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Theme: Reproduction in organisms

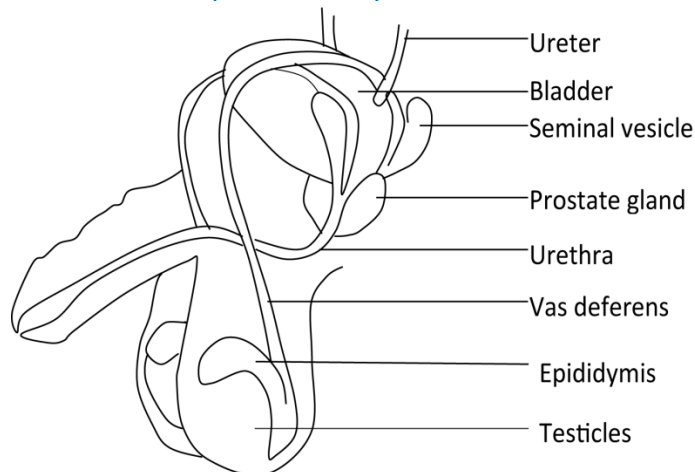
S4 New Curriculum Biology-Chapter 3– Sexual reproduction in animals

Reproduction is a process by which mature living organisms give rise to individuals of their own kind.

Reproduction in humans

Reproduction in human being involves a male and female. They have male and female reproductive system. These produce and allows fusion of male and female sex cells.

Human male reproductive system



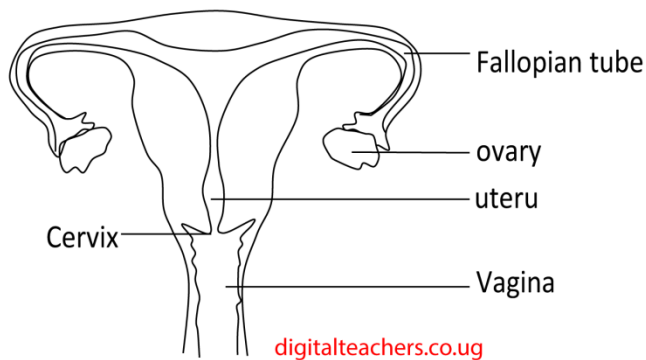
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Functions of parts of male human reproductive system

- **Testes (singular –testis):** These are two oval shaped structures. They are responsible for production of sperms and male sex hormone called testosterone
- **Epididymis:** This is highly coiled tube that connects the testes and vas deferens. It is a site where sperms mature and develop ability to swim. Mature sperms are also stored here until ejaculation
- **Vas deferens or sperm duct:** it is along tube which conducts sperms from the testes to the prostate gland.
- **Seminal vesicle:** It secretes a mucus-like fluid which protect and nourishes the sperms. It also produces a prostaglandin that triggers uterine contractions.
- **Prostate gland:** It secretes an alkaline fluid that neutralizes vaginal acids. This helps to maintain viability of the sperms.

- **Cowper's gland (Bulbourethral glands):** These are a pair of pea-sized glands located around the urethra just before it leads into the penis. It secretes a fluid that neutralizes the acidity along the urethra.
- **Urethra:** It is a narrow tube that runs through the penis. It conducts sperm and semen from the prostate gland to outside of the body. It is also used to convey urine hence said to be urino-genital.
- **Penis:** It is an organ made up of erectile tissue muscle and numerous blood capillaries. During sexual stimulation, the erectile tissues fill with blood making it firm and erect. It transfers sperm to the vagina of the female during copulation.
- **Prepuce or foreskin:** These are folds of skin that cover the tip of the penis. It protects the penis from friction and dryness. It is removed during circumcision.
- **Glans penis:** It is the tip of the penis covered by the prepuce. It is highly connected with nerve endings making it highly sensitive for arousal during sexual intercourse.

