School of Medicine

Graduate Entry 2012/13

## Reproductive Medicine

Spring Term Course Guide

****

*http://www1.imperial.ac.uk/medicine/about/divisions/sora/teaching/postgraded/reproductivebiology/*

Course Leader: **Dr Mark Sullivan**
tel: 020 7594 2133
email:mark.sullivan@imperial.ac.uk

<http://learn.imperial.ac.uk>

<https://education.med.imperial.ac.uk>

Reproductive Medicine

Graduate entry year 1 – Spring Term Course Guide

CONTENTS

Page

SOLE *iii*

INTRODUCTION 1

COURSE STRUCTURE 2

ASSESSMENT DETAILS 2

TIMETABLE 3

LEARNING OBJECTIVES 5

READING LIST 8

CONTACT DETAILS 9

SESSION MATERIALS 9-29

Lecture 1: Sexual differentiation

Lecture 2: Anatomy of the adult male reproductive tract

Lecture 3: Anatomy of the adult female reproductive tract

Lecture 4: Menstrual cycle

Lecture 5: The HPG axis throughout life

Lecture 6: Oogenesis and ovulation

Lecture 7: Spermatogenesis and sperm transport

Lecture 8: Fertilisation and preimplantation development

Lecture 9: Genesis of aneuploidy

Lecture 10: The human placenta: basic information

Lecture 11: Key stages of embryonic development

Lecture 12: Extra-embryonic membranes

Lecture 13: Normal term labour

Lecture 14: Preterm labour

Lecture 15: Miscarriage & ectopic pregnancy

Lecture 16: Major complications of pregnancy

Lecture 17: Assisted conception

<https://education.med.imperial.ac.uk>

**SOLE FEEDBACK – *Graduate entry Reproductive medicine***

The following pages provide you with templates on which you can record your thoughts as the course proceeds. At the end of the course you can enter your views onto SOLE.

**Please answer all questions by selecting the response which best reflects your view.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
| The content of this module is useful. |  |  |  |  |  |
| The support materials available for this module (e.g. handouts, web pages, problem sheets) are helpful. |  |  |  |  |  |
| I receive sufficient feedback and guidance. |  |  |  |  |  |
| Overall, I am satisfied with this module. |  |  |  |  |  |

Please use this box for constructive feedback and suggestions for improvement.

|  |
| --- |
|  |

**SOLE FEEDBACK - INDIVIDUAL LECTURERS**

Please note that for SOLE, a Lecturer’s name will only appear once. This template gives you the opportunity to record your comments about each lecture in the order of delivery.

**On the following section, you have an opportunity to record any comments and constructive feedback you have for each lecturer.**

|  | **The lecture(s) are well structured** | **The lecturer explains concepts clearly** | **The lecturer engages well with the students** |
| --- | --- | --- | --- |
| **Lecturer and Lecture Title** | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
| Prof. Ilpo HuhtaniemiSexual differentiation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Fah Feroze-ZaidiDisorders of sexual diferentiation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr Vicky SharpBasic reproductive anatomy (male) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Fah Feroze-ZaidiBasic reproductive anatomy (female) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Fah Feroze-ZaidiMenstrual cycle |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Mandy Donaldson & Prof. Stephen FranksHPG axis |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Prof. Kate HardyOogenesis & ovulation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Kevin LindsaySpermatogenesis & sperm transport |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Prof. Kate HardyFertilization and preimplantation development |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Prof. Kate HardyGeneration of aneuploidy |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Mark Sullivan Human placenta |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Mark Sullivan Embryonic development |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Mark Sullivan Extra-embryonic membranes |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Mark Sullivan Normal term labour |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. TG Teoh Preterm labour |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Raj RaiMiscarriage & ectopic pregnancy |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Lorin LakasingPlacental complications |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dr. Ben LavenderAssisted conception |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

| **Lecturer and Lecture Title** | **Please use this box for additional constructive feedback.** |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Reproductive Medicine

