Learning Objectives

Upon completion of this module, the student will be able to

- Describe anatomy of male and female reproductive organs
- Describe and interpret the hormonal events underlying male and female reproductive life cycle
Male Reproductive Tract: Anatomy

Public Domain
Male Reproductive Anatomy

- **Testis**
  - **Seminiferous tubules** have germ cells which differentiate in successive stages (spermatogenesis) producing sperm
  - **Leydig cells** produce testosterone required for spermatogenesis
Male Reproductive Anatomy

- **Epididymis**
  - Transports sperm from testis to vas deferens
  - Plays important role in maturation of sperm

- **Vas Deferens**
  - Carry sperm from epididymis to urethra
  - Site for male sterilization
The Hormonal Basis of Male Reproduction: Extra-testicular

- Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH):
  - Secreted by anterior pituitary gland (located in brain)
  - Stimulates Leydig cells in the testis to secrete testosterone
The Hormonal Basis of Male Reproduction: Testicular

- **Testosterone**
  - Released by Leydig cells in a pulsatile manner in response to LH
  - Has reproductive and non-reproductive sites of action.
  - Required for spermatogenesis
Production of Sperm

- Starts at puberty and continues all through the life span of man - Menopause in men!
- Hundreds of millions of spermatozoa are produced daily - two months to leave body
- Requires Testosterone and lower temperature than normal body temperature
- Has a life of 48-72 hours in the female genital tract
Testosterone: As a Possible Male Contraception

- Testosterone as a male contraceptive-
  - Administered testosterone suppresses the LH production by negative feedback
  - Suppression of LH results in suppression of production of endogenous testosterone
  - If dose of administered testosterone is enough to sustain the other testosterone dependant function, but low enough to stimulate spermatogenesis - contraception is achieved
  - Still under exploratory stage
Female Reproductive Tract: Anatomy

- Fallopian Tubes
- Ovaries
- Uterus
- Cervix
- Vagina

Public Domain
Female Reproductive Tract: Ovaries

- Equivalent of testis in males

- At three months gestation contain all potential gametes required to produce ovum throughout the reproductive life span of the women

- Secretes female reproductive hormones estrogen and Progesterone
Oviducts (Fallopian Tubes)

- Equivalent of vas deferens in males
- Transports ovum from the ovary to uterus
- Site of fertilization between ovum and sperm
- Site for female sterilization
Female Reproductive Tract

- **Uterus**
  - Site of implantation of fertilized ovum if pregnancy occurs
  - Site of placement of various intra-uterine devices for prevention of pregnancy

- **Cervix** the lower most part of uterus
  - Biological valve - mucus can be monitored
  - Hormonal contraceptives thickens the mucus secretions from cervix to block sperms entering the uterus
The Hormonal Basis of Female Reproduction

- Menstrual cycle
  - Monthly cyclical changes in ovulating women
  - Repeated with a mean of 28± 7 days
  - Begins with the first day of vaginal bleeding and ends on the day prior to the first day of vaginal bleeding of the next cycle
Menstrual Cycle

- Release of ovum from the ovary (ovulation) divides the cycle into 2 phases:
  - Follicular phase: Phase before ovulation
  - Luteal phase: Phase after ovulation
- Regulated by ovarian and anterior pituitary hormones
Follicular Phase

- Maturation of Graffian follicle containing ovum
- **Early follicular phase:** Rising FSH and LH levels and low estrogen and progesterone levels
- **Late follicular phase:** Rising estrogen levels slowly initially, then rapidly
- $14 \pm 2$ days, variable.
Ovulation

- Occurs about the middle of the cycle in a 28 days cycle, may be late if follicular phase is longer
- Follows a mid-cycle surge of estrogen, LH and FSH levels
- Hormonal contraceptives inhibit ovulation by interfering with this mid-cycle surge in estrogen and LH
Luteal Phase

- Secretion of progesterone (from corpus luteum) which prepares endometrium (uterus) for pregnancy if it occurs
- 14 ± 2 days, much less variable
- No pregnancy: The levels of estrogens and progesterone fall \( \Rightarrow \) onset of bleeding
- Pregnancy: Implantation of fertilized zygote in the uterus \( \Rightarrow \) no bleeding

Continued
Safe Period and Fertile Period

First day of cycle

Ovulation: 14th day of cycle

Last day of cycle

Safe Period

Fertile Period (7-10 days)

Safe Period

Continued
Safe period and Fertile Period

- Woman is at risk of pregnancy for about 1/3 of days during menstrual cycle
- Scientific basis: Ovulation occurs about 14 days (± 3 days) prior to the start of the next menstrual cycle. The life of ovum is 1 day and of sperm 3 days.
- Safe period: cannot get pregnant
Fertile Period

- Length: 7 to 10 days in a 28 day cycle.
- Timing: May change according to the length of the menstrual cycle
- Calendar Rhythm
- Mucus Observation
- Basal Temperature Rise
This concludes this lecture. The key concepts introduced in this lecture include:

- Anatomy and physiology of male and female genital tract
- The hormonal basis for reproduction in men and women
- Menstrual cycle and ovulation in women
Contraception

Module 10b
Learning Objectives

Upon completion of this module, the student will be able to

- Describe the mechanism of action, advantages and disadvantages of different contraceptive methods
Methods of Contraception

