

DAFTAR PUSTAKA

- Abah, K. O., A. Fontbonne, A. Partyka, and W. Nizanski. 2023. Effect of male age on semen quality in domestic animals: Potential for advanced functional and translational research. *Vet. Res. Commun.* 47(3): 1125–1137. <https://doi.org/10.1007/s11259-023-10159-1>
- Abd El-Hamid, I.S., F. Ali, R.H. Mohamed, N.A. Yousef, A.M. El-Sebaey, R.M. Ibrahim, E.A. Noseer, H.A. Hussein, and S.Y. Nour. 2024. Testicular Biometry, Spermigram, and Biochemical Parameters in Male Goats. *Egyptian Journal of Veterinary Science (Egypt)*. 55(3): 671–679. <https://doi.org/10.21608/EJVS.2023.235081.1607>
- Afiati, F., M. R. Yulnawati, and R. I. Arifiantini. 2015. Abnormalitas spermatozoa domba dengan frekuensi penampungan berbeda. *Pros Sem Nas Masy Biodiv Indon.* 1(4): 930–934.
- Aitken, R. J. 2017. Reactive oxygen species as mediators of sperm capacitation and pathological damage. *Molecular Reproduction and Development*. 84(10): 1039–1052. <https://doi.org/10.1002/mrd.22871>
- Aitken, R. J., Z. Gibb, M. A. Baker, J. Devet, and P. Gharagozloo. 2016. Causes and consequences of oxidative stress in spermatozoa. *Reproduction, Fertility and Development*. 28(2): 1–10. <https://doi.org/10.1071/RD15325>
- Aitken, R., T. Smith, M. Jobling, M. Baker, and G. De Iuliis. 2014. Oxidative stress and male reproductive health. *Asian Journal of Andrology*. 16(1): 31. <https://doi.org/10.4103/1008-682X.122203>
- Akhigbe, R. E., P. A. Oyedokun, A. E. Adeogun, O. O. Ogunleye, C. A. Adegbola, and T. M. Akhigbe. 2025. The aging male: Impact of aging on male reproduction. *Biogerontology*. 26(6) :198. <https://doi.org/10.1007/s10522-025-10343-7>
- Al-Ameri, M. H. 2022. Evaluation of testicular biometry and spermatozoa recovered after slaughter from cauda epididymal of Awassi ram. *Archives of Razi Institute*. 6: 2329–2334. <https://doi.org/10.22092/ari.2022.358950.2338>
- Ali, N., A. A. Memon, A. A. H. M. Kaka, M. I. Panhwar, N.A. Solangi, K.A. Malik, F.U. Rahman, and M.A. Vistro. 2024. In-vitro and In-vivo Fertilizing Potential of Kamohri Buck Semen Frozen in Tris-Based Egg Yolk Extender Supplemented with Selenium. *Journal of Animal Health and Production*. 12(1): 64–70. <https://doi.org/10.17582/journal.jahp/2024/12.1.64.70>
- Almeida, S., L. Rato, M. Sousa, M.G. Alves, and P.F. Oliveira. 2017. Fertility and Sperm Quality in the Aging Male. *Current Pharmaceutical Design*, 23(30). <https://doi.org/10.2174/1381612823666170503150313>
- Amaral, A., B. Lourenço, M. Marques, and J. Ramalho-Santos. 2013. Mitochondria functionality and sperm quality. *Reproduction*. 146(5): R163–R174. <https://doi.org/10.1530/REP-13-0178>
- Asghari-Moghadam, M., and M. Mehri. 2025. Enhanced Sperm Quality in Aged Broiler Breeder Roosters with Organic Selenium and Selenium Nanoparticles: A Comparative Bioavailability Study. *Biological Trace Element Research*. 203(4): 2409–2419. <https://doi.org/10.1007/s12011-024-04323-0>

- Atabany, A. 2013. *Beternak Kambing Peranakan Etawah* (Cetakan 1). PT Penerbit IPB Press. Kampus IPB Taman Kencana Bogor.
- Atabany, A., I. K. Abdulgani, A. Sudono, dan K. Mudikdjo. 2001. Performa produksi, reproduksi dan nilai ekonomis kambing Peranakan Etawah di peternakan Barokah. *Media Peternakan*. 24(2):1–7.
- Awuy, F. D., D.S. Purwanto, dan Y.M. Mewo. 2021. Pengaruh Pemberian Vitamin C Terhadap Kualitas Spermatozoa Yang Terpapar Asap Rokok. *EBiomedik*. 9(2).
- Azzahra, F.Y., E.T. Setiatin, dan D. Samsudewa. 2016. Evaluasi motilitas dan persentase hidup semen segar sapi PO Kebumen pejantan muda. *Jurnal Sain Peternakan Indonesia*. 11(2): 99–107.
- A'yun, Z.Q, G. Rosita, Y.I. Pratama, L.N. Pawestri, U. Fadlilah, M. Arifin, dan Y.L.R.E. Nugrahini. 2021. Pengaruh Penggunaan Pengencer Filtrat Kecambah Kacang Hijau Terhadap Kualitas Semen Ayam Kampung. *Prosiding Seminar Nasional Teknologi Agribisnis Peternakan (Stap)*. 8: 744–752.
- Bachtell, N. E., J. Conaghan, and P. J Turek. 1999. The relative viability of human spermatozoa from the vas deferens, epididymis and testis before and after cryopreservation. *Human Reproduction*. 14(12) : 3048–3051.
- Baity, A. N., S. Maghfiroh, K. Fitriana, K. D. Prihantoko, D. Maharani, dan D.T. Widayati. 2024. Effect of storage periods on DNA fragmentation of post-thawed Bali bull sperm. *Advances in Animal and Veterinary Sciences*. 12(8), 1456–1464.
- Bansal, A. K. 2015. Antioxidants and Other Potent Strategies to Reduce Oxidative Stress in Semen. In V. Rani and U. C. S. Yadav (Eds.), *Free Radicals in Human Health and Disease*. Springer India. pp. 381–395. https://doi.org/10.1007/978-81-322-2035-0_24
- Baskaran, S., R. Finelli, A. Agarwal, and R. Henkel. 2021. Reactive oxygen species in male reproduction: A boon or a bane?. *Andrologia*. 53(1): 1–12. <https://doi.org/10.1111/and.13577>
- Bertuzzi, M.L., F.G. Fumuso, D.M. Neild, M. Udaquiola, and M.I. Carretero. 2022. Use of commercial extenders, with and without the addition of egg yolk, for cooling llama semen. *Anim. Reprod. Sci*. 247(9): 1-10. 107073. <https://doi.org/10.1016/j.anireprosci.2022.107073>
- Bhave, K. G., K. Thilak Pon Jawahar, P. Kumarasamy, T. Sivakumar, C. Joseph, R. Jadhav, J. Khadse, and R. Venkataramanan. 2021. Effect of management and environmental factors on semen production potential of indigenous cattle breeds. *Indian Journal of Animal Research*. 55(5) : 603–608. <https://doi.org/10.18805/ijar.B-3985>
- Bintara, S., D.T. Widayati. and P.I Sitaresmi. 2025. Curcuma xanthorrhiza Diluent's Effect on the Freezing and Thawing of Thin-Tailed Ram Sperm. *Pak. J. Zool*. 57(1): 1-8.
- Bodu, M., M. Hitit, O. C. Greenwood, R.D. Murray, and E. Memili. 2025. Extender development for optimal cryopreservation of buck sperm to increase reproductive efficiency of goats. *Front. Vet. Sci*. 12: 1–18.

