



1. Name: CHAUHAN MANMOHAN SINGH  
(Dr. M.S. CHAUHAN)
2. Date of Birth: 05/01/1960
3. Gender: Male
4. Designation: Principal Scientist
5. Present address: Animal Biotechnology Centre  
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6. Qualifications: M.Sc., Ph.D. (Reproductive Physiology)
7. Discipline of ARS: Animal Physiology
8. Area of Research: In vitro fertilization (IVF) and Embryo Transfer Technology,  
Ovum pick-up Technique, Embryonic Stem cell culture,  
Cloning and Transgenic in farm animals.
- Ongoing out funding Projects (as Principal Investigator):
- 1) Establishment and maintenance of buffalo embryonic stem cell lines, Principal Investigator (PI), sponsored by DBT (Govt. of India), New Delhi.
  - 2). Embryo production by Ovum Pick-Up from live cattle, (PI), sponsored by DBT (Govt. of India), New Delhi.
  - 3) Conservation and multiplication of germplasm of Yak (*Poephagus grunnies* L.) and its hybrid using in vitro embryo production techniques, (collaborative project with NRC-Yak, (PI), sponsored by DBT (Govt. of India), New Delhi.
  - 4) Characterisation and differentiation of embryonic and spermatogonial stem cells in cattle and buffaloes, (PI), sponsored by NAIP (ICAR).

## 9. Research Experience: 23 Years

### 10. Major Research Accomplishments:

- a) Developed freezing technology for goat semen (*Chauhan & Anand 1990, Theriogenology 34, 1003-1013*).
- b) First in the world, developed IVF technology in goat (*Chauhan & Anand 1991, Ind. J. Exp. Biol. 29, 105-110*).
- c) Produced 6 IVF buffalo calves (*Chauhan et al., Ind. J. Anim. Sci., 67, 306-308*).
- d) Developed cost effective IVF technology in buffalo by replacing hormones and serum with follicular fluid (*Chauhan et al., 1997, Theriogenology 4, 461-469*).
- e) Developed IVF protocol in buffalo and submitted to DBT (Govt. of India) for implementation.
- f) Established embryo sexing in buffalo (*Sood, Chauhan et al., Buffalo J., 17, 113-124*).
- g) Developed identification of transgenic embryo through GFP tagged DNA microinjection in cattle and buffaloes (*Chauhan et al 1999, Journal. Dairy Science 82, 918-926*).
- h) Established ovum pick-up technology in buffalo (*Manik, Chauhan et al., Veterinary Record 2002, 150, 22-24*).
- i) Established procedure for stem cell culture system in buffalo (*Reproduction Fertility & Development 18: 205-206, 2006; Verma, Chauhan et al., Molecular Reproduction & Development 74:520-529, 2007*).
- j) Developed zona free cloning technology in buffalo and produced buffalo cloned calves (*Riaz,---, Chauhan, 2008, Cloning and stem cell 10, 435-442*).

### 11. Important Research Publications:

1. Saugandhika, S., Kumar, D., Singh, M.K., Shah, R., Anand, T., Chauhan, M.S., Manik, R.S., Singla, S.K. and Palta, P. (2009). Effect of sodium nitroprusside, a nitric oxide donor, and aminoguanidine, a nitric oxide synthase inhibitor, on in vitro development of buffalo (*Bubalus bubalis*) embryos. *Reproduction in Domestic Animals* (in press) doi: 10.1111/j.1439-0531.2009.01359.
2. Shah RA, George A, Singh MK, Kumar D, Chauhan MS, Manik RS, Palta P and Singla SK (2008). Hand-made cloned buffalo (*Bubalus bubalis*) embryos: comparison of different media and culture systems. *Cloning and stem cell 10, 435-442*.
3. Gautam SK, Verma V, Palta P, Singla SK, Chauhan MS and Manik RS (2008) Effect of type of cryoprotection on morphology and developmental competence of in vitro-matured buffalo (*Bubalus bubalis*) oocytes subjected to slow freezing. *Reproduction Fertility and Development 18: 205-206*.
4. Verma V, Gautam SK, Palta P, Manik RS, Singla SK, Chauhan MS (2008). Development of a pronuclear DNA microinjection technique for production of green fluorescent protein-expressing bubaline (*Bubalus bubalis*) embryos. *Theriogenology 69: 655-665*.
5. Anand T, Kumar D, Chauhan MS, Manik RS, and Palta P (2008). Cysteamine supplementation of in vitro maturation medium, in vitro culture medium or both media promotes in vitro development of buffalo (*Bubalus bubalis*) embryos. *Reproduction, fertility and Development 20, 253-257*.