- **Traditional methods**: Withdrawal, Calendar rhythm

- **Modern methods**:
  - **Permanent methods**: Female sterilization (tubectomy), male sterilization (vasectomy)
  - **Non-permanent methods**: Condom, mucus, oral pills, IUD, injectables etc.
Non-permanent Methods

Non- intercourse related:
- Hormonal: OC, injectables, implants
- Intrauterine devices: Medicated or non-medicated

Intercourse related
- Barriers: physical (condom/diaphragm) or chemical (spermicides)
- Natural
- Post-coital methods
# Modern Methods of Contraception

## Something for Everyone

<table>
<thead>
<tr>
<th>Injection</th>
<th>Norplant</th>
<th>Pills</th>
</tr>
</thead>
<tbody>
<tr>
<td>IUD</td>
<td>Abstinence</td>
<td>Diaphragm and Cap</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>Emergency Contraceptive Pills</td>
<td>Natural Family Planning</td>
</tr>
</tbody>
</table>

## Prevent AIDS and STDs

- Male Condom
- Female Condom

## Permanent Methods

- Vasectomy
- Tubal Ligation
Combined Oral Contraceptives

- Contain low doses of two hormones: estrogen and progesterone

- How do they work?
  - Inhibit ovulation
  - Thicken cervical mucus

- How effective?
  - Typical use (as commonly use)- 6-8 % pregnancy rate
  - Perfect use - 0.1% pregnancy rate
Combined Oral Contraceptives

- **Advantages**
  - Safe, effective and reversible
  - Can be used at any age (adolescence to menopause)

- **Potential health benefits**
  - Prevent/reduce iron deficiency anemia
  - Reduce risk of Pelvic Inflammatory disease
  - Reduced risk of uterine /ovarian cancer
Combined Oral contraceptives (cont.)

- **Disadvantages:**
  - Have to be taken daily
  - Reduce milk supply- not recommended postpartum

- **Health risks**
  - Increased risk of Myocardial infarction, stroke, venous thrombosis
  - Equivocal evidence of increased risk of breast and cervical cancer
Barrier Methods

Female Condom

Male Condom

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Condoms

- Create physical barrier that block sperm entry into vagina
- **Effectiveness**: 6-18% failure rate on typical use, 2-3% on perfect use
- **Advantages**: safe and reversible, protection against STDs including AIDS, protection against cervical cancer
- **Disadvantages**: High failure rates
Female Condoms

- Introduced in 1992
- A female controlled method
- Limited availability
- Expensive

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Intra-Uterine devices (IUD)

- Can be Non-medicated (Lippes Loop) or medicated (copper IUDs)
- How do they work?
  - Interferes with the transport of ovum to uterus
  - Interferes with implantation
- How effective?
  - 1-6% failure rate varying with the type of IUD
Intra-uterine Devices (IUD)

- **Advantages:**
  - Long term action (T-380 - the most common type of IUD is effective up to 10 years, good for spacing
  - Can be inserted by paramedical workers after some training
  - Reduced risk of ectopic pregnancy

- **Side effects and health risks:**
  - Increased bleeding and pain
  - Increased risk of PID/ infertility, perforation of uterus
Injectable Contraceptives

- Long acting progesterones- can be once/month or once/3 months
- Inhibit ovulation and thickens cervical mucus
- Effectiveness: Failure rates less than 1%
Injectables (cont.)

- Advantages: reduced risk of endometrial/ ovarian cancer
  - Reduced risk of pelvic inflammatory disease, anemia and ectopic pregnancy
  - Can be used by breast-feeding women
  - Can be delivered by para-medical workers after some training
- Disadvantages: menstrual irregularity- may be a serious side-effect in some cultures
  - Equivocal evidence of increased risk of breast and cervical cancer
Subdermal Implants (Norplant)

- Long acting, low dose, progestin only contraceptive
- Delivered by means of six Silastic capsules implanted subdermally in the arm by a minor surgical technique
- Needs to replaced every 5 years
- Effectiveness- Failure rates are less than 1%

Continued
Subdermal Implants (Norplant)

- Acts by inhibiting ovulation
- Advantages:
  - All health benefits as that of injectables
  - Can be used by breast feeding women
- Disadvantages: provider controlled
  - Needs medical personnel to deliver and to remove
Male and Female Sterilization

- Male Sterilization (vasectomy)
  - Interrupting the sperm transport through the vas deferens
  - Result: no sperm in ejaculate

- Female Sterilization (tubectomy)
  - Interrupts egg and sperm transport through the fallopian tubes
  - Egg and sperm cannot meet
Emergency Contraception

- Also called post-coital or “morning after” contraception
- Used after having an unprotected sex to prevent pregnancy
- Has to be taken within 72 hours of unprotected sex

<table>
<thead>
<tr>
<th>Within 72 hrs of unprotected intercourse</th>
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<tbody>
<tr>
<td>![Diagram of dosage intervals]</td>
</tr>
</tbody>
</table>

12 hours

Repeat Dose

Continued
Emergency Contraception

- The following hormonal methods can be used for emergency contraception:
  - 4 low dose tablets of combined oral contraceptives followed by another dose 12 hours later.
  - 2 “standard dose” combined oral contraceptives followed by another equal dose 12 hours later.
  - 20-25 Progestin-only OC, and then take another equal dose 12 hours later.
This concludes this lecture. The concepts introduced in this slide are:

- Traditional methods of contraception
- Modern methods of contraception
- Mechanism of action, advantages and disadvantages of different methods of contraception