

Curriculum Vitae



Name Sandeep Goel
Present Designation Scientist F
Address for correspondence DBT-National Institute of Animal Biotechnology (NIAB)
Telangana-500032, Hyderabad.
Email: goel@niab.org.in

Area of research Stem cell biology, reproductive biology, spermatogenesis, transgenesis, genome editing, conservation biology, animal biotechnology

Educational qualification

Ph.D. /2008

University: Kyoto University, Japan

Major: Applied Biosciences/Reproductive Biology

Thesis: Identification, Stem Cell Potential and In Vitro Cultivation of Primitive Germ Cells from Neonatal Porcine Testis

M. Vet. Sc. /2000

University: Tamil Nadu Veterinary and Animal Sciences University, Chennai, India

Major: Animal Biotechnology

Thesis: Effect of Growth Factors on In Vitro Development of Sheep oocytes

B.Vet. Sc. & A. H. (equivalent to DVM)/ 1996

University: Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, India

Major: Veterinary Sciences and Animal Husbandry

Details of employment (starting from current employment)

DBT-National Institute of Animal Biotechnology (NIAB), Hyderabad, India

- Scientist F (Joined on 06 August 2020)

CSIR-Centre for Cellular and Molecular Biology (CCMB), Hyderabad, India

- Senior Principal Scientist/Project Leader (June 2018 – 05 August 2020)
- Principal Scientist/Project Leader (June 2011-June 2018)
- Senior Scientist/Project Leader (June 2007- June 2011)
- Scientist/team member transgenic facility/ Ph.D. student (June 2003- June 2007)
- Junior Scientist/team member transgenic facility (June 2000- June 2003)

Kyoto University, Kyoto, Japan (tenure-track)/ March 2017 - March 2019

- **Associate Professor**, Laboratory of Reproductive Biology, Dept. of Applied Biosciences, Graduate/ Faculty of Agriculture

Georgetown University School of Medicine, Washington DC/October 2012-March 2013

- **Visiting Scientist**, Department of Biochemistry and Molecular & Cellular Biology

Professional training

1. Production of transgenic and gene knock out animals. National Institute of Immunology (NII), Department of Biotechnology (DBT), New Delhi, India, 15 February to 01 March 2001.
2. Hands-on Training on Cloning Research for Quality Animal Production. National Dairy Research Institute (NDRI), Indian Council of Agriculture Research (ICAR), Karnal, Haryana, India, 21-30 November 2011.

Research Experience

- April 1999- May 2000 (Master course program in Veterinary Sciences in Animal Biotechnology)
(With financial support from Department of Biotechnology, Government of India)

Title of thesis: Effect of Growth Factors on In Vitro Development of Sheep oocytes

The effect of various growth factors such as IGF-I, EGF, and TGF-beta and hormones such as insulin was assessed on the *in-vitro* maturation of sheep oocyte. The matured oocytes were *in-vitro* fertilized and the development of embryos was assessed. Co-culture of embryos with various cell lines such as BHK-21, cumulus, BRL, and oviductal epithelial cells was also assessed by evaluating the embryonic development.

- June 2000- March 2005 (National Facility for Transgenic and Gene Knockout Mice, CCMB)
Member of the core faculty at the National Facility for Transgenic and Gene Knockout Mice. Instrumental in the generation of transgenic and gene-knockout mice models for studying regulation and function of genes in-vivo (functional genomics). Actively involved in different research projects to elucidate the functions of various genes in-vivo using transgenic (pro-nuclear injection) and gene knockout (embryonic stem cell) based technology. Extensive experience with mouse embryo culture, IVF, micromanipulation, genomic techniques like Southern blot and Northern blot analysis, designing gene targeting vector and molecular cloning, PCR strategies for detection of mutation, embryonic stem cell culture, and manipulation.

Research Projects (as a team member)

1. X-Chromosome: Functional genomics approach
 2. Establishment of a national facility on transgenic and gene knockout mice
 3. Targeted Deletion of Casein Gene Family in Mouse
 4. Functional Analysis of Mouse Wdr13 Gene
- April 2005-March 2008 (In-service deputation to Kyoto University, Kyoto, Japan for the Ph.D. program)
(With financial support from the Japanese Government MEXT Fellowship program)

Title of Thesis: Identification, Stem Cell Potential and In Vitro Cultivation of Primitive Germ Cells from Neonatal Porcine Testis

Primitive testicular germ cells (gonocytes), which are the only germ cells that exist in the neonatal testis, were examined for expression of germ-cell and pluripotency-specific proteins. A porcine gonocyte-specific marker was identified and using the markers gonocytes were isolated and cultured in vitro and characterized using germ cell and pluripotency-specific

gene markers. The stem cell potential of porcine gonocytes was determined using the testis transplantation assay.

