Proceedings of the Annual Board of Studies Meeting for the subject MSc. (Clinical Embryology and Preimplantation Genetics)

Place: Asia Pacific Institute of Embryology, Mysuru

Date: 16th December 2024 Time: 3:00PM

Members Present:

Prof M Y Sreenivasa – Chairman

Dr. Suresh Kattera – Member

Dr.Prajwal Gowda – Member

Dr Thimmaiah – Member

Dr Muthukumar Serva Peddha – Member

Members Unable to Attend: Dr. Uma Maheshwari , Dr Sachin H

The Chairman welcomed the members and initiated the Board of Studies Meeting for the subject M.Sc. (Clinical Embryology and Preimplantation Genetics)

1. Syllabus Revision : Minor Changes (Less than 10 %) has been made (Details attached as Annexure 1)
2. Update of Examiners List: The list was revised and approved by the BOS Members for the year 2025-26. The Same shall be handed over to the Registrar (Evaluation) for reference.(Attached as Annexure 2)
3. Any Other Matters : Nil

The Chairman concluded the meeting by proposing vote of thanks.

16/12/2024

Prof M Y Sreenivasa

Dr. Suresh Kattera

Dr. Prajwal Gowda

Dr. Thimmaiah

Dr Muthukumar Serva Peddha

(Annexure 1)

Revised Syllabus 2025 onwards
MSc (Clinical Embryology & Pre-Implantation Genetics)

I Semester

Theory Paper 1 : Introduction to Reproductive System
2 Credits

Lecture (2 Credits 2 hours / week)

Module A: Introduction to Evolution,

Module B: Cell and molecular biology- somatic cells, Cell membranes, ER, microvilli, Cell cytoplasm, microtubules, microfilaments, centrioles, nucleus, active and inactive chromatin, mitochondria, Nuclear RNA, endoplasmic reticulum, golgi apparatus, metabolism of cell (mammalian), Reactive oxygen species, super Oxide Dismutase, methylation, DNA replication, Homeobox genes, Ribosomal RNA, Transfer RNA, Messenger RNA, Transcription in oocytes, Translation (Protein synthesis), cellular replication, mitosis, meiosis, chromosomes, chromatin, chromatids, centromere, Kinetochore, Diploid, Haploid, Aneuploid, HeLa cells.

Module C: Anatomy Physiology, Genetics and development of vertebrates

Embryology; history and concepts

Primordial germ cells. Gonadogenesis;

Module D: Female reproductive system and female anatomy: development of ovary, oogenesis, folliculogenesis, and oocyte development, gamete transport, Fertilization, zygote formation & Cleavage, early development of embryos, Blastulation & gastrulation, Germ layer formation, implantation.

Module E: Male Reproductive system and male anatomy; development of testes; spermatogenesis and spermiogenesis

Seminal plasma and its composition, Biochemical analysis of semen sample, microbiological analysis of semen sample, Antisperm antibodies, Structure, and function of spermatozoa,

Module F: Preparation of embryology lab and personnel for oocyte retrieval, selection of culture media and disposables, Equilibration of culture tubes and dishes, composition of culture media, use of culture media for different purposes, Insemination procedures, Denudation and fertilization check, zygote, cleavage and blastocyst development assessment, Embryo Transfer

Theory Paper 2: Introduction to Infertility
2 Credits
Lecture (2 Credits 2 hours / week)

Module A: Orientation of IVF Centre and workflow, Responsibilities of Embryologist, Ethics (concise), basic requirements to set up IVF Centre

Module B: Reproductive health, Infections, bacterial and other infections affecting fertility,

Module C: Infertility; definition, history, Incidence of infertility; global fertility rates and declining birth rates, society and infertility. Age and declining fertility, Causes of male infertility; anatomical causes and varicocele, hormonal causes, genetic causes, environmental causes

Module D: Female infertility: Anatomical causes, hormonal causes, polycystic ovary syndrome, anovulation

Module E: Investigation of male: Physical examination, semen examination and hormonal assessment, recent advances in investigation, karyotyping

Module F: Investigation of the female: Physical examination, hormonal evaluation, Karyotyping, Genetic causes, environmental causes

Introduction to Embryology Laboratory Techniques
Practical Paper 1: (6 Credits, 12 hours / week)

Embryology Laboratory: Standard Operating Protocols (SOPS); Various SOPS and work instructions in the embryology lab, Functions of IVF Centre and the laboratory, Personnel involved and workflow, Maintenance of lab and monitoring equipment, Personnel proficiency, inventory management, Quality control and Quality assurance.

