

The effect of different equilibration times on buck semen cryopreservation using soybean lecithin supplemented extender

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Abstract

The aim of this study was to determine the effects of different pre-freezing equilibration times (2, 4 and 6 hour) on post-thawed buck semen quality parameters using soybean lecithin supplemented extender. Semen samples were collected from four Mahabadi bucks, primarily evaluated and pooled together. Afterward, pooled semen samples were divided into three equal parts and diluted in semen extender containing soybean lecithin. After spending different equilibration times, diluted semen samples were frozen. After thawing, sperm motility characteristics, plasma membrane integrity and functionality, abnormality and lipid peroxidation were evaluated. Base on the obtained results, six hour equilibration time resulted in higher progressive motility (25.6 ± 1.39 %) compared to other groups ($P < 0.05$). The other sperm quality parameters did not alter by different equilibration times. In conclusion, spending six hour equilibration time improved only sperm progressive motility.

Key words: Goat semen, Equilibration time, Cryopreservation, Soybean lecithin

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References

- Ahmad, M.; Nasrullah, R. and Ahmad, N. (2015). Effect of cooling rate and equilibration time on pre-freeze and post-thaw survival of buck sperm. *Cryobiology*, 70: 233-238.
- Andrabi, S.M. (2009). Factors affecting the quality of cryopreserved buffalo (*Bubalus bubalis*) bull spermatozoa. *Reproduction in Domestic Animals*, 44: 552-569.
- Becker-Silva, S.C. and Holtz, W.H. (2008). Freezing of goat semen in AndroMed (R), a soybean lecithin based extender, *Reproduction in Domestic Animals*, Wiley-Blackwell Publishing, inc Commerce Place, 350 main st, malden 02148, MA USA, Pp: 72-72.
- Bilodeau, J.F.; Chatterjee, S.; Sirard, M.A. and Gagnon, C. (2000). Levels of antioxidant defenses are decreased in bovine spermatozoa after a cycle of freezing and thawing. *Molecular Reproduction and Development*, 55: 282-288.
- Bucak, M.N.; Ateşşahin, A. and Yüce, A. (2008). Effect of anti-oxidants and oxidative stress parameters on ram semen after the freeze–thawing process. *Small Ruminant Research*, 75(2), 128-134.
- Câmara, D.R.; Silva, S.V.; Almeida, F.C.; Nunes, J.F. and Guerra, M.M. (2011). Effects of antioxidants and duration of pre-freezing equilibration on frozen-thawed ram semen. *Theriogenology*, 76: 342-350.
- Cox, J.F.; Alfaro, V.; Montenegro, V. and Rodriguez-Martinez, H. (2006). Computer-assisted analysis of sperm motion in goats and its relationship with sperm migration in cervical mucus. *Theriogenology*, 66: 860-867.
- Deka, B.C. and Rao, A.R. (1986). Effect of glycerol level in Tris-base extender and equilibration period on quality of frozen goat semen. *Theriogenology*, 26(2), 231-238.
- Evans, G. and Maxwell, W.C. (1987). Salmons' artificial insemination of sheep and goats. Butterworths, P: 194.
- Fleisch, A.; Malama, E.; Witschi, U.; Leiding, C.; Siuda, M.; Janett, F. and Bollwein, H. (2017). Effects of an extension of the equilibration period up to 96 hours on the characteristics of cryopreserved bull semen. *Theriogenology*, 89: 255-262.
- Foote, R.H. and Kaproth, M.T. (2002). Large batch freezing of bull semen: effect of time of freezing and fructose on fertility. *Journal of Dairy Science*, 85: 453-456.
- Forouzanfar, M.; Sharafi, M.; Hosseini, S.; Ostadhosseini, S.; Hajian, M.; Hosseini, L. et al. (2010). In vitro comparison of egg yolk-based and soybean lecithin-based extenders for cryopreservation of ram semen. *Theriogenology*, 7: 480-487.
- Hirano, Y.; Shibahara, H.; Obara, H.; Suzuki, T.; Takamizawa, S.; Yamaguchi, C. et al. (2001). Andrology: Relationships between sperm motility characteristics assessed by the computer-aided sperm analysis (CASA) and fertilization rates in vitro. *Journal of Assisted Reproduction And Genetics*, 18: 215-220.
- Leite, T.G.; do Vale Filho, V.R.; de Arruda, R.P.; de Andrade, A.F.C.; Emerick, L.L.; Zaffalon, F.G. et al. (2010). Effects of extender and equilibration time on post-thaw motility and membrane integrity of cryopreserved Gyr bull semen evaluated by CASA and flow cytometry. *Animal Reproduction Science*, 120: 31-38.
- López-Urueña, E.; Alvarez, M.; Gomes-Alves, S.; Martínez-Rodríguez, C.; Borragan, S.; Anel-López, L. et al. (2014). Tolerance of brown bear spermatozoa to conditions of pre-freezing cooling rate and equilibration time. *Theriogenology*, 81: 1229-1238.
- Mehdipour, M.; Daghigh Kia, H.; Najafi, A.; Vaseghi Dodaran, H. and García-Álvarez, O. (2016). Effect of green tea (*Camellia sinensis*) extract and pre-freezing equilibration time on the post-thawing quality of ram semen cryopreserved in a soybean lecithin-based extender. *Cryobiology*, 73: 297-303.
- Misra, H.P. and Fridovich, I. (1972). The univalent reduction of oxygen by reduced flavins and quinones. *Journal of Biological Chemistry*, 247: 188-192.
- Najafi, A.; Zhandi, M.; Towhidi, A.; Sharafi, M.; Akbari Sharif, A.; Khodaei-Motlagh, M. et al. (2013). Trehalose and glycerol have a dose-dependent synergistic effect on the post-thawing quality of ram semen cryopreserved in a soybean lecithin-based extender. *Cryobiology*, 66: 282-285.

