DEPARTMENT OF BIO AND NANO TECHNOLOGY
GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY
HISAR-125001 (HARYANA)

ORGANIZES ONE WEEK WORKSHOP-COURSE

ON

MAMMALIAN REPRODUCTIVE BIOTECHNOLOGIES – TOOLS, TECHNIQUES & METHODS

11th December to 15th December, 2017

BROAD AREA: Reproductive Biotechnology/ Reproduction/ Biotechniques/ Reproductive Biology

OVERVIEW

Reproductive biology is a rapidly changing discipline that bridges basic science and clinical practice. The applied arm of this field, reproductive biotechnology, has far reaching economic and societal implications. In human medicine, the application is mainly as a treatment for infertility with over 2 million children born as a result of this technology since the advent of in vitro fertilization in 1977. In agriculture, the technology is used for breed improvement and selection of breeding stock. With the development of somatic cell nuclear transfer, the so called cloning technique, new challenges and opportunities have arisen including increasing the number of individuals with unique and valuable genomes, the creation of embryonic stem cells and the development of research models and tools. However, epidemiological studies in humans and retrospective studies in domestic animals have shown a number of abnormalities that appear to be associated with these technologies. To be able to appreciate the application, side effects and ethical issues surrounding reproductive biotechnologies it is necessary to understand the underlying biological principles upon which these techniques are founded. Therefore, this course is designed to introduce key concepts in reproductive biology and principles of emerging reproductive technologies.

Livestock contribute directly to livelihoods worldwide, providing food, but also non-food products, draught power and financial security. Livestock production already accounts for more than one third of the global agricultural GDP in developing countries, and this proportion is expected to increase. The rapidly increasing demand for livestock products, known as the "Livestock Revolution", has created opportunities for improving the welfare of at least some of the nearly one billion poor people who depend on livestock for their livelihoods. However, land degradation, environmental pollution, global warming, the erosion of animal genetic resources, water shortages and emerging diseases are all expected to present challenges to the growing global livestock sector.

Conventional technologies and biotechnologies in livestock have contributed immensely to increasing productivity, particularly in developed countries, and can help to alleviate poverty and hunger, reduce the threats of diseases and ensure environmental sustainability in developing countries.

OBJECTIVES

The primary objectives of the course are as follows:

i) To introduce the biological principles that form the basis for reproductive biotechnologies.
ii) To introduce current and emerging topics in reproductive biology.
iii) To provide a platform for discussion of current research in reproductive biotechnologies.
iv) To help students understand major ethical and socio-economic aspects of reproductive biology.
v) Help students understand the basic principles of scientific communication, oral and written, pertaining to reproductive physiology/medicine.