**INTRODUCTION**

The ***Reproductive Medicine*** course is taught in the Spring Term of year 1

The key features of the course are listed below

#### Learning Outcomes

* Understand how the anatomy of the adult reproductive tract is established
* Explain the regulation of sexual differentiation, and the clinical consequences of dysregulation
* Understand how the brain and reproductive tract interact to support gametogenesis, fertilization, pregnancy and birth
* Understand changes in the HPG axis during childhood, puberty, reproductive life and ageing, and the aetiology of clinical disorders
* Understand the differences between the male and female in meiosis and gametogenesis
* Describe the cellular and biochemical events that occur during fertilization and preimplantation development
* Describe how aneuploidy arises during meiosis and early embryo development, and the relative contributions of the male and female
* Understand the main events and processes of normal pregnancy and birth, including reasons for the gaps in our knowledge
* Understand the main causes of infertility, and outline possible clinical treatments
* Consider possible explanations the high incidence of pregnancy loss in the human
* Understand the main complications of pregnancy and birth, and outline possible clinical interventions

#### Key Educational Features

1) Progressive series of basic lectures, which build sequentially upon each other, to provide fundamental knowledge of:

• development, structure and function of the reproductive tract

• endocrine regulation of reproductive processes from birth to old age, illustrated by case histories of common endocrine disorders and disorders of sexual differentiation

• development of viable gametes.

• embryogenesis, fetal growth and development from fertilization to birth

2) Descriptions of incidence and causes of common clinical disorders of reproduction and pregnancy, (including menstrual disturbances, infertility, miscarriage, intrauterine growth restriction, preterm labour), illustrated by case histories

3) Lecture slides: All slides to be available on web, printed out for lecture.

4) All lecture sessions to conclude with a run through the lecture objectives

The organization of the teaching programme is around 5 consecutive themes:

#### Themes:

1: Development, differentiation and function of reproductive tract

* Development of male and female reproductive tract and sexual differentiation
* Disorders of sexual differentiation
* Overview of function of male and female reproductive tract and its interaction with the hypothalamic-pituitary axis (gamete production, steroid production, gamete transport, support of fetal development, delivery of baby)

2: The HPG axis in health and disease

* HPG axis
	+ Infancy and prepuberty
	+ Puberty and adrenarche
	+ Reproductive life (and during pregnancy and lactation)
	+ Menopause
	+ Post menopause
* Endocrine disorders

3: Gametogenesis and preimplantation development

* Gametogenesis: oogenesis and spermatogenesis
* Gamete transport and fertilization
* Preimplantation development
* Genesis of aneuploidy and chromosomal disorders

4: Human pregnancy

* Overview of normal human pregnancy
* Fetal growth and development of organ systems
* Development and function of placenta
* Labour

5: Reproductive medicine

* Infertility and assisted conception
* Miscarriage and ectopic pregnancy
* Placental Disease - Pre-Eclampsia and Fetal Growth Restriction
* Preterm labour and problems of labour

**COURSE STRUCTURE**

There are 17 lectures and 1 discussion of cases

**ASSESSMENT**

**Formative Assessments**

The course will be formatively assessed in the summative exam on 31st January 2012.

**Summative Assessment**

The course will be examined in a single examination
Reproductive medicine — **Part 2 Paper 2 June 2012**

The questions will be in SBA format

**Examples of specimen questions**

These are provided, linked to each of the lectures.

Further details about examinations are provided on the Intranet.

**TIMETABLE 2012/13 – Spring term**

Details are correct at the time of going to press. Any amendments will be shown on the Course Timetable shown on the Intranet.