<https://doi.org/10.3389/fvets.2025.1554771>

- Bogdaniuk, A., V. Garkavi, and M. Petrushko. 2023. Reproductive characteristics of Saanen and Alpine bucks. *Animal Biology*. 25(3): 19-22.
- Brohi, R. D., and L. J. Huo. 2017. Posttranslational modifications in spermatozoa and effects on male fertility and sperm viability. *OMICS: J. Integr. Biol.* 21(5): 245–256.
- Cahya, R. I., S. O. Yon, and E. T. S. 2017. Persentase Membran Plasma Utuh Dan Tudung Akrosom Utuh Spermatozoa Kambing Peranakan Etawah Dalam Pengencer Yang Berbeda. *Seminar Nasional: Sekolah Tinggi Penyusunan Pertanian (STPP) Magelang*. 406–416.
- Carreira, J. T., J.T. Trevizan, I.R. Carvalho, B. Kipper, L.H. Rodrigues, C. Silva, S.H.V. Perri, J. R. Drevet, and M. B. Koivisto. 2017. Does sperm quality and DNA integrity differ in cryopreserved semen samples from young, adult, and aged Nellore bulls?. *Basic and Clinical Andrology*. 27(1): 1–8. <https://doi.org/10.1186/s12610-017-0056-9>.
- Castañeda, J. M., H. Miyata, M. Ikawa, and M. M. Matzuk. 2018. Sperm Defects. In *Encyclopedia of Reproduction*. Elsevier. 276–281. <https://doi.org/10.1016/B978-0-12-801238-3.64778-5>
- Castro, M., K. Leal, F. Pezo, and M. J. Contreras. 2025. Sperm Membrane: Molecular Implications and Strategies for Cryopreservation in Productive Species. *Animals*. 15(12): 1–18. <https://doi.org/10.3390/ani15121808>
- Castro, C. D. S., C. F. C. Cotrim, I. R. D. Santos, K. J. G. D. Santos, J. A. M. D. Paula, S. S. Caramori, L. M. D. Almeida, E. F. L. C. Bailão, and L. L. Borges. 2022. Application of natural antioxidants in animal reproduction. *Ciência Animal Brasileira*. 23 : e-73601E. <https://doi.org/10.1590/1809-6891v23e-73601e>
- Castro, J. S., S. Braz-Mota, D.F. Campos, S.S. Souza, and A. L. Val. 2020. High Temperature, pH, and Hypoxia Cause Oxidative Stress and Impair the Spermatogenic Performance of the Amazon Fish *Colossoma macropomum*. *Frontiers in Physiology*. 11: 772. <https://doi.org/10.3389/fphys.2020.00772>
- Chauychu-noo, N., P. Thananurak, W. Boonkum, T. Vongpralub, and V. Chankitisakul, V. 2021. Effect of organic selenium dietary supplementation on quality and fertility of cryopreserved chicken sperm. *Cryobiology*. 98: 57–62. <https://doi.org/10.1016/j.cryobiol.2020.12.008>
- Cheng, H., X. Zhang, Y. Li, D. Cao, C. Luo, Q. Zhang, S. Zhang, and Y. Jiao. 2024. Age-related testosterone decline: mechanisms and intervention strategies. *Reproductive Biology and Endocrinology*. 22(1): 144–157. <https://doi.org/10.1186/s12958-024-01316-5>
- Christi, R. F., E. Wulandari, dan A. F. Prasetya. 2024. Evaluasi mutu sensorik, berat jenis, lemak, dan protein susu kambing sapera di Peternakan Kambing Perah Alam Farm Manglayang Kecamatan Cilengkrang Kabupaten Bandung. *Zootec*. 44(1): 202–212.
- Coelho, L. A., A. Sasa, C. E. Nader, and E. C. C. Celeguini. 2006. Características do ejaculado de caprinos sob estresse calórico em câmara bioclimática. *Arquivo Brasileiro de Medicina Veterinária e Zootecnia*. 58(4): 544–549.

<https://doi.org/10.1590/S0102-09352006000400015>

- Datt, C., A. Kumar, S. Prusty, and S.S. Kundu. 2014. Effect of supplementation of arsenic and Pentasulphate mixture in the diets of Murrah buffaloes given high level of selenium on blood selenium and erythrocyte glutathione peroxidase activity. *The Journal of Animal and Plant Sciences*. 24(Suppl 1): 12–15.
- delBarco-Trillo, J., and E.R.S. Roldan. 2014. Effects of metabolic rate and sperm competition on the fatty-acid composition of mammalian sperm. *Journal of Evolutionary Biology*. 27(1) : 55–62. <https://doi.org/10.1111/jeb.12275>
- Diansyah, A. M., M. Yusuf, A. L. Tolleng, S. Surahman, M. Raafi, and Sahiruddin. 2021. The quality of intact plasma membrane of bull frozen sperm in different breeds. *IOP Conference Series: Earth and Environmental Science*. 788(1): 1–5. <https://doi.org/10.1088/1755-1315/788/1/012134>
- Diyasa, I. G. S. M., W. S. J. Saputra, A. A. N. Gunawan, D. Herawati, S. Munir, and S. Humairah. 2024. Abnormality Determination of Spermatozoa Motility Using Gaussian Mixture Model and Matching-based Algorithm. *Journal of Robotics and Control (JRC)*. 5(1):103–116. <https://doi.org/10.18196/jrc.v5i1.20686>
- Domingos, A., F. Santos, C. Alexandre, A. Torres, J. Ferreira, A.M. Borges, E. Paulino, J.D. Guimarães, and H. Rovay. 2006. Reproductive aspects of male goats under an artificial photoperiod exposure. *Revista Brasileira de Zootecnia*. 35(5): 1926–1933.
- Dorostkar, K., S. M. Alavi-Shoushtari, and A. Mekarizadeh. 2012. Effects of in vitro selenium addition to the semen extender on the spermatozoa characteristics before and after freezing in water buffaloes (*Bubalus bubalis*). *Veterinary Research Forum: An International Quarterly Journal*. 3(4): 263–268.
- Durairajanayagam, D. 2019. Physiological Role of Reactive Oxygen Species in Male Reproduction. In *Oxidants, Antioxidants and Impact of the Oxidative Status in Male Reproduction*. Elsevier. 65–78. <https://doi.org/10.1016/B978-0-12-812501-4.00008-0>
- El Akbar, R. R., H. Indrijani, dan L. B. Salman. 2019. Analisis Perbandingan Performa Reproduksi Kambing Saanen Dan Peranakan Etawa (Kasus Di Bbptu-Hpt Baturraden) Reproduction Of Saanen And Peranakan Etawa Goat Performance Comparative Analysis (Case Study At Bbptu-Hpt Baturraden). *JANHUS Jurnal Ilmu Peternakan Journal of Animal Husbandry Science*. 3(2): 27–32.
- El-Sisy, G. A., D. A. El-Badry, R. I. El-Sheshtawy, and W. S. El-Nattat. 2018. Effects of Phoenix dactylifera pollen grains extract supplementation on post-thaw quality of arabian stallion semen. *Bulgarian Journal of Veterinary Medicine*. 21(1): 40–49. <https://doi.org/10.15547/bjvm.1044>
- Esteves, S.C., R.K. Sharma, A.J. Thomas Jr, and A. Agarwal. 2000. Improvement in motion characteristics and acrosome status in cryopreserved human spermatozoa by swim-up processing before freezing. *Human Reproduction*. 15(10): 2173–2179.
- Faigl, V., N. Vass, A. Jávör, M. Kulcsár, L. Solti, G. Amiridis, and S. Cseh. 2012. Artificial insemination of small ruminants—A review. *Acta Veterinaria*

