung P., Aries S. 2014. Kadar MDA Spermatozoa Setelah Pembekuan. *Jurnal Biotropika*. 3 (2).
- Irvine, D. S., Twigg, J. P., Gordon, E. L., Fulton, N., Milne, P.A., Aitken, R. J. 2000. DNA integrity in human spermatozoa: relationships with semen quality. *J Androl*; 21: 33–44.
- Isachenko, V., Isachenko, E., Katkov, I.I., Montag, M., Dessole, S., Nawroth, F., Van derven, H., 2004. Cryoprotectant-free cryopreservation of human spermatozoa by vitrification and freezing in vapor: effects on motility, DNA integrity and fertilization ability. *Biol. Reprod.* 71, 1167–1173. <https://doi.org/10.1095/biolreprod.104.028811>
- Ismaya. 2003. Influence of the female reproductive tract on the motility and morphological characteristics of ram spermatozoa. Thesis for the degree

of Doctor of Philosophy in the Australian Institute of Tropical Veterinary and Animal Science, James Cook University, Australia.

Johnson, L., Blanchard, T.L., Varner, D.D., Scrutchfield, W.L. 1997. Factors affecting spermatogenesis in the stallion. *Theriogenology* 48:1199-1216.

Jothipriya, R., Sasikumar, R., Madhankumar, E.K., Pranetha, A., and Kalaiselvi, S. 2016. A Studi of Hypo Osmotic Swelling Test in Human Spermatozoa. *International Journal of Current Research and Academic Review*. 2(11): 47-68.

Junaedi, Arifiantini, R.I., Sumantri, C., Gunawan, A. 2016. Penggunaan Dimethyl Sulfoxide Sebagai Krioprotektan dalam Pembekuan Semen Ayam Kampung. *Jurnal Veteriner* 17 (2): 300-308.

Jung, E. Y., Lee, B. J., Yun, Y. W., Kang, J. K., Baek, I. J., Yon, J. M., Lee, Y. B., Sohn, H. S., Lee, J. Y., Kim, K. S., Yu, W. J., Do, J. C., Kim, Y. C., and Nam, S. Y. 2004. Effects of Exposure to Genistein and Estradiol on Reproductive Development in Immature Male Mice Weaned from Dams Adapted to a Soybased Commercial Diet. *Journal of Veterinary Medicine Science* 66 (11): 1347-1354

Kantor, J.K. 1995. DNA damage and repair. Di dalam: Meyer, R.A. editor. *Molecular Biology and Biotechnology*. USA: VCH. 217-219.

Kaproth, M. T., Rycroft, H. E., Gilbert, G. R., Abdel-Azim, G., Putnam, B. F., Schnell, S. A., Everett, R. W. and Parks, J. E. 2005. Effect of semen thaw method on conception rate in four large commercial dairy heifer herds. *Theriogenology* 63 (9): 2535 – 2549.

Kardivel G, Kumar S dan Kumaresan A. 2009. Lipid Peroxidation, Mitochondrial Membran Potential and DNA Integrity of Spermatozoa in Relation to Intracellular Reactive Oxygen Species in Liquid and Frozen. *J Animal Reproduction Science*. 114:125-134.

Kim, T. H., Yuh, I. S., Park, I. C., Cheong, H. T., Kim, J. T., Park, C. K., and Yang, B. K. 2014. Effects of Quercetin and Genistein on Boar Sperm Characteristics and Porcine IVF Embryo Developments. *Journal of Embryo Transfer* 29 (2): 141-14

Kostaman, T., dan Setioko, A.R. 2011. Perkembangan Penelitian Teknik Kriopreservasi untuk Penyiapan Semen Unggas. *WARTAZOA Indonesian Bulletin of Animal and Veterinary Sciences*. 21 (3)

Kovacs, A., Foote, R.H. 1992. Viability and acrosome staining of bull, boar and rabbit spermatozoa. *Biotechnology Histochemical* 67(3): 120-124.