|  |  |  |  |
| --- | --- | --- | --- |
| **Date and campus** | **Time** | **Lecture topic** | **Lecturer** |
| Thursday**3rd January 2013**Hammersmith LT3 (Wolfson Education Centre) | 9.30 am | Sexual differentiation: development of the male and female reproductive tract | Kim Jonas |
| 10.15 am | Anatomy of the reproductive tract in the adult | Layi Oduwole (male)Bryony Jones (female) |
| 11.10 am | Menstrual cycle | Mandy Donaldson |
| Tuesday**8th January 2013**Hammersmith LT3 (Wolfson Education Centre) | 9:00 am – 11:00 am | HPG axis - childhood/reproductive life/ageing | Mandy DonaldsonStephen Franks |
| 11:00 am | Discussion of case histories: endocrine disorders | Stephen Franks |
| Tuesday**15th January 2013**Hammersmith LT3 (Wolfson Education Centre) | 9:00 am | Oogenesis and ovulation | Kate Hardy |
| 9:45 am | Spermatogenesis and sperm transport | Kevin Lindsay / Sheba Jarvis |
| 10:30 am | Fertilization and preimplantation development | Kate Hardy |
| 11:15 am | Genesis of aneuploidy | Kate Hardy |
| Thursday**17th January 2013**Charing Cross Hospital 8th Floor LT  | 9:00 am | Overview of normal human pregnancy | Mark Sullivan |
| 9:45 am | Basic structure and functions of the human placenta | Mark Sullivan |
| 10:30 am | Key stages of embryonic development | Mark Sullivan |
| 11:15 am | Normal term labour | Mark Sullivan |
| Friday**18th January 2013**Hammersmith LT3 (Wolfson Education Centre) | 2.00 pm | Placental complications (IUGR and PE) | Mark Sullivan  |
| 2.45 pm | Assisted conception – success and failure | Mausumi Das |
| 3.35 pm  | Preterm labour | TG Teoh |

Tutorials

No tutorial groups for this component of the teaching.

Learning Objectives – Graduate Entry 2012-13 Spring Term

These session objectives may include tasks you should be able to carry out after you have completed the relevant activity. They provide you with a way to assess how well you are keeping up with the material. Note that they are also provided to the external examiners as a guide to what you should know at the end of the course.

**1 Lecture 1** Sexual differentiation: development of the male and female reproductive tract

 (Ilpo Huhtaniemi)

* the Jost concept of sexual differentiation
* origin of somatic and germinal components of the gonad
* differentiation of the cellular components of the testis
* differentiation of the cellular components of the ovary
* differentiation of the urogenital ductal system
* genes involved in gonadal differentiation into testis and ovary
* hormones and paracrine factors regulating the differentiation and maturation of the
* urogenital ductal system

**2 Lecture 2** Basic anatomy of the reproductive tract in the adult human male

 (Layi Oduwale)

1. Structures and functions of the reproductive tract in the human male

**3 Lecture 3** Basic anatomy of the reproductive tract in the adult human female

(Jenny Loudon)

1. Structures and functions of the reproductive tract in the human female

**4 Lecture 4** Menstrual cycle

(Mandy Donaldson)

1. Introduction to the HPG axis
2. The menstrual cycle

**5 Lecture 5** HPG axis - childhood/reproductive life/ageing

(Stephen Franks & Mandy Donaldson)

* To know the hormones of the HPG including: structure, synthesis and function
* To understand the control mechanisms of these hormones
* To know their role in human reproduction
* To be aware of the physiological and anatomical changes of puberty
* To know the endocrine changes underlying the above
* To be aware of the role of body fat and leptin in puberty
* To be aware of delayed and precocious puberty
* To be aware of disorders of the adult male and female HPG

**6 Discussion 1** Consideration of case histories: endocrine disorders

(Stephen Franks)

1. Case histories to illustrate disorders of HPG axis and their management.

**7 Lecture 6** Oogenesis and ovulation

(Kate Hardy)

* the embryological origins of the somatic and germ cells of the ovary
* the timing and path of migration of germ cells into the ovary
* the extent of the proliferation of germ cells before and after colonization of the ovary
* the timing of differentiation of germ cells into oogonia and oocytes (and understanding of the major functional differences between these three cell types), their entry into meiosis, and subsequent arrest
* the sequence of events during meiosis
* progression and timing of meiosis in the oocyte (including periods of meiotic arrest), triggers resumption and completion of meiosis
* relationship between timing of meiosis and follicle development
* the timing of follicle formation
* anatomy of the adult ovary
* structure of the follicle, communication between the oocyte and the surrounding granulosa cells, function of different compartments of the follicle
* the stages of follicle development
* the decline in oocyte number and onset of the menopause
* ovulation and corpus luteum formation

**8 Lecture 7** Spermatogenesis and sperm transport

(Kevin Lindsay)

• To understand basic testicular anatomy

• To understand the cell types and their relationships within the testis

• To understand the development of the human sperm

• To understand the relationship between the various testicular compartments

• To understand the temporal and spatial characteristics needed in the testis

• To understand post-testicular sperm maturation and transport from male to female