- Hungarica. 60(1): 115-129. <https://doi.org/10.1556/avet.2012.010>
- Fang, Y., H. Blair, R. Zhong, H. Sun, and D. Zhou. 2016. Optimizing the freezing rate for ovine semen cryopreservation: Phospholipid profiles and functions of the plasma membrane and quality and fertilization of spermatozoa. *Small Ruminant Research*. 139: 46–51. <https://doi.org/10.1016/j.smallrumres.2016.04.012>
- Feng, Q., Y. Yang, B. Zhang, W. Shi, Y. Fang, C. Xu, Z. Deng, W. Feng, and D. Shi. 2025. The Effects of Limonin, Myo-Inositol, and L-Proline on the Cryopreservation of Debao Boar Semen. *Animals*. 15(15): 1–17. <https://doi.org/10.3390/ani15152204>
- Ferreira, G., C. Annandale, M. Smuts, and D. Holm. 2022. The potential effects and interactions of oxidative stress and trace minerals on fresh and frozen semen in bulls – a review. *Journal of the South African Veterinary Association*. 93(2): 70–75. <https://doi.org/10.36303/JSAVA.02>
- Firhamsah, I., S. Bintara, dan D. T. Widayati. 2022. The effect of thawing duration on the post thawing quality of Bali cattle's frozen semen and conseption rate in smallholder farms of east lombok regency. *Buletin Peternakan*. 46(2): 112–120.
- Fitriana, S. B., N. A. Maghfiroh, A. N. Baity, D. F. F. Diatmono, K. D. Prihantoko, S. Bintara, dan D. T. Widayati. 2025. Effect of Different Thawing Methods on Frozen Semen Characteristics and DNA Damage of Indonesian Simmental Bull. *Pakistan Journal of Agricultural Research*. 38(1): 8-18.
- Flores, C., Y. C. Márquez, L. Vilanova, N. Matheus, and L.O. A. 2014. Administration of selenium decreases lipid peroxidation in semen of Brahman bulls. *Revista Veterinaria*. 25(2): 95–99.
- Ghafarizadeh, A. A., G. Vaezi, M. A. Shariatzadeh, and A. A. Malekirad. 2018. Effect of in vitro selenium supplementation on sperm quality in asthenoteratozoospermic men. *Andrologia*. 50(2) : 1–7. <https://doi.org/10.1111/and.12869>
- Gibb, Z., R. A. Griffin, R. J. Aitken, and G. N. De luliis. 2020. Functions and effects of reactive oxygen species in male fertility. *Animal Reproduction Science*. 220(January): 1–13. <https://doi.org/10.1016/j.anireprosci.2020.106456>
- Gordon, I. 2004. *Reproductive Technologies in Farm Animals*. CABI Publishing.
- Gore, A. C., J. E. Hall, and F. J. Hayes. 2015. Aging and Reproduction. In *Knobil and Neill's Physiology of Reproduction* (pp. 1661–1693). Elsevier. <https://doi.org/10.1016/B978-0-12-397175-3.00037-5>
- Hafez, E. S. E., and B. Hafez. 2000. Reproductive cycles, in *Reproduction in Farm Animals*. 55–67.
- Hafez, E. S. E., R.L. Ax, M.R. Dally, B. A. Didin, R.W. Lenz, C.C. Love, D.D. Varner, B. Hagez, and M.E. Bellin. 2003. Semen Evaluation, in *Reproduction In Farm Animals*. 7th edition. E.S.E Hafez ed. Lea and Febiger. Philadelphia, USA
- Hall, J. O. 2025. Selenium. In *Veterinary Toxicology*. Elsevier. (pp. 473–482). <https://doi.org/10.1016/B978-0-443-29007-7.00079-0>
- Hamdan, B., A. Sutriana, D. Aliza, E. Rahmi, and A.R. Dalimunthe. 2010. Pengaruh

- Lama Penyimpanan Epididimis Pada Suhu 5°C Terhadap Kualitas Spermatozoa Kambing Lokal Aceh. *Jurnal Kedokteran Hewan*. 4(2): 81-86
- Hayati, A., S. Mangkoewidjojo, A. Hinting, dan S. Moeljopawiro. 2006. Hubungan Kadar Mda Sperma Dengan Integritas Membran Spermatozoa Tikus (*Rattus norvegicus*) Setelah Pemaparan 2-Methoxyethanol. *Berkala Penelitian Hayati*. 11(2): 151–154. <https://doi.org/10.23869/bphjbr.11.2.20069>
- Hayden, R. P., A. Aboukhshaba, and P. N. Schlegel. 2020. DNA Damage in Spermatozoa. In J. Aitken, D. Mortimer, and G. Kovacs (Eds.). *Male and Sperm Factors that Maximize IVF Success*. (1st ed., pp. 199–210). Cambridge University Press. <https://doi.org/10.1017/9781108762571.017>
- Herdis, H. 2018. Karakteristik semen segar domba Garut tipe laga pada tiga waktu penampungan semen. *Zoo Indonesia*. 26(1).
- Heriyanta, E., M. N. Ihsan, dan N. Isnaini. 2014. Pengaruh umur kambing peranakan etawah (PE) terhadap kualitas semen segar. *Ternak Tropika Journal of Tropical Animal Production*. 14(2): 1–5.
- Hmood Jassim, A., S.A. Abed, A. Kareem thamer, K. Judi, and H.A. Enad. 2021. Effect of Letrozole administration as a selective aromatase inhibitor on Male Rat's Reproductive performance. *Archives of Razi Institute*. 77(1): 343–349. <https://doi.org/10.22092/ari.2021.356539.1864>
- Huang, D., Y. Zuo, C. Zhang, G. Sun, Y. Jing, J. Lei, S. Ma, S. Sun, H. Lu, X. Zhang, Y. Cai, W. Zhang, F. Gao, A. P. Xiang, J.C. Izpisua Belmonte, G.H. Liu, J. Qu, and S. Wang. 2022. A single-nucleus transcriptomic atlas of primate testicular aging reveals exhaustion of the spermatogonial stem cell reservoir and loss of Sertoli cell homeostasis. *Protein & Cell*. 14(12): 888–907. <https://doi.org/10.1093/procel/pwac057>
- Imran, S., M. S. Khan, A. U. Hyder, S.A. Bhatti, F. Ramzan, M.S. Rehman and F. Hassanul. 2025. Comparing Fertility Outcomes of Washed and Unwashed Cryopreserved Semen in Beetal Goat Through Artificial Insemination. *Pakistan Journal of Agricultural Sciences*. 62(1): 59–68.
- Ingold, I., and M. Conrad. 2018. Oxidative Stress, Selenium Redox Systems Including GPX/TXNRD Families. In B. Michalke (Ed.). *Selenium* (pp. 111–135). Springer International Publishing. https://doi.org/10.1007/978-3-319-95390-8_6
- Joy, A., F. R. Dunshea, B. J. Leury, I. J. Clarke, K. Digiacomio, and S.S. Chauhan. 2020. Resilience of small ruminants to climate change and increased environmental temperature: A review. *Animals*. 10(5): 1–18. <https://doi.org/10.3390/ani10050867>
- Jumintono, J., S. Alkubaisy, K. Singh, I. Mikolaychik, and L. Morozova. 2021. Effect of cystamine on sperm and antioxidant parameters of ram semen stored at 4 C for 50 hours. *Archives of Razi Institute*. 76(4): 1115-1123.
- Karim, K., M.R. Jura, and S.M. Sabang. 2015. Uji aktivitas antioksidan ekstrak daun patikan kebo (*euphorbia hirta* L.). *Jurnal Akademika Kimia*. 4(2): 56–63.
- Khalil, W.A., M.A. El-Harairy, A.E.B. Zeidan, and M.A.E. Hassan. 2019. Impact of selenium nano-particles in semen extender on bull sperm quality after cryopreservation. *Theriogenology*. 126: 121–127.