Mammalian Reproductive Biotechnologies – Tools, Techniques & Methods

11th December to 15th December, 2017

Module A: December 11, 2017 (MONDAY)	**Reproductive Biology & Animal Reproductive Biotechnology Around Us** **Inauguration:** 9:00 AM a. **Lecture 1**: 9:30 to 11:00 AM Hormones as double-edged swords b. **Lecture 2**: 11:30 to 1:00 PM Inhibiting or augmenting fertility using hormones c. **Problem Based Learning (PBL) Module 1:** 2:00 to 4:00 PM Computer Assisted Laboratory using simulated cases pertaining to endocrinological micromanipulation will be presented. Introduction to Ignite Talk Module, Dragons Den and Amazing Race
Module B: December 12, 2017 (TUESDAY)	**Embryo Developmental Competence and Biomarkers of Development** a. **Lecture 3**: 9:30 to 11:00 AM Embryo arrest and apoptosis: Perspectives for animal production in India b. **Lecture 4**: 11:30 to 1:00 PM Biomarkers of embryo health: Creating diagnostics for animal production augmentation in India c. **Problem Based Learning (PBL) Module 2:** 2:00 to 4:00 PM Laboratory simulated cases using computer assisted technology pertaining to embryo arrest and/or assessing embryonic health will be presented
Module C: December 13, 2017 (WEDNESDAY)	**Factors Affecting Reproduction in the Tropical Environment** a. **Lecture 5**: 9:30 to 11:00 AM Gene regulating oogenesis, oocyte maturation and embryo development: Cell biology of embryo development b. **Lecture 6**: 11:30 to 1:00 PM Endocrinology of stress (heat/cold and climate change) in reproduction c. **Problem Based Learning (PBL) Module 3:** 2:00 to 4:00 PM Ignite talks on current topics in Reproduction (Given out on during Module A).
Module D: December 14, 2017 (THURSDAY)	**Micromanipulation of Gametes & Zygotes** a. **Lecture 7**: 9:30 to 11:00 AM Assisted Reproductive Biotechnologies – I (Artificial Insemination, Induction of ovulation, Embryo Transfer (SOET, MOET, OPU), In Vitro Fertilization, Semen Sexing) b. **Lecture 8**: 11:30 to 1:00 PM Assisted Reproductive Biotechnologies – II (Embryo Cloning, Intra Cytoplasmic Sperm Injections, Gene Therapy, CRISPER/CAS9, Sperm cryopreservation, Germline preservation, Stem Cell, Chimera formation) c. **Problem Based Learning (PBL) Module 4:** 2:00 to 4:00 PM **Repro Amazing Race** (This is an outside classroom activity): Team of two to three trainees will race in competition to answer puzzles or questions based on exhibits related to reproductive biology across the GJU campus. The exhibits would be related to topics covered during lectures and will help to review the topics covered. After answering the questions/solving a puzzle at the station, they will get a clue to go to the next station on campus and follow the same procedure. A total of six-eight stations will be set up. The team to answer all questions correctly in the shortest possible time will be winners and will be awarded special prize.
Module E: December 15, 2017 (FRIDAY)	**Future of Reproductive Biotechnologies with focus on India** a. **Lecture 9**: 9:30 to 11:00 AM Changing face of reproductive biotechnologies with emerging technologies like Omics (proteomics, metabolomics and transcriptomics): Is India prepared? b. **Lecture 10**: 11:30 to 1:00 PM Epigenetic modulation and reproduction: Protection of male germline against transposons, importance of epigenetic processes in the female germ line, mechanisms underlying the acquisition of DNA methylation patterns c. **Problem Based Learning (PBL) Module 4:** 2:00 to 4:00 PM **Repro Dragon's Den:** In consultation with the instructors, students (divided into groups) will work on a topic in reproductive biology (after the intro lecture). The students should be assimilating the material presented in the course and come up with a new idea for a scientific grant or a business idea based on the problems facing the field and how will they solve the problems (given a chance and unlimited resources). **Number of participants for the course will be limited to fifty only.**
You should attend if….	• You are an executive and researcher from manufacturing, service and government organizations including R&D laboratories in the area of reproduction/biotechnology. • You are a student (at all levels including BSc/MSc/MVSc/PhD) or faculty from reputed academic institutions and technical institutions
Registration	**The participants are required to get themselves register on GIAN web portal (http://www.gian.iitkgp.ac.in)** The course registration fee is separate. The participation fees (Demand draft drawn in favour of Registrar, GJUS&T, Hisar or NEFT/RTGS at PNB A/C No. 4674000100036542 IFSC: PUNB0467400) for taking the course is as follows: **Foreign delegates : US $500** **Participants from Industry : ₹ 10,000/-** **Participants from Indian Academic Institutions/ Research Organizations : ₹ 2,500/-** The above fee includes all instructional materials, computer use for tutorials and assignments, equipment usage charges, and internet facility. However, the participants will be provided with accommodation on payment basis, subject to availability.