□ March 2008-September 2012

Project 1: Conservation of Endangered Species with an Emerging Technology: Exploiting the Male Germ Line Stem Cells, Department of Biotechnology, Government of India

The testis is a male gonad and is a component of both the reproductive and the endocrine system. This organ determines the fertility and secondary sexual characteristics of a male. Testis comprises of two types of cells, the germ, and the somatic cells. Spermatogonia are the most undifferentiated germ cells present in the adult testis that differentiate to haploid sperm through the process of spermatogenesis. Somatic cells of the testis, such as Sertoli, peritubular myoid and Leydig cells interact with germ cells for maintaining the fertility and libido of a male., Using the domestic buffalo and mice as model species, we deciphered the molecular characteristics of testicular germ and somatic cells to develop a better understanding of the underlying mechanism of spermatogenesis and germ cell biology that can be utilized for improving the fertility of males.

Project 2: Preservation of Endangered Species and their Genetic Resources by Biotechnological Interventions, Department of Science and Technology, Government of India.

A collaborative research project with India and Kyoto University, Japan. Under this project, we established several novel techniques that enabled us to establish male germlines stem cell biology in domestic buffalo and several endangered species. We also established several somatic cell lines from endangered species under the project.

Project 3: Ectopic expression of vascular endothelial growth factor (VEGF): Implication in testis xenograft survival and development. EMPOWER (Encouraging and Motivating Pursuit of World Class Exploratory Research) scheme of Council for Scientific and Industrial Research, Government of India

Grafting of immature gonadal tissues to xenogenic hosts such as nude mice leads to the recovery of functional gametes capable of fertilization. Due to the time delay in vascularization following xenografting, impaired development and degeneration of gonadal tissue are reported. Further, the age of donor tissue also determines the vascularization status of the graft. Vascular Endothelial Growth Factor (VEGF) plays an important role in angiogenesis by forming new blood vessels, which restores oxygen supply leading to the establishment of a connection with the host's vascular system for growth and development. The role of VEGF in testis xenograft of wild mammals is not studied to date. In the present project, cell lines that stably express VEGF protein were established and, coalesced with testicular tissues before xenografting. The xenografted testicular tissues showed higher graft survival, graft weight, and higher testosterone level.

➤ October 2012- March 2013

Visiting scientist at Department of Biochemistry and Molecular & Cellular Biology, Georgetown University School of Medicine, Washington DC

Financially supported by **Indo-US Science and Technology Forum (IUSSTF) Fellowship**
Research Project: Deciphered regulation of PDZ (postsynaptic density-95/Discs large/zona occludens-1)-binding kinase/T-LAK (lymphokine-activated killer T cell) cell originating protein

kinase (PBK/TOPK) in testis. Preliminary studies on telomerase activity in cultured mouse and human spermatogonial stem cells (SSCs) were also done during the tenure.

□ April 2013-February 2017

Projects 4: Conservation of Endangered Animals based on Genetic Polymorphism Studies and Assisted Reproduction; Central Zoo Authority, Government of India.

Understanding cryosenstivity of testicular tissues from young and adult animals, developing cryopreservation protocols, xenografting of the cryopreserved testis, retrieval of fertilization-competent gametes, deciphering mechanism of cryopreservation

Project 5: Conservation of Endangered Animals of India: Molecular Genetics and Reproductive Approach; Council for Scientific and Industrial Research (CSIR), Government of India

Understanding of germ and somatic interaction in testis, mechanism of angiogenesis in xenografted testis, regulation of testis-specific kinase in spermatogenesis, discovering novel cryoprotectants for cells and tissues.

□ March 2017- March 2019 (Associate Professor, Kyoto University)

Project 6: Regulation and the role of serine-threonine protein kinase (PBK/TOPK) in spermatogenesis; Japanese Society for the Promotion of Science (JSPS), Government of Japan.

Non-specific male infertility is a major concern in the current scenario. Cancer/testis antigens are a category of tumor antigens that are normally expressed in germ cells in the testis and are believed to regulate male fertility. One such cancer/testis antigen is PDZ (postsynaptic density-95/Discs large/zona occludens-1)-binding kinase/T-LAK (lymphokine-activated killer T cell) cell originating protein kinase (known as PBK/TOPK), which is a spermatogenesis-related serine-threonine protein kinase. PBK/TOPK is involved in many cellular functions, including tumor development, cell growth, apoptosis, and inflammation. However, the regulatory mechanism of PBK/TOPK in spermatogenesis is not known. In the present project, using the PBK/TOPK null mice generated using CRISPER/Cas9 nuclease, we aim to understand the regulatory mechanism of PBK/TOPK in spermatogenesis and its role in non-specific male infertility.

➤ March 2019 and continuing

Project 7: Deciphering spermatogenic arrest in xenografted testis, CSIR, Government of India

Ectopic testis tissue xenografting complemented with cryopreservation is a feasible technique for the fertility preservation of male cancer patients and endangered animals. Fertilization-competent gametes recovered from xenografted testis can be used for assisted reproduction. Because spermatogenesis in humans and several wild animal testes is arrested after xenografting and the reasons remain unknown, there is a need to investigate the plausible causes. Further, overcoming spermatogenic arrest is necessary for the applicability of the testis tissue xenografting in fertility preservation. Using rat-to-mouse testis xenograft as a model (because spermatogenesis is arrested similarly to human testis following xenografting), we propose to decipher the molecular, hormonal and cellular mechanism underlining spermatogenic arrest. We also propose to develop methods/approaches to overcome spermatogenic arrest so as to enable testis tissue xenografting for fertility preservation of humans and animals.

