**‘The ESHRE Embryology Certification Preparatory Course’-Curriculum**

**The curriculum has been divided into two parts.**

**Applicants are expected to have a good knowledge of the following aspects of the curriculum and will have to undertake a**

**Pre-assessment on-line exam**

**Part 1 - SELF TAUGHT CURRICULUM**

**Block 1: Basic concepts: cell biology, molecular biology and genetics**

1.1 The cell

Internal organization

Cell cycle control, checkpoints

Mitosis and meiosis

The reproductive cells: spermatozoa and oocytes

1.2 Cell-cell interaction

Membrane receptors: function, type, regulation

Signaling

Junctions

1.3 Basic genetics of the cell

DNA chromatin and chromosomes

Concept of a gene

Mutations

Epigenetics

**Block 2: Male Reproduction**

2.1 The foetal testis

Factors regulating development

Primordial cells

Cell migration

Time scale (days / week)

2.2 Anatomy and function of the male reproductive system

Including accessory systems

Including function of the organs

2.3 Spermatogenesis

Regulating factors

CNS, pituitary

FSH, LH, testosterone, endocrine feedback

Leydig & Sertoli cells

Maturation

Biochemistry and metabolism of the sperm cell

Sperm morphology/structure

Function of each structure

**Block 3: Female reproduction**

3.1 The foetal ovary

Factors regulating development

Primordial cells

Cell migration

3.2 Anatomy and function of the female reproductive system

Including accessory systems

Including function of the organs

3.2 Anatomy and function of the female reproductive system

Including accessory systems

Including function of the organs

Primordial cells

Cell migration

Time scale (days / week)

**Block 5:** **Infertility reasons, work-up and treatment**

5.1 The infertile couple

Reasons, medical, genetic, hormonal, physical

Causes and effects

Definitions, primary infertility, secondary infertility, female vs. male

5.2 Patient screening

Physical / Serological

What tests are used? What to look for?

Screening of donors

5.3 Type and choice of treatment

Surgical

Hormone stimulation

Insemination IVF / ICSI

Sperm donation

Egg donation

5.4 Ovarian hyperstimulation

Basic principles

Types of medication

Stimulation regimes (types, rationales)

OHSS

5.5 Outcome

The health of the children

Risk factors

Maternal factors

Paternal factors

Multiple pregnancies

Chromosomal factors

Malformations

Imprinting

Block 8: Legislation, EU Tissue Cell Directives, Non Routine methods

8.4 Legislation

National legislation (what is allowed in your country)

Ethical consideration

Code of practice

8.5 The EU Tissue and Cells Directives (EUTCDs)

Examples of what the EUTCDs cover

Implementation in own country

8.6 Non-routine methods

Examples of non-routine methods, e.g. in vitro maturation, pre-genetic screening, assisted hatching

**Part -2 TAUGHT BY LECTURES**

**Block 1: Basic Gene regulations, Genetics, Genetic analysis,**

1.4 Basic gene regulation

Translation

Transcription

Expression

Imprinting

1.5 Basic genetics

Genotype and phenotype

Basic Mendelian inheritance patterns

Monogenic diseases

Chromosomal abnormalities: numerical, structural

Interpretation of an inheritance / family tree / pedigree

1.6 Genetic analysis

How and why is it performed?

Basic methods: cytogenetics (e.g. karyotyping, FISH), molecular genetics (e.g. PCR)

