

REFERENCES

- Abecia, J. A., F. Forcada, and A. Gonzalez-Bulnes. 2011. Pharmaceutical control of reproduction in sheep and goats. *Vet. Clin. North Am. Food Anim. Pract.* 27: 67–79.
- Abecia, J. A., F. Forcada, and A. González-Bulnes. 2012. Hormonal control of reproduction in small ruminants. *Anim. Reprod. Sci.* 130: 173-179.
- Adams, G. P. 1999. Comparative patterns of follicle development and selection in ruminants. *J. Reprod. Fertil.* 54: 17–32.
- Alacam, E., S. Oszar, C. Kilicogui, B. Guven, H. Izgur, T. Tekele, and P. Glatzel. 1985. Induction of oestrus in Saanen goats at early breeding season by intravaginal progesterone sponge (MAP) or by prostaglandin F₂ α injections. Effect on different age groups. *Theriogenology* 24: 283-291.
- Álvarez, M., C. A. Chamorro, M. Kaabi, L. Anel-López, J. C. Boixo, E. Anel, L. Anel and P. de Paz. 2012. Design and “in vivo” evaluation of two adapted catheters for intrauterine transcervical insemination in sheep. *Anim. Reprod. Sci.* 131: 153-159.
- Al Yacoub, A. N., M. Gaulty, B. Sohnrey, and W. Holtz. 2011. Fixed-time deep uterine insemination in PGF₂ α -synchronized goats. *Theriogenology* 76: 1730-1735.
- Amiridisa, G. S., and S. Cseh. 2012. Assisted reproductive technologies in the reproductive management of small ruminants. *Anim. Reprod. Sci.* 130: 152– 161.
- Ax, R. L., M. Dally, B. A. Didion, R. W. Lenz, C. C. Love, D. D. Varner, B. Hafez, and M. E. Bellin, 2000. Semen evaluation In: *Reproduction in Farm Animals*. E.S.E. Hafez and B. Hafez (eds.), England, Blackwell Publishers 366-368 pp.
- Baldassarre, H. and C. N. Katatzas. 2004. Advanced assisted reproduction technologies (ART) in goats. *Anim. Reprod. Sci.* 82-83: 255-266.
- Baril, G., and J. C. Vallet. 1990. Time of ovulations in dairy goats induced to superovulate with porcine follicle stimulating hormone during and out of the breeding season. *Theriogenology* 34: 303-311.

- Baril, G., B. Leboeuf, and J. Saumande. 1993. Synchronization of estrus in goats: the relationship between time of occurrence of estrus and fertility following artificial insemination. *Theriogenology* 40: 621–628.
- Bartlewski, P. M., A. P. Beard, S. J. Cook, R. K. Chandolia, A. Honaramooz, and N. C. Rawlings. 1999. Ovarian antral follicular dynamics and their relationships with endocrine variables throughout the oestrous cycle in breeds of sheep differing in prolificacy. *J. Reprod. Fertil.* 115: 111–124.
- Bispo, C. A. S., G. Pugliesi, P. Galvão, M. T. Rodrigues, P. G. Ker, B. Filgueiras, and G. R. Carvalho. 2011. Effect of low and high egg yolk concentrations in the semen extender for goat semen cryopreservation. *Small Rumin. Res.* 100: 54-58.
- Boonchoo, C. 1997. Estrous Cycle in Goats and Superovulation Induced by Pregnant Mare Serum Gonadotropin (PMSG). MS Thesis, Prince of Songkla University. 111 p. (in Thai).
- Braden, W. H., R. Lamond, and M. Radford. 1960. Control of the time of ovulation in sheep. *J. Agric. Res.* 11: 389–401.
- Buckrell, B. C., C. Buschbeck, C. J. Gartley, T. Kroetsch, W. McCutcheon, J. Martin, W. K. Penner, and J. S. Walton. 1994. Further development of a transcervical technique for artificial insemination in sheep using previously frozen semen. *Theriogenology* 42: 601–611.
- Bunch, T. D., and H. S. Ellsworth. 1981. Gross anatomy of the ovine cervix. *Int. Goat Sheep Res.* 1: 282-285.
- Campbell, J. W., T. G. Harvey, M. F. McDonald, and R. I. Sparksman. 1996. Transcervical insemination in sheep: An anatomical and histological evaluation. *Theriogenology* 45: 1535-1544.
- Colazo, M. G., J. P. Kastelic, P. R. Whittaker, Q. A. Gavaga, R. Wilde, R. J. Mapletoft. 2004. Fertility in beef cattle given a new or previously used CIDR insert and estradiol, with or without progesterone. *Anim. Reprod. Sci.* 81: 25–34.
- Corteel, J. M., B. Leboeuf, and G. Baril. 1988. Artificial breeding of adults goats and kids induced with hormones to ovulate outside the breeding season. *Small Rumin. Res.* 1: 19–35.