**9 Lecture 8** Fertilization and preimplantation development

(Kate Hardy)

• Stages of preimplantation development

• The anatomy of the cleavage stage embryo, morula and blastocyst

• Timing and localization of preimplantation development

• Cellular changes during first cell cycle

• Molecular changes during early cleavage (activation of the embryonic genome)

• Cellular changes during compaction and blastocyst formation

• Differentiation of first two lineages

• Developmental arrest during human preimplantation development

• Genesis of chromosomal abnormalities in human embryos

• Cell abnormalities during preimplantation development (cytoplasmic fragmentation)

**10 Lecture 9** Genesis of aneuploidy

(Kate Hardy)

• The incidence of aneuploidy in gametes, preimplantation embryos, during fetal life and at birth.

• Gamete and chromosome variation in susceptibility, and possible reasons (prolonged meiotic arrest in female, chromosome size)

• Non-disjunction during meiosis I and II

• Non-disjunction and anaphase lag during mitosis, and the possible consequences

• The increase of aneuploidy with age and the possible reasons

**11 Lecture 10** Overview of human pregnancy

(Mark Sullivan)

1. Maternal perspectives
2. Infant perspectives
3. Placental perspectives

**12 Lecture 11** Basic structure and functions of the human placenta

(Mark Sullivan)

1. Key placental structures
2. Key placental functions
3. Development of placenta
4. Blood flow and placenta

**13 Lecture 12** Key stages of embryonic development

(Mark Sullivan)

1. Embryonic disc
2. Gastrulation & axis formation
3. Ectoderm, mesoderm & endoderm
4. Development of main body structures
5. Development and vulnerability

**14 Lecture 13** Normal term labour

(Mark Sullivan)

1. Stages of labour & main events
2. Changes in cervix and myometrium in labour
3. Biochemistry of labour – an inflammatory process
4. Role of fetal membranes in labour

**15 Lecture 14** Preterm labour

(TG Teoh)

1. Multi-factorial causes of preterm labour
2. Cervical length can be a predictor of risk of preterm labour
3. Primary prevention by cervical cerclge
4. Secondary prevention by tocolysis
5. Infective cause / association as cause of preterm labour
6. Fetal fibronectin as screen for risk of preterm labour

**16 Lecture 15** Miscarriage and ectopic pregnancy

(Raj Rai)

1. List of objectives

**17 Lecture 16** Placental complications (IUGR and PE)

(Lorin Lakasing)

1. Definition of Pre-eclampsia
2. Proposed Aetiology of PET
3. Maternal consequences of poor placentation
4. Definition of Fetal Growth Restriction
5. Difference between FGR, low birthweight and small for gestational age
6. Clinical Assessment of the small fetus
7. Neonatal consequences of FGR

**18 Lecture 17** Assisted conception – success and failure

(Ben Lavender)

1. List of objectives

**Recommended reading**

Johnson MH. *Essential Reproduction*. Publ: Blackwell Publishing, 2007. ISBN 9781405118668

Strauss J, Barbieri R. *Yen and Jaffe’s Reproductive Endocrinology: Physiology, Pathophysiology & Clinical Management.* (6th edition). Elsevier ISBN-13: 978-1-4160-4907-4, 2009

**Supplementary reading**

**Online resources**

**CONTACT DETAILS**

Course Leaders: Dr. Mark Sullivan (mark.sullivan@imperial.ac.uk), Prof. Stephen Franks (s.franks@imperial.ac.uk), Prof. Kate Hardy (k.hardy@imperial.ac.uk)

*Session 1: Development, differentiation and function of reproductive tract*Professor Stephen Franks (Professor in Reproductive Endocrinology)

*Session 2: The HPG axis in health and disease*Professor Stephen Franks (Professor in Reproductive Endocrinology)
Dr Mandy Donaldson (Honorary Lecturer)

*Session 3: Gametogenesis and preimplantation development*Prof Kate Hardy (Professor in Reproductive Biology),

*Session 4: Human pregnancy*Dr Mark Sullivan (Senior Lecturer)

*Session 5: Reproductive medicine*Dr Mark Sullivan (Senior Lecturer)

**Lecture 1: Sexual differentiation: development of the male and female reproductive tract**

Dr. Kim Jonas
(k.jonas@imperial.ac.uk)