- Kumar, P., Monika S., Dharmendra K., M.H. Jana., Dheer S. S., R.K. Sharmaa. 2016. Quantification of leptin in seminal plasma of buffalo bulls and its correlation with antioxidant status, conventional and computer-assisted sperm analysis (CASA) semen variables. *Animal Reproduction Science* 166 : 122–127
- Ladha, S. 1998. Lipid heterogeneity and membrane fluidity in a highly polarized cell, the mammalian spermatozoon. *The Journal of Membrane Biology* 165 : 1–10.
- Larson, J.L., Miller, D.J. 1999. Simple histochemical stain for acrosomes on sperm from several species. *Molecular Reproduction and Development* 52: 445-449.
- Larson, J.L, DeJonge, C.J., Barnes, A.M., Jost, L.K., Evenson, D.P. 2000 Sperm chromatin structure assay parameters as predictors of failed pregnancy following assisted reproductive techniques. *Hum Reprod*;15:1717–22.
- Layek, S.S., Mohanty, T.K., Kumaresan, A. and Parks, J.E. 2016. Cryopreservation of bull semen: Evolution from egg yolk based to soybean- based extenders. *Animal Reproduction Science* 172 : 1-9.
- Lechniak, D., Kedzierski, A., Stanislawski, D., 2002. The use of HOS test to evaluate membrane functionality of boar sperm capacitated in vitro. *Reprod. Domest. Anim.* 37, 379–380.
- Lim, H.K. and M.H. Le, 2013. Evaluation of extenders and cryoprotectants on motility and morphology of longtooth grouper (*Epinephelus bruneus*) sperm. *Theriogenology*, 79: 867-871.
- Linfor, J.J., Meyers, S.A., 2002. Detection of DNA damage in response to cooling injury in equine spermatozoa using single cell gel electrophoresis. *J. Androl.* 23, 107–113.
- Lu, S.H., Y.K. Yen, T.Y. Ling, K.T.Cheng, J.A.Shu, H.K. Au, and Y.H. Huang. 2010. Capacitation suppression by mouse seminal vesicle autoantigen involves a decrease in plasma membrane Ca^{2+} -ATPase (PMCA)-mediated intracellular calcium. *J. Biol of Reprod.* 59(1): 7-11.
- Mariyono, E. Romjali, D.B. Wijono dan Hartati 2006. Paket Rakitan Teknologi Hasil-Hasil Penelitian Peternakan untuk Mendukung Upaya Kalimantan Selatan Mencapai Swasembada Sapi Potong.
- Martin, G., Sabido, O., Durand, P., and Levy, R. 2004. Cryopreservation Induced an Apoptosis-like Mechanism in Bull Sperm. *Biology of Reproduction* 71, 28-37.