- Khan, A., M. S. Thakur., S. Joshi., S. N. Shukla., A. Khare., V. Khare, R. K. Vandred., and M. Sharma. 2024. Effect of age on testicular biometry, sexual behaviour and semen characteristics in indigenous goat breeds. *Indian J. Small Ruminants*. 30(1): 46–51. <https://doi.org/10.5958/0973-9718.2024.00023.0>
- Kielczykowska, M., J. Kocot, M. Paździor, and I. Musik. 2018. Selenium-a fascinating antioxidant of protective properties. *Adv Clin Exp Med*. 27(2): 245–255.
- Koshevoy, V., S. Naumenko, P. Skliarov, S. Fedorenko, and L. Kostyshyn. 2021. Male Infertility: Pathogenetic Significance of Oxidative Stress and Antioxidant Defence (Review). *Scientific Horizons*. 24(6): 107–116. [https://doi.org/10.48077/scihor.24\(6\).2021.107-116](https://doi.org/10.48077/scihor.24(6).2021.107-116)
- Kumaresan, A., A. Johannisson, E.M. Al-Essawe, and J.M. Morrell. 2017. Sperm viability, reactive oxygen species, and DNA fragmentation index combined can discriminate between above-and below-average fertility bulls. *Journal of Dairy Science*. 100(7): 5824–5836.
- Kusrianty, N., Mirajuddin, dan Awalludin. 2016. Efektifitas Inseminasi Buatan Pada Sapi Potong Menggunakan Semen Cair. *E-Jurnal Mitra Sains*. 4(1): 50–57. <https://doi.org/10.22487/mitrasains.v4i1.162>
- Kusumawati, E D., H. Leondro, T. Susilawati, dan N. Isnaini. 2015. Spermatozoa, Viability of Filial Ettaea Goat After Sexing Process. In *Proceeding Internasional Seminar Improving Tropical Animal*.
- Laučienė, L., V. Juozaitienė, B. Šlyžienė, L. Anskienė, R. Bižienė, and Šlyžius, E. 2022. The influence of crossbreeding and LPL genotype on the yield, composition and quality of goat milk. *Mljekarstvo*. 72(1) : 33–42. <https://doi.org/10.15567/mljekarstvo.2022.0104>
- Leahy, T., and B. Gadella. 2015. New insights into the regulation of cholesterol efflux from the sperm membrane. *Asian Journal of Andrology*. 17(4) : 561. <https://doi.org/10.4103/1008-682X.153309>
- Leboeuf, B., B. Restall, and S. Salamon. 2000. Production and storage of goat semen for artificial insemination. *Animal Reproduction Science*. 62(1–3) : 113–141.
- Lestari, T. P., M.N. Ihsan, and N. Isnaini. 2014. Pengaruh waktu simpan semen segar dengan pengencer andromed pada suhu ruang terhadap kualitas semen kambing Boer. *Ternak Tropika Journal of Tropical Animal Production*. 15(1) : 43–50.
- Lima-Verde, I., E. Hurri, T. Ntallaris, A. Johannisson, H. Stålhammar, and J.M. Morrell. 2022. Sperm Quality in Young Bull Semen Can Be Improved by Single Layer Centrifugation. *Animals*. 12(18) : 24–35. <https://doi.org/10.3390/ani12182435>
- Liu, T., Y. Han, T. Zhou, R. Zhang, H. Chen, S. Chen, and H. Zhao. 2019. Mechanisms of ROS-induced mitochondria-dependent apoptosis underlying liquid storage of goat spermatozoa. *Aging*. 11(18) : 7880–7898. <https://doi.org/10.18632/aging.102295>
- López-Gil, L., A. Pascual-Ahuir, and Proft. 2023. Genomic Instability and Epigenetic Changes during Aging. *International Journal of Molecular*

- Science. 24(18): 1–28. <https://doi.org/10.3390/ijms241814279>
- Lovari, S., E. Mori, and E. L. Procaccio. 2020. On the Behavioural Biology of the Mainland Serow: A Comparative Study. *Animals*. 10(9) : 1–14. <https://doi.org/10.3390/ani10091669>
- Lukusa, K., and K.C. Lehloenya. 2017. Selenium supplementation improves testicular characteristics and semen quality of Saanen bucks. *Small Ruminant Research*. 151:52-58.
- Luo, J., W. Wang, and S. Sun. 2019. Research advances in reproduction for dairy goats. *Asian-Australasian Journal of Animal Sciences*. 32(8) : 1284–1295. <https://doi.org/10.5713/ajas.19.0486>
- Lv, C., A. Larbi, C. Li, J. Liang, G. Wu, Q. Shao, and Q. Quan. 2024. Decoding the influence of semen collection processes on goat sperm quality from a perspective of seminal plasma proteomics. *Journal of Proteomics*. 298(2) : 105–141. <https://doi.org/10.1016/j.jprot.2024.105141>
- Mahfud, A., N. Isnaini, A. P. A. Yekti, K. Kuswati, dan T. Susilawati. 2019. Kualitas Spermatozoa Post Thawing Semen Beku Sperma Y Hasil Sexing Pada Sapi Limousin. *Ternak Tropika Journal of Tropical Animal Production*. 20(1): 1–7. <https://doi.org/10.21776/ub.jtapro.2019.020.01.1>
- Mai, Z., D. Yang, D. Wang, J. Zhang, Q. Zhou, B. Han, and Z. Sun. 2024. A narrative review of mitochondrial dysfunction and male infertility. *Translational Andrology and Urology*. 13(9) (September 30, 2024). <https://tau.amegroups.org/article/view/129257>
- Mahfuza, S., S. Nani Gopal, B. Sukanta, and P. Ashit Kumar. 2022. Collection and evaluation of indigenous buck semen at the coastal region of Bangladesh. *Insights in Veterinary Science*. 6(1) : 001–004. <https://doi.org/10.29328/journal.ivs.1001034>
- Mamutse, J., A. Susanto, D. Purwanti, M.Y. Sumaryadi, Y. Subagyo, and A. Sodik. 2023. Exploring the non-genetic factors that affect reproductive traits of Saanen goats in Indonesia. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*. 124(2): 129–135. <https://doi.org/10.17170/KOBRA-202311028939>
- Marciane, D. S. M. (2014). Semen processing and artificial insemination in goats. *Acta Veterinaria Brasilica*. 8(supl.2): 389–395. <https://doi.org/10.21708/avb.2014.8.0.3959>
- Marcondes Seneda, M., K. C. Silva-Santos, and L. S. R. Marinho. 2016. *Biotechnology of animal reproduction*. Nova Science Publisher's, Inc.
- Martín Muñoz, P., L. Anel-López, J. Ortiz-Rodríguez, M. Álvarez, P. De Paz, C. Balao Da Silva, H. Rodríguez Martínez, M. Gil, L. Anel, F. Peña, and C. Ortega Ferrusola. 2018. Redox cycling induces spermtosis and necrosis in stallion spermatozoa while the hydroxyl radical (OH•) only induces spermtosis. *Reproduction in Domestic Animals*. 53(1): 54–67. <https://doi.org/10.1111/rda.13052>
- Martorana, K., K. Klooster, and S. Meyers. 2014. Suprazero cooling rate, rather than freezing rate, determines post thaw quality of rhesus macaque sperm. *Theriogenology*. 81(3): 381–388.