Learning Objectives

* the Jost concept of sexual differentiation
* origin of somatic and germinal components of the gonad
* differentiation of the cellular components of the testis
* differentiation of the cellular components of the ovary
* differentiation of the urogenital ductal system
* genes involved in gonadal differentiation into testis and ovary
* hormones and paracrine factors regulating the differentiation and maturation of the
* urogenital ductal system

**Handout notes should appear here**

**Example question(s) based on this session’s content (single best answer, SBA)**

**Lecture 2: Revision of basic reproductive tract anatomy**

**in the adult male**

Dr. Olayiwola Oduwole
(o.oduwole@imperial.ac.uk)

Learning Objectives

1. Male reproductive tract structure in adult

1. Recognise the main structures of a section of functional testis.

2. Identify the levels of the epididymis according to their cellular structural variations and have an understanding of their function.

3. Discuss the structure and function of the efferent duct system and the accessory glands.

4. Understand the process of erection and ejaculation.

**Lecture 3: Revision of basic reproductive tract anatomy**

**in the adult female**

Dr. Bryony Jones

(Bryony.Jones@imperial.nhs.uk)

Learning Objectives

1. Female reproductive tract structures in the adult
2. Relate these structures to their primary functions

**Handout notes should appear here**

**Example question(s) based on this session’s content (single best answer, SBA)**

**Lecture 4: Menstrual Cycle**

Dr Mandy Donaldson
(Mandy.Donaldson@imperial.nhs.uk)

Learning Objectives

1. Introduction to the HPG axis
2. The menstrual cycle

**The hypothalamic-pituitary-ovarian-axis**

 Neurosecretion and GnRH

 Pituitary gonadotrophins

 Negative and positive feedback

**The menstrual cycle**

 The endometrial cycle

The ovarian cycle

Variations in the cycle

**Example question(s) based on this session’s content (single best answer, SBA)**

***The luteal phase of the human menstrual cycle***

1. is the same length as the follicular phase
2. is more consistent in length than the follicular phase
3. is associated with suppressed levels of FSH and LH
4. is the most fertile stage of the cycle

**Lecture 5: The HPG axis - childhood/reproductive life/ageing**

Prof Stephen Franks & Dr Mandy Donaldson
(s.franks@imperial.ac.uk; Mandy.Donaldson@imperial.nhs.uk)

Learning Objectives

* To know the hormones of the HPG including: structure, synthesis and function
* To understand the control mechanisms of these hormones
* To know their role in human reproduction
* To be aware of the physiological and anatomical changes of puberty
* To know the endocrine changes underlying the above
* To be aware of the role of body fat and leptin in puberty
* To be aware of delayed and precocious puberty
* To be aware of disorders of the adult male and female HPG

**The HPG Axis**

* GnRH structure and function
* Gonadotrophins structure and function
* Gonaldal steroids structure and fuction
* Inhibins structure and function
* Prolactin structure and function

**Onset of puberty**

* Adrenarche, telarche and menarche
* Tanner staging
* Hormones of the HPG
* Growth spurt, gonadal steroids and bones
* Signal for puberty

**Disorders of puberty**

* Precocious puberty, definition and causes
* Delayed puberty, definition and causes

**The HPG in the Adult**

* Control mechanisms
* Pregnancy
* Ageing and the menopause

**Disorders of the HPG in the adult male and female**

* Disorders of the female
* Disorders of the male

Others - prolactinoma

**Example question(s) based on this session’s content (single best answer, SBA)**

**Leydig cells are responsible for the synthesis of**

1. LH
2. Testosterone
3. Inhibin B
4. FSH
5. Oestrogens

**Lecture 6: Oogenesis and ovulation**

Prof. Kate Hardy
k.hardy@imperial.ac.uk

Learning Objectives

Students will be able to understand the development of the ovary, and the inter-relationships between cellular changes in the oocyte and the surrounding somatic cells during the development of a mature oocyte. Specifically, they will understand:

**Development of the ovary**

• the embryological origins of the somatic and germ cells of the ovary

• the timing and path of migration of germ cells into the ovary

• the extent of the proliferation of germ cells before and after colonization of the ovary