Teaching Experience

□ April 2008- June 2016

Doctoral thesis evaluated as an external examiner (Thesis title/year)

1. Molecular Mechanism of Estrogen-Dependent Germ Cell Reduction in Madeka, *Oryzias latipes* (Temminck & Schlegel, 1846)/ 2013

2. Development of fluorescent transgenic zebrafish biosensors responsive to heavy metal toxicity/ July 2017

Master's thesis supervised (Thesis title/ year)

1. Identification, isolation, culture, and characterization of buffalo germ cells/2009
2. Liposome-mediated Gene Delivery in Buffalo (*Bubalus bubalis*) fibroblast/2009
3. Transcriptional analysis of testis tissue xenografts of buffalo in nude mice/2010
4. Expression of vascular endothelial growth factor165 mRNA in a variety of vertebrate species/2011
5. Molecular cloning of large T-antigen cDNA into a eukaryotic expression vector, pcDNA 3.1(+)/2011
6. Molecular cloning of human telomerase (hTERT) cDNA into a eukaryotic expression vector (pCDNA 3.1+) for the application in immortalization of cells from endangered species/2011
7. Water buffalo (*Bubalus bubalis*) Leydig cells: isolation, culture, and characterization/2012
8. Expression of ubiquitin carboxy-terminal hydrolase-1 (UCHL-1) mRNA in the testis of a wide variety of vertebrates/2012
9. Leydig cell survival and regeneration in autografted adult mice testis/2012
10. Buffalo ocular fluid (BOF) as serum replacement in cryopreservation of buffalo (*Bubalus bubalis*) testicular tissue/2012
11. Effect of the protein composition of buffalo ocular fluid (BuOF) on cryopreserved c18-4 spermatogonial cell line: a protein expression analysis/2013
12. Maturation and germ cell development in xenografted buffalo (*Bubalus bubalis*) testes cryopreserved in ocular fluid/2014
13. Evaluation of sperm quality to establish effective combinations of DMSO and FBS for cryopreservation of adult non-human primate testis/2015
14. Morphological evaluation and expression of proteins in cryopreserved adult non-human primate testicular tissues to determine the effective combination of DMSO and FBS/2015
15. Role of protein binding kinase/T-Lak originated kinase (PBK/TOPK) in spermatogenesis/2016
16. Gene expression analysis in unilateral cryptorchid testis/2016

Undergraduate thesis supervised (Thesis title/ year)

1. Optimization of serum concentration for long-term culture of Black Buck (*Antelope cervicapra*) skin fibroblasts in vitro/2009
2. Estimation of molecular weight of POU5F1 and NANOG proteins in buffalo testis by western blot analysis/2011
3. Standardization for testosterone and expression analysis following luteinizing hormone (LH) treatment on cultured buffalo Leydig cells/2012
4. Evaluation of Cryopreserved Testicular Tissues from Wild Mammals/2012
5. Morphological and Immuno-histological evaluation of cryomixture for immature buffalo (*Bubalus bubalis*) testis/2013
6. Comparison of controlled and uncontrolled freezing methods for cryopreservation of immature water buffalo (*Bubalus bubalis*) testicular tissues/ 2013
7. Effect of different additives in cryopreservation of immature buffalo (*Bubalus bubalis*) testicular tissue based on morphological evaluation/2014

8. Evaluation of components responsible for cryopreservative ability of buffalo ocular fluid (BuOF)/2015
9. Effect of HI-TOPK-032 on seminiferous tubule degeneration and cell proliferation in rat testis/2016
10. Inhibition of PBK/TOPK using HI-TOPK-032 in rat testis/2016

□ March 2017- March 2019 (Kyoto University, Kyoto, Japan)

Associate Professor (tenure-track), Department of Applied Biosciences, Graduate/faculty of Agriculture

1. Taught following undergraduate courses averaging 100 students per semester
 - a. **Animal Reproduction:** Lectures covering male and female reproductive systems, reproductive endocrinology, reproductive cyclicity, embryogenesis of reproductive system, gametogenesis, puberty, reproductive behaviour, sperm in female reproductive tract, early embryogenesis and maternal recognition of pregnancy, placentation and endocrinology of gestation, puerperium and mammary gland development, artificial insemination and embryo transfer technology
 - b. **Cell & Molecular Biology of Reproduction:** Lectures covering origin and specification of germ cells, sexual differentiation and development, spermatogenesis, oogenesis/folliculogenesis, gamete transport and fertilization, implantation, pregnancy and embryonic development, genetics and endocrine disorders of reproduction, fertility and its control, stem cells of reproduction, infertility and its remedies and, cloning and transgenesis.
 - c. **Animal Biotechnology:** Topics covering embryo transfer technology (ETT), artificial insemination (AI), in vitro fertilization (IVF), intra-cytoplasmic sperm injection (ICSI), embryo/gamete biotechnology, reproductive cloning and xenotransplantation, cryobiology, stem cells, genome editing technologies, transgenic technology, and bioethics
 - d. **Conservation of Endangered Species:** Topics covering history and importance of wildlife, the current status of endangered species, wildlife protection system in Japan, genetics and conservation, conservation breeding, introduction to ex-situ conservation, AI, IVF, ICSI, ETT and reproductive cloning in conservation of endangered species, cryobiology in wildlife conservation, failure in conservation, practical approaches for conservation.
2. Developed quizzes, exams, and assignments
3. Revised the syllabus to meet accreditation standards
4. Taught laboratory courses for reproductive biology
5. Conducted seminar for Reproductive Biology
6. Mentoring of undergraduate and graduate students