<https://doi.org/10.1016/j.theriogenology.2013.10.008>

- Masuda, Y., T. Kheawkanha, A. Nagahama, K. Kawasaki, T. Konno, K. Yamanaka, and H. Tatemoto. 2023. Antifreeze protein type III addition to freezing extender comprehensively improves post-thaw sperm properties in Okinawan native Agu pig. *Animal Reproduction Science*. 252: 1–10. <https://doi.org/10.1016/j.anireprosci.2023.107232>
- Matzkin, M. E., R.S. Calandra, S.P. Rossi, A. Bartke, and M.B. Frungieri. 2021. Hallmarks of Testicular Aging: The Challenge of Anti-Inflammatory and Antioxidant Therapies Using Natural and/or Pharmacological Compounds to Improve the Physiopathological Status of the Aged Male Gonad. *Cells*, 10(11): 3114. <https://doi.org/10.3390/cells10113114>
- Meseguer, M., N. Garrido, C. Simón, A. Pellicer, and J. Remohi. 2004. Concentration of Glutathione and Expression of Glutathione Peroxidases 1 and 4 in Fresh Sperm Provide a Forecast of the Outcome of Cryopreservation of Human Spermatozoa. *Journal of Andrology*. 25(5): 773–780. <https://doi.org/10.1002/j.1939-4640.2004.tb02855.x>
- Mintziori, G., A. Mousiolis, L. H. Duntas, and D. G. Goulis. 2020. Evidence for a manifold role of selenium in infertility. *Hormones*. 19(1): 55–59. <https://doi.org/10.1007/s42000-019-00140-6>
- Miraz, M. F. H., T. Yamanaka, S. Akter, M. Koyago, and M. Shimada. 2025. Lactate inhibits glucose-induced zigzag motility and enhances linear motility in bull spermatozoa by suppressing glycolysis. *Andrology*. andr.70113. <https://doi.org/10.1111/andr.70113>
- Moawad, A. R., T. Reese, M. Schauston, M. Singh, and B. Kouakou. 2022. PSXIV-10 Influence of Breeds on the Quality of Chilled Goat Semen Collected by Artificial Vagina. *Journal of Animal Science*. 100(Supp_3): 230–230. <https://doi.org/10.1093/jas/skac247.416>
- Mojapelo, M. M., and K.C. Lehloenya. 2019. Effect of selenium supplementation on attainment of puberty in Saanen male goat kids. *Theriogenology*. 138: 9–15. <https://doi.org/10.1016/j.theriogenology.2019.06.044>
- Mojapelo, M.M., J B.J. van Ryssen, and K.C. Lehloenya. 2021. Selenium supplementation reduces induced stress, enhances semen quality and reproductive hormones in Saanen bucks. *Small Ruminant Research*. 201(106443): 1-6.
- Moya, C.F., M. Piagentini, D. Silva. C. da, F.H. Fernandes, D.M.F. Salvadori, and E. Oba. 2021. Selenium supplementation prevents DNA damage in RAM spermatozoa. *Ciencia Rural*. 51(1): 1–6. <https://doi.org/10.1590/0103-8478cr20200102>
- Mustaqilla, S. 2020. Pengaruh Konsentrasi Kuning Telur Angsa Dalam Medium Sitrat Dan Lama Waktu Pendinginan Pada Suhu 5°C Terhadap Integritas Membran Plasma Spermatozoa Sapi Aceh Effect Of Goose Egg Yolk Concentration in Citrate Medium and different chilling period at 5°C on Ac. *JIMVET Fakultas Kedokteran Hewan Universitas Syiah Kuala*. 4: 30–38.
- Nenkova, G., L. Petrov, and A. Alexandrova. 2017. Role of Trace Elements for Oxidative Status and Quality of Human Sperm. *Balkan Medical Journal*.

34(4): 343–348. <https://doi.org/10.4274/balkanmedj.2016.0147>

Noris, D., J. W. Ngambi, K. Benyi, and C. A. Mbajorgu. 2011. Milk production of three exotic dairy goat genotypes in Limpopo Province, South Africa. *Asian Journal of Animal and Veterinary Advances*. 6(3): 274–281. <https://doi.org/10.3923/ajava.2011.274.281>

Nguyen-Powanda, P., and B. Robaire. 2020. Oxidative Stress and Reproductive Function in the Aging Male. *Biology*. 9(9): 282–296. <https://doi.org/10.3390/biology9090282>

Nisfimawardah, L., A. Firmawati, M. Nur Ihsan, T. Susilawati, and S. Wahjuningsih. 2023. Semen Cryopreservation Quality and Sperm Kinematics of Saanen Goats Using Different Diluents. *World's Veterinary Journal*. 13(2): 300–309. <https://doi.org/10.54203/scil.2023.wvj32>

O'Donnell, L., and R.I. McLachlan. 2012. The role of testosterone in spermatogenesis. In E. Nieschlag, H. M. Behre, & S. Nieschlag (Eds.). *Testosterone* (4th ed., pp. 123–153). Cambridge University Press. <https://doi.org/10.1017/CBO9781139003353.007>

O'Flaherty, C., and E. Scarlata. 2022. Oxidative Stress And Reproductive Function: The protection of mammalian spermatozoa against oxidative stress. *Reproduction*. 164(6): F67–F78. <https://doi.org/10.1530/REP-22-0200>

Ouennes, H., B. F. Afri, Z. Bouzebda, S. Medjedoub, Djaout, and S. M. Adnane. 2019. Effect of testicle post-mortem storage on goat epididymal sperm quality: The first step towards cryobank for local Algeria breeds. *Ecole Nationale Veterinaire*, 170(7), 184–19.

Ozkosem, B., S.I. Feinstein, A.B. Fisher, and C. O'Flaherty. 2015. Advancing age increases sperm chromatin damage and impairs fertility in peroxiredoxin 6 null mice. *Redox Biology*. 5:15–23. <https://doi.org/10.1016/j.redox.2015.02.004>

Pascal, C., C. Pânzaru, R.M. Radu-Rusu, V. Maciuc, A.M. Florea, and I. Nechifor. 2024. The Influence of Season and Age on Specific Semen Traits and Reproductive Behavior in Carpatina Breed Bucks. *Agriculture*. 14(11): 1–19. <https://doi.org/10.3390/agriculture14112092>

Paul, D.R., D. Talukdar, F.A. Ahmed, K. Lalrintluanga, G. Kalita, T.C Tolengkomba, H. Chakravart., R. Katiyar, G. Khargharia, and S. Deori. 2024. Effect of selenium nanoparticles on the quality and fertility of short-term preserved boar semen. *Frontiers in Veterinary Science*. 10(1333841): 1-7.

Pei, J., X. Pan, G. Wei, and Y. Hua. 2023. Research progress of glutathione peroxidase family (GPX) in redox. *Frontiers in Pharmacology*. 14: 1–14. <https://doi.org/10.3389/fphar.2023.1147414>

Peña, F. J., J. M. Ortiz-Rodríguez, G. L. Gaitskell-Phillips, M. C. Gil, C. Ortega-Ferrusola, and F.E. Martín-Cano. 2022. An integrated overview on the regulation of sperm metabolism (glycolysis-Krebs cycle-oxidative phosphorylation). *Animal Reproduction Science*. 246(5). <https://doi.org/10.1016/j.anireprosci.2021.106805>

Pisoschi, A. M., and A. Pop. 2015. The role of antioxidants in the chemistry of

- oxidative stress: A review. *European Journal of Medicinal Chemistry*. 97: 55–74. <https://doi.org/10.1016/j.ejmech.2015.04.040>
- Plumeriastuti, H. 2023. Surat Tugas Wakil Dekan 1 Fakultas Kedokteran Hewan Universitas Airlangga.
- Pratiwi, I. N., W. Aligita, and M. Kaniawati. 2021. A study of antioxidant potential from herbal plants and the effects on Parkinson's disease. *Jurnal Ilmiah Farmasi*. 17(1): 80–95.
- Pratiwi, N., T.L. Yusuf, I. Arifiantini, dan C. Sumantri. 2019. Kualitas spermatozoa dalam modifikasi pengencer ringer laktat kuning telur dengan tambahan astaxanthin dan glutathione pada tiga jenis ayam lokal. *Acta Veterinaria Indonesiana*. 7(1): 46–54.
- Prieto, O.B., C. Algieri, M. Spinaci, F. Trombetti, S. Nesci, and D. Bucci. 2023. Cell bioenergetics and ATP production of boar spermatozoa. *Theriogenology*. 210(6): 162–168. <https://doi.org/10.1016/j.theriogenology.2023.07.018>
- Prihantoko, K. D. 2023. Analisis Kerusakan Oksidatif dan Pemanfaatan Antioksidan pada Kryopreservasi Semen Sapi Peranakan Ongole Indonesia. *American Journal of Animal and Veterinary Sciences*. 17 (1): 11-18.
- Prihantoko, K.D., A. Kusumawati, M. Pangestu, D.T. Widayati, and A. Budiyo. 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.
- Prihantoko, K.D., F. Yulastuti, H. Haniarti, A. Kusumawati, D.T. Widayati, dan A. Budiyo. 2020. The Effect of Genistein on the Plasma Membrane Integrity of Frozen Ongole Grade Bull Semen Based on Skim Milk–Soy Lecithin Extender. *IOP Conference Series: Earth and Environmental Science*. 465(1): (12054), 2-11.
- Prihatin, K. W., and A. Amam. 2022. Respon inseminasi buatan (IB) dan kawin alami (KA) kambing perah persilangan peranakan etawah dan senduro terhadap litter size, tipe kelahiran, dan rasio jenis kelamin anak per kelahiran. *Jurnal Peternakan*. 19(2): 116–122.
- Puente, M., I. Covelo, and M. Tartaglione. 2022. Testicular development and its relationship with seminal quality in crossbred goats Anglo Nubian x Boer (Nubor). *Revista de Investigaciones Veterinarias Del Peru*. 33(1): 1–7. <https://doi.org/10.15381/rivpe.v33i1.20387>
- Purnomo, M. 2019. Kualitas Semen Segar Dan Recovery Rate Kambing Senduro Berdasarkan Pengaruh Musim. Universitas Brawijaya.
- Rachmawati, A., I. Ismaya, B.P. Widyobroto, S. Bintara, and T. Susilawati. 2018. Aplikasi Inseminasi Buatan pada Induk Sapi Potong Menggunakan Semen Cair Sapi Peranakan Ongole dengan Pengencer Cauda Epididymal Plasma-2+ 0, 6% Bovine Serum Albumin. *Jurnal Ilmu-Ilmu Peternakan*. 28(3): 247–258.
- Rahmawati, N. A., A. P. A. Yekti, A. Wahyudi, F. A. D. Nafis, N. Isnaini, and T. Susilawati. 2025. The Quality of Sexed Bali Bull Semen Using Percoll Density Gradient Centrifugation in Various Gradients with Tris