- Cseh, S., V. Faigl, and G. S. Amiridis. 2012. Semen processing and artificial insemination in health management of small ruminants. *Anim. Reprod. Sci.* 130: 187-192.
- Cushwa, W. T., G. E. Bradford, G. H. Stabenfeldt, Y. M. Berger, and M. R. Dally. 1992. Ram influence on ovarian and sexual activity in anestrus ewes: effects of isolation of ewes from rams before joining and date of ram introduction. *J. Anim. Sci.* 70: 1195-1200.
- Dayan, M. O., K. Beşoluk, E. Eken, and S. Özkadif. 2010. Anatomy of the cervical canal in the angora goat (*Capra hircus*). *Kafkas. Univ. Vet. Fak. Derg.* 16: 847-850.
- de Castro, T., E. Rubianes, A. Menchaca, and A. Rivero. 1999. Ovarian dynamics, serum estradiol and progesterone concentrations during the interovulatory interval in goats. *Theriogenology* 52: 399–411.
- Dixon, A. B., M. Knights, J. L. Pate, P. E. Lewis, and E. K. Inskeep. 2006. Reproduction performance of ewes after 5-day treatment with intravaginal inserts containing progesterone in combination with injection of prostaglandin F_{2α}. *Reprod. Dom. Anim.* 41: 142-148.
- Donovan, A., J. P. Hanrahan, E. Kummen, P. Duffy, and M. P. Boland. 2004. Fertility in the ewe following cervical insemination with fresh or frozen-thawed semen at a natural or synchronized oestrus. *Anim. Reprod. Sci.* 84: 359-368.
- Driancourt, M. A. 2001. Regulation of ovarian follicular dynamics in farm animals. Implications for manipulation of reproduction. *Theriogenology* 55: 1211–1239.
- East, N. E., and J. D. Rowe. 1989. Subcutaneous progestin implants versus intravaginal sponges for dairy goat estrus synchronization during the transitional period. *Theriogenology* 32: 921-928.
- Eppleston, J., S. Salamon, N. Moore, and G. Evans. 1994. The depth of cervical insemination and site of intrauterine insemination and their relationship to the fertility of frozen-thawed ram semen. *Anim. Reprod. Sci.* 36: 211–25.
- Evans, G., and W. M. C. Maxwell. 1987. Salamon's Artificial Insemination of sheep and goats. Butterworths, Sydney, Australia. 200 p.

- Evans, A. C. O., P. Duffy, N. Hynes, and M. P. Boland. 2000. Waves of follicle development during the estrous cycle in sheep. *Theriogenology* 53: 699–715.
- Fatet, A., M. T. Pellicer-Rubio, and B. Leboeuf. 2011. Reproductive cycle of goats. *Anim. Reprod. Sci.* 124: 211-219.
- Fleisch, A., S. Werne, F. Heckendorn, S. Hartnack, M. Piechotta, H. Bollwein, R. Thun and F. Janett. 2012. Comparison of 6-day progestagen treatment with Chronogest[®] CR and Eazi-breed[™] CIDR[®] G intravaginal inserts for estrus synchronization in cyclic ewes. *Small Rumin. Res.* 107: 141-146.
- Fonseca, J. F., J. H. Bruschi, I. C. C. Santos, J. H. M. Viana, and A. C. M. Magalhães. 2005. Induction of estrus in non-lactating dairy goats with different estrous synchrony protocols. *Anim. Reprod. Sci.* 85: 117–124.
- Fonseca, J. F., C. A. A. Torres, A. D. F. Santos, V. V. Maffili, L. S. Amorim, and E. A. Moraes. 2008. Progesterone and behavioral features when estrous is induced in Alpine goats. *Anim. Reprod. Sci.* 103: 366–373.
- Foote, R. H. 2002. The history of artificial insemination: Selected notes and notables. *J. Anim. Sci.* 80: 1-10.
- Freitas, V. J., G. Baril, and J. Saumande. 1997. Estrus synchronization in dairy goats: Use of flurogestone acetate vaginal sponges or norgestomet ear implants. *Anim. Reprod. Sci.* 46: 237-244.
- Fukui, Y., and E. M. Roberts. 1978. Further studies on non-surgical intrauterine technique for artificial insemination in the ewe. *Theriogenology* 10: 381-393.
- Gaafar, K. M., M. K. Gabr, and D. F. Tebeb. 2005. The hormonal profile during the estrous cycle and gestation in Damascus goats. *Small Rumin. Res.* 57: 85-93.
- Gacitua, H., and A. Arav. 2005. Successful pregnancies with directional freezing of large volume buck semen. *Theriogenology* 63: 931–938.
- Gama, L. T., and M. C. Bressan. 2011. Biotechnology applications for the sustainable management of goat genetic resources. *Small Rumin. Res.* 98: 133-146.
- Gibbons, J. R., K. Kot, D. L. Thomas, M. C. Wiltbank, and O. J. Ginther. 1999. Follicular and FSH dynamics in ewes with a history of high and low ovulation rates. *Theriogenology* 52: 1005–1020.
- Ginther, O. J. and K. Kot. 1994. Follicular dynamics during the ovulatory season in goats. *Theriogenology* 42: 987-1001.