Foreign Faculty

Dr. Pavneesh Madan is a faculty at the Ontario Veterinary College (OVC), University of Guelph (UofG). Dr. Madan pursued his doctoral studies at the University of British Columbia (UBC), under the supervision of Dr. Colin MacCalman and Dr. R. Rajamahendran in Vancouver, Canada. He completed his post-doctoral training at the University of Western Ontario (UWO), Canada in Dr. Andy Watson's Laboratory and joined OVC in the department of biomedical sciences and started his independent laboratory in 2008. His research interests include various aspects of reproductive biotechnologies including embryo gene expression, metabolomics, gene inhibition, genetic manipulation and animal cloning. Dr. Madan is also involved in graduate, undergraduate and (Doctor of Veterinary Medicine) DVM teaching. He is also a certified Veterinarian, licensed to practice veterinary medicine in North America. Through the help of funding from Canadian Foundation for Innovation, Dr. Madan has developed "Centre for Embryonic Health and Viability" (CEHV), which is undertaking cutting edge science in the field of early embryo development and embryo biotechnologies. Dr. Madan is a recipient of several research and teaching awards, which include Elizabeth Roxann Howland Fellowship (2000, 2001 & 2002), and Wyeth Award for Research Excellence (2004, 2005 & 2006). He is also a two-time winner of the Pfizer-Carl J. Norden Distinguished Teacher Award (2009 & 2013), which is the highest teaching award in the field of Veterinary Medicine.

Host Faculty

Prof. Neeraj Dilbaghi completed his Masters and Doctorate degree in Microbiology from CCS Haryana Agricultural University, Hisar and is presently working at the Department of Bio and Nano Technology, Guru Jambheshwar university of Science and Technology, Hisar, Haryana, India. Prof. Dilbaghi holds position of Director, UGC- Human Resource Development Centre, Institutional Coordinator of RUSA & Incharge, Radio-Ecology Centre of GJUS&T, Hisar. He has over 23 years of research and 20 years PG Teaching experience. During his professional career Dr. Neeraj Dilbaghi has guided nine Ph.D. and over 40 M.Tech. students. Presently, 8 Ph.D. students and one PDF are pursuing research under his guidance. His current research focuses on Microbial Biotechnology, Bionanotechnology, Nanosensors for healthcare and environmental applications, Nano medicine and Drug Delivery and Toxicological evaluation of nanomaterials. Prof. Neeraj Dilbaghi has published over 115 research papers in peer reviewed international and national journals of repute with over 1600 citations and H-index of 22. He is also the Life Member of Association of Microbiologists of India and Society for Conservation of Domestic Animal Biodiversity. Dr Dilbaghi has received several grants from national and international funding agencies like DST, UGC, BARC-BRNS, LSRB-DRDO etc to manage his research activities.

Course Co-Coordinator

Dr. Sandeep Kumar, Assistant Professor, is a researcher of international recognition at the Department of Bio and Nano Technology, Guru Jambheshwar University of Science and Technology, Hisar, Haryana, India. Dr. Sandeep Kumar has received his PhD degree from Punjab University, Chandigarh. His current research includes synthesis and characterization of nanomaterials, nano-carriers for healthcare applications, nanomaterials based sensors, biomaterials and nanotoxicity. Dr. Kumar has one patent and published more than 70 research papers in international journals of repute. Dr. Kumar has international and national sponsored research projects from different funding agencies like DST, DBT, DRDO etc. Dr. Kumar visited Hanyang University, Seoul, South Korea as a visiting Professor and also Australia, UK, Scotland, Bangkok under different schemes of Govt. of India. Dr. Kumar has recently received Haryana Yuva Vigyan Ratna Award 2015-16.