6. Gautam SK, Verma V, Singh B, Palta P, Singla SK, Chauhan MS and Manik RS (2008). Effect of slow freezing on morphology and developmental competence of buffalo (*Bubalus bubalis*) immature oocytes. *Animal Reproduction Science*, 105: 311-318.
7. Verma V, Gautam SK, Singh B, Manik RS, Palta P, Singla SK, Goswami SL and Chauhan MS (2007). Isolation and characterization of embryonic stem cell like cells from in vitro produced buffalo (*Bubalus bubalis*). *Molecular Reproduction & Development* 74:520-529
8. Chauhan, M.S., Verma, V., Manik, R.S., Singla, S.K., Palta, P. and Goswami, S.L. (2006). In vitro fertilization of oocytes obtained through transvaginal oocyte retrieval from cyclic buffaloes (*Bubalus bubalis*). *Reproduction Fertility and Development* 18: 205-206.
9. Manik, R.S., Chauhan, M.S., Gupta, V., Singla, S.K., and Palta, P. (2006). In vitro fertilization of oocytes obtained through transvaginal oocyte retrieval from cyclic buffaloes (*Bubalus bubalis*). *Reproduction Fertility and Development* 18: 219.
10. Gupta V, Manik RS, Chauhan MS, Singla SK, Akshey YS and Palta P (2006) Repeated ultrasound-guided transvaginal oocyte retrieval from cyclic Murrah buffaloes (*Bubalus bubalis*): Oocyte recovery and quality. *Animal Reproduction Science* 91, 89-96.
11. Akshey YS, Palta P, Manik RS, Vivekanand and Chauhan MS (2005) Effect of removal of follicles through repeated transvaginal follicle aspiration on subsequent follicular populations in Murrah buffalo (*Bubalus bubalis*)  
*Asian –Australasian Journal of Animal Sciences* 18, 632-636.
12. Arathy DS, Saha A, Sharma GT, Majumdar AC and Chauhan MS (2004) Effect of specific gravity of culture medium on in vitro embryo development in buffalo. *Reproduction, Fertility and Development* 16, 253.
13. Wirtu G, Bailey TL, Chauhan MS, Parker NA, Dascanio JJ, Gwazdauskas FC and Ley WB (2004) Xenogenous fertilization of equine oocytes following recovery from slaughterhouse ovaries and in vitro maturation.  
*Theriogenology* 61, 381-391.
14. Manik RS, Chauhan MS, Singla SK, and Palta P (2002). Transvaginal ultrasound-guided aspiration of follicles in problem Murrah buffaloes (*Bubalus bubalis*). *Veterinary Record* 150, 22-24.
15. Manik RS, Singla SK, Palta P and Chauhan MS (2002). Ultrasonographic study of ovulation in buffalo following natural and after synchronization of oestrus by treatment with prostaglandin or norgestomet and estradiol valerate.  
*Indian Journal of Animal Sciences* 72, 145-147.
16. Sood SK, Chauhan MS and Tomer OS (2001) A direct duplex PCR assay for sex determination of murrah buffalo (*Bubalus bubalis*) embryos.  
*Buffalo Journal* 1:113-124.
17. Nandi S, Chauhan MS and Palta P (2001) Effect of environmental temperature on quality and developmental competence in vitro of buffalo oocyte.  
*Veterinary Record* 148: 278-279.
18. Nandi S, Chauhan MS and Palta P (2000) Effect of a corpus luteum on the recovery and developmental potential of buffalo oocytes.  
*Veterinary Record* 147, 580-581.
19. Chauhan MS, Nadir S, Baily TL, Pryor AW, Butler SP, Velandar WH and Gwazdauskas FC. (1999). Bovine follicular dynamics, oocyte recovery, and development of oocytes microinjected with green fluorescent protein construct. *Journal of Dairy Science* 82: 918-926.
20. Chauhan MS, Nadir S, Baily TL, Pryor AW, Butler SP, Velandar WH and Gwazdauskas FC. (1999). Bovine follicular dynamics, oocyte recovery, and microinjection of green fluorescent protein DNA into different quality oocytes. *Theriogenology* 51:418-418.
21. Chauhan MS, Singla SK, Palta P, Manik RS and Madan ML. (1999). Effect of epidermal growth factor on the cumulus expansion, meiotic maturation and development of buffalo oocytes in vitro.