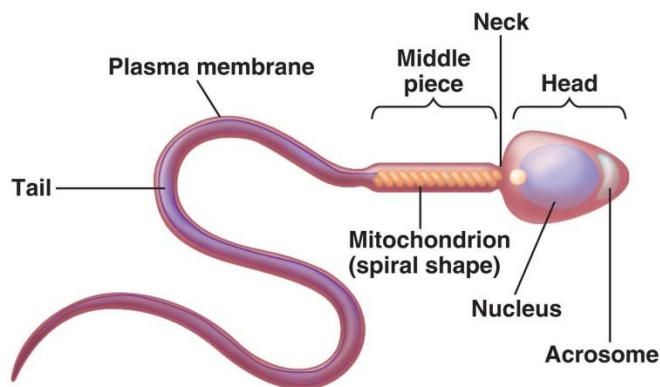
Female reproductive system



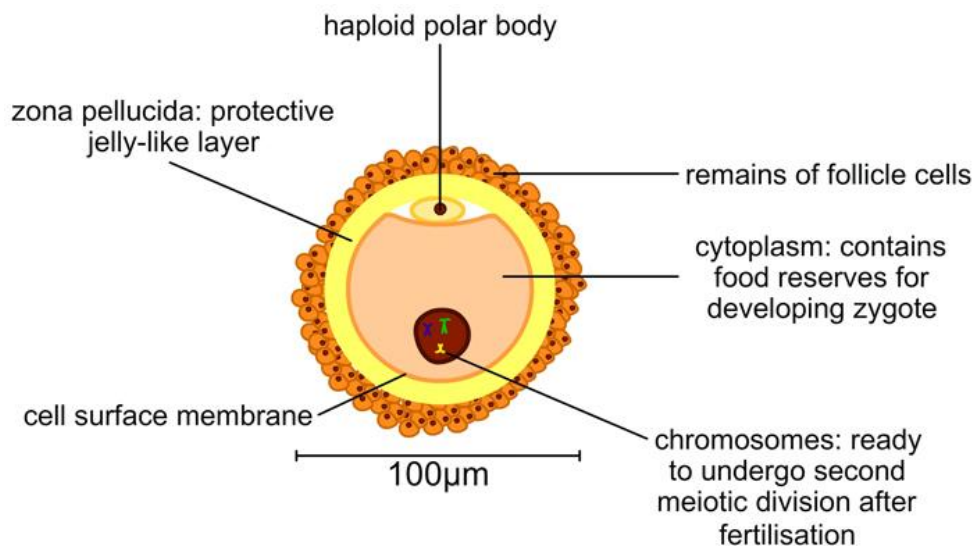
Functions of parts of the female reproductive system

- **Valva:** These are external female reproductive structures that protect the female urethra and the entrance to the female reproductive tract (vagina). The vulva also has vestibular glands that produce mucus to lubricate the penis during intercourse.
- **Vagina:** It is an elastic, muscular canal leading from the valve to the cervix. It is where sperm are deposited and where the baby passes through during delivery hence is referred to as birth canal.
- **Uterus (womb):** It is a pear-shaped muscular organ that is located above the vagina. The uterus is where a foetus develops during gestation.
- **Cervix:** It is a ring of muscles found and protect the entry of the uterus.
- **Fallopian tubes (oviducts):** They connect the ovary to the uterus and conduct the egg(s) from the ovary to the uterus. Also, Fertilization takes place in the Fallopian tubes.
- **Ovaries:** produce the eggs and female hormones, oestrogen and progesterone.

Structure of the sperm



Structure of an ovum



Fertilization

This is the union of the male and female gametes. It occurs about a third of the way along the oviduct. After fertilization, the zygote is pushed down the oviduct by gentle contraction of the circular muscle in oviduct wall. Once the egg has been successfully fertilized, conception is achieved. The embryo then develops into a foetus. The period taken between conception to delivery varies from species to species, in human it is 9 months. Within a few days of implantation, nourishment of the embryo is taken over by the placenta.

The menstruation/ sexual/ oestrus cycle

This cycle found in female; ensures that female reproductive physiology events are synchronised. For the uterus prepares itself for implantation before ovulation.

