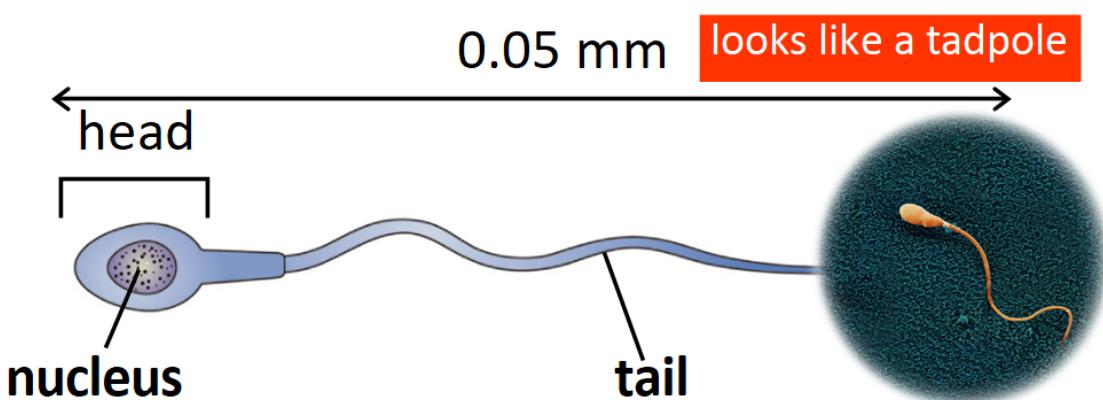


4.3 Human reproduction

- - one of the vital functions of all living things
 - Living things produce offspring 後代 to ensure the continuity of species.
- human sex cells
 - Humans reproduce by sexual reproduction
 - a male sex cell called sperm
 - a female sex cell called ovum (plural: ova) or egg.
- Sperms
 - has head & tail
 - look like a tadpole
 - nucleus
 - carries the genetic materials of the male parent (father)
 - tail
 - beats to allow the sperm to swim
-

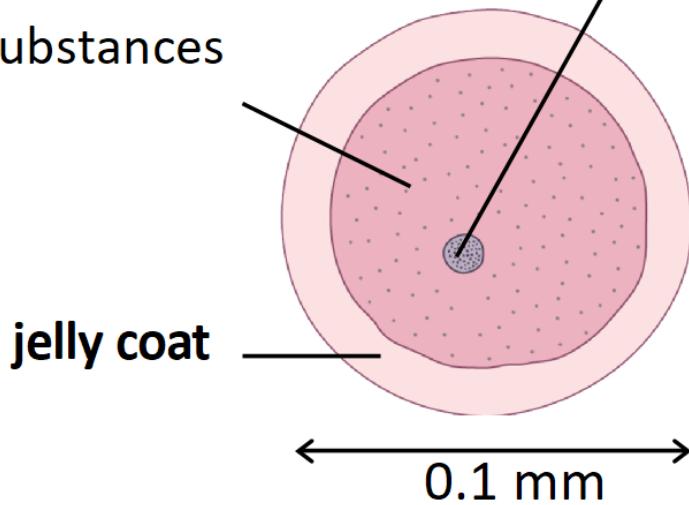


- Ovum / Ova / Egg
 - a spherical shape 球體
 - much larger than a sperm
 - surrounded by a jelly coat
 - nucleus
 - carries the genetic materials of the female parent (mother)
 - cytoplasm

- contains food substances
- cannot move
-

cytoplasm

- contains food substances



nucleus

- carries the genetic materials of the female parent (mother)