Familiarization and calibration of digital thermometer, Temperature monitoring of incubators, Laminar Flow, heating block and refrigerator, Familiarization of CO2 analyzer and CO2 measurement, Preparation of 70% alcohol, cleaning of CO2 incubator, Laminar Flow, Bench top incubators, Monitoring of CO2 and Triple gas cylinder pressures, Monitoring the level of liquid nitrogen in the liquid nitrogen Dewar of sperm and embryo storage tank

Good laboratory practice, Tissue culture laboratory, Designing and layout of embryology laboratory, Requirements of embryology laboratory, clean air system, Embryology lab equipment, disposables, culture media used in the laboratory

Sterilization methods; autoclave, dry heat sterilization, gas sterilization and gamma radiation, Handling of hazardous and biological samples, Cleaning and maintenance of embryology laboratory, Common lab contaminants-bacteria, fungi and viruses; identification of bacilli and cocci, Gram stain

Tissue culture techniques, culture media and formulation, familiarization of embryology

Microscopy: Phase contrast microscope, stereo zoom microscope and inverted microscope

Sheep Ovary dissection: identification of follicles on the ovary, isolation of oocyte cumulus complex and separation of oocytes, identification of granulosa cells, cumulus cells, corona cells and zona pellucida.

Mitosis, Meiosis, Identification of cells in stained blood smear, blood grouping

Andrology Laboratory Techniques

Practical Paper 2 (8 Credits 12 hours / week)

Male anatomy model; Sheep testes dissection and processing, identification of stages of sperm development, identification of sperm and its morphology

Semen analysis; normospermic and oligospermic semen samples, calculation of spermatozoa concentration, motility grading, morphology assessment in stained and neat semen samples, assessment of viability, examination for sperm agglutination, differentiation of immature spermatogenic cells and pus cells (peroxidase test), Fructose test to rule out obstructive azoospermia, Tests for antisperm antibodies (Mar test), Sperm DNA fragmentation test, HOST test, Sperm survival test, Hyaluronan binding assay

Sperm separation methods; classical swim up method, standard swim up method, gradient method, SEPD method, Semen Cryopreservation

2 Semester

Theory Paper 1 Principles of Genetics and Reproductive endocrinology

2 Credits

Lecture (2 Credits, 2 hours / week)

Mendelian Inheritance – Autosomal Recessive, Autosomal Dominant

Atypical Mendelian Inheritance: Mitochondrial Inheritance; X-linked Recessive

Molecular Basis of Inheritance - DNA;

Cell Cycle - Mitosis; Meiosis; Nondisjunction

Chromosomes; Autosomes and Sex Chromosomes

Karyotyping

Indications for Performing a Chromosome Analysis

Reasons for Analyzing Chromosomal Disorders

Inherited and Non-Inherited Chromosome Abnormalities – Trisomy, Monosomy, Numerical Chromosome Abnormalities; Translocation, Deletion, Structural Chromosome Abnormalities, Sex Chromosome Abnormalities

Mutations - Dynamic Mutation; Somatic Mutation; Point Mutation; Gene Deletion; Mutation

Polymorphism Primer, Probe

Genomic Imprinting Genetic Counselling

General principles of endocrinology- Hormones and their release; Techniques for studying hormones-Immunoassays, The hypothalamic pituitary system, Thyroid hormones, Physiology of reproductive hormones (Male & Female), Hirsutism, Primary and secondary amenorrhea

Hormonal regulation of spermatogenesis, testicular function and sex differentiation

Hormonal regulation of ovarian cycles & luteal phase defect & support, implantation and pregnancy

Theory Paper 2 : Assisted Reproduction

2 Credits

Lecture (2 Credits 2 hours / week)

Module A: History of assisted reproduction, Gonadotrophins, Ovarian reserve test: antral follicle count, AMH test

Module B: Ovulation induction (IUI, IVF), In Vitro Fertilization, Premature ovulation, Recurrent implantation failure, Empty follicle syndrome, Laparoscopy and Transvaginal ultrasound, Oocyte retrieval, variations of IVF: GIFT, ZIFT, Gamete and embryo donation & third party reproduction, Surrogacy & Gestational carrier

Module C: Agonist and Antagonist protocols, Newer Stimulation protocols, individualized protocols,

Module D: Complications of assisted reproduction; OHSS (Ovarian hyperstimulation syndrome), multiple pregnancy & complications, Fetal reduction, Fertility drugs and ovarian cancer, miscarriage, ectopic pregnancy, risks associated with ICSI

Ovarian tissue cryopreservation: Harvesting ovary, preparation and processing of ovarian cortex, Vitrification of ovarian cortex, storage of vitrified ovarian cortex, warming of ovarian cortex.