- Martinez, J. C., Juan de D., Alfonso G.A., José L. L., Joaquín G. 2010. Effect of genistein supplementation of thawing medium on characteristics of frozen human spermatozoa. *Asian Journal of Andrology* 12: 431–441
- Masoudi, R., Sharafi, M., Pourazadi, L., Davachi, N.D., Asadzadeh, N., Esmaeilkhani, S., Dirandeh, E. 2019b. Supplementation of chilling storage medium with glutathione protects rooster sperm quality. *Cryobiology*, *j.cryobiol.*2019.10.005.
- Masoudi, R., Sharafi, M., Shahneh, A.Z., Motlagh, M.K. 2019a. Effects of reduced glutathione on the quality of rooster sperm during cryopreservation. *Theriogenology* 128 149-155.
- MataHine, T., Burhanuddin., dan Marawali, A. 2014. Efektivitas Air Buah Lontar dalam Mempertahankan Motilitas, Viabilitas, dan Daya Tahan Hidup Spermatozoa Sapi Bali. *Jurnal Veteriner* 15 (2): 263-273.
- Medeiros, C.M.O., Forell, F., Oliveira, A.T.D., Rodrigues, J.L. 2002. Current status of sperm cryopreservation. *Theriogenology* 57: 327-344.
- Menzel, V.A., Hinsch, E., Hagele, W., and Hinsch, K.D. 2007. Effect of genistein on acrosome reaction and zona pellucida binding independent of protein tyrosine kinase inhibition in bull. *Asian Journal of Andrology* 9 (5): 650-658.
- Ming-Wen Li 1, K. C. Kent Lloyd. 2020. DNA fragmentation index (DFI) as a measure of sperm quality and fertility in mice. *Nature* 10:3833.
- Miranda, P.V., Allaire, A., Sosnik, J., Visconti PE. 2009. Localization of low-density detergent-resistant membrane proteins in intact and acrosome-reacted mouse sperm. *Biology Reproduction* 80: 897-904.
- Mitchell, L.A. B., Nixon, R.J., Aitken. 2007. Analysis of Chaperone proteins associated with human spermatozoa during capacitation. *J Mol Hum Reprod.* 13: 605-613
- Moore, A.I, Squires, E.L., Graham, J.K. 2005. Adding cholesterol to the stallion sperm plasma membrane improve cryosurvival. *Cryobiology* 51: 241-249.
- Nadeem, S., Singh, V., Yadav, H.P., Verma, M., Chauhan, D.S., Saxena, A., Yadav, S., Swain, D.K., 2017. Effect of reduced glutathione supplementation in semen extender on tyrosine phosphorylation and apoptosis like changes in frozen thawed Haryana bull spermatozoa. *Animal Reproduction Science.* 182: 111–122.
- Neild, D.N., Gadella, B.M, Agüero, A., Stout, T.A.E, Colenbrander, B. 2005. Capacitation, acrosome function and chromatin structure in stallion sperm. *Animal Reproduction Science* 89: 47-56.

- Nofa, Y., Ni Wayan, K. K., Raden L. A. 2017. Status Akrosom dan Kualitas Post-Thawed Spermatozoa pada Beberapa Rumpun Sapi dari Dua Balai Inseminasi Buatan . *Acta Veterinaria Indonesiana* 5 (2): 81– 82.
- Nolan, J. P. and Hammerstedt, R. H. 1997. Regulation of membrane stability and the acrosome reaction in mammalian sperm. *The Federation of American Societies for Experimental Biology Journal* 11: 670– 682.
- Nur, Z., Dogan, I., Soylu, M. K. and Ak, K. 2003. Effect of different thawing procedures on the quality of bull semen. *Revue de Medecine Veterinaire* 154 (7): 487 – 490.
- Nurdiman, M., dan Ramadhany, A. 2018. Statistik Peternakan dan kesehatan hewan 2018. Kementerian Pertanian Direktorat Jenderal Peternakan dan Kesehatan Hewan. Jakarta. ISBN : 978-979-628-0353-3.
- O’Connell M, McClure N, Lewis SEM, 2002: The effects of cryopreservation on sperm morphology, motility and mitochondrial function. *Hum Reprod* 17, 704–709. <https://doi.org/10.1093/humrep/17.3.704>
- Ozkavukcu S, Erdemli E, Isik A, Oztuna D, Karahuseyinoglu S. 2008. Effects of cryopreservation on sperm parameters and ultrastructural morphology of human spermatozoa. *Journal of Assisted Reproduction Genetic* 25: 403-411. DOI 10.1007/s10815-008-9232-3
- Paasch, U., Sharma, R.K., Gupta, A.K., Grunewald, S., Mascha, E.J., Thomas, A.J., Glander, H.J., Agarwal, A., 2004. Cryopreservation and thawing is associated with varying extent of activation of apoptotic machinery in subsets of ejaculated human spermatozoa. *Biol. Reprod.* 71, 1828–1837. <https://doi.org/10.1095/biolreprod.103.025627>
- Parks, J.E., and Graham, J.K. 1992. Effects of Cryopreservation Procedures on Sperm Membranes. *Theriogenology* 38: 209-222.
- Parrish, J.J. and N.L. First. 1993. Fertilization. Reproduction in Domesticated Animals. *World Animal Science*. 8: 195-203.
- Pesch, B., and Bergmann, M. 2006. Structure of Mamalian Spermatozoa in Respect to Viability, Fertility and Cryopreservation. *Science Direct Micron* No. 37 (2006): 597-612.
- Poot, M., Zhang, Y. Z., Kramer, J. A., Wells, K. S., Jones, L. J., Hanzel, D. K., Lugade, A. G., Singer, V. L. and Haugland, R. P. (1996) Analysis of mitochondrial morphology and function with novel fixable fluorescent stains. *Journal of Histochemistry and Cytochemistry* 44:1363–1372.
- Prihantoko K D, F Yulastuti, H Haniarti, A Kusumawati, D T Widayati, A Budiyanto (2020^a). The Acrosome Integrity Examination of Post-thawed