- Veterinary Record* 144:266-267.
22. Sood SK, Chauhan MS and Tomer OS. (1999). Sex- linked developmental rate differences in Murrah buffalo (*Bubalus bubalis*) embryos fertilized and cultured in vitro. *Asian Australation Journal of Animal Sciences* 12:15-21.
  23. Singla SK, Manik RS, Chauhan MS and Madan ML. (1999). Quality of oocytes obtained from buffalo ovaries during winter and summer months. *Indian Journal of Animal Reproduction* 20, 100-102.
  24. Chauhan MS, Singla SK, Palta P, Manik RS. and Madan ML.(1998). In vitro maturation and fertilization, and subsequent development of buffalo embryos: effects of oocyte quality and type of serum. *Reproduction Fertility & Development* 10:173-177.
  25. Chauhan MS, Singla SK, Palta P, Manik RS and Tomer OS. (1998). Development of in vitro produced buffalo (*Bubalus bubalis*) embryos in relation to time. *Asian Australation Journal of Animal Sciences* 11:398-403.
  26. Chauhan MS, Singla SK, Palta P, Manik RS and Tomer O S (1998). IGF-II stimulation of in vitro maturation, fertilisation and subsequent development of buffalo (*Bubalus bubalis*) oocytes vitro. *Veterinary Record* 142:727-728.
  27. Chauhan MS, Palta P, Das SK and Tomer OS. (1998). Effect of culture conditions on the hatching ability of in vitro produced buffalo (*Bubalus bubalis*) embryos. *Veterinary Record* 142:169-171.
  28. Nandi S, Chauhan MS. (1998). Effect of cumulus cells and sperm concentrations on cleavage and subsequent development to blastocyst stage of buffalo oocytes matured and fertilized in vitro. *Theriogenology* 49: 264-264.
  29. Nandi S. Chauhan MS and Palta P. (1998). Influence of cumulus cells and sperm concentration on cleavage rate and subsequent embryonic development of buffalo (*Bubalus bubalis*) oocytes matured and fertilized in vitro. *Theriogenology* 50: 1251-1262.
  30. Chauhan MS, Singla SK, Manik RS and Madan ML. (1997). Increased capacitation of buffalo sperm by heparin as confirmed by electron microscopy and in vitro fertilization. *Indian Journal of Experimental Biology* 35:1038-1043.
  31. Chauhan MS, Katiyar PK, Singla SK, Manik RS and Madan ML. (1997). Production of buffalo calves through in vitro fertilization. *Indian Journal of Animal Sciences* 67: 306-308.
  32. Chauhan MS, Palta P, Das SK, Katiyar PK and Madan ML. (1997). Replacement of hormone and serum additives with follicular fluid: Effects on maturation, fertilization and subsequent development of buffalo oocytes in vitro. *Theriogenology* 48: 461-469.
  33. Das SK, Chauhan MS, Palta P and Tomer OS. (1997).Influence of cumulus cells on in vitro maturation of denuded buffalo (*Bubalus bubalis*) oocytes. *Veterinary Record* 141:522-523.
  34. Yadav BR, Katiyar PK, Chauhan MS and Madan ML. (1997). Chromosome configuration during in vitromaturation goat, sheep and buffalo oocytes. *Theriogenology* 47: 943-951.
  35. Chauhan MS, Katiyar PK, Madan ML, Singla SK and Manik RS. (1996). Influence of follicle stimulating hormone on in vitro maturation and cleavage of buffalo (*Bubalus bubalis*) oocytes after in vitro fertilization. *Theriogenology* 45: 243-243.
  36. Das SK, Chauhan MS, Palta P, Katiyar PK and Madan ML. (1996). Replacement of fetal bovine serum and FSH with buffalo follicular fluid in in vitro maturation of buffalo oocytes. *Theriogenology* 45: 245.
  37. Chauhan MS, Kapila R, Gandhi KK and Anand SR. (1994). Acrosome damage and enzyme leakage of goat spermatozoa during dilution cooling and freezing. *Andrologia* 26: 21-26.
  38. Madan ML, Chauhan MS, Singla SK and Manik RS. (1994). Pregnancies established