Training Course/ Workshop/Conference Organized

1. A hands-on training course on Transgenic and Gene Knockout Mice technologies for 8thADNAT training course conducted at CCMB, Hyderabad, India, 23 and 24 February 2004.
2. Co-convener for workshop/conference on “Reproduction and Welfare of Endangered Animals in Conservation Breeding.” Sponsored by CSIR and CZA, Govt. of India, 28-30 January 2015.

Honors/Awards

1. University Gold Medal (B.V.Sc. & A.H.) for outstanding academic performance
2. P.K. Pathwardhan Silver Medal (B.V.Sc. & A.H.), a sponsor's medal for excellent academic performance
3. Awarded Department of Biotechnology (DBT), Government of India, fellowship for pursuing an M.V.Sc. program in Animal Biotechnology
4. Qualified National Eligibility Test (NET) 1999 – Indian Council of Agriculture Research (ICAR)
5. Nominated by the Indian government for the Commonwealth scholarship/fellowship 2004 for Ph.D. study in the United Kingdom (denied).
6. Selected for Commonwealth scholarship/ fellowship 2005 for Ph.D. study in Canada (declined).
7. Awarded Japanese Government Monbukagakusho (MEXT) scholarship, 2005 for the Ph.D. studies at Kyoto University, Kyoto, Japan (accepted).
8. Asia-Pacific Developmental Biology Network (APDBN) travel award for attending the 4th Annual Conference of Asian Reproductive Biotechnology Society held at the National University of Singapore, Singapore (November 24-28, 2007).
9. Award for an excellent poster presentation at the 4th Annual Conference of Asian Reproductive Biotechnology Society held at the National University of Singapore, Singapore (November 24-28, 2007).
10. Awarded International Society for Stem Cell Research (ISSCR) travel grant for attending the 6th ISSCR annual meeting held at Philadelphia, USA (June 11-14, 2008). Further, 100% support from CSIR was also extended for the same.
11. Awarded full grant (travel, accommodation, and registration) for attending and presenting a poster at the 16th International Congress on Animal Reproduction (ICAR) held at Budapest, Hungary (July 13-17, 2008).
12. Awarded Asia-Pacific Developmental Biology Network (APDBN) travel award for attending the 5th Annual Conference of Asian Reproductive Biotechnology Society (ARBS) held at Kunming, China (November 26-30, 2008).
13. Awarded Indo-US Science and Technology Forum (IUSSTF) Fellowship, 2012 for visiting researcher at Georgetown University Medical School, Washington DC (October 2012-March, 2013).

List of Publications (Papers): *(In national and international peer-reviewed journals)*

1. Singh BN, Suresh A, UmaPrasad G, Subramanian S, Sultan M, **Goel S**, Kumar S, and Singh L (2003). A highly conserved human gene encoding a novel member of WD-repeat family of protein (WDR13). *Genomics*. 81 (3), 315-328. **(IF: 3.32; HI: 135)**
2. **Goel S**, Palanisamy A and Nainer M (2004). Development of sheep embryos *in vitro*: effect of insulin and insulin-like growth factor (IGF-I). *Indian Journal of Animal Sciences* 74(4) 341-344. **(IF: 0.28; HI: 20)**
3. Ajaikumar KB, Nair HB, **Goel S**, Alex JA, Parachuri V, Patel KB, and Padikkala J (2004). Manipulation of the mouse genome and its application in biomedical research. *Amala Research Bulletin* 24: 224-245 (ISSN No. 0971-4987). **(IF: NA; HI: NA)**
4. Alex J L, Sarathi D P, **Goel S** and Kumar S (2005). Isolation and characterization of a mouse embryonic stem cell line that contributes efficiently to the germline. *Current Science*. 88(7) 1167-1169. **(IF: 0.76; HI: 104)**