- Noei Razliqi, R.N.; Zhandi, M.; Shakeri, M.; Towhidi, A.; Sharafi, M.; Emamverdi, M. and Motlagh, M.K. (2015). Protective role of glutathione in buck semen cryopreservation. *Iranian Journal of Veterinary Research*, 16: 298-300.
- O'Connell, M.; McClure, N. and Lewis, S.E.M. (2002). The effects of cryopreservation on sperm morphology, motility and mitochondrial function. *Human Reproduction*, 17(3), 704-709.
- Oberoi, B.; Kumar, S. and Talwar, P. (2014). Study of human sperm motility post cryopreservation. *Medical Journal Armed Forces India*, 70(4), 349-353.
- Revell, S.G. and Mrode, R.A. (1994). An osmotic resistance test for bovine semen. *Animal Reproduction Science*, 36: 77-86.
- Salmani, H.; Nabi, M.M.; Vaseghi-Dodaran, H.; Rahman, M.B.; Mohammadi-Sangcheshmeh, A.; Shakeri, M. et al. (2013). Effect of glutathione in soybean lecithin-based semen extender on goat semen quality after freeze-thawing. *Small Ruminant Research*, 112: 123-127.
- Seifi-Jamadi, A.; Kohram, H.; Zareh-Shahne, A.; Dehghanizadeh, P. and Ahmad, E. (2016). Effect of various concentrations of butylated hydroxyanisole and butylated hydroxytoluene on freezing capacity of Turkman stallion sperm. *Animal Reproduction Science*, 170: 108-113.
- Shahverdi, A.; Rastegarnia, A. and Rezaei Topraggaleh, T. (2014). Effect of extender and equilibration time on post thaw motility and chromatin structure of buffalo bull (*Bubalus bubalis*) spermatozoa. *Cell Journal*, 16: 279-288.
- Sukhato, P.; Thongsodseang, S.; Utha, A. and Songsasen, N. (2001). Effects of cooling and warming conditions on post-thawed motility and fertility of cryopreserved buffalo spermatozoa. *Animal Reproduction Science*, 67: 69-77.
- Sullivan, J. and Mixner, J. (1963). Effects of method of egg yolk addition and of glycerol equilibration time upon post-thawing motility and metabolic activity of frozen bull semen. *Journal of Dairy Science*, 46: 463-467.
- Tartaglione, C. and Ritta, M. (2004). Prognostic value of spermatological parameters as predictors of in vitro fertility of frozen-thawed bull semen. *Theriogenology*, 62: 1245-1252.
- Uysal, O. and Bucak, M.N. (2007). Effects of oxidized glutathione, bovine serum albumin, cysteine and lycopene on the quality of frozen-thawed ram semen. *Acta Veterinaria Brno*, 76(3): 383-390.
- Van der Westhuysen, J.M. (1978). Observations on the deep freezing of Angora goat semen. *South African Journal of Animal Science*, 8: 111-113.