- from water buffalo (*Bubalus bubalis*) blastocysts derived from *In vitro* matured *In vitro* fertilized oocytes and co-cultured with cumulus and oviductal cell. *Theriogenology* 42: 591-600.
39. Madan ML, Singla SK, Chauhan MS and Manik RS. (1994). *In vitro* production and transfer of embryo in buffaloes. *Theriogenology* 41: 139-143.
  40. Chauhan MS and Anand SR. (1991). *In vitro* maturation and fertilization of goat oocytes. *Indian Journal of Experimental Biology* 29: 105-110.
  41. Chauhan MS and Anand SR. (1990). Effect of egg yolk lipids on freezing of goat semen. *Theriogenology* 34: 1003-1013.
  43. Anand SR, Atreja SK, Chauhan MS and Behl R. (1989). *In vitro* capacitation of goat spermatozoa. *Indian Journal of Experimental Biology* 27: 921-924.

Review Articles:

45. Palta P. and Chauhan MS. (1999) Laboratory production of buffalo embryos. *Reproduction Fertility & Development* 10: 379-391.
46. Nandi S, Raghu HM, Ravindranatha BM and Chauhan MS (2002) Production of buffalo (*Bubalus bubalis*) embryos in vitro: premises and promises. *Reproduction of Domestic Animals* 37, 65-74.
47. Singh B, Chauhan M. S., Singla S. K., Gautam S. K., Verma V., Manik R. S., Singh A. K, Sodhi M. and Mukesh M. (2009). Reproductive biotechniques in buffaloes (*Bubalus bubalis*): status, prospects and challenges: A Review, *Reproduction, Fertility and Development* 21, 299-510.

12. Patent, Technology, Methodology developed:

- a) Developed freezing technology for goat semen
- b) IVF technology in goat and buffaloes.
- c) OPU technology in cattle and buffaloes
- d) Developed identification of transgenic embryo through GFP tagged DNA microinjection in cattle and buffaloes.
- e) Protocol for stem cell culture system in buffalo
- f) Developed hand made cloning technique in buffalo.

13. Training Attended (National and International):

- 1) Agricultural Research Management Training (44 FCARPM) at the National Academy of Agril. Research Management, Hyderabad.
- 2) DNA Fingerprinting in Farm Animals from Feb. 25 to March 14, 1997 at NDRI, Karnal.
- 3) Transgenic Animal Production Technology from November 2, 1997 to November 1, 1998 at Virginia Tech, Virginia, USA.
- 4) Clinical Endocrinology at IVRI Izatnagar from March 20 to April 9, 2001.
- 5) Molecular Techniques for Gene Characterization and Genome Analysis from Nov. 17 to 26, 2005 at National Bureau of Animal Genetics Resources (NBAGR), Karnal.
- 6) Stem Cell and Cloning from April 30 to July 30, 2004 at the Department of Dairy Science, Virginia Tech., Virginia, USA.

14. Guidance to Students:

(Major Advisor)

- a. Master Degree (MSc./ MVSc) – 7 Students
- b. PhD – 3 students

15. Awards and Recognitions:

1. Appreciation letter was received from DBT (Govt of India) for developing IVF Technology in Buffalo.
2. Best poster awards in 2 International conferences.
3. Overseas Fellowship Award by the Department of Biotechnology (Govt. of India) New Delhi in 1997.
4. Exemplary Research Award 1999 by Virginia Tech., USA.

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