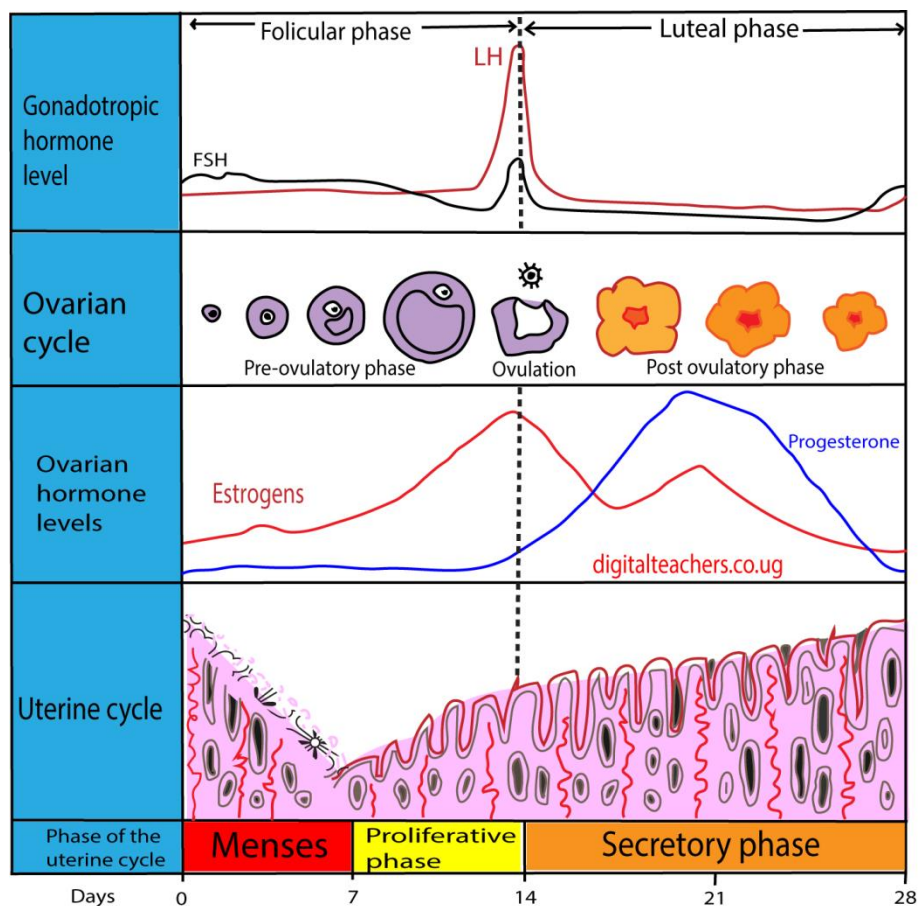
The events that occur in the course of the cycle follow a set of regulated pattern by hormones which are produced by the pituitary gland and the ovary. A complete cycle takes about 28 days. If pregnancy occurs the cycle is interrupted by other hormones produced by the placenta. The woman is most likely to get pregnant between 12th and the 17th day from the onset of menstruation.

Hormonal control of the cycle

Pituitary hormones secreted by the anterior lobe of pituitary gland are Follicle stimulation hormones (FSH) and luteinising hormone (LH).

Ovarian hormones produced by the ovary are oestrogen and progesterone.

The menstrual cycle of the human female showing the events occurring in ovary together with relative levels of oestrogen and progesterone.



1. Just after menstruation, the anterior lobe of the pituitary gland starts secreting FSH.
2. FSH cause a Graafian follicle to develop in the ovary to secrete oestrogen.
3. Oestrogen
 - brings about the healing and repair of the uterine endometrium following menstruation.
 - inhibits production of FSH
 - stimulates production of LH.

In the course of 11 days or so the amount of oestrogen in blood stream steadily increases. Then shortly before ovulation takes place, LH is released.

4. LH
 - causes ovulation
 - promotes development the Graafian follicle into a corpus luteum to secrete progesterone
5. The corpus luteum secretes progesterone.
6. Progesterone
 - This along with oestrogen, causes the continued thickening and vascularization of the uterine endometrium in preparation for implantation.
 - Inhibits secretion of LH leading to degeneration of corpus luteum
7. For a week or so after ovulation the concentration of progesterone and oestrogen gradually increase and then suddenly decrease.
8. With the fall in the levels of the two hormones, the uterine endometrium begins to disintegrate and menstruation starts and the cycle repeat.

In the events of pregnancy

Implantation

Following fertilisation, the zygote divides (cleavage) mitotically until a hollow ball of cells, the **blastocyst** is produced. It takes three days to reach the uterus and a further three or four days to become implanted in the lining of the uterus. The outer layer of the blastocyst, called the **trophoblast**, develops into embryonic membranes, the **chorion** and **amnion**.

The chorion develops villi which grow into the surrounding uterine tissue from which they absorb nutrients. These will form part of the **placenta** which is connected to the foetus by the umbilical cord.