spherical shape



• Chromosomes in human sex cells

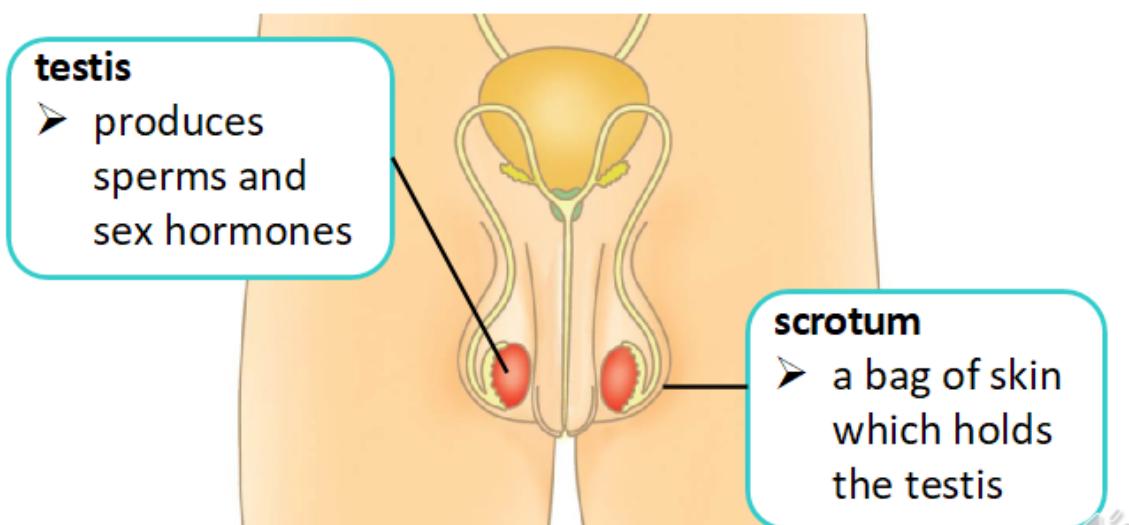
- sex chromosomes
 - sex chromosomes in female body cells → XX
 - sex chromosomes in male body cells → XY
- Sperms
 - formed from father's sperm-producing cells
 - During their formation, each pair of autosomes and the pair of sex chromosomes separate.
- Ova
 - formed from mother's ovum-producing cells.
 - During their formation, each pair of autosomes and the pair of sex chromosomes separate.
- a sperm and an ovum each carries 23 chromosomes.
-

	Male		Female	
	Body cell	Sex cell (sperm)	Body cell	Sex cell (ovum)
No. of chromosomes	46 (in 23 pairs)	23	46 (in 23 pairs)	23
No. of autosomes	44	22	44	22
Sex chromosomes	XY	half in number: X half in number: Y	XX	X

- Human reproductive systems

- Male reproductive system

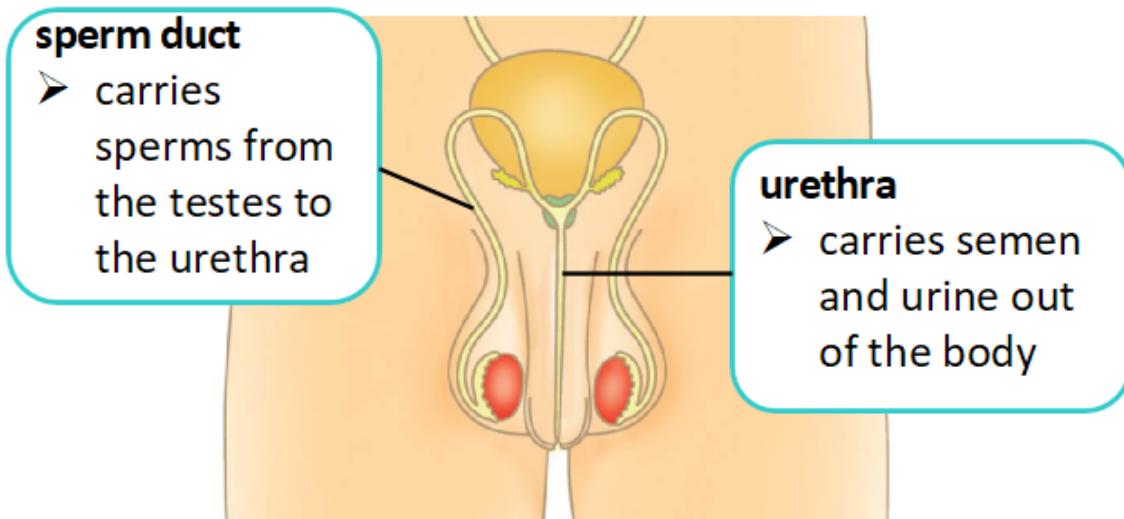
- sperms
 - produced in the testes (singular: testis) 睾丸
 - enclosed in the scrotum 陰囊
- testis 睾丸
 - produces sperms and sex hormones
- scrotum 陰囊
 - a bag of skin which holds the testis
-



- sperm ducts 輸精管
 - connect the testes to the urethra
 - carries sperms from the testes to the urethra
- urethra 尿道