- Aminomethane Diluent. *Jurnal Ilmu-Ilmu Peternakan*. 35(1): 35–41.
<https://doi.org/10.21776/ub.jiip.2025.035.01.4>
- Rajabi-Toustani, R., M. R. A. Mehr, and R. Motamedi-Mojdehi. 2021. Reduction of seminal plasma concentration can decrease detrimental effects of seminal plasma on chilled ram spermatozoa. *Animal Reproduction*. 18(1): 1–12.
<https://doi.org/10.1590/1984-3143-ar2020-0211>
- Ramu, S., and R.S. Jeyendran. 2013. The hypo-osmotic swelling test for evaluation of sperm membrane integrity. *Methods in Molecular Biology*. 927: 21–25. https://doi.org/10.1007/978-1-62703-38-0_3
- Ranjan, R., R. Kumar, C. Gangwar, and P. Kumar. 2025. Estrus Synchronization and Mating Systems in Goats, *Elements of Reproduction and Reproductive Diseases of Goats*. Wiley. (1st ed.): 95–107.
<https://doi.org/10.1002/9781394190089.ch9>
- Raza, S., U. Uçan, M. Aksoy, G. Erdoğan, Z. Nasee, and K. Khan. 2024. Sericin-Enriched Rabbit Semen Preservation: Implications for Short-Term Storage Quality and Fertility at 4 or 15°C. *Animals*. 14(23): 1–11.
<https://doi.org/10.3390/%20ani14233429>
- Rehman, R., F. Alam, S. Amjad, and R. Henkel. 2024. Oxidative Stress in Infertility. In S. Andreescu, R. Henkel, and A. Khelfi (Eds.). *Biomarkers of Oxidative Stress* (pp. 123–150). Springer Nature Switzerland.
https://doi.org/10.1007/978-3-031-69962-7_6
- Riyadhi, M., M. Rizal, and A. Wahdi. 2017. Diseminasi teknologi Inseminasi Buatan menggunakan semen kambing Peranakan Etawa (PE) dengan pengencer air kelapa muda dan kuning telur di Kecamatan Bati Bati Kabupaten Tanah Laut Kalimantan Selatan. *Panrita Abdi-Jurnal Pengabdian Pada Masyarakat*. 1(2): 125–130.
- Rosa, G. J. M. 2013. Progeny Testing. In *Brenner's Encyclopedia of Genetics*. Elsevier. 466–467. <https://doi.org/10.1016/B978-0-12-374984-0.01217-1>
- Rusdiana, S., L. Praharani, dan S. Sumanto. 2016. Kualitas Dan Produktivitas Susu Kambing Perah Persilangan Di Indonesia. *Jurnal Penelitian Dan Pengembangan Pertanian*. 34(2): 79.
<https://doi.org/10.21082/jp3.v34n2.2015.p79-86>
- Sabés-Alsina, M., O. Tallo-Parra, M. T. Mogas, J. M. Morrell, and M. Lopez-Bejar. 2016. Heat stress has an effect on motility and metabolic activity of rabbit spermatozoa. *Animal Reproduction Science*. 173: 18–23.
<https://doi.org/10.1016/j.anireprosci.2016.08.004>
- Sacko, I., M. Dao, S. Sanogo, B.M. Orounladji, K. Diakité, D. Traore, M.D. Coulibaly, and A.B. Cisse. 2022. Semen Characteristics of Crossbred Bucks Anglo-Nubian × Sahelian Goats in Mali. *Advances in Animal and Veterinary Sciences*. 10(9): 1900–1906.
<https://doi.org/10.17582/journal.aavs/2022/10.9.1900.1906>
- Saha, U., A. Fayiga, D. Hancock, and L. Sonon. 2016. Selenium in animal nutrition: deficiencies in soils and forages, requirements, supplementation and toxicity. *Int. J. Appl. Agric. Sci*. 2(6): 112–125.
- Salama, A., Y. Sakr, and K. Reinhart. 2007. The role of selenium in critical illness:

- Basic science and clinical implications. *Indian Journal of Critical Care Medicine*. 7(4):127–138. <https://doi.org/10.4103/0972-5229.35086>
- Salvado, J., D. Catilina, P. Borges, J. Simoes, and A. Martins-Bessa. 2024. Influence of two collection frequency intervals on sperm quality of standard and miniature bull Terriers during short breeding periods: A clinical field study. *Veterinary World*. 17(4): 820–828. <https://doi.org/10.14202/vetworld.2024.820-828>
- Sarmin, I. Widiyono, and D. Anggraeni. 2021. Comparison of Hematological and Biochemical Parameters of Clinically Healthy Buck Kid of Saanen, Sapera, and Ettawa Crossbred in Indonesia. *IOP Conference Series: Earth and Environmental Science*. 690(1): 1–13. <https://doi.org/10.1088/1755-1315/690/1/012029>.
- Sartorius, G. A., and E. Nieschlag. (2010). Paternal age and reproduction. *Human Reproduction Update*. 16(1): 65–79. <https://doi.org/10.1093/humupd/dmp027>
- Satrio, F. A., N. W. K. Karja, M. A. Setiadi, E. M. Kaiin, M. Gunawan, and B. Purwantara. 2022. Post-Thaw Characteristics of the Simmental Sperm Function in Different Ages of Bulls. *Tropical Animal Science Journal*. 45(4): 381–388. <https://doi.org/10.5398/tasj.2022.45.4.381>
- Scano, P., and P. Caboni. 2022. Seasonal Variations of Milk Composition of Sarda and Saanen Dairy Goats. *Dairy*. 3(3): 528–540. <https://doi.org/10.3390/dairy3030038>
- Shi, L., R. Song, X. Yao., Y. Duan, Y. Ren, C. Zhang, W. Yue, and F. Lei. 2018. Effects of maternal dietary selenium (Se-enriched yeast) on testis development, testosterone level and testicular steroidogenesis-related gene expression of their male kids in Taihang Black Goats. *Theriogenology*. 114: 95–102.
- Shi, L., C. Zhang, W. Yue, L. Shi, X. Zhu, and F. Lei. 2010. Short-term effect of dietary selenium-enriched yeast on semen parameters, antioxidant status and Se concentration in goat seminal plasma. *Animal Feed Science and Technology*. 157(1–2): 104–108.
- Silvestre, M. A., J. L. Yániz, F. J. Peña, P. Santolaria, and M. Castelló-Ruiz. 2021. Role of Antioxidants in Cooled Liquid Storage of Mammal Spermatozoa. *Antioxidants*. 10(7): 1096. <https://doi.org/10.3390/antiox10071096>
- Sitepu, S. A., Z. Udin, J. Jaswandi, and H. Hendri. 2018. Quality Differences Of Boer Liquid Semen During Storage With Addition Sweetorangeessential Oil In Tris Yolk And Gentamicin Extender. *Jcrs (Journal of Community Research and Service)*. 1(2): 78–82.
- Sitepu, S. A., J. Marisa, dan A. A. Riyanto. 2023. Bahan Pengencer Andromed Pada Semen Cair Kambing/Domba. Penerbit Tahta Media. <https://tahtamedia.co.id/index.php/issj/article/view/298>
- Słowińska, M., E. Liszewska, S. Judycka, M. Konopka, and A. Ciereszk. 2018. Mitochondrial membrane potential and reactive oxygen species in liquid stored and cryopreserved Turkey (*Meleagris gallopavo*) spermatozoa. *Poultry Science*. 97(10): 3709–3717. <https://doi.org/10.3382/ps/pey209>