Spermatozoa of Several Ongole Grade Bull in Indonesia Using Giemsa Staining Method. *IOP Conf. Ser.: Earth Environ. Sci.* 478 012042. DOI: 10.1088/1755-1315/478/1/012042

Prihantoko K D, F Yulianti, H Haniarti, A Kusumawati, D T Widayati, A Budiyo (2020^b). The Effect of Genistein on the Plasma Membrane Integrity of Frozen Ongole Grade Bull Semen Based on Skim Milk – Soy Lecithin Extender. *IOP Conf. Ser.: Earth Environ. Sci.* 465 012054. DOI:10.1088/1755-1315/465/1/01205

Priyanto, L. 2014. Deteksi Kerusakan Dna Spermatozoa Sapi Menggunakan Pewarnaan Toluidine Blue Dan Kit Halomax® Yang Dimodifikasi. (tesis). Bogor (ID) : Institut Pertanian Bogor.

Priyanto, L., Arifiantini, R.I., Yusuf, T.L. 2015. Deteksi kerusakan DNA spermatozoa semen segar dan semen beku sapi menggunakan pewarnaan toluidine blue. *J Vet* 16 (1): 48-55.

Putro, P.P, Kusumawati, A. 2014. Dinamika Folikel Ovulasi Setelah Sinkronisasi Estrus dengan Prostaglandin F2a pada Sapi Perah. *Jurnal Sain Veteriner* 32 (1)

Raheja, N., Coudhary, S., Grewal, S., Sharma, N., and Kumar, N. 2018. A review on Semen Extender and Additives used in Cattle and Buffalo Semen Preservation. *Journal of Entomology and Zoology Studies* 2018; 6(3): 239-245.

Ramu, S. dan Jeyendran, R.S. 2013. Chapter 3 the hypo-osmotic swelling test for evaluation of sperm membrane integrity. Totowa New Jersey: Humana Press

Rath, D., Bathgate R., Rodriguez-Martinez H., Roca J., Strzezek J. and Waberski D. 2009. Recent Advances in Boar Semen Cryopreservation. *Society of Reproduction and Fertility Supplement*. 66:51–66.

Rizal M, Toelihere MR, Yusuf TL, Purwantara B, Situmorang B. 2003. Kualitas semen beku domba garut dalam berbagai konsentrasi gliserol. *Jurnal Ilmu Ternak Veteriner* 7(3): 194-199.

Roca, J., Rodriguez, M.J., Gil, M.A., Carvajal, G., Garcia, E.M., Cuello, C., Vazquez, J.M., Martinez, E.M., 2005. Survival and in vitro fertility of boar spermatozoa frozen in the presence of superoxide dismutase and/or catalase. *J. Androl.* 26, 15–24. <https://doi.org/10.1002/j.1939-4640.2005.tb02867.x>