5. Shekar P C*, **Goel S***, Rani S D, Sarathi D P, Alex J L, Singh S, Kumar S (2006). kappa-casein-deficient mice fail to lactate. *Proceeding of the National Academy of Science of the USA*. 103 (21), 8000-8005. **(IF: 9.58; HI: 699) (*Equally contributing first authors)**
6. **Goel S**, Sugimoto M, Minami N, Yamada M, Kume S, Imai H (2007). Identification, isolation, and in vitro culture of porcine gonocytes. *Biology of Reproduction* 77 (1), 127-137. **(IF: 2.96; HI: 166)**
7. Miyamoto K, Furusawa T, Ohnuki M, **Goel S**, Tokunaga T, Minami N, Yamada M, Ohsumi K, Imai H (2007). Reprogramming events of mammalian somatic cells induced by *Xenopus laevis* egg extracts. *Molecular Reproduction and Development* 74(10):1268-1277. **(IF: 2.12; HI: 96)**
8. **Goel S**, Sugimoto M, Minami N, Yamada M, Kume S, Imai H (2007). 146 Lectin dolichos biflorus agglutinin (DBA) is a specific marker for primitive germ cells in neonatal porcine testis. *Reproduction, Fertility and Development* 19 (1), 190. **(IF: 1.72; HI: 68)**
9. **Goel S**, Fujihara M, Minami N, Yamada M, Imai H (2008). Expression of NANOG, but not POU5F1, points to the stem cell potential of primitive germ cells in neonatal pig testis. *Reproduction* 135: 785-795. **(IF: 3.12; HI: 120)**
10. Fujihara M, **Goel S**, Minami N, Yamada M, Imai H (2008). In vivo and in vitro preservation of primitive germ cells from neonatal pig testis. *Reproductive Medicine and Biology* 7: 153- 160. **(IF: NA, HI: 13)**
11. **Goel S**, Fujihara M, Minami N, Yamada M, Imai H (2008). NANOG is expressed by the progenitor-type stem cells and differentiated germ cells in pig testis. *Reproduction in Domestic Animals* 43, 217. **(IF: 1.51; HI: 56)**
12. Fujihara M, **Goel S**, Kimura Y, Minami N, Yamada M, Imai H (2008). 72 Preservation of porcine gonocytes at 4° c and in liquid nitrogen—a preservation model of genetic resources in domestic animals and in endangered species. *Reproduction, Fertility and Development* 20 (1), 117. **(IF: 1.72; HI: 68)**
13. **Goel S**, Fujihara M, Tsuchiya K, Takagi Y, Minami N, Yamada M, Imai H (2009). Multipotential ability of primitive germ cells from neonatal pig testis cultured in vitro. *Reproduction Fertility and Development* 21: 696-708. **(IF: 1.72; HI: 68)**
14. **Goel S***, Reddy N, Mandal S, Kim S, Fujihara M and Imai H (2010). Spermatogonia-specific proteins expressed in prepubertal buffalo (*Bubalus bubalis*) testis and their utilization for isolation and in vitro cultivation of spermatogonia. *Theriogenology* 74: 1221-1232. **(IF:2.3; HI: 118) (*Corresponding author)**
15. **Goel S***, Mahla RS, Suman SK, Reddy N and Imai H (2010). UCHL-1 protein expression specifically marks spermatogonia in wild bovid testis. *European Journal of Wildlife Research* 57: 663-667. **(IF: 1.45; HI: 41) (*Corresponding author)**
16. **Goel S***, Reddy N, Mahla RS, Suman SK, and Pawar RM (2011). Spermatogonial stem cells in the testis of an endangered bovid: Indian blackbuck (*Antelope cervicapra L.*). *Animal Reproduction Science* 126: 251-257. **(IF: 1.51; HI: 92) (*Corresponding author)**
17. Reddy N, Kasukurthi KB, Mahla RS, Pawar RM and **Goel S*** (2012). Expression of vascular endothelial growth factor (VEGF) transcript and protein in the testis of several vertebrates including endangered species. *Theriogenology* 77: 608-614. **(IF:2.3; HI: 118) (*Corresponding author)**
18. Reddy N, Mahla RS, Thati R, Suman SK, Jose J and **Goel S*** (2012). Gonadal status of male recipient mice influences the germ cell development in immature buffalo testis