INTERNATIONAL WORKSHOP

on

"Mammalian Reproductive Biotechnologies – Tools, Techniques & Methods"

An event under

11th December to 15th December, 2017

Organized by

Department of Bio & Nano Technology
Guru Jambheshwar University of Science and Technology, Hisar

Course Co-ordinator
Prof. Neeraj Dilbaghi
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E-mail: biotechgian2017@gmail.com, ndnano@gmail.com

Participants

S.No.	Name	Designation	Institution
1	Aditya Kumar Sharma	Ph.D. Scholar	ICAR-NDRI, Karnal
2	Dr. Arvind Gautam	General Manager	Genus Breeding Pvt. Ltd. (ABS, India)
3	Apurva Goel	Ph.D. Scholar	GJUS&T, Hisar
4	Bharti	Project Fellow	GJUS&T, Hisar
5	Dr. Archana Sarangi	Ph.D. Scholar	ICAR-NDRI, Karnal
6	Dr. Mohd. Matin Ansari	Scientist	ICAR-National Research Centre on Camel, Bikaner
7	Dr. Bhanita Devi	Ph.D. Scholar	Department of Animal Biotechnology, LUVAS, Hisar
8	Jasmer	Ph.D. Scholar	Department of Animal Biotechnology, LUVAS, Hisar
9	Dr. Kanisht Batra	Research Associate	NRCE, Hisar
10	Kapila Taneja	Ph.D. Scholar	GJUS&T, Hisar
11	Mala Singh	Ph.D. Scholar	ICAR-NDRI, Karnal
12	Monika	Ph.D. Scholar	GJUS&T, Hisar
13	Monika	Ph.D. Scholar	GJUS&T, Hisar
14	Neeraj Sethi	Ph.D. Scholar	GJUS&T, Hisar
15	Prabhat Kumar	Research Associate	NRCE, Hisar
16	Muhammad Abubakar Wakil	Ph.D. Scholar	Embryo Biotechnology Laboratory, APR Division, ICAR-CIRB, Hisar
17	R.Rasika	Project Fellow	Embryo Biotechnology, APR Division, ICAR-CIRB, Hisar
18	Ram Kumar Singh	Ph.D. Scholar	ICAR-NDRI, Karnal
19	Ram Narayan Patel	MVSc.	ICAR-CIRB, Hisar
20	Ritesh Kumar	Ph.D. Scholar	GJUS&T, Hisar
21	Sakina	Project Fellow	GJUS&T, Hisar
22	Sarita	Ph.D. Scholar	GJUS&T, Hisar
23	Saroj Panghal	SRF	Central Institute for Research on Buffaloes, Hisar
24	Shakti	Ph.D. Scholar	GJUS&T, Hisar
25	Shikha Jain	Ph.D. Scholar	GJUS&T, Hisar
26	Shivani Kapoor	Ph.D. Scholar	GJUS&T, Hisar

27	Sumitra Panigrahi	Ph.D. Scholar	Department of Animal Biotechnology, LUVAS, Hisar
28	Susham Rani	Ph.D. Scholar	GJUS&T, Hisar
29	Sweety	Ph.D. Scholar	Dept. of Veterinary Biochemistry, COVS, LUVAS, Hisar
30	Vipin	JRF	IVRI
31	Navjot Mehta	Ph.D. Scholar	GJUS&T, Hisar
32	Manpreet Kaur	M.Sc Student	GJUS&T, Hisar
33	Prasant Bhardwaj	M.Tech Student	GJUS&T, Hisar
34	Sonika	M.Sc Student	GJUS&T, Hisar
35	Nikhil Dawar	M.Sc Student	GJUS&T, Hisar
36	Parth Saini	M.Sc Student	GJUS&T, Hisar

Global Initiative of Academic Network (GIAN) Programme
GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