- Ginther, O. J., K. Kot, and M. C. Wiltbank. 1995. Associations between emergence of follicular waves and fluctuations in FSH concentrations during the estrous cycle in ewes. *Theriogenology* 43: 689–703.
- Gonzalez de Bulnes, A., J. Santiago Moreno, A. Gomez-Brunet, E. K. Inskoop, E. C. Townsend, and A. Lopez-Sebastian. 1999. Follicular dynamics during the oestrous cycle in dairy goats. *Anim. Sci.* 68: 547–554.
- Gonzalez-Bulnes, A., C. Diaz-Delfa, R. M. Garcia-Garcia, B. Urrutia, J. A. Carrizosa, and A. Lopez-Sebastian. 2005. Origin and fate of preovulatory follicles after induced luteolysis at different stages of the luteal phase of the oestrous cycle in goats. *Anim. Reprod. Sci.* 86: 237–245.
- Goodman, R. L., and F. J. Karsh. 1980. Pulsatile secretion of luteinizing hormone: differential suppression by ovarian steroids. *Endocrinology* 107: 1286-1290.
- Greyling, J. P. C., W. F. Kotze, G. J. Taylor, and W. J., Hagendijk. 1994. Synchronization of oestrus in sheep: use of different doses of progestagen outside the normal breeding season. *S. Afr. J. Anim. Sci.* 24: 33-37.
- Greyling, J. P. C., J. A. Erasmus, G. J. Taylor, and S. Van der Merwe. 1997. Synchronization of oestrus in sheep using progestogen and inseminating with chilled semen during the breeding season. *Small Rumin. Res.* 26: 137–143.
- Greyling, J. P. C. 2000. Reproduction traits in the Boer goat doe. *Small Rumin. Res.* 36: 171-177.
- Greyling, J. P. C., and M. van der Nest. 2000. Synchronization of oestrus in goats: dose effect of progestagen. *Small Rumin. Res.* 36: 201–207.
- Halbert, G. W., H. Dobson, J. S. Walton, and B. C. Buckrell. 1990. The structure of the cervical canal of the ewe. *Theriogenology* 33: 977-992.
- Hansel, W., and E. M. Convey. 1983. Physiology of the estrous cycle. *J. Anim. Sci.* 57: 404–424.
- Hidalgo, M., I. Rodri'guez, and J. M. Dorado. 2007. The effect of cryopreservation on sperm head morphometry in Florida male goat related to sperm freezability. *Anim Reprod. Sci.* 100: 61–72.
- Holtz, W. 2005. Recent developments in assisted reproduction in goats. *Small Rumin. Res.* 60: 95-110.