1.7 Embryonic stem cells

Origins, definitions, characteristics

**Block 2: Male Reproduction**

2.4 The sperm sample – assessment

Functional analysis

Microscopic analysis

WHO & ESHRE guidelines

CASA systems

**Block3: Female Reproduction**

3.3 Oogenesis

Regulating factors

CNS, pituitary

FSH, LH, Estrogen, feedback

Theca & granulosa cells

Maturation biochemistry and metabolism of the oocyte

Oocyte morphology/structure

Function of each structure

3.4 The oocyte - markers of competence

Nuclear maturity

Cytoplasm

Polar bodies

Zona pellucida

Cumulus cells

**Block 4: Embryo development and early pregnancy**

4.1 Gamete interaction – until 1st cleavage

Fertilization

Acrosome reaction

Sperm- oocyte signalling

Sperm decondensation

Oocyte activation

Meiosis II, pronuclei and spindle formation

4.2 Embryo development - from first cleavage to implantation

Metabolism, cell positions, embryonic axis

Kinetics, timing, regulation

Apoptosis

4.3 Implantation

Hatching, adhesion, invasion, endometrium

4.4 Post-implantation embryology

Gastrulation

Organogenesis

Sex differentiation

4.5 IVF outcome

hCG production, pregnancy test

Implantation rate, ultrasound (sacs, heartbeat)

4.6 Early pregnancy failures

Extra uterine pregnancies,

Spontaneous abortions

Embryo factors vs. uterine factors

**Block 6: Laboratory procedures - practical – from oocyte pick-up to transfer.**

6.1 Strategies for choosing fertilization procedures

IVF or ICSI, criteria

IVM

PESA, TESA, TESE,

Donor sperm in relation to serological tests (different handling and storage)

Why are we doing things in a certain manner / certain order?

6.2 The sperm sample – preparation methods

Centrifugation, swim-up, ”swim-out”, etc

Functional

When to use what, why, differences

6.3 IVF

Practicalities for IVF and ICSI

Pick-up, oocyte handling, insemination

6.4 ICSI

Denudation

Injection procedure

6.5 Embryo scoring, Day 1 - 6

PN scoring,

Morphology criteria

Kinetics, genetics, physiology (e.g. amino acids, oxygen metabolism)

Consequences (freeze, transfer)

6.6 Culture conditions

Media

Culture systems

Requirements for consumables

Physiochemical parameters (temperature, pH, osmolality)

Stage specific requirements

6.7 Equipment

Calibrations

Validation, monitoring, logbooks, maintenance and control

6.8 Microscopes

Principals of optical system, calibrations, maintenance and control

6.9 Embryo transfer

Identity check

Number of embryos

Catheter loading and checking

6.10 Cell biopsy

Zona opening (pros and cons)

Different biopsy types, number of cells

**Block 7: Cryopreservation**

7.1 Principles for freezing and thawing of cells

Basic cryobiology

Cryoprotectants, additives

Slow freezing, timing

Vitrification, timing

Advantages/disadvantages with different methods

7.2 Sperm freezing /thawing

Theory and practice

7.3 Oocyte freezing/thawing

Theory and practice

7.4 Embryo freezing/thawing

Theory and practice

7.5 Ovarian freezing/thawing

Theory and practice

7.6 Testicular freezing/thawing

Theory and practice

7.7 Equipment

Machines

Straws/ampoules

Media, contamination from storage medium (what and why)

Minimal safety requirements

Security

7.8 The frozen-thawed embryo treatment cycle

Monitoring and timing of the thawing cycle

Controlled and natural cycles

**Block 8: Quality assessment, statistics, handling data, ethics.**

8.1 Patient data

Identity check

Confidentiality

Keeping records

Safety

Coding

8.2 Quality assurance

Identification procedures

Monitoring of performance, index variables

Standard operating procedures

Traceability

Validation

Monitoring and use of key performance indicators

Logbooks

If/ how/when to bring in new methods

8.3 Statistical analysis

Sample size evaluation

Study design

Statistical variance

Interpretation of results

**Block 9: Risks**

9.1 Contaminated samples

Processing and storage of sample known/suspected to be contaminated with contagious agents

9.2 Staff protection

Hygiene

Rules and regulations

Protective measures (gloves, masks, etc.)

Actions upon injury

9.3 Adverse events, back-up strategies

How to avoid, what to do?

Risk of mix-up of gametes, loss or damage during handling

Transfer of wrong embryos

Breakdown of equipment, back-up strategies

9.4 Troubleshooting