3 Semester

Theory Paper 1: Research Methodology and Preimplantation Genetic Diagnosis 2 credits

Lecture (2 Credits 2 hours / week)

Overview of research process and Research hypothesis
Observational study designs, analysis of data and interpretation
Process of conducting clinical trials
Ethics and scientific conduct in human and animal research
Literature search, systematic review and meta-analysis
Publication process-Manuscript writing, selection of journal and uploading manuscript impact factor
Statistics-variables in statistics, measures of central tendency and dispersions, data distributions, parametric and non-parametric tests, correlation and regression analysis, estimation of sample size, Chi-square test, t Test, P value
Plagiarism and similarity search tool
Preimplantation genetics (PGD), overview, Indications; Sex linked disorders, Single gene defects, chromosomal disorders
Technical of Biopsy procedures; Polar body biopsy; Cleavage-stage biopsy, Blastocyst biopsy, Cumulus cell analysis
Genetic analysis techniques and diagnosis; FISH, PCR-comparative genomic hybridization, Next generation sequencing, Preimplantation genetic haplotyping
Implications of PGD, PGD and religion, Legal aspects in India and rest of the world
PGS (pre-implantation genetic screening) and aneuploidy screening

Theory Paper 2: Principles of Cryopreservation
2 credits

Lecture (2 Credits 2 hours / week)

History of cryopreservation, Principles of cryobiology; cryoprotectants, cryofreezers, Factors affecting freezing, cryopreservation protocols,
Embryo cryopreservation; slow freezing and thawing method, penetrating and non-penetrating cryoprotectants, slow freezing method for embryos,
Vitrification and warming of embryos, Cryoprotectants used in vitrification, Vitrification devices, Freeze all strategy, Importance of embryo cryopreservation

Module E: Counselling in ART: Clinical, Embryological, Financial and Psychological counselling, Negative counselling

Sperm retrieval procedures: PESA/MESA, TESA/TESE

Module G: Success in Assisted Reproduction, Data analysis, Reproductive tourism

Clinical Embryology Techniques

8 credits

Practical Paper 1 (8 Credits 16 hours / week)

Conventional IVF; short & long coincubation, preparing for oocyte retrieval: Studying patient file, calculating the number of tubes and dishes for IVF and ICSI procedure, labelling of dishes and tubes, adding culture media into the tubes and dishes, equilibration of culture dishes and tubes

Day 1: Checking for equilibration of culture media, preparation of lab for oocyte retrieval, arranging necessary disposables in the laminar flow workstation, screening of follicular fluid, identification of oocyte cumulus complex, identification of granulosa cells, separation of cumulus oocyte complex and further culture of oocytes, assessment of fertilization, assessment of cleavage embryos, stage and grading of cleavage stage embryos, blastocyst culture and grading

Embryo loading procedures and transfer techniques

Embryology laboratory maintenance; data analysis and monitoring laboratory performance

Trouble shooting in the laboratory

Cryopreservation Techniques

8 Credits

Practical Paper II (8 Credits 16 hours / week)

Preparation of cryopreservation solutions, selection of embryos for cryopreservation, setting up of dishes for vitrification & warming, selection of devices for vitrification, process of vitrification and warming, Trouble shooting in vitrification and warming, documentation of patient details and maintenance of patient records on embryos after warming, safety practice in vitrification, selection of blastocysts for vitrification, collapsing blastocoel for vitrification, method of blastocyst vitrification

Vitrification of oocytes: preparation of dishes for vitrification, selection of devices for vitrification of oocytes, preparation of vitrification solutions for vitrfication, process of oocyte vitrification

Semen cryopreservation, cryoprotectants used, epididymal and testicular sperm cryopreservation

Frozen embryo transfer cycles
Oocyte cryopreservation: history, indications, method of cryopreservation of mature and immature oocytes, current status of oocyte vitrification
Fertility preservation; ovarian tissue cryopreservation; history, current status, prospects, In vitro culture of ovarian tissue, Ovarian tissue transplantation and outcome
Cryopreservation of semen and testicular tissue
Storage of cryopreserved samples and its safety

Practical Paper 1: Intracytoplasmic sperm Injection (ICSI)

8 credits

Practical Paper 1 (8 Credits 16 hours / week)