- Ireland, J. J., M. Mihm, E. A. Diskin, and J. F. Rochet. 2000. Historical perspective of turnover of dominant follicles during the bovine estrous cycle: key concepts, studies, advancements, and terms. *J. Dairy Sci.* 83: 1648–1658.
- Jainudeen, M. R., H. Wahid, and E. S. E. Hafez. 2000. Ovulation induction, embryo production and transfer. In: reproduction in farm Animals, seventh ed (Ed. B. Hafz and E. S. E. Hafez). Lippincott Williams & Wilkins, Philadelphia. 405-409 pp.
- Kaabi, M., M. Alvarez, E. Anel, C. A. Chamorro, J. C. Boixo, P. de Paz, and L. Anel. 2006. Influence of breed and age on morphometry and depth of inseminating catheter penetration in the ewe cervix: a postmortem study. *Theriogenology* 66: 1876-1883.
- Karagiannidis, A., S. Varsakeli, G. Karatzas, and C. Brozos. 2001. Effect of time of artificial insemination on fertility of progestagen and PMSG treated indigenous Greek ewe, during non-breeding season. *Small Rumin. Res.* 39: 67-71.
- Karatzas, G., A. Karagiannidis, S. Varsakeli, and P. Brikas. 1997. Fertility of fresh and frozen-thawed goat semen during the nonbreeding season. *Theriogenology* 48: 1049–59.
- Kershaw, C. M., M. Khalid, M. R. McGowan, K. Ingram, S. Leethongdee, G. Wax, and R. J. Scaramuzzi. 2005. The anatomy of the sheep cervix and its influence on the transcervical passage of an inseminating pipette into the uterine lumen. *Theriogenology* 64: 1225-1235.
- Khalifa, R. M., B. L. Sayre, and G. S. Lewis. 1992. Exogenous oxytocin dilates the cervix in ewes. *J. Anim. Sci.* 70: 38-42.
- Killeen, I. D., and N. W. Moore. 1970. Transport of spermatozoa, and fertilization in the ewe following cervical and uterine insemination early and late in oestrus. *Aust. J. Biol. Sci.* 23: 1271-1277.
- Kinder, E., F. N. Kojima, E. G. M. Bergfeld, M. E. Wehrman, and K. E. Fike. 1996. Progestin and estrogen regulation of pulsatile LH release and development of persistent ovarian follicles in cattle. *J. Anim. Sci.* 74: 1424-1440.

- Kulick, L. J., D. R. Bergfelt, K. Kot, and O. J. Ginther. 2001. Follicle selection in cattle: follicle deviation and codominance within sequential waves. *Biol. Reprod.* 65: 839–846.
- Leboeuf, B., B. Restall, and S. Salomon. 2000. Production and storage of goat semen for artificial insemination. *Anim. Reprod. Sci.* 62: 113-141.
- Leboeuf, B., Y. Forgerit, D. Bernelas, J. L. Pougnaud, E. Senty, and M. A. Driancourt. 2003. Efficacy of two types of vaginal sponges to control onset of oestrus, time of preovulatory LH peak and kidding rate in goat inseminated with variable numbers of spermatozoa. *Theriogenology* 60: 1371-1378.
- Leboeuf, B., P. Guillouet, J. L. Bonne, Y. Forgerit, and M. Magistrini. 2004. Goat semen preserved at 4 °C until 76 hours before artificial insemination: different attempts to maintain the fertility. *S. Afr. J. Anim. Sci.* 34: 233–235.
- Leethongdee, S. 2009. Development of trans-cervical artificial insemination in sheep with special reference to anatomy of cervix. *J. Sci. Technol.* 17: 57-69.
- Leeuwenhoek, A. 1678. De natis è semine genital animalculis. *R. Soc. (Lond.) Philos. Trans.* 12: 1040-1043.
- Lertchunhakiat, K. 2012. Pregnancy establishment processes and assessment of placental and fetal growth in Thai-native goat. Ph. D. Thesis Khon Kaen University, Thailand.
- Lertchunhakiat, K., C. Navanukraw, J. Thammasiri, W. Jaikan, A. Swannakorn, T. Moonmanee, and D. A. Redmer. 2012. Evaluation of Protocols Based on Synthetic Progesterone and Gonadotropin on Estrus and Ovulatory Response in Thai-Native Goats. *J. Anim. Vet. Adv.* 11: 3385-3389.
- Martemucci, G., and A. G. D. Alessandro. 2011. Synchronization of oestrus and ovulation by short time combined FGA, PGF2 α , GnRH, eCG treatments for natural service or AI fixed-time. *Anim. Reprod. Sci.* 123: 32-39.
- Maule, J. P. 1962. The semen of animals and artificial insemination. Commonwealth Agricultural Bureaux, Farnham Royal, U. K.
- McCorkell, R. B., M. R. Woodbury, and G. P. Adams. 2007. Evaluation of an ovarian synchronization scheme for fixed-time artificial insemination in Wapiti. *Theriogenology* 67: 1217-1223.