- tissue xenograft. *Reproduction* 135 (6), 785-796. **(IF: 3.12; HI: 120) (*Corresponding author)**
19. Mahla R, Reddy N and **Goel S*** (2012). Spermatogonial stem cells (SSCs) in buffalo (*Bubalus bubalis*) testis. *PLoS One* 7 (4), e36020. **(IF: 2.77; HI: 268) (*Corresponding author)**
 20. SinghVP, Lakshmi BJ, Singh S, Shah V, **Goel S**, Sarathi DP and Kumar S (2012). Lack of Wdr13 gene in mice leads to enhanced pancreatic beta cell proliferation, hyperinsulinemia, and mild obesity. *PLoS one* 7 (6), e38685. **(IF: 2.77; HI: 268)**
 21. Reddy N, Sreshtha S, Katakam M, Ashwini M, Sonam S, Kumar V and **Goel S ***(2013). Prepubertal buffalo (*Bubalus bubalis*) Leydig cells: isolation, culture, and characterization. *Journal of Buffalo Science* 2, 25-33 **(IF: NA; HI: NA) (*Corresponding author)**
 22. Devi L, Makala H, Pothana L, Nirmalkar K and **Goel S*** (2014). Comparative efficacies of six different media for cryopreservation of immature buffalo calf (*Bubalus bubalis*) Testis. *Reproduction Fertility and Development* 28 (7), 872-885. **(IF: 1.72; HI: 68) (*Corresponding author)**
 23. Devi L, Pawar R, Makala H and **Goel S*** (2015). Conserved expression of ubiquitin carboxyl-terminal esterase I1 (uchl1) in mammalian testes. *Indian Journal of Experimental Biology* 53: 305-312 PubMed PMID: 2604002. **(IF: 0.93; HI: 67) (*Corresponding author)**
 24. Pothana L, Makala H, Devi L, Varma V and **Goel S*** (2015). Germ cell differentiation in cryopreserved immature Indian spotted mouse deer (*Moschiola indica*) testes xenografted onto mice. *Theriogenology* 83 (4), 625-633 **(IF:2.3; HI: 118) (*Corresponding author)**
 25. Makala H, Pothana L, Sonam S, Malla and **Goel S*** (2015). Regeneration of Leydig cells in ectopically autografted adult mouse testes. *Reproduction* 49 (3), 259-268. **(IF: 3.12; HI: 120) (*Corresponding author)**
 26. Varma VP, Devi L, Venna NK, Murthy CLN, Idris MM and **Goel S*** (2015). Ocular fluid as a replacement for serum in cell cryopreservation media. *PLoS one* 10 (7), e131291 **(IF: 2.77; HI: 268) (*Corresponding author)**
 27. Devi L and **Goel S*** (2016). Fertility preservation through gonadal cryopreservation. *Reproductive Medicine and Biology*. 15(4): 235–251 (invited review article). **(IF: NA, HI: 13) (*Corresponding author)**
 28. Pothana L, Venna NK, Devi L, Singh A, Chatterjee I and **Goel S*** (2016). Cryopreservation of adult primate testes. *European Journal of Wildlife Research*. 62 (5), 619-626. **(IF: 1.45; HI: 41) (*Corresponding author)**
 29. Pothana L, Devi L, Venna NK, Pentakota N, Varma VP, Jose J and **Goel S*** (2016). Replacement of serum with ocular fluid for cryopreservation of immature testes. *Cryobiology* 73 (3), 356-366. **(IF: 2.05; HI: 76) (*Corresponding author)**
 30. Pothana L, Devi L and **Goel S ***(2017) Cryopreservation of adult cervid testes. *Cryobiology* 74, 103-109. **(IF: 2.05; HI: 76) (*Corresponding author)**
 31. Devi L, Pothana L and **Goel S*** (2017). Dysregulation of angiogenesis-specific signaling in adult testis results in xenograft degeneration. *Scientific Reports* 7 (1), 2605. **(IF: 4.52; HI: 149) (*Corresponding author)**

32. **Goel S*** and Minami N (2019). Altered hormonal milieu and dysregulated protein expression can cause spermatogenic arrest in ectopic xenografted immature rat testis. *Scientific Reports* 9 (1), 4036. (IF: 4.52; HI: 149) (*Corresponding author)
33. Miki Y, Devi L, Imai Y, Koide T, Minami N and **Goel S*** (2020). Male fertility is not impacted by the deletion of the PDZ-binding kinase (*Pbk*) gene in mice. *Reproduction Fertility and Development* 32 (10):893-902. doi: 10.1071/RD19445. (IF: 1.72; HI: 68) (*Corresponding author).

List of Publications (Book Chapters):

1. **Sandeep Goel** and Hiroshi Imai (2011). Pluripotent Stem Cells from Testis, Embryonic Stem Cells - Differentiation and Pluripotent Alternatives, Michael S. Kallos (Ed.), ISBN: 978-953-307-632-4, InTech
<http://www.intechopen.com/articles/show/title/pluripotent-stem-cells-from-testis>
2. Lalitha Devi and **Sandeep Goel** (2016). Conservation of Germplasm of Livestock through Gonadal Cryopreservation. *Innovation Designs, Implements for Global Environment and Entrepreneurial Needs Optimizing Utilitarian Sources, INDIGENOUS, International Livestock Conference & Expo, 23rd Annual Convection ISPAM, Hyderabad Reddy SR, Prasad RMV and Rao AR (Eds.), pp 377-389, SBN No. 978-93-84869-99-1, Excel India Publishers.*

Popular Articles

1. Avian Transgenics: An Industrial Perspective **Sandeep Goel** & Satish Kumar, <http://www.poultvet.com/poultry/articles/3.php>. Indian Poultry Science Association and National Symposium (IPSACON) 2005.

List of Publications (Abstracts):