Report on Conduct of GIAN Course

Title of GIAN Course	MAMMALIAN REPRODUCTIVE BIOTECHNOLOGIES–TOOLS, TECHNIQUES & METHODS
GIAN Course ID	176016H03
Period of Course	11th Dec, 2017 to 15th Dec, 2017
Name and Department of Faculty from Guru Jambheshwar University of Science and Technology, Hisar	
Course Coordinator	
Name	Prof. Neeraj Dilbaghi
Department	Department of Bio and Nano Technology, GJUS&T, Hisar
Co-host Faculty, if any	
Name	Dr. Sandeep Kumar
Department	Department of Bio and Nano Technology, GJUS&T, Hisar
Name and Affiliation of International Faculty	
Name	Dr. Pavneesh Madan
Affiliation	University of Guelph, Canada
Name and Affiliation of National Faculty, if any	
Name & Affiliation	Prof. Jagat Phogat, LUVAS, Hisar
Name & Affiliation	Dr Arvind Gautam, Managing Director, Genus Breeding I Pvt ltd. (ABS India)
Name & Affiliation	Dr Subhash Jangra, Veterinarian, Haryana Semen bank, Hisar
Structure of the Course	
Duration of course (1 week or 2 weeks)	1 week
Number of credits (1 or 2)	1
Total number of lectures in the course	26
Number of lectures by International Faculty	13
Number of lectures by Host Faculty	2

Number of hours of laboratory/tutorial sessions	10+1 =11
Participants of the course	
Number of student participants	34
Number of participants from Industry/Research Organizations	1
Number of Faculty participants	1
Total Number of participants	36
Number of participants who credited for the course	33
Course Generated Fund	
Sponsorship, if any (in Rs.)	Rs 39,900/- (For Working Lunch)
Registration Fee Collected	66,000/- (in rupees)
Total amount	66,000/- (in rupees)

Interaction with International Faculty

In the inaugural session, Prof. Neeraj Dilbaghi introduced the international faculty Dr. Pavneesh Madan. The interaction of all the participants was very good with course coordinators and international faculty. Dr. Madan gave a brief overview of workshop-course. He briefed about Reproductive Biology and Animal Reproductive Biotechnology around us. He shared his personal experience about the development and birth of "**PRATHAM**"- first IVF (*in vitro* fertilization) buffalo in the world made at National Dairy Research Institute (NDRI). He also tried to know the type of participants present in the hall to mould the lectures accordingly. There was extreme diversity among participants ranging from undergraduates to Ph.D. with different specialization in biotechnology, reproductive technology, and engineering. He introduced the "Clicker" system for participants to answer the questions that make the session more interesting. Dr. Pavneesh put very hard efforts to make the lectures very interactive from the first session itself.

Dr. Madan described different hormones involved in reproduction in details. He also discussed the concepts of inhibiting or augmenting fertility using hormones, reproductive cyclicity of ovulation in mammals, and concept of estrus and menstrual cycles. Dr. Madan also introduced the concept of Embryo arrest and apoptosis. He explained the possible reasons for halting the process of embryo development at 8 cell stage or before. To trigger the curiosity of the participants, he further discussed some latest news articles like Recharging of ovum, first penile transplant, age, and fertility. Dr. Pavneesh introduced the concept of different genes involved in regulation of oogenesis, oocyte maturation and embryo development. He also tried best to ensure the clarity of concept among the participants with different multiple choice questions with "Clicker" system. He also awarded the participants with prizes for giving justification of the correct answers to promote the enthusiasm among the participants. The national faculty, Prof. Jagat Phogat, LUVAS-HAU, described different types of stress and its effect on endocrine system and ultimately on reproduction. He threw some light on various case studies related to stress and reproduction,

to give the participants an understanding of the phenomenon. To make the sessions more interesting and clear, a visit to Haryana Semen bank, Hisar, was also planned to give practical experience to the participants. There, Dr. Subash Jangra explained the detailed procedure of collection, processing and storage of semen. He also elucidated the selection procedure of bulls, their operating conditions, and detailed procedure of the quality check of sperm.

Tutorial sessions included Computer Assisted Laboratory studies of simulated cases pertaining to endocrinological micromanipulation. Dr. Madan also briefed about the task that participants have to perform during the rest of the days of the workshop i.e. Ignite Talk, Amazing Race, and Dragons Den. Dr. Madan then helped each group with their task. He discussed their tasks individually with the group and suggested amazing ideas to make the better presentation. Repro Dragon's Den was more interesting where participants (in group of three) presented new business idea for a scientific grant with consideration of advanced research problems facing the society. The laboratory simulated cases pertaining to embryo arrest and/or assessing embryonic health was presented followed by discussion to every aspect of the case. Dr. Madan elaborated every possible reason behind each case and the conceivable solution to each problem. He made the session interactive by asking participant's opinion and possible solution.