- Medan, M. S., G. Watanabe, K. Sasaki, S. Sharawy, N. P. Groome, and K. Taya. 2003. Ovarian dynamics and their associations with peripheral concentrations of gonadotropins, ovarian steroids, and inhibin during the estrous cycle in goats. *Biol. Reprod.* 69: 57–63.
- Mellado, M., and R. Valdez. 1997. Synchronization of estrus in goats under range conditions treated with different doses of new or recycled norgestomet implants in two seasons. *Small Rumin. Res.* 25: 155-160.
- Menchaca, A., A. Pinczak, and E. Rubianes. 2002. Follicular recruitment and ovulatory response to FSH treatment initiated on day 0 or day 3 post-ovulation in goats. *Theriogenology* 58: 1713–1721.
- Menchaca, A., and E. Rubianes. 2004. New treatments associated with timed artificial insemination in small ruminants. *Reprod. Fertil. Dev.* 16: 403-413.
- Menchaca, A., and E. Rubianes. 2007. Pregnancy rate obtained with short-term protocol for timed artificial insemination in goats. *Reprod. Dom. Anim.* 42: 590-593.
- Menchaca, A., V. Miller, V. Salveraglio, and E. Rubianes. 2007. Endocrine, luteal and follicular responses after the use of the Short-Term Protocol to synchronize ovulation in goats. *Anim. Reprod. Sci.* 102: 76–87.
- Mihm, M., M. A. Crowe, P. G. Knight, and E. J. Austin. 2002. Follicle wave growth in cattle. *Reprod. Domest. Anim.* 37: 191–200.
- Moaeen-ud-Din, M., L. G. Yang, S. L. Chen, Z. R. Zhang, J. Z. Xiao, Q. Y. Wen, and M. Dai. 2008. Reproductive performance of Matou goat under subtropical monsoonal climate of Central China. *Trop. Anim. Health. Prod.* 40: 17-23.
- Motlomelo, K. C., J. P. C. Greyling, and L. M. J. Schwalbach. 2002. Synchronisation of oestrus in goats: the use of different progestagen treatments. *Small Rumin. Res.* 45: 45-49.
- Naqvi, S. M., G. K. Pandey, K. K. Gautam, A. Joshi, V. Geethalakshmi, and J. P. Mittal. 2005. Evaluation of gross anatomical features of cervix of tropical sheep using cervical silicone moulds. *Anim. Reprod. Sci.* 85: 337-344.

- Navanukraw, C., D. A. Redmer, L. P. Reynolds, J. D. Kirsch, A. T. Grazul-Bilska, and P. M. Fricke. 2004. A modified presynchronization protocol improves fertility to timed artificial insemination in lactating dairy cows. *J. Dairy Sci.* 87: 1551-1557.
- Nogueira, D. M., E. S. L. Junior, R. M. de Peixoto, M. Christilis, S. R. Martins, and A. P. O. do Monte. 2011. Using the same CIDR up to three times for estrus synchronization and artificial insemination in dairy goats. *Acta. Sci. Anim. Sci.* 33: 321-325.
- Nordstoga, A. B., L. Söderquist, T. Adnøy, W. Farstad, and H. Paulenz. 2010. Vaginal deposition of frozen-thawed semen in Norwegian dairy goats: Comparison of single and double insemination with equal total number of spermatozoa. *Theriogenology* 75: 895-900.
- Nordstoga, A. B., L. Söderquist, T. Adnøy, and H. Paulenz. 2011. Fertility results after vaginal deposition of frozen-thawed buck semen diluted with two different extenders using one- or two-step procedures. *Reprod. Domest. Anim.* 46: 82–86.
- NRC. 1981. Nutrient Requirements of goats: angora, dairy and meat goats in temperate and tropical countries. National Academy Press, Washington D.C.
- Nutthakornkul, J., C. Navanukraw, P. Pakdee, C. Wachirapakorn, C. Kamollert, and K. Lertchunhakit. 2010. Technique for fertility improvement of Thai-native goat using stair-step feeding regimen. *Proceeding of 11th KKU Veterinary Annual Conference 2010*, Khon Kean University, Thailand. 66-71.
- Nutthakornkul, J. 2011. Application of compensatory growth and assisted reproduction technology (ART) in Thai native goats. Ph. D. Thesis Khon Kaen University, Thailand.
- Olivera-Muzante, J., S. Fierro, V. López, and J. Gil. 2011. Comparison of prostaglandin- and progesterone-based protocols for timed artificial insemination in sheep. *Theriogenology* 75: 1232-1238.
- Oliveira, M. A. L., S. I. Guido, and P. F. Lima. 2001. Comparison of different protocols used to induce and synchronize estrus cycle of Saanen goats. *Small Rumin. Res.* 40: 149-153.