1. **Goel S**, Palanisamy A and Nainar M (2000) Effect of Insulin and Insulin-like Growth Factor (IGF-I) on In vitro Development of Sheep Embryo. *International Congress on Fertilization, Embryo Development, and Implantation, National Institute of Immunology (NII), New Delhi, India.*
2. Rani SD, **Goel S**, Alex JL, Sarathi DP and Kumar S (2003). Generation of kappa-casein gene-deficient mouse through gene targeting in embryonic stem cells. *10th Congress of Federation of Asian and Oceanian Biochemists and Molecular Biologist (FAOBMB), Indian Institute of Sciences (IISc), Bangalore, India.*
3. **Goel S**, Sugimoto M, Minami N, Yamada M, Kume S, Imai H (2007) Lectin *Dolichos biflorous* agglutinin (DBA) is a specific marker for primitive germ cells in neonatal porcine testis. *Reprod Fertil Dev* 19 (1): 190. *33rd International Embryo Transfer Society (IETS) Annual Meeting, Kyoto, Japan.*
4. Fujihara M, **Goel S**, Kimura Y, Minami N, Yamada M, Imai H (2008). Preservation of porcine gonocytes at 4°C and in liquid nitrogen – a preservation model of genetic resources in domestic animals and in endangered species. *Reprod Fertil Dev* 20 (1): 117. *34th International Embryo Transfer Society (IETS) Annual Meeting, Denver, Colorado, USA.*
5. **Goel S**, Fujihara M, Minami N, Yamada M, Imai H (2008). NANOG is expressed by the progenitor-type stem cells and differentiated germ cells in pig testis. *Reprod Domestic*

Anim 43, 217. 16th International Congress of Animal Reproduction (ICAR) Budapest, Hungary.

6. **Goel S**, Fujihara M, Tsuchiya K, Takagi Y, Minami N, Yamada M, Imai H (2008). Germ cells from neonatal pig testis acquire multipotent characteristic in vitro. *6th Annual Meeting of International Society for Stem Cell Research (ISSCR), Philadelphia, USA.*
7. **Goel S**, Fujihara M, Tsuchiya K, Takagi Y, Minami N, Yamada M, Imai H (2008). Multipotency of in vitro cultured primitive germ cells isolated from neonatal pig testis. *5th Annual conference of Asian Reproductive Biotechnology Society (ARBS), Kunming, China.*
8. **Goel S**, Fujihara M, Tsuchiya K, Takagi Y, Minami N, Yamada M, Imai H (2009). Multipotency of cultured germ cells isolated from neonatal pig testis. *27th International Conference on Novel Updates in Reproductive Biology and Comparative Endocrinology, University of Hyderabad, India.*
9. Fujihara M, **Goel S**, Minami N, Yamada M, Imai H (2009). Characterization and Cultivation of Gonocytes In Vitro Derived from Bovine Neonatal Testes. *7th Annual Meeting of International Society for Stem Cell Research (ISSCR), Barcelona, Spain.*
10. **Goel S**, Mandal S, Reddy N, Mahla RS, Suman SK, Raj A, Kim S, Fujihara M and Imai H (2010). Stem cells of the male germline: An aid to the conservation of endangered species. *11th International Symposium on Spermatology, Okinawa, Japan.*
11. Kim S, Fujihara M, **Goel S**, Minami N, Yamada M, Imai H (2010). Lectin DBA specifically recognizes glycan cell surface epitope of gonocytes in developing mouse testis. *11th International Symposium on Spermatology, Okinawa, Japan.*
12. Mahla RS, Suman SK, Reddy N and **Goel S** (2010) Generation of vascular endothelial growth factor (VEGF) expressing cell line to aid in testis xenograft survival. *International Conference on Stem Cells and Cancer (ICSCC), Pune, India.*
13. Reddy N, Mahla RS, Suman SK, Pawar RM and **Goel S** (2011). *Stem Cell Potential of Spermatogonial Stem Cells (SSCs) in an Endangered Bovid: Indian Black Buck (Antelope cervicapra L.). 8th Indo-Australia Biotechnology Conference on "Stem Cell Biology", JNCASR, Bangalore, India.*
14. Kim SM, Fujihara M, **Goel S**, Sahare M, Minami N, Yamada M and Imai H (2011). Identification of reprogramming factors associated with a pluripotent potential of porcine and bovine spermatid stem cells in culture. *16th World Congress on In-Vitro Fertilization and 5th World Congress in In-Vitro Maturation, Tokyo, Japan.*
15. **Goel S**, Devi L, Pothana L and Varma V (2015). Can results from cryopreservation of livestock testis be extrapolated to germplasm conservation of endangered species? *International Conference on Low-Temperature Science and Biotechnological Advances, New Delhi, India.*
16. Biswa BB, Devi L, Pothana L, Iyer S, Ghoshal T and **Goel S** (2017). Role of testis-specific kinase PBK/TOPK in spermatogenesis. *International Conference on Reproductive Health with Emphasis on Strategies for Infertility, Assisted Reproduction and Family Planning, New Delhi, India.*
17. **Goel S**, Devi L and Pothana L (2017). Impaired Angiogenesis-specific Signaling in Adult Testis Results in Xenograft Degeneration. *The International Symposium on Regulation of Germ Cell Development in vivo and in vitro. Centennial Hall, Kyushu University, School of Medicine Fukuoka, Japan.*
18. **Goel S** (2018). Testis tissue cryopreservation and xenografting as tools for the conservation of endangered species. *The 8th International Seminar on Biodiversity and Evolution, Kyoto, Japan.*
19. **Goel S** (2019). Testis tissue cryopreservation and xenografting as tools for the conservation of endangered species. *International Conference in Advancement in Veterinary Sciences for Wildlife Conservation and 13th Annual Meeting of Association*

of Indian Zoo and Wildlife Veterinarians, CSIR-Centre for Cellular and Molecular Biology, Hyderabad, India, 13-15 November 2019.