• the timing of differentiation of germ cells into oogonia and oocytes (and understanding of the major functional differences between these three cell types), their entry into meiosis, and subsequent arrest

**Meiosis**

• the sequence of events during meiosis

• progression and timing of meiosis in the oocyte (including periods of meiotic arrest), triggers resumption and completion of meiosis

• relationship between timing of meiosis and follicle development

• the timing of follicle formation

• anatomy of the adult ovary

**Follicle Development**

• structure of the follicle, communication between the oocyte and the surrounding granulosa cells, function of different compartments of the follicle

• the stages of follicle development

• the decline in oocyte number and onset of the menopause

• ovulation and corpus luteum formation

**Handout notes should appear here**

**Example question(s) based on this session’s content (single best answer, SBA)**

**Lecture 7: Spermatogenesis and sperm transport**

Dr. Kevin Lindsay / Dr. Sheba Jarvis
Kevin.Lindsay@imperial.nhs.uk / sheba.jarvis@imperial.ac.uk

Learning Objectives

* To understand basic testicular anatomy
* To understand the cell types and their relationships within the testis
* To understand the development of the human sperm
* To understand the relationship between the various testicular compartments
* To understand the temporal and spatial characteristics found in the testis
* To understand post testicular sperm maturation and transport from male to female

**Handout notes should appear here**

**Example question(s) based on this session’s content (single best answer, SBA)**

**Lecture 8: Fertilization and preimplantation development**

Prof. Kate Hardy
k.hardy@imperial.ac.uk

Learning Objectives

Students will be able to describe and understand:

• Stages of preimplantation development

• The anatomy of the cleavage stage embryo, morula and blastocyst

• Timing and localization of preimplantation development

• Cellular changes during first cell cycle

• Molecular changes during early cleavage (activation of the embryonic genome)

• Cellular changes during compaction and blastocyst formation

• Differentiation of first two lineages

• Developmental arrest during human preimplantation development

• Genesis of chromosomal abnormalities in human embryos

• Cell abnormalities during preimplantation development (cytoplasmic fragmentation)

**Handout notes should appear here**

**Example question(s) based on this session’s content (single best answer, SBA)**

**Lecture 9: Genesis of aneuploidy**

Prof. Kate Hardy
k.hardy@imperial.ac.uk

Learning Objectives

Students will be able to describe and understand:

• The incidence of aneuploidy in gametes, preimplantation embryos, during fetal life and at birth.

• Gamete and chromosome variation in susceptibility, and possible reasons (prolonged meiotic arrest in female, chromosome size)

• Non-disjunction during meiosis I and II

• Non-disjunction and anaphase lag during mitosis, and the possible consequences

• The increase of aneuploidy with age and the possible reasons

**Handout notes should appear here**

**Example question(s) based on this session’s content (single best answer, SBA)**

**Lecture 10: Overview of normal human pregnancy**

Dr Mark Sullivan
(mark.sullivan@imperial.ac.uk)

Learning Objectives

1. Maternal perspectives on human pregnancy
2. Fetal and infant perspectives on human pregnancy
3. Placental perspectives on human pregnancy

**The mother during pregnancy**

 Changes in the uterus

 Changes in other maternal tissues and systems

**The baby during pregnancy**

 What is the difference between conceptus, embryo, fetus and infant?

 The main steps in fetal development

 The regulation of fetal development

 The limits of viability and of normal outcome of pregnancy

**The placenta during pregnancy**

 Changes in the uterus – how the interface varies as pregnancy proceeds

 The structure of the normal human placenta and its main functions

 The key features of human placental development

**Example question(s) based on this session’s content (single best answer, SBA)**

The decidua that overlies the chorion in early pregnancy is called:

(a) vera

(b) basalis

(c) parietalis

(d) capsularis

(e) cervicalis

**Lecture 11: Basic structure and functions of the human placenta**

Dr Mark Sullivan
(mark.sullivan@imperial.ac.uk)

Learning Objectives

1. Key placental structures
2. Key placental functions
3. Development of placenta
4. Blood flow and placenta

**The nature of placental villi – basic structure and functions**

 Syncytium or syncytiotrophoblast

 Cytotrophoblast

 Mesodermal core & Hofbauer cells

 Blood vessels

**Main placental functions**

 Transport & mechanisms

 Endocrinology

 Invasion

 Synthesis and metabolism

 Vascular remodeling (maternal)