- Orita, J., T. Tanaka, H. Kamomae, and Y. Kaneda. 2000. Ultrasonographic observation of follicular and luteal dynamics during the estrous cycle in Shiba goats. *J. Reprod. Dev.* 46: 31–37.
- Parkinson, T. 2009. In: Noakes, D. E., T. J. Parkinson, G. C. W. England. (Eds.), *Veterinary Reproduction and Obstetrics.*, 9th ed. Saunders-Elsevier, London, UK, 681–806 pp.
- Paulenz, H., L. Soderquist, T. Adnoy, K. Soltun, P. A. Saether, K. R. Fjellsoy, and K. Andersen Berg. 2005. Effect of cervical and vaginal insemination with liquid semen stored at room temperature on fertility of goats. *Anim. Reprod. Sci.* 86: 109-117.
- Perry, K., W. Haresign, D. C. Wathes, and M. Khalid. 2010. Intracervical application of hyaluronan improves cervical relaxation in the ewe. *Theriogenology* 74: 1685–1690.
- Pralomkarn, W., S. Saithano, W. Ngampongsai, C. Suwanrut, and J. T. B. Milton. 1996. Growth and puberty traits of Thai native (TN) and TN x Anglo-Nubian does. *Asian-Australian J. Anim. Sci.* 9: 591-595.
- Purdy, P. H. 2006. A review on goat sperm cryopreservation. *Small Rumin. Res.* 63: 215–225.
- Quispe, T., L. Zarco, J. Valencia, and A. Ortiz. 1994. Estrus synchronization with melengestrol acetate in cyclic ewes. Insemination with fresh or frozen semen during the first or second estrus post treatment. *Theriogenology* 41: 1385-1392.
- Rahman, A. N. M. A., R. B. Abdullah, and W. E. Wan-Khadijah. 2008. Estrus synchronization and superovulation in goats: a review. *J. Biol. Sci.* 8: 1129-1137.
- Restall, B. J., J. T. B. Milton, P. Klong-yutti, and S. Kochapakdee. 1990. Pregnancy diagnosis in Thai native goats. *Theriogenology* 34: 313-7.
- Ritar, A. J., and S. Salamon. 1983. Fertility of fresh and frozen-thawed semen of the Angora goat. *Aust. J. Biol. Sci.* 36: 49–59.

- Ritar, A. J., S. Salamon, P. D. Ball, and P. J. Ó May. 1989. Ovulation and fertility in goats after intravaginal device-PMSG treatment. *Small Rumin. Res.* 2: 323-331.
- Ritar, A. J., P. D. Ball, and P. J. O'May. 1990. Artificial insemination of Cashmere goats: effects on fertility and fecundity of intravaginal treatment, method and time of insemination, semen freezing process, number of motile spermatozoa and age of females. *Reprod. Fertil. Dev.* 2: 377-84.
- Robinson, T. J., N. W. Moore, D. R. Lindsay, I. C. Fletcher, and S. Salamon. 1970. Fertility following synchronization of oestrus in sheep with intravaginal sponges. 1. Effects of vaginal douche, supplementary steroids, time of insemination, and numbers and dilution of spermatozoa. *Aust. J. Agric. Res.* 21: 767-781.
- Roca, J., J. A. Carrizosa, I. Campos, A. Lafuente, J. M. Va'zquez, and E. Martínez. 1997. Viability and fertility of unwashed Murciano-Granadina goat spermatozoa diluted in Tris-egg yolk extender and stored at 5 °C. *Small Rumin. Res.* 25: 147-53.
- Romano, J. E. 1996. Comparison of fluorgestone and medroxyprogesterone intravaginal pessaries for estrus synchronization in dairy goats. *Small Rumin. Res.* 22: 219-233.
- Romano, J. E. 2004. Synchronization of estrus using CIDR, FGA or MAP intravaginal pessaries during the breeding season in Nubian goats. *Small Rumin. Res.* 55: 15-19.
- Roy, A. 1957. Egg yolk-coagulation enzyme in the semen and Cowper's gland of the goat. *Nature* 179: 318-319.
- Rubianes, E., and A. Menchaca. 2003. The pattern and manipulation of ovarian follicular growth in goats. *Anim. Reprod. Sci.* 78: 271-287.
- Saithanoo, S., and J. T. B. Milton. 1988. Goat meat production in Thailand. Paper presented at a workshop on Goat Meat Production in Asia. 13-18. March 1988. Tando Jam. Pakistan.