Media Coverage

1. Stemming the tides, The Telegraph, July 11, 2011.
http://www.telegraphindia.com/1110711/jsp/knowhow/story_14222109.jsp

Technical manual

1. Collection of the testis from dead animals for germplasm preservation (2017).
Manual for biological sample collection and preservation for genetic, reproductive, and disease analysis. Central Zoo Authority, Govt. of India.

Presentations

1. International Congress on Fertilization, Embryo Development, and Implantation, National Institute of Immunology (NII), New Delhi, India 6-9th Nov 2000 (Poster).
2. The 10th Congress of Federation of Asian and Oceanian Biochemists and Molecular Biologist (FAOBMB), Indian Institute of Sciences (IISc), Bangalore, India, 7-11th Dec 2003 (Poster).
3. The 33rd International Embryo Transfer Society (IETS) Annual Meeting, Kyoto International Convention Centre, Kyoto, Japan, 6-10 Jan 2007 (Oral and poster).
4. The 4th Annual conference of Asian Reproductive Biotechnology Society held at the National University of Singapore (NUS), Singapore, November 24-28, 2007 (Poster).
5. The 6th International Society for Stem Cell Research (ISSCR) annual meeting held at Philadelphia, USA, June 11-14, 2008 (Poster).
6. The 16th International Congress of Animal Reproduction (ICAR) held at Budapest, Hungary, July 13-17, 2008 (Poster).
7. The 5th Annual conference of Asian Reproductive Biotechnology Society (ARBS) held at Kunming, China, November 26-30, 2008 (poster and oral)
8. The 11th International Symposium on Spermatology, Okinawa, Japan, June 24-29, 2010 (poster).
9. The 69th Annual Conference of World Association of Zoos and Aquariums (WAZA) 2014, New Delhi, India, November 03-05, 2014 (poster).
10. The 8th International Seminar on Biodiversity and Evolution, Kyoto, Japan 2018, Kyoto, Japan, June 5, 2018 (oral).

Scientific Editor

1. *Scientific Reports*, an online, open-access journal from the publishers of *Nature*. It publishes scientifically valid primary research from all areas of the natural and clinical sciences.

Scientific Reviewer for (Peer-reviewed journals)

Molecular Human Reproduction, Human Reproduction, Reproduction, Journal of Endocrinology, Fertility and Development, Reproduction in Domestic Animals, Journal of Reproduction and Development, Theriogenology, Mitochondria, PLoS One, DNA and Cell Biology, Systems Biology and Reproductive Medicine, Reproductive Medicine and Biology, Indian Journal of Experimental Biology, Indian Journal of Medical Research,

Czech Journal of Animal Science Cell and Tissue Research and Developmental Dynamics.

Invited Lectures/Keynote Speaker

1. Invited speaker at the International Conference on Novel Updates in Reproductive Biology and Comparative Endocrinology, University of Hyderabad, India, January 19-21, 2009.
2. Keynote speaker at the International Symposium on “Role of biotechnology in conserving biodiversity and livestock development for food security and poverty alleviation” & XVII Annual convention of Indian Society of Veterinary Immunologist & Biotechnologist; College of Veterinary & Animal Sciences, the Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, 29-31 December 2010
3. Keynote Speaker on a two-day workshop on ‘Analysis of Biomolecules through Molecular Techniques’, Dr. G R Damodaran College of Science, Coimbatore, India, July 29, 2011
4. Invited speaker at the International Conference on ‘Reproductive Health: Issues and Strategies Under Changing Climate Scenario’, Indian Veterinary Research Institute (IVRI), Izatnagar, UP, India, February 6-8, 2014
5. Invited speaker at International Conference on ‘Low-Temperature Science and Biotechnological Advances’, NASC Complex, Pusa Campus, New Delhi, India, 27-30th April 2015.
6. Invites speaker and Chairman (Livestock Reproduction Management session) at the International Livestock Conference and Expo, 23rd Annual Convention of Indian Society of Animal Production (ISAPM) and Management, Agriculture University, Hyderabad, India, 28-31 January 2016.

Technical Session Chaired in International Conferences

1. Technical session on ‘Livestock Reproduction Management’ at the International Livestock Conference and Expo, 23rd Annual Convention of Indian Society of Animal Production (ISAPM) and Management, Agriculture University, Hyderabad, India, 28-January 2016.
2. Technical session ‘on Wildlife Health and Management’ at the International Conference in Advancement in Veterinary Sciences for Wildlife Conservation and 13th Annual Meeting of Association of Indian Zoo and Wildlife Veterinarians, CSIR-Centre for Cellular and Molecular Biology, Hyderabad, India, 13-15 November 2019.

Professional memberships

1. Life member, International Society for Stem cell Research (ISSCR)
2. Life member, Indian Society for Study on Reproduction and Fertility (ISSRF).
3. Life member, Association of the Promotion of DNA Finger Printing and other DNA Technologies (ADNAT).
4. Life member, Indian Society for Veterinary Immunology and Biotechnology (ISVIB).