- Rybar, R., Faldikova, L., Faldyna, M., Machatkova, M. Rubes, J. 2004. Bull and boar sperm DNA integrity evaluated by sperm chromatin structure assay in the Czech Republic. *Veterinary Medicine* 49: 1- 8.
- Said, S. and K. Niwa. 2004. Successfull ICSI depends on DNA stability and disulfide status of sperm nuclei. *Jurnal Ilmu Ternak dan Veteriner* 9 (3): 210-215
- Sailer, B. L, Jost, L. K, Evenson, D. P .1995. Mammalian sperm DNA susceptibility to in situ denaturation associated with the presence of DNA strand breaks as measured by the terminal deoxynucleotidyl transferase assay. *J Androl.* 16:80 –7.
- Saili, T. 2006. Morfologi dan Integritas DNA Spermatozoa Domba Setelah Diawetkan dengan Metode Pengering bekuan. (disertasi). Bogor (ID): Institut Pertanian Bogor.
- Sakkas, D. and Alvarez, J. G (2010). Sperm DNA fragmentation: mechanisms of origin, impact on reproductive outcome, and analysis. *Fertil. Steril.* 93, 1027–1036.
- Salisbury, G.W dan Denmark, N.L.V. 1985. Fisiologi Reproduksi dan Inseminasi Buatan pada Sapi. Penerjemah: Djanuar,R. judul buku asli: Physiology of Reproduction and Artificial Insemination of Cattle. Universitas Gadjah Mada Press. Yogyakarta. 102-103.
- Sanocka, D. and Kurpisz, M. 2004. Reactive oxygen species and sperm cells. *Reproductive Biology Endocrinology* 2 : 12-19.
- Santos, J.H. Mandavilli, B.S, Van Houten, B. Measuring oxidative mtDNA damage and repair using quantitative PCR. *Methods Mol Biol* 2002;197:159–76.
- Santos, J.H. Meyer, J.N. Mandavilli, B.S. Van Houten B. 2006. Quantitative PCR based measurement of nuclear and mitochondrial DNA damage and repair in mammalian cells. *Methods Mol Biol.* 314:183–99.
- Sapanidou, V., I. Taitzoglou, I. Tsakmakido, I. Kourtzelis, D. Fletouris, A. Theodoridis, I. Zervos, M. Tsatarliotou. 2015. Antioxidant effect of crocin on bovine sperm quality and in vitro fertilization. *Theriogenology* 84 : 1273 – 1282.
- Sarastina, Susilawati T, Ciptadi G. 2012. Analisa Beberapa Parameter Motilitas Spermatozoa pada berbagai bangsa sapi menggunakan Computer Assisted Semen Analysis (CASA). *Jurnal Ternak Tropika* 6(2): 1-12.
- Scarlett, J.L, Murphy, M.P. 1997. Release of apoptogenic proteins from the mitochondrial intermembrane space during the mitochondrial permeability transition. *FEBS Lett* ;418:282–6.

