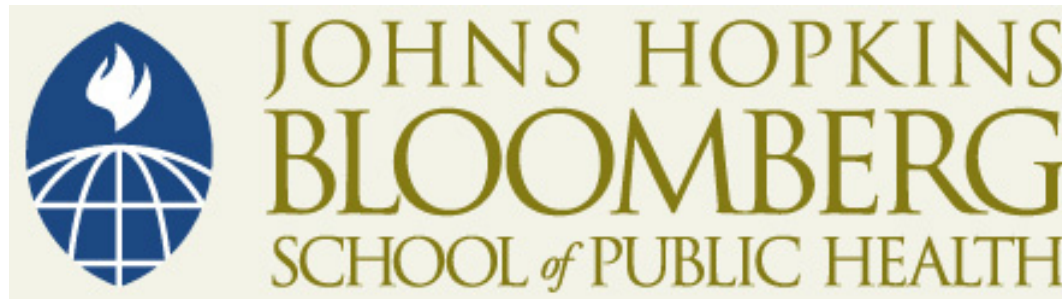


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# Anatomy and Physiology of Human Reproduction

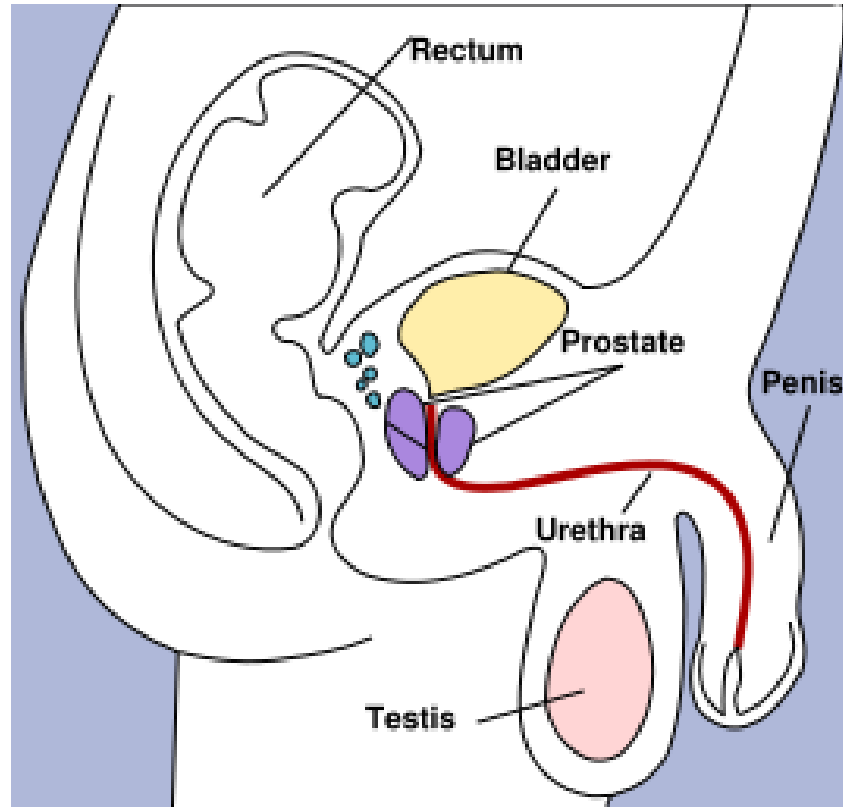
Module 10a

# 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



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# Male Reproductive Anatomy

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

*Continued*

# 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

*Continued*

# 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



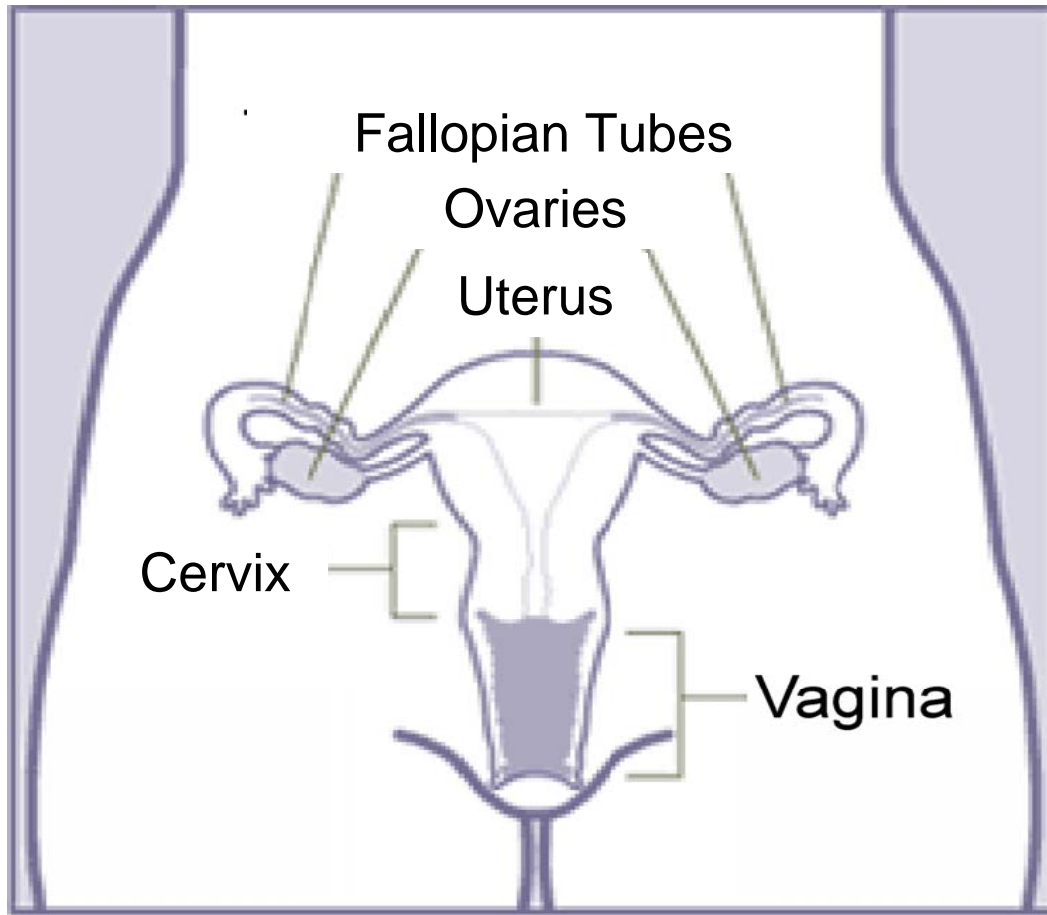
# Production of Sperm

- ◆ 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 feed back