Dr. Pavneesh discussed the latest development in reproductive biotechnologies like artificial insemination, induction of ovulation- superovulation using hormonal and gene therapy, embryo biopsy, embryo transfer (SOET, MOET, OPU), *In Vitro* fertilization, semen sexing, embryo cloning, intra cytoplasmic sperm injections (ICSI), gene therapy, CRISPER/CAS9, sperm cryopreservation, germline preservation, stem cell and chimera formation. Dr. Madan also introduced the participants with an overview of omics including: proteomics, metabolomics and transcriptomics. He discussed about restriction enzyme and its types. He also introduced the concept of gene cloning, gene pharming and gene therapy. He discussed the case study about how it helped in correcting colour blindness in Dalton: a squirrel monkey. He also discussed different transgenic animals *viz.* Dolly and other ollies, ANDi, fluorescent mice etc. Dr. Madan elaborated different stages of parturition i.e. stage I: dilation of cervix, stage II: expulsion of the fetus or active labour and stage III: expulsion of fetal membrane. He described different factors governing initiation of parturition including hormonal and neural stimulation. In addition to this, he also discussed post-partum ovarian activities. At the end, Dr. Madan left participants pondering the future of genetics in mammalian reproduction.

Interaction of Host Faculty

There was a very warm interaction of host faculty, Prof. Neeraj Dilbaghi and Dr. Sandeep Kumar with foreign faculty, Dr. Pavneesh Madan. Prof. Dilbaghi introduced all participants with the expert faculty. He briefly described the achievements of Dr. Madan and their significant contribution in reproductive field. Dr. Sandeep Kumar thanked all expert international/national faculties for giving their valuable time to this workshop-course. The host faculty also confirmed the availability of lecture notes and timing of all events either related to lectures, lunch, tea break, or tutorial sessions. The host faculty also ensured the comfort of the participants to ensure their significant contribution for success of the GIAN workshop course. During the sessions, the host faculty also ensured their participation in

lectures as well as their tutorial sessions. The host faculty also raised the ethical issues of this emerging field of reproductive biotechnologies in front of the foreign faculty.

Interaction of other Faculty from Guru Jambheshwar University of Science and Technology, Hisar

There was a good interaction of faculty from GJUS&T with international/national faculty. Prof. Vinod Chokkar (Chairperson) and Prof. Namita Singh from Department of Bio & Nano Technology expressed their curiosity for various aspects of biotechnology in reproduction. Prof. Hem Chander Garg from Mechanical Engineering Department, and Prof. Devender Kumar from Department of Chemistry also ensured their presence in the workshop course.

Interaction of faculty/researchers from other institute/organizations

The researchers from all different institute/organizations including Central Institute for Research on Buffaloes (CIRB) Hisar, National Dairy Research Institute (NDRI) Karnal, National Research Centre on Equines (NRCE) Hisar, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS) Hisar, ICAR-National Research Centre on Camel, Bikaner etc. participated in the workshop course to learn latest techniques in reproductive biotechnology. They discussed different problems that they were facing in embryo culture during their research. Dr. Madan introduced a very effective method of learning with "Clicker" system. Also, great enthusiasm and healthy competition was seen among participants during Ignite Talk Module, Dragon's Den and Amazing Race. They were willing to attend such workshops with Dr. Madan, again in near future also, as reflected in their oral feedback.

Signature of Course Coordinator	Prof. NEERAJ DILBAGHI GIAN COORDINATOR DEPARTMENT OF BIO- & NANO TECHNOLOGY, GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR.
Date of submission of report	9th January, 2018