- Seki, S. and Mazur, P. 2009. The dominance of warming rate over cooling rate in the survival of mouse oocytes subjected to a vitrification procedure. *Cryobiology* 59(1): 75 – 82.
- Shannon, P. and Vishwanath, R. 1995. The effect of optimal and suboptimal concentrations of sperm on the fertility of fresh and frozen bovine semen and a theoretical model to explain the fertility differences. *Animal Reproduction Science* 39: 1–10.
- Sharma, R., Masaki, J., Agarwal, A. 2013. Sperm DNA fragmentation analysis using the TUNEL assay. *Methods Mol Biol*; 927: 121–136.
- Sharma, R., Sabanegh, E., Mahfouz, R., Gupta, S., Thiyagarajan, A., Agarwal A. 2010. TUNEL as a test for sperm DNA damage in the evaluation of male infertility. *Urology*; 76: 1380–1386.
- Silva, P.F.N., Gadella, B.M. 2006. Detection of damage in mammalian sperm cells. *Theriogenology*.65:958-978.
- Singh, A., and Agarwal, A. 2011. The role of sperm chromatin integrity and DNA damage on male infertility. *Open Reprod Sci J*; 3: 65–71.
- Soto, J.C.M., DiosHaurcade, J.D., Adan, A.G., Landeras, J.L., and Gadea, J. 2010. Effect of Genistein Supplementation of Thawing medium on Characteristics of Frozen Human Spermatozoa. *Asian Journal of Andrology* (2010): 1-11.
- Srivastava, N., dan Panda, M., (eds). 2017. *Protocols of Semen Biology (Comparing Assays)*. Springer. India : 60-61.
- Sugiarto, N., Susilawati, T., dan Wahyuningsih, S. 2014. Kualitas Semen Cair Sapi Limousin selama Pendinginan menggunakan Pengencer CEP-2 dengan Penambahan berbagai Konsentrasi Sari Kedelai. *Jurnal Ternak Tropika* Vol. 15, no.1: 51-57.
- Sugiyanta. 2007. Peran glutathione sebagai master antioksidan. *Biomedis* 1 (1): 48-53.
- Sujoko, H., Setiadi, M.A. dan Boediono, A. (2009). Seleksi spermaozoa domba Garut dengan metode sentrifugasi gradien densitas percoll. *Jurnal Veteriner* vol 10 No 3: 125-132.
- Sukmawati E, Arifiantini RI, Purwantara B. 2015. Daya tahan spermatozoa terhadap proses pembekuan pada berbagai jenis sapi pejantan unggul. *Jurnal Ilmu Ternak dan Veteriner* 19(3): 168-175.
- Supriatna, J. (2018). *Konservasi dan Biodiversitas: Teori dan Praktik di Indonesia*. Yayasan Pustaka Obor Indonesia. Jakarta. 340-342.

- Susilawati, T. 2004. Sapi Lokal Indonesia (Jawa Timur dan Bali). UB Press. Indonesia. 81: 88-91.
- Susilawati, T. 2011. Spermatology. UB Press. Indonesia.
- Susin, S.A., Lorenzo, H.K., Zamzami, N., Marzo, I., Snow, B.E., Brithers, G.M. Molecular characterization of mitochondrial apoptosis-inducing factor. *Nature* 1999;397:441–6.
- Syauqi, A. 2014. Evaluasi Kromatin Sperma sebagai Indikator Kualitas Sperma. e-*Jurnal Majalah Kedokteran Sriwijaya* vol. 46 no. 3, Juli 2014.
- Takeda, K., Kyoko, U., Masashi, K., Takahiro, T., Masahiro, K., and Shinya, W 2015. Evaluation of sperm DNA damage in bulls by TUNEL assay as a parameter of semen quality. *J Reprod Dev.* 61(3):185-90.
- Therien, I., Moreau, R., and Manjunath, P. 1999. Major proteins of bovine seminal plasma and high-density lipoprotein induce cholesterol efflux from epididymal sperm. *Reproductive Biology* 59: 768-776.
- Thomson, L.K., Fleming, S.D., Aitken, R.J., uis, G.N., Zieschang, J.A., and Clark, A.M. 2009. Cryopreservation induced Human Sperm DNA Damage in Predominantly mediated by oxidative stress rather than Apoptosis. *Journal of Human Reproduction* 24:2061-2070.
- Toelihere, M.R. 1993. Inseminasi Buatan pada Ternak. Penerbit Angkasa. Bandung.
- Tremellen, K. 2008. Oxidative stress and male infertility—a clinical perspective. *Hum Reprod Update*; 14: 243–258.
- Trzcińska, M., Bryła, M., 2015. Apoptotic-like changes of boar spermatozoa in freezing media supplemented with different antioxidants. *Pol. J. Vet. Sci.* 18 : 473–480.
- Tulsiani, D.R.P., Komiya, Y., Araki. 1997. Mammalian fertilization:a carbohydrate mediated event. *Biology Reproduction* 57: 487-494.
- Tuncer, P. B., Mustafa N. B, Serhat B., Serpil S., Deniz Y., Eken, Pınar P. A., Huseyin K., Fatih A., A. Fatih F., Mustafa G. 2010. The effect of cysteine and glutathione on sperm and oxidative stress parameters of post-thawed bull semen. *Cryobiology* 61 : 303–307
- Uma, D.K., Jha, K., Patil, S.B., Padma, P., and Shivaji, S. 2000. Inhibition of motility of hamster spermatozoa by protein tyrosine kinase inhibitors. *Andrologia* vol 32: 95–106