- Saithanoo, S., W. A. Pattie, and B. W. Norton. 2001. Simulation models of breeding systems for village goat production in southern Thailand. PSU goat research publications (1985-2001), Small Ruminants Research and Development Center, Prince of Songkla University, Songkla. 37- 43 pp.
- Salamon, S., and W. M. C. Maxwell. 1995. Frozen storage of ram semen II. Causes of low fertility after cervical insemination and methods of improvement. *Anim. Reprod. Sci.* 38: 1-36.
- Salamon, S., and W. M. C. Maxwell. 2000. Storage of ram semen. *Anim. Reprod. Sci.* 62: 77–111.
- SAS. 2001. SAS/STAT: User Guide for the International Database. SAS Inst., Cary NC.
- Schrick, F. N., R. A. Surface, J. Y. Pritchard, R. A. Dailey, E. C. Townsend, and E. K. Inskeep. 1993. Ovarian structures during the estrous cycle and early pregnancy in ewes. *Biol. Reprod.* 49: 1133–1140.
- Schwarz, T., and E. Wierzchos. 2000. Relationship between FSH and ovarian follicular dynamics in goats during the estrous cycle. *Theriogenology* 53: 381-387.
- Shelton, M. 1978. Reproduction and breeding of goats. *J. Dairy Sci.* 61: 994-1010.
- Shipley, C. F. B., B. C. Buckrell, and M. J. A. Mylne. 2007. In: Youngquist, R.S., W.R. Threlfall. (Eds.), *Current Therapy in Large Animal Theriogenology*, 2nd ed. Saunders-Elsevier, St. Louis, MO. 629–641 pp.
- Sias, B., F. Ferrato, M. Pellicer-Rubio, Y. Forgerit, P. Guillouet, B. Leboeuf, and F. Carriere. 2005. Cloning and seasonal secretion of the pancreatic lipase-related protein2 present in goat seminal plasma. *Biochim. Biophys. Acta* 1686: 169–180.
- Sirois, J., and J. E. Fortune. 1988. Ovarian follicular dynamics during the estrous cycle in heifers monitored by real-time ultrasonography. *Biol. Reprod.* 39: 308–317.
- Sohnrey, S. B., and W. Holtz. 2000. Transcervical embryo collection in Boer goats. *Small Rumin. Res.* 36: 195-200.
- Sohnrey, B., and W. Holtz. 2005. Transcervical deep cornual insemination of goats. *J. Anim. Sci.* 83: 1543-1548.

- Souza, J. M. G., C. A. A. Torres, A. L. R. S. Maia, F. Z. Brandao, J. H. Bruschi, J. H. M. Viana, E. Oba, and J. F. Fonseca. 2011. Autoclaved, previously used intravaginal progesterone devices induces estrus and ovulation in anestrous Toggenburg goats. *Anim. Reprod. Sci.* 129: 50-55.
- Spallanzani, L. 1784. *Dissertations relative to the natural history of animals and vegetables*. Trans. by T. Beddoes in *dissertations relative to the natural history of animals and vegetables*. J. Murray, London. 195-199 pp.
- Steel, R. G. D., J. H. Torrie, and D.A. Dickey. 1997. *Principles and procedures of statistics a biometrical approach*. 666 pp.
- Stellflug, J. N., M. C. Wulster-Radcliffe, E. L. Hensley, E. A. Cowardin, R. C. Seals, and G. S. Lewis. 2001. Oxytocin-induced cervical dilation and cervical manipulation in sheep: effects on laparoscopic artificial insemination. *J. Anim. Sci.* 79: 568-573.
- Stenbak, T. K., A. T. Grazul-Bilska, H. R. Berginski, J. J. Bilski, A. S. Erickson, J. D. Kirsch, K. C. Kraft, C. Navanukraw, M. J. Toutges, L. P. Reynolds and D. A. Redmer. 2003. Ovulation rate in ewes synchronized with Syncro-Mate-B. (SMB) and follicle stimulating hormone. *Small Rumin. Res.* 48: 1-8.
- Suttiyotin, P., B. J. Restall, J. T. B. Milton, S. Saithanoo, and P. Klong-yutti. 1991. Ovulatory activity in native Thai goats. *Theriogenology* 36: 443-447.
- Tenório Filho, F., M. H. B. Santos, P. G. Carrazzoni, F. F. Paula-Lopes, J. P. Neves, C. C. Bartolomeu, P. F. Lima, M. A. L. Oliveira. 2007. Follicular dynamics in Anglo-Nubian using transrectal and transvaginal ultrasound. *Small Rumin. Res.* 72: 51–56.
- Ungerfeld, R., and E. Rubianes. 1999. Effectiveness of short-term progestogen priming for the induction of fertile oestrus with eCG in ewes during late seasonal anoestrus. *Anim. Sci.* 68: 349–353.
- Ungerfeld, R., and E. Rubianes. 2002. Short term primings with different progestogen intravaginal devices (MAP, FGA and CIDR) for eCG-estrous induction in anestrous ewes. *Small Rumin. Res.* 46: 63-66.
- Ungerfeld, R. 2009. The induction of oestrus in ewes during the non-breeding season using pre-used CIDRs and oestradiol-17 β treatment. *Small Rumin. Res.* 84: 129–131.