  - 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



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# 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

*Continued*

# 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

*Continued*

# 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  $28 \pm 7$  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

*Continued*

# 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

*Continued*



# 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.

*Continued*

# 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

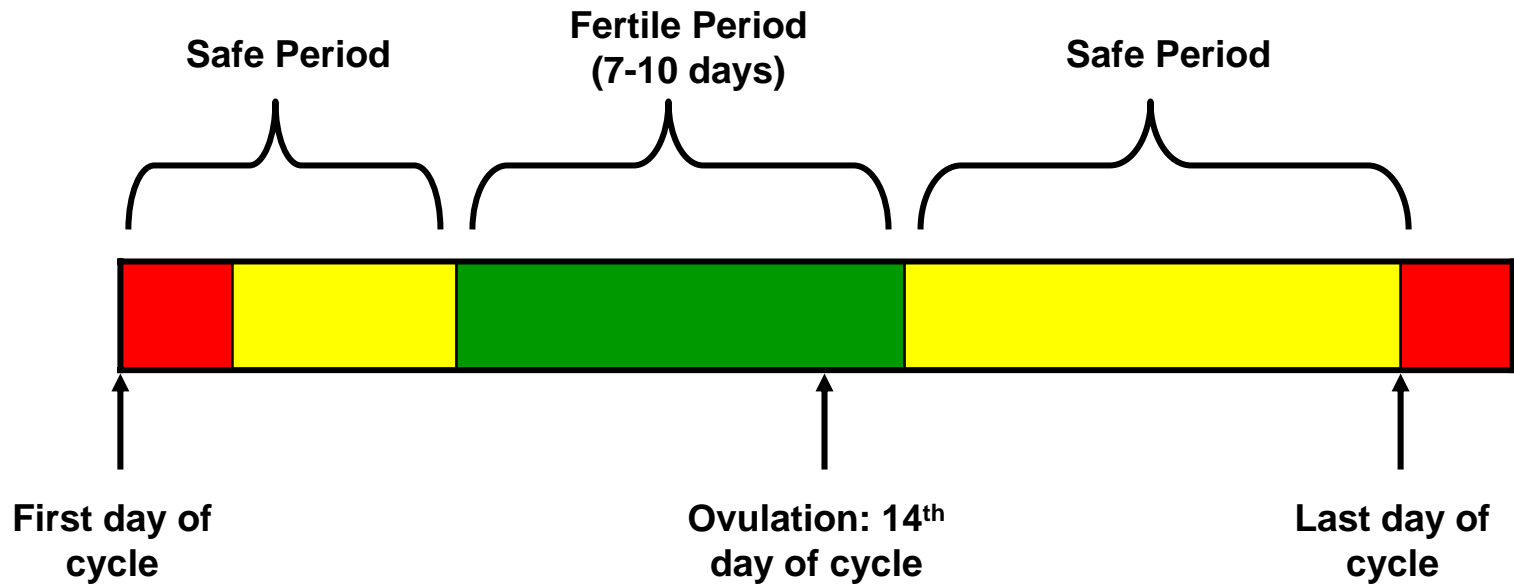
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# Luteal Phase

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

*Continued*

# Safe Period and Fertile 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 ( $\pm$  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

*Continued*

# 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

# Summary Slide

- ◆ 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		
Injection	Norplant	Pills
IUD	Abstinence	Diaphragm and Cap
Breast-feeding	Emergency Contraceptive Pills	Natural Family Planning

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



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## 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 be 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

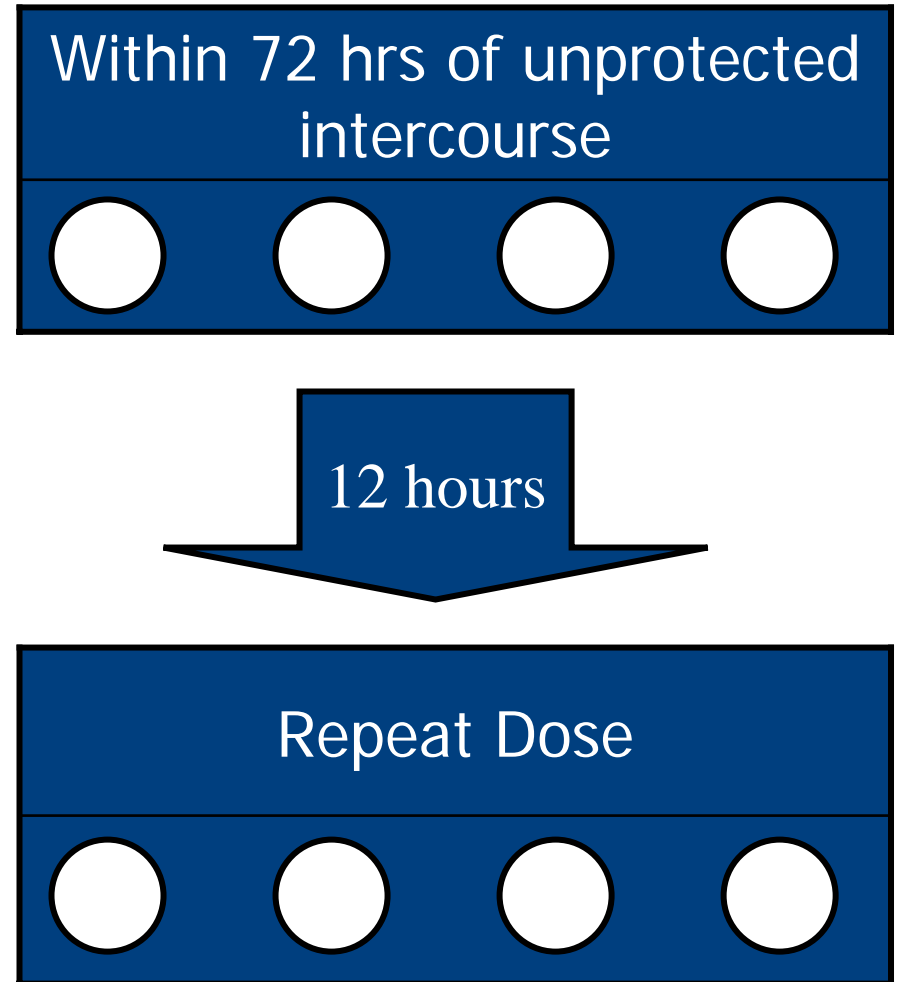


# Male and Female Sterilization

- ◆ 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



*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

# Summary Slide

- ◆ 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