- carries semen and urine out of the body

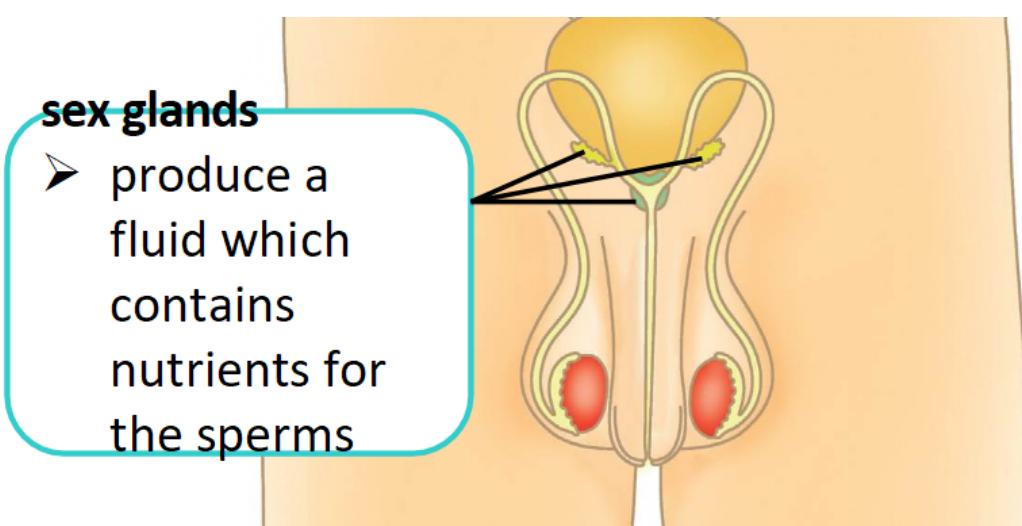
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- sex glands 性腺體

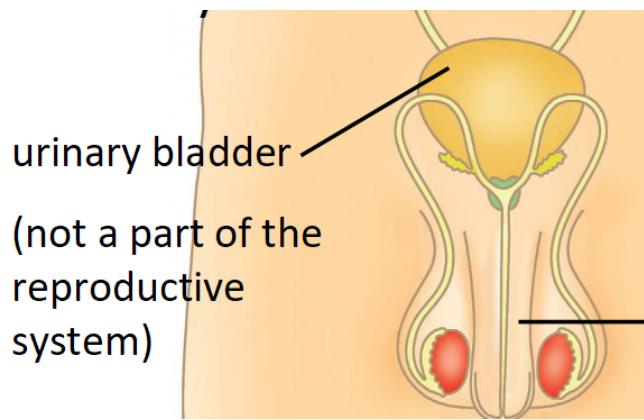
- When the sperms travel up the sperm ducts, they are mixed with a fluid from the sex glands
- produce a fluid which contains nutrients for the sperms
 - keep the sperms alive
- The sperms and the fluid together form the semen 精液
-

•



- penis 陰莖

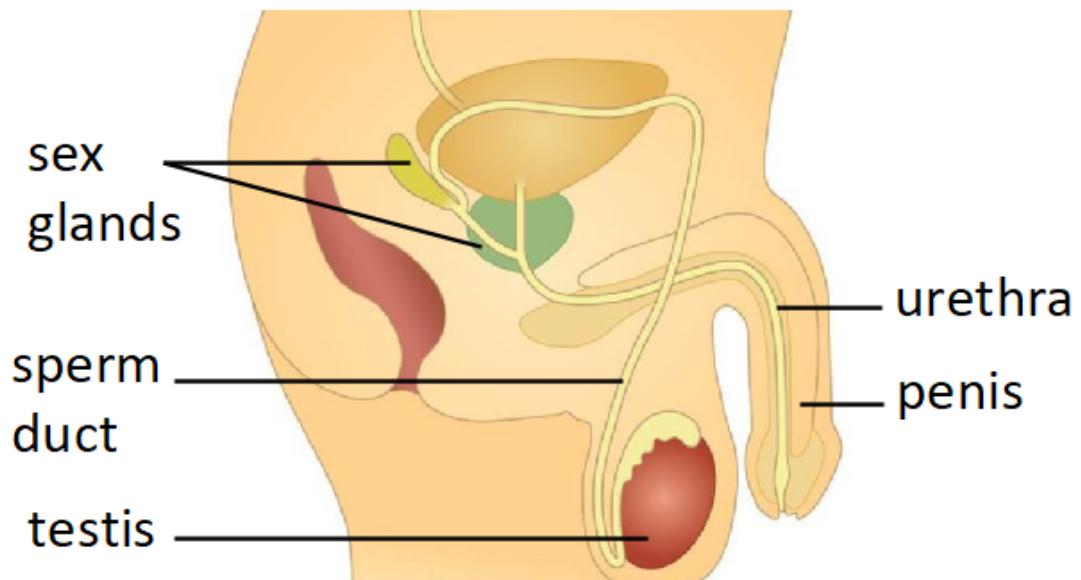
- The semen flows through the urethra to the tip of the penis & passed out of the body
- ejects semen to the female reproductive system during sexual intercourse
-