- Souto, P. L. G., E. A. Barbosa, F. I. C. da Silva, V. M. V. Martins, L. K. Hatamoto-Zervoudakis, C. McManus, E. R. de Alencar, and A. F. Ramos. 2022. Seasonal semen quality of a local and commercial taurine cattle breeds, raised in a subtropical climate: Relationship between external morphology of the animals and climate. *Animal Reproduction Science*. 240(3): 1–11. <https://doi.org/10.1016/j.anireprosci.2022.106974>
- Su, J., Y. Yang, F. Zhao, Y. Zhang, H. Su, D. Wang, K. Li, Y. Song, G. and Cao. 2023. Study of spermatogenic and Sertoli cells in the Hu sheep testes at different developmental stages. *The Faseb Journal*. 37(8): 1-10. <https://doi.org/10.1096/fj.202300373R>
- Sun, L., W. Fan, C. Wu, S. Zhang, J. Dai, and D. Zhang. 2020. Effect of substituting different concentrations of soybean lecithin and egg yolk in tris-based extender on goat semen cryopreservation. *Cryobiology*. 92: 146–150.
- Surachman, M., M. Rizal, dan H. Maheshwari. 2009. Kualitas semen cair asal epididimis kerbau belang dalam bahan pengencer andromed yang mendapat penambahan sukrosa. *Media Peternakan*. 32(2): 88-94.
- Surai, P. F. 2002. Selenium in poultry nutrition 2. Reproduction, egg and meat quality and practical applications. *World's Poultry Science Journal*. 58(4): 431–450.
- Suranindyah, Y. Y., D. H. A. Khairy, N. Fidaus, and Rochijan. 2017. Milk Production and Composition of Etawah Crossbred, Sapera and Saperong Dairy Goats in Yogyakarta, Indonesia. *International Journal of Dairy Science*. 13(1): 1–6. <https://doi.org/10.3923/ijds.2018.1.6>
- Susilawati, T. 2013. *Pedoman inseminasi buatan pada ternak*. Universitas Brawijaya Press.
- Susilawati, T., N. Isnaini, A.T. Kuswati, Satria, A. N. Huda, and A.P.A. Yekti. 2020. The Pregnancy Evaluation on Ongole Crossbred Cows by using Liquid Semen and Frozen Semen. *IOP Conference Series: Earth and Environmental Science*. 478(1): 012–015. <https://doi.org/10.1088/1755-1315/478/1/012015>
- Suyadi, S., dan A. Rachmawati. 2012. Effect of $\hat{\pm}$ -Tocopherol in Tris-Aminomethane “Egg Yolk on the Semen Quality during Cold Storage in Boer goats. *Jurnal Ilmu-Ilmu Peternakan*. 22(3):15–26.
- Suyadi, S. Wahjuningsih, and P.B. Wara. 2015. Sperm Membrane Integrity of Pe Crossbred Goat Semen Following Supplementation of Onion Extract in Extender During Cold Storage. *University Brawijaya*.
- Syafitri, M., T. A. Prabowo, P. I. Sitaresmi, L. M. Yusiati, S. Bintara. and D. T. Widayati, 2022. The effect of glutathione addition in diluent semen on ram spermatozoa quality. In 9th International Seminar on Tropical Animal Production (ISTAP 2021). Atlantis Press. 251-255.
- Tahar, M. A., K. Komariah, H. Nuraini, T. Maulana, M. Gunawan., and R.I. Arifiantini. 2022. Assessment of sperm acrosome status, malondialdehyde and aspartate aminotransferase enzyme concentration of frozen semen from Limousin and Simmental bulls in different commercial diluents. *Jurnal Ilmu Ternak Dan Veteriner*. 27(3): 122–129.

<https://doi.org/10.14334/jitv.v27i3.3049>

- Tamargo, C., F. Garriga, M. Yeste, E. Pinart, R. Muiño, M. T. Carbajo, and C. O. Hidalgo. 2024. Predictive Indicators of Cryotolerance and Fertility in Bovine Sperm: Evaluating Fresh Semen Quality to Improve AI Outcomes With Frozen–Thawed Sperm. *Reproduction in Domestic Animals*. 59(11): 1–9. <https://doi.org/10.1111/rda.14742>
- Tambing, S. N., I. K. Utama, dan R.I. Arifiantini. 2003a. Efektivitas Berbagai Konsentrasi Laktosa dalam Pengencer Tris terhadap Viabilitas Semen Cair Kambing Saanen. *Jurnal Ilmu ternak dan Veteriner*. 8(2): 84-90.
- Tambing, S. N., M. R. Toelihiere, T. L. Yusuf, B. Purwantara, K. Utama, dan P. Z. Situmorang. 2003b. Pengaruh frekuensi ejakulasi terhadap karakteristik semen segar dan kemampuan libido kambing Saanen. *Jurnal Sain Veteriner*. 21(2): 57–65.
- Taufiqurrahman. 2012. Peran ROS terhadap Fungsi Spermatozoa. In *The Journal of Andrology Indonesia*. 12(3): 34–35).
- Toor, J. S., and S.C. Sikka. 2019. Human Spermatozoa and Interactions With Oxidative Stress. In *Oxidants, Antioxidants and Impact of the Oxidative Status in Male Reproduction*. (pp. 45–53). Elsevier. <https://doi.org/10.1016/B978-0-12-812501-4.00006-7>
- Trevizan, J. T., J.T. Carreira, I.R. Carvalho, B.H. Kipper, W.B. Nagata, S.H.V. Perri, M.E. Franco Oliveira, J.C. Pierucci, and M.B.D. Koivisto. 2018. Does lipid peroxidation and oxidative DNA damage differ in cryopreserved semen samples from young, adult and aged Nellore bulls?. *Animal Reproduction Science*. 195: 8–15. <https://doi.org/10.1016/j.anireprosci.2018.04.071>
- Ulfah, S., T.H. Suprayogi, dan S. Sudjatmogo. 2016. Total Koloni Bakteri dan pH Susu Segar Kambing Perah Saanen akibat Dipping Puting Susu Menggunakan Iodosfor (Iodin Povidon+ Sorbitol) dengan Konsentrasi yang Berbeda. *Fakultas Peternakan Dan Pertanian Undip*.
- Usman, M., R. Maqsood, R. Riaz, I. Şerbetçi, M. N. Bhaya, and M. U. Hassan. 2025. Selenium as a Modulator of Reproductive Immunity: Molecular Insights and Translational Potential in Livestock. *Reproduction in Domestic Animals*. 60(11): 1–9. <https://doi.org/10.1111/rda.70146>
- Utami, T., and T.C. Tophianon. 2014. Pengaruh suhu thawing pada kualitas spermatozoa sapi pejantan Friesian Holstein. *Jurnal Sain Veteriner*. 32(1): 126–421.
- Varlyakov, I., T. Slavov, V. Radev, I. Nedeva, and G. Nikolov. 2018. Milking behaviour of Saanen goats. *Agricultural Academy (Bulgaria)*. 24: 109–118.
- Wang, K., Y. Xu, N. Qin, Y. Guo, J. Bai, and Z. Li. 2025. Effect of Donor Sperm on Quality of Life in Patients with Severe Oligoasthenosperm After ICSI Failure. *Journal of Multidisciplinary Healthcare*. Volume 18: 123–132. <https://doi.org/10.2147/JMDH.S494319>
- Wang, Y., X. Fu, and H. Li. 2025. Mechanisms of oxidative stress-induced sperm dysfunction. *Frontiers in Endocrinology*. 16: 1520835. <https://doi.org/10.3389/fendo.2025.1520835>

