

## PhD Entrance Syllabus for Clinical Embryology

1	History Robert G Edward Beginning of Human IVF Problem in fertilization of human egg The Birth of Louise Brown
2	Cell Division Mitosis Meiosis  Use of stem cell and regenerative medicine in ART  In Vitro Gametogenesis  Oocyte corona cumulus complex (OCCC) evaluation OCCC maturation (Immature, Approximately, Postmature, atretic) Oocyte nuclear maturity evaluation  Preparation of oocyte for ICSI
3	Morphology as assessment tool The pronucleate oocyte Cleavage stage embryo Morula stage embryo Blastocyst stage embryo Metabolism of preimplantation embryo  Future Development in embryo culture system
4	Embryo Transfer ZIFT, GIFT Cleavage stage embryo transfer Blastocyst transfer Cleavage stage grading Blastocyst grading
5	Identification of abnormal and immature sperm  <b>Advanced sperm selection Techniques</b> Sperm surface charge HA Binding PICS1 Apoptotic sperm binding MACS IMSI Sperm separation from testicular biopsy PESA TESA

	MESA Preparation of surgically extracted spermatozoa
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6	<p><b>Introduction to Andrology :</b></p> <ul style="list-style-type: none"> <li>• Composition of seminal plasma</li> <li>• Physiology and structure of Sperm (Head, acrosome, neck, tail, mitochondria)</li> <li>• Abnormal forms of sperm (Head, neck, mid piece, tail defects)</li> <li>• Spermatogenesis</li> </ul>
7	<p><b>Semen analysis :</b></p> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Steps involved in semen analysis: Sample collection, collection in retrograde ejaculation, different methods of collection.</li> <li>• <u>Initial macroscopic examination</u>: Liquefaction, appearance or color, viscosity, volume, pH, odour.</li> <li>• <u>Primary Microscopic Examination</u>: Count, motility, morphology, Agglutination, aggregation of spermatozoa.</li> <li>• <u>Secondary Microscopic Examination</u>: Grading/assessment of sperm by motility and morphology, HOS Test, Vitality test, Staining Process.</li> <li>• <u>Other cellular components</u>: RBC's, WBC's, Mucosal Strands, Pus cells, Epithelial cells, Germ cell.</li> <li>• <u>Different types of sperm counting chambers</u>: Neubauer haemocytometer, Macklers chamber</li> </ul>
8	<p><b>Reference Values and Nomenclature :</b></p> <ul style="list-style-type: none"> <li>• Nomenclature related to Semen Quality: Azoospermia, Aspermia, Asthenozoospermia, Asthenotetrazoospermia, cryptozoospermia, hemospermia, Leukospermia, Normozoospermia, oligozoospermia, Oligoasthenozoospermia, Oligoasthenoteratozoospermia, Oligoteratozoospermia, teratozoospermia, Necrozoospermia.</li> <li>• Lower reference limits for semen characteristics</li> <li>• Factors causing infertility in male</li> </ul>
9	<p><b>Male Factor for Infertility :</b></p> <ol style="list-style-type: none"> <li>1. Erectile &amp; Ejaculatory dysfunction.</li> <li>2. Obstructive azoospermia.</li> <li>3. Non- obstructive Azoospermia.</li> <li>4. Other sperm Abnormality (OATZ).</li> <li>5. Endocrine disorders.</li> </ol>

10	<p><b><u>Sperm separation techniques:</u></b> Introduction, choice of method, general principles of sperm separation, simple washing, Direct swim-up, discontinuous density gradient, preparation of infectious sample, preparation surgically extracted spermatozoa, preparation of retrograde ejaculation sample.</p>
11	<p>Processing of HIV infected sample  Sperm DNA Fragmentation  Y Micro Deletion , Sperm Staining, HOS Test  Andrology lab setup</p>
12	<p><b><u>Cryopreservation of sperm:</u></b> Introduction, Semen cropreservation protocol.  <b><u>Reasons for cropreservation of spermatozoa:</u></b> Donation of sperm, Fertility preservation, infertility treatment, minimizing infectious disease transmission.  <b><u>Risk assessment of cryopreservation and storage of human semen:</u></b> Resources, staff safety and protection, risk of cross contamination, security of frozen sample.  <b><u>Semen Cryopreservation protocols:</u></b> Preparation of GEYC cryoprotectant, adding cryoprotectant to semen, filling semen vial, sealing semen vials, cooling and freezing semen in liquid nitrogen. Thawing of frozen, transport of frozen semen.</p>
13	<p>Genetics of Infertility</p>