- Varum P, Benta C, Sousa A, Gomes-Santos C, Henriques P, Almedia- Santos T. Charaterization of human sperm population using conventional parameters, surface ubiquitination, and apoptotic markers. *Fertil Steril* 2007;87:572–83.
- Venkatesh, S., Shamsi, M.B., Deka, D., Saxena, V., Kumar, R., Dada, R. 2011. Clinical implications of oxidative stress & sperm DNA damage in normozoospermic infertile men. *Indian J Med Res*; 134: 396–398.
- Visconti, P.E. and G.S. Kopf. 1998. Capacitation of mouse spermatozo: correlation between the capacitation state and protein tyrosine phosphorylation. *J Mol Reprod Dev.* 121: 1129-1150.
- Vishwanath, R., Shannon, P., 2000. Storage of bovine semen in liquid and frozen state. *Anim. Reprod. Sci.* 62, 23–53. [https://doi.org/10.1016/S0378-4320\(00\)00153-6](https://doi.org/10.1016/S0378-4320(00)00153-6)
- Wang, A.W., Zhang, H., Ikemoto, I., Anderson, D.J., Lioughlin, K.R., 1997. Reactive oxygen species generation by seminal cells during cryopreservation. *Urology* 49, 921–925. [https://doi.org/10.1016/S0090-4295\(97\)00070-8](https://doi.org/10.1016/S0090-4295(97)00070-8)
- Watson, P.F., 2000. The causes of reduced fertility with cryopreserved semen. *Anim. Reprod. Sci.* 60/61, 481–492. [https://doi.org/10.1016/S0378-4320\(00\)00099-3](https://doi.org/10.1016/S0378-4320(00)00099-3)
- Widianingtyas, G.N. 2007. Dinamika dan peta distribusi populasi sapi potong di Kecamatan Sentolo Kabupaten Kulon Progo (Studi Kasus). Skripsi Fakultas Peternakan Universitas Gadjah Mada. In-Press.
- Yanagimichi, R. 1994. Mammalian fertilization. In: Knobil E, Neil J.D, *The Physiology of Reproduction*. Vol 1. New York, NY: Raven Press Ltd.
- Yeste, Marc, Flores, Eva, Estrada, E., Bonet, S., Rigau, T., Joan, E., Rodríguez-G, and, 2012. Reduced glutathione and procaine hydrochloride protect the nucleoprotein structure of boar spermatozoa during freeze–thawing by stabilizing disulfide bonds. *Reproductive., Fertility, and Development.* 25 (7): 1036–1050.
- Youngquist, R.S., and Threlfall, W.R. 2007. *Current Therapy in Large Animal Theriogenology*. Saunders Elsevier. Missouri. 226.
- Zamzami N, Susin SA, Marchetti P, Hirsch T, Gomez-Monterrey I, Castedo M, et al. Mitochondrial control of nuclear apoptosis. *J Exp Med* 1996;183:1533–44.

Zelpina, E., B. Rosadi, dan T.Sumarsono. 2012.Kualitas spermatozoa post thawing dari semen beku sapi perah.Jambi. *Jurnal Ilmu-Ilmu Peternakan*, 15: 94-102.

Zini A, Jamal W, Cowan L, Al-Hathal N (2011). Is sperm DNA damage associated with IVF embryo quality? A systematic review. *J Assist Reprod Genet*; 28: 391–397.

Zini,A., Argawal,A., 2011. Sperm Chromatin. Newyork:Spinger. 34.