History of micromanipulation, Operation and maintenance of micromanipulation, Familiarization of different micromanipulators, Advantages and disadvantages of different micromanipulators, microtools: preparation and choice of microtools,
Alignment of microtools and troubleshooting, preparation of dishes for micromanipulation, method of stopping sperm motility, method of aspiration of spermatozoa, method of holding oocyte, focusing oocyte and injection pipette,
Method of intracytoplasmic sperm injection

Practical Paper II: Micromanipulation and Embryo biopsy

8 credits

Practical Paper II (8 Credits 16 hours / week)

Assisted hatching; zona drilling, zona thinning, chemical and laser assisted hatching
Biopsy procedures: Instrumentation, preparation of laboratory for biopsy procedure, method of biopsy, Acid Tyrode zona drilling, laser zona drilling,
Biopsy of polar body, biopsy of blastomeres, trophectoderm

4 Semester

Theory Paper 1: New Developments in ART
2 credits
Module A: Stem cells and regenerative medicine; adult hemopoietin stem cells, testicular stem cells, embryonic stem cells, induced pluripotent stem cells
Module B: Isolation of ICM (inner cell mass) and derivation of embryonic stem cells, preparation of mouse and human monolayer cells, Placental fibroblast cells, embryonic stem cell culture systems, identification of stem cell colonies, markers of stem cells, stem cell banking.

Differentiation of stem cells, potential of stem cells in regenerative medicine, disease conditions stem cells investigated, disadvantages, current problems and future prospects
Module C: Uterine and ovarian transplant, ovarian rejuvenation
Module D: Mitochondrial DNA mutations and diseases; Introduction
Prevention of mitochondrial diseases and oocyte reconstruction; Pronuclear transfer technique, Spindle transfer technique, Ethics of oocyte reconstruction, current research
Module E: Proteomics and metabolomics
New embryo culture techniques-Time Lapse embryo culture systems
Embryo editing, Artificial intelligence in ART
New stimulation protocols-dual stimulation, luteal phase stimulation, sperm vitrification, gametes from stem cells, non-invasive pre-implantation genetic testing, endometrial receptivity assay, endometrial rejuvenation
New developments in gamete and embryo vitrification
Current and future developments

Theory Paper 2: Regulation and Ethics in assisted reproduction.
2 credits

ART act 2021 (definitions in ART, authorities to regulate ART, Procedures for registration, duties of ART clinic & bank, Offence & Penalties, PCPNDT act, MTP Act and Recent amendments 2021, Surrogacy act 2021(Definitions, regulation of surrogacy clinics and procedures, Registration of surrogacy clinics, NARI and Surrogacy board/state ART & Surrogacy board, Authorities, Offences & Penalties, Schedules & forms, Regulations of ART in other countries
Controversial ART practice-age, donor anonymity
Benefits of auditing
Moral philosophy, Regulation and ethics in clinical IVF practice; Ethical practices for embryologists, gamete and embryo donation, Research on embryos, sex selection, surrogacy, cloning; reproductive and therapeutic
Regulation of gamete banks and gamete donors,
Accreditation of ART centres and personnel, Counselling in ART, Ethics and regulations of embryo editing, Ethics of 3 parent baby, Ethics and regulations of PGD & PGT-A

Research Seminar
4 credits

Collection of information, Search engines (PubMed, gene data bank), Preparation of PPT.
The student shall present a recently published research paper related to infertility and embryology through power point presentation

Project work

10 Credits

Project work is designed to provide research experience to the students. The student has to work independently on a research problem related to infertility. The student shall carry out this project in consultation with faculty

Proceedings of the Board of Studies Meeting – Eligibility Criteria for MSc (Clinical Embryology & Pre-implantation Genetics)

Following a detailed review and consultation process, the Chairman and Members of the Board of Studies of ASPIER, through formal email circulation on June 9, 2025, we have revised and approved the eligibility criteria for admissions to the above MSc program.

MSc (Clinical Embryology & Pre-implantation Genetics)– Eligibility Criteria

Candidates must hold one of the following qualifications with a minimum of 50% marks except for SC/ST candidates which is 45%

Students of Bachelor of Science (B.Sc.) degree from any UGC recognized Universities/MBBS/ BDS/ BAMS/ BHMS, Pharmacy, Nursing, BVSc, Dairy, Fishery and Engineering with Science (Biotechnology and Life science related) or any other equivalent degree in science are eligible to apply for this course.

CHAIRMAN
BOARD OF STUDIES
MICROBIOLOGY (PG)
UNIVERSITY OF MYSORE

Prof. M. Y. Sreenivasa
Chairman, Board of Studies
Asia Pacific Institute of Embryology (ASPIER)

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