 Immunology

**Development of the placenta**

 Initial adherence of blastocyst & primary invasion

 Syncytial invasion (2-3 weeks)

 Cytotrophoblast development

 Villous development and elaboration

**Blood flow and placenta**

 Initial contact with capillaries

 Role of the cytotrophoblast shell

 Nutrition before 10 weeks of gestation

 Spiral artery remodeling

 Blood flow after 12 weeks gestation

**Example question(s) based on this session’s content (single best answer, SBA)**

**For the majority of pregnancy, nutrition is provided from the following maternal source:**

(a) glandular products

(b) capillary blood

(c) venous blood

(d) arterial blood

(e) apoptotic cells

**Lecture 12: Key stages of embryonic development**

Dr Mark Sullivan
(mark.sullivan@imperial.ac.uk)

Learning Objectives

1. Embryonic disc
2. Gastrulation & axis formation
3. Ectoderm, mesoderm & endoderm
4. Development of main body structures
5. Development and vulnerability

**Initial development**

 2 cell layers

 Yolk sac

 Amniotic cavity

**Gastrulation and axis formation**

 Primitive streak

 Primitive node

 Cell movement

 Notochord

 A-P axis

**Three-layer embryo**

 Generation of ectoderm, mesoderm and endoderm

 Formation of neural plate and tube

**Development of main body structures**

 Conversion of flat embryo to 3-dimensional structure

 Generation of polarity and limb development

**Development and vulnerability**

 Chromasomal defects

 Toxins & teratogens

 Pathologies

**Example question(s) based on this session’s content (single best answer, SBA)**

**Which of the following directs formation of the neural tube?**

(a) neural plate

(b) notochord

(c) mesoderm

(d) primitive streak

(e) primitive node

 **Lecture 13: Normal term labour**

Dr Mark Sullivan
(mark.sullivan@imperial.ac.uk)

Learning Objectives

1. Stages of labour & main events
2. Changes in cervix and myometrium in labour
3. Biochemistry of labour – an inflammatory process
4. Role of fetal membranes in labour

**Stages of labour & main events**

 Main phases: 0, 1, 2, 3

 Relation to functional changes

 Primary tissues of labour

**Changes in cervix and myometrium in labour**

 Remodelling events in labour

 Control of tissue re-structuring: MMPs

 Recruitment of inflammatory cells

**Biochemistry of labour – an inflammatory process**

 Production and role of prostaglandins

 Production and role of cytokines

 Loss of effects of progesterone

**Role of fetal membranes in labour**

 Production of prostaglandins

 Production of interleukins and cytokines

**Example question(s) based on this session’s content (single best answer, SBA)**

The main tissue responsible for expelling the infant from the pregnant uterus is

(a) cervix

(b) myometrium

(c) decidua

(d) chorion

(e) amnion

**Lecture 14: Preterm labour**

Dr. TG Teoh
Tg.Teoh@imperial.nhs.uk

Learning Objectives

1. Multi-factorial causes of preterm labour
2. Cervical length can be a predictor of risk of preterm labour
3. Primary prevention by cervical cerclge
4. Secondary prevention by tocolysis
5. Infective cause / association as cause of preterm labour
6. Fetal fibronectin as screen for risk of preterm labour

**Handout notes should appear here**

**Example question(s) based on this session’s content (single best answer, SBA)**

**Lecture 15: Assisted conception – success and failure**

To be Confirmed

Learning Objectives

* <Ideally, should be stated here>

**Handout notes should appear here**

**Example question(s) based on this session’s content (single best answer, SBA)**

**Lecture 16: Placental Disease - Pre-Eclampsia and Fetal Growth Restriction**

Dr. Bryony Jones

(Bryony.Jones@imperial.nhs.uk)

Learning Objectives

1. Definition of Pre-eclampsia
2. Proposed Aetiology of PET
3. Maternal consequences of poor placentation
4. Definition of Fetal Growth Restriction
5. Difference between FGR, low birthweight and small for gestational age
6. Clinical Assessment of the small fetus
7. Neonatal consequences of FGR

**Handout notes should appear here**

**Example question(s) based on this session’s content (single best answer, SBA)**