The amnion develops as a membrane around the foetus and encloses the amniotic fluids, a watery liquid which protects the foetus by cushioning it from physical damage.

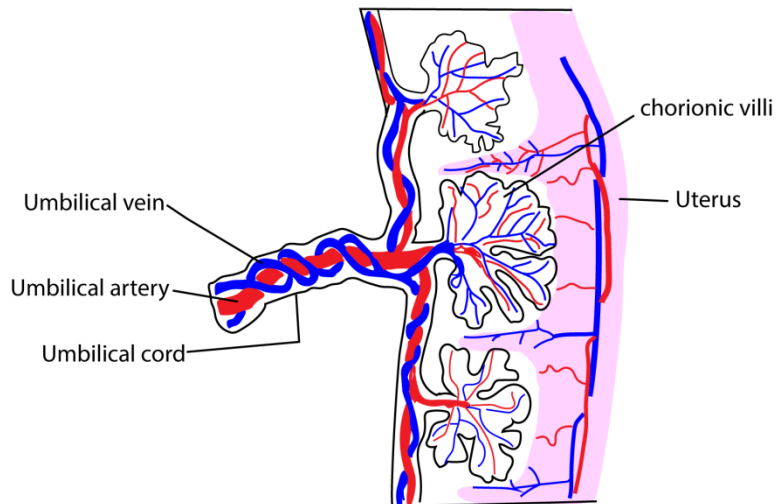
The corpus luteum persist due to the secretion a hormone called **chorionic gonadotrophin** by the placenta. This hormone signals to the mother's body that an embryo is present in the uterus.

The corpus luteum continues to secrete progesterone which coupled with small but steady secretion of oestrogen, maintain the continued development of the uterus and prevents menstruation.

After the first three or four months of pregnancy, the corpus luteum begins to regress and the job of secreting oestrogen and progesterone is taken over by the placenta.

In this way, the endometrium is maintained in a suitable state throughout pregnancy.

Placenta



Structure Placenta

is a disc-like **structure** embedded in the uterine wall. It contains villi on the side of the embryo. It contains blood spaces, on mother's side, which surround the villi.

Functions of the placenta

1. It allows exchange of materials between the mother and foetus without the two-blood mixing
2. Oxygen, water, amino acid, glucose and other essential minerals are transferred from the mother to the foetus
3. Carbon dioxide, urea and other wastes are transferred from foetal blood to mother's blood.
4. Prevents certain pathogens from entering foetal blood
5. Produces HCG
6. It allows certain maternal hormones to cross to the foetus.

Adaptations of the placenta to its functions

1. Rich blood supply allow absorbs necessary nutrients and deliver waste products to mother's drug
2. Has villi that that increases surface area for exchange of material
3. Placental blood has high affinity for oxygen
4. Thin membrane reduce diffusion distance
5. High blood supply
6. Blood capillaries of the fetus and mother flow in opposite direction (counter current system) to maintain diffusion gradient.
7. Contain numerous mitochondria to provide energy for active transport.

Why should mother's and foetal blood not mix

1. To prevent blood incompatibility due to different blood group
2. To prevent incompatibility due to different rhesus factors
3. To prevent infections from the mother attacking the fetus
4. To protect the fetus from high blood pressure of the others blood

Internal fertilization

This is the union of male and female gametes to form a zygote inside female animal.

The advantages and disadvantages of internal fertilization

Advantages

- more chances of fertilization
- fewer predators of oval/fertilized egg protected in females body
- stable internal environment
- fewer gametes required
- eggs/foetus protected from dehydration
- The embryo is protected and nourished by female (mammals only)

Disadvantages

- number of gametes fewer hence less number of offspring
- less adapted for sudden change of environment after birth
- in mammals females suffer gestation stress

The hormonal control of birth

Towards the end of pregnancy, the levels of oestrogen in blood rises while that of progesterone falls. It has been suggested that this plays some part in bringing about birth. Indeed, oestrogen promotes uterine contraction whereas progesterone doesn't.

But the most direct cause of birth in another hormone, **oxytocin** secreted by the posterior lobe of pituitary gland that cause uterine muscle contraction.

Oestrogen and progesterone are also responsible for the growth of the mammary gland in preparation for milk production (lactation). After birth, milk flow is initiated by a hormone called **prolactin** secreted by the anterior lobe of the pituitary gland.