- Uriyapongsan, S., W. Toburan, P. Tangkawattana, and A. Sangkaew. 1997. Development and technology transfer of goat production for small farmers in the Northeast of Thailand. *Livestock Research for Rural Development*. 9: 133-136.
- Ustuner, U., Z. N. Gunay, and H. Ustuner. 2007. Effects of long and short-term progestagen treatments combined with PMSG on estrus synchronization and fertility in Awassi Ewes during the breeding season. *Acta. Vet. BRNO*. 76: 391-397.
- Van Cleeff, J., M. C. Lucy, C. J. Wilcox, and W. W. Thatcher. 1992. Plasma and milk progesterone and plasma LH in ovariectomized lactating cows treated with new or used controlled internal drug release devices. *Anim. Reprod. Sci.* 27: 91-106.
- Van Cleeff, J., F. J. Karsch, and V. Padmanabhan. 1998. Characterization of endocrine events during the peri-estrous period in sheep after estrous synchronization with controlled internal drug release (CIDR) device. *Domest. Anim. Endocrinol.* 15: 23-34.
- Vilariño, M., E. Rubianes, E. van Lier, and A. Menchaca. 2010. Serum progesterone concentrations, follicular development and time of ovulation using a new progesterone releasing device (DICO[®]) in sheep. *Small Rumin. Res.* 91: 219-224.
- Vilariño, M., E. Rubianes, and A. Menchaca. 2011. Re-use of intravaginal progesterone devices associated with the short-term protocol for timed artificial insemination in goats. *Theriogenology* 75: 1195-1200.
- Viñoles, C., M. Forsberg, G. Banchemo, and E. Rubianes. 2001. Effect of long-term and short-term progestagen treatment on follicular development and pregnancy rate in cyclic ewes. *Theriogenology* 55: 993-1004.
- Vonnahme, K. A., J. Evoniuk, M. L. Johnson, P. P. Borowicz, J. S. Luther, D. Pant, D. A. Redmer, L. P. Reynolds, and A. T. Grazul-Bilska. 2008. Placental vascularity and growth factor expression in singleton, twin, and triplet pregnancies in the sheep. *Endocrine* 33: 53-61.
- Watson, P. F. 2000. The causes of reduced fertility with cryopreserved semen. *Anim. Reprod. Sci.* 60-61: 481-492.

- Wheaton, J. E., K. M. Carlson, H. F. Windels, and L. J. Johnston. 1993. CIDR: a new progesterone-releasing intravaginal device for induction of estrus and cycle control in sheep and goats. *Anim. Reprod. Sci.* 33: 127-141.
- Whitley, N. C., and D. J. Jackson. 2004. An update on estrus synchronization in goats: a minor species. *J. Anim. Sci.* 82: E270–E276.
- Wildeus, S. 2000. Current concepts in synchronization of estrus: Sheep and goats. *J. Anim. Sci.* 77: 1-14.
- Wulster-Radcliffe, M. C., and G. S. Lewis. 2002. Development of a new transcervical artificial insemination method for sheep: effects of a new transcervical artificial insemination catheter and traversing the cervix on semen quality and fertility. *Theriogenology* 58: 1361-1371.
- Wulster-Radcliffe, M. C., S. Wang, and G. S. Lewis. 2004. Transcervical artificial insemination in sheep: effects of a new transcervical artificial insemination instrument and traversing the cervix on pregnancy and lambing rates. *Theriogenology* 62: 990-1002.
- Zelege, M., J. P. C. Greyling, L. M. J. Schwalbach, T. Muller, and J. A. Erasmus. 2005. Effect of progestagen and PMSG on estrous synchronization and fertility in Dorper ewes during the transition period. *Small Rumin. Res.* 56: 47-53.