- Weide, T., K. Mills, I. Shofner, M.W. Breitzman, and K. Kerns. 2024. Metabolic Shift in Porcine Spermatozoa during Sperm Capacitation-Induced Zinc Flux. *International Journal of Molecular Sciences*. 25(14). <https://doi.org/10.3390/ijms25147919>
- Widayati, D. T. 2023a. Reproduksi Ternak. Yogyakarta. Lintang Pustaka Utama
- Widayati, D. T. 2023b. Addictive and sperm. International Conference on Reproductive science and Medicine and Embryology (CRISME). 18-19 Oktober 2023. Kuala Lumpur, Malaysia.
- Wijaya, F. M. P., S. Sutopo, D. Samsudewa, A. SetiYono, and A. SetiAji. 2023. Fresh Semen Quality of Bos taurus, Bos indicus and Bos sondaicus Bulls in the Tropical Condition. *Yüzüncü Yıl Üniversitesi Tarım Bilimleri Dergisi*. 33(3): 420–428. <https://doi.org/10.29133/yyutbd.1244506>
- Widjaya, N. 2011. Pengaruh Pemberian Susu Skim dengan Pengencer Tris Kuning Telur terhadap Daya Tahan Hidup Spermatozoa Sapi pada Suhu Penyimpanan 5°C. *Sains Peternakan: Jurnal Penelitian Ilmu Peternakan*. 9(2): 72–76.
- Xi, H., F. Ren, Y. Li, Y. Du, L. Wang, and J. Hu. 2021. Changes in histology, protein expression, and autophagy in dairy goat testes during nonbreeding season. *Biology of Reproduction*. 105(5): 1344–1354. <https://doi.org/10.1093/biolre/ioab164>
- Xu, Z., Q. Yan, K. Zhang, Y. Lei, C. Zhou, T. Ren, N. Gao, F. Wen, and X. Li. 2025. Mitochondrial Regulation of Spermatozoa Function: Metabolism, Oxidative Stress and Therapeutic Insights. *Animals*. 15(15): 2246. <https://doi.org/10.3390/ani15152246>
- Xu, C. L., J. B. Zhou, B. T. Zhao, G. C. Lan, M. J. Luo, Z. L. Chang, H. S. Sui, and J. H. Tan. 2009. Liquid storage of goat semen in chemically defined extenders. *Reproduction in Domestic Animals*. 44(5): 771–778. <https://doi.org/10.1111/j.1439-0531.2008.01071.x>
- Xue, S.H., B.B. Xu, X.C. Yan, J. X. Zhang, and R. Su. 2025. Sperm Membrane Stability: In-Depth Analysis from Structural Basis to Functional Regulation. *Veterinary Sciences*. 12(7): 658. <https://doi.org/10.3390/vetsci12070658>
- Winangun, K. 2019. Kualitas Larutan Pengencer Dan Kualitas Semen Domba Pada Temperatur Penyimpanan Yang Berbeda. *Kandaga– Media Publikasi Ilmiah Jabatan Fungsional Tenaga Kependidikan*. 1(1): 1-7. <https://doi.org/10.24198/kandaga.v1i1.21217>
- Yan, Y.Q., M. Liu, Z. J. Xu, Z. J. Xu, Y.X. Huang, X. M. Li, C.J. Chen, G. Zuo, J.C. Yang, X.G. Lei, and L.H. Sun. 2024. Optimum Doses and Forms of Selenium Maintaining Reproductive Health via Regulating Homeostasis of Gut Microbiota and Testicular Redox, Inflammation, Cell Proliferation, and Apoptosis in Roosters. *The Journal of Nutrition*. 154(2): 369–380. <https://doi.org/10.1016/j.tjnut.2023.12.021>
- Yendraliza, Y., T. Adelina, dan A. Amdes. 2020. Evaluasi Keterampilan Peternak dalam Menerapkan Aspek Teknis Pemeliharaan Sapi Potong di Kecamatan Koto Besar Kabupaten Dharmasraya. *Jurnal Sain Peternakan Indonesia*. 15(4): 398–405. <https://doi.org/10.31186/jspi.id.15.4.398-405>

- Yeoh, B. N., Z. Z. Zainuddin, M. W. H. Hiew, S. A. Sidik, S. T. Wong, S. Sipangkui, and A. H. Ahmad. 2023. Semen cryopreservation in Bornean Sun Bear (*Helarctos malayanus euryspilus*). *Theriogenology Wild.* 3: 1–8. <https://doi.org/10.1016/j.therwi.2023.100057>
- Yi, X. D., Y. N. Zhanf, S. Xiao, and X. C. Lei. 2019. Role and regulatory mechanism of glycometabolism of Sertoli cells in spermatogenesis. *Zhonghua Nan Ke Xue.* 25(10): 923–927.
- Yi, X., Y. Qiu, X. Tang, Y. Lei, Y. Pan, S.H.A. Raza, N.A. Althobaiti, A.E. Albalawi, W. Al Abdulmonem, R.T.M. Makhlof, M.A. Alsaad, Y. Zhang, and X. Sun. 2024. Effect of Five Different Antioxidants on the Effectiveness of Goat Semen Cryopreservation. *Reproductive Sciences.* 31(7): 1958–1972. <https://doi.org/10.1007/s43032-024-01452-8>
- Yuan, S., Y. Zhang, P.Y. Dong, Y. M. Chen-Yan, J. Liu, B. Q. Zhang, M. M. Chen, S.E. Zhang, and X.F. Zhang. 2024. A comprehensive review on potential role of selenium, selenoproteins and selenium nanoparticles in male fertility. *Heliyon.* 10(15): 1–32. <https://doi.org/10.1016/j.heliyon.2024.e34975>
- Yumte, K., B. Wantouw, and E. de Queljoe. 2013. Perbedaan Motilitas Spermatozoa Sapi Janta (Frisian Holstein) Setelah Pemberian Cairan Kristaloid-ringer Laktat. *Ebiomedik.* 1(1): 184-189.
- Yuniar, R.M., A. Kusumawati, E. Maha, dan N. Setyawan. 2024. Efek Penambahan Antioksidan Selenium , Kurkumin dan Kombinasinya Terhadap Motilitas , Recovery Rate dan Viabilitas Spermatozoa pada Kriopreservasi Semen Sapi Peranakan Ongole The Effect of Supplementation Antioxidant Selenium , Curcumin and Their Combinat. 42(3): 389–399. <https://doi.org/10.22146/jsv.85255>
- Zhang, L., Y. Sun, C. Jiang, T. Sohail, X. Sun, J. Wang, and Y. Li. 2024. Damage to Mitochondria During the Cryopreservation, Causing ROS Leakage, Leading to Oxidative Stress and Decreased Quality of Ram Sperm. *Reproduction in Domestic Animals.* 59(10): 1–10. <https://doi.org/10.1111/rda.14737>
- Zhang, Y., J. Liu, X. Li, G. Zhou, Y. Sang, M. Zhang, L. Gao, J. Xue, M. Zhao, H. Yu, and X. Zhou. 2023. Dietary selenium excess affected spermatogenesis via DNA damage and telomere-related cell senescence and apoptosis in mice. *Food and Chemical Toxicology.* 171(1–10): 113556. <https://doi.org/10.1016/j.fct.2022.113556>
- Zhang, Y., Y. J. Roh, S.J. Han, I. Park, H. M. Lee, Y. S. Ok, B. C. Lee, and S. R. Lee. 2020. Role of Selenoproteins in Redox Regulation of Signaling and the Antioxidant System: A Review. *Antioxidants.* 9(5): 383–399. <https://doi.org/10.3390/antiox9050383>
- Zhou, J., L. Chen, J. Li, H. Li, Z. Hong, M. Xie, S. Chen, B. Yao, and J.R. Drevet. 2015. The semen pH affects sperm motility and capacitation. *PLoS ONE.* 10(7): 1–15. <https://doi.org/10.1371/journal.pone.0132974>