Breastfeeding

Breastfeeding is the natural process of feeding infants with milk produced by the mother's breasts. It provides essential nutrients, antibodies, and hormones that promote healthy growth and development.

Benefits of Breastfeeding

1. **Nutritional Benefits** – Breast milk contains the perfect balance of proteins, fats, vitamins, and minerals for infants.
2. **Boosts Immunity** – Antibodies in breast milk help protect babies from infections and diseases.
3. **Enhances Bonding** – Physical closeness during breastfeeding strengthens the emotional connection between mother and child.
4. **Aids Brain Development** – Breast milk supports cognitive development and reduces the risk of neurological disorders.
5. **Easier Digestion** – Breast milk is gentle on a baby's stomach, reducing colic and digestive problems.
6. **Lowers Risk of Chronic Diseases** – Breastfed babies have a reduced risk of obesity, diabetes, and allergies.

Benefits for Mothers

- Helps the uterus return to normal size faster.
- Reduces the risk of breast and ovarian cancer.
- Burns extra calories, aiding postpartum weight loss.
- Releases hormones that promote relaxation and bonding.

Challenges & Solutions

Some mothers may face difficulties like **low milk supply, sore nipples, or latching issues**. Consulting a lactation specialist, staying hydrated, and using breast pumps can help overcome challenges.

Antenatal medical care

Antenatal medical care refers to the healthcare and medical support given to a pregnant woman before childbirth. It is essential for monitoring both the mother's and the baby's health, preventing complications, and ensuring a safe pregnancy.

Importance of Antenatal Care

1. **Monitors Maternal Health** – Regular check-ups help detect and manage conditions like high blood pressure, diabetes, and infections.

2. **Fetal Growth Assessment** – Ultrasounds and physical examinations ensure the baby is developing properly.
3. **Nutritional Guidance** – Doctors provide advice on diet, vitamins (like folic acid), and lifestyle habits.
4. **Screening for Complications** – Tests for anemia, gestational diabetes, and genetic conditions help in early detection and treatment.
5. **Vaccinations & Medications** – Pregnant women receive necessary vaccines, such as tetanus, to protect both mother and baby.
6. **Birth Planning & Education** – Healthcare providers offer guidance on labor, delivery options, and newborn care.
7. **Mental & Emotional Support** – Counseling and support groups help manage anxiety, stress, and depression.

Health risks associated with teenage pregnancy

Teenage pregnancy poses several health risks for both the mother and the baby. Here are some of the key concerns:

Health Risks for Teenage Mothers

1. **High Blood Pressure & Preeclampsia** – Pregnant teens have a higher risk of developing pregnancy-induced hypertension, which can lead to complications.
2. **Anemia** – A lack of essential nutrients can result in low red blood cell count, causing fatigue and weakness.
3. **Preterm Labor & Birth** – Babies born to teenage mothers are more likely to be premature, leading to health challenges.
4. **Poor nutrition leading to nutritional deficiency:**
5. **Complications During Delivery** – Young mothers may experience difficulties due to underdeveloped pelvic structures, increasing the risk of cesarean section.
6. **Mental Health Challenges** – Anxiety, depression, and emotional stress are common due to social stigma and financial struggles.

Health Risks for Babies

1. **Low Birth Weight** – Babies born to teenage mothers often weigh less, increasing the risk of infections and developmental delays.
2. **Higher Infant Mortality Rate** – The chances of infant death are higher due to inadequate prenatal care.
3. **Long-Term Health Issues** – Babies may face respiratory problems, learning difficulties, and chronic conditions.

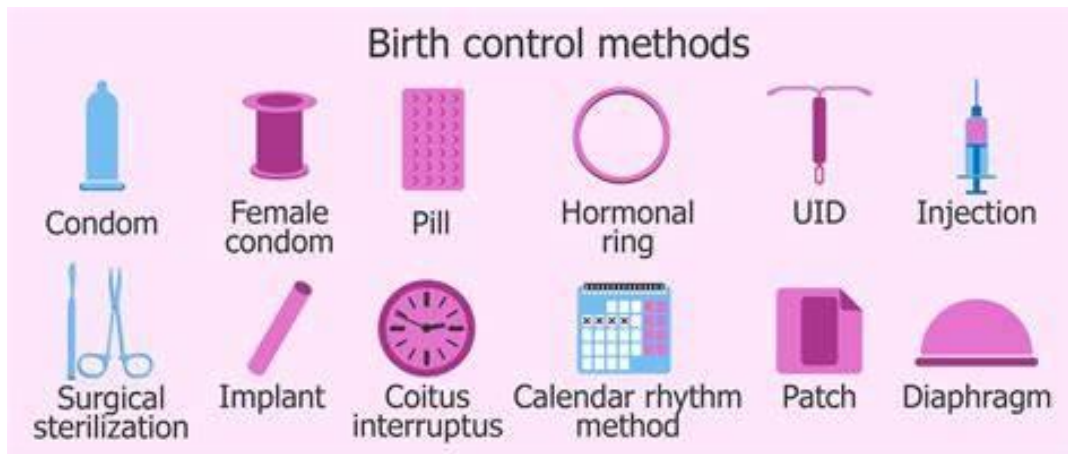
Preventive Measures

- **Access to Prenatal Care** – Regular check-ups help monitor health and prevent complications.
- **Proper Nutrition** – A balanced diet supports both mother and baby.
- **Education & Support** – Guidance on pregnancy management and emotional well-being is crucial.

Birth control

Birth control, also known as **contraception**, refers to methods used to prevent pregnancy. There are various types, each designed to suit different health needs and lifestyles.

Types of Birth Control



1. Barrier Methods

- **Condoms** – Prevent sperm from reaching the egg while also protecting against sexually transmitted infections (STIs).
- **Diaphragms & Cervical Caps** – Silicone or rubber devices that block sperm from entering the uterus.

2. Hormonal Methods

- **Birth control pills** – Taken daily to regulate hormones and prevent ovulation.
- **Hormonal patches** – Worn on the skin, releasing hormones to prevent pregnancy.
- **Injectable contraceptives** – Given every few months to suppress ovulation.
- **Implants** – Small devices placed under the skin that release hormones for long-term protection.

3. Intrauterine Devices (IUDs)

- **Hormonal IUDs** – Release hormones to prevent pregnancy for several years.
- **Copper IUDs** – Non-hormonal devices that create an environment unsuitable for sperm.

4. Permanent Methods

- **Tubal ligation** – Surgical procedure for women that blocks the fallopian tubes.
- **Vasectomy** – Surgical procedure for men that prevents sperm from being released.

5. Natural & Behavioral Methods

- **Fertility awareness** – Tracking ovulation to avoid pregnancy.
- **Withdrawal method** – Pulling out before ejaculation.
- **Abstinence** – Choosing not to have sexual intercourse.

6. Emergency Contraception

- **Morning-after pill** – Taken after unprotected sex to prevent pregnancy.
- **Copper IUD** – Can be inserted after sex to prevent fertilization.

Sexually transmitted diseases

Sexually Transmitted Diseases (STDs)—also known as **Sexually Transmitted Infections (STIs)**—are infections spread through sexual contact, including vaginal, anal, and oral sex. They can be caused by bacteria, viruses, or parasites.

Common STDs & Their Causes

1. Bacterial Infections

- **Chlamydia** – Often asymptomatic but can cause infertility if untreated.
- **Gonorrhea** – Can lead to pelvic inflammatory disease and complications in pregnancy.
- **Syphilis** – Develops in stages, with serious complications if untreated.

2. Viral Infections

- **HIV/AIDS** – Weakens the immune system, making the body vulnerable to infections.
- **Human Papillomavirus (HPV)** – Some strains cause genital warts; others increase the risk of cervical cancer.
- **Herpes (HSV-1 & HSV-2)** – Causes painful blisters and sores around the genitals or mouth.
- **Hepatitis B** – Affects the liver and can lead to serious complications.

3. Parasitic Infections

- **Trichomoniasis** – Causes irritation and discharge in both men and women.
- **Pubic Lice & Scabies** – Tiny parasites that infest the skin and genital area.

Symptoms of STDs

- Unusual discharge or odor
- Pain during urination or intercourse
- Genital sores, bumps, or rash
- Fever and fatigue (in some cases)

Prevention & Treatment

- **Use Protection:** Condoms greatly reduce the risk of transmission.
- **Regular Testing:** Early detection prevents serious health complications.
- **Vaccination:** HPV and Hepatitis B vaccines provide protection.
- **Medication:** Antibiotics treat bacterial STDs, while antivirals help manage viral infections.

STDs can be serious but are **preventable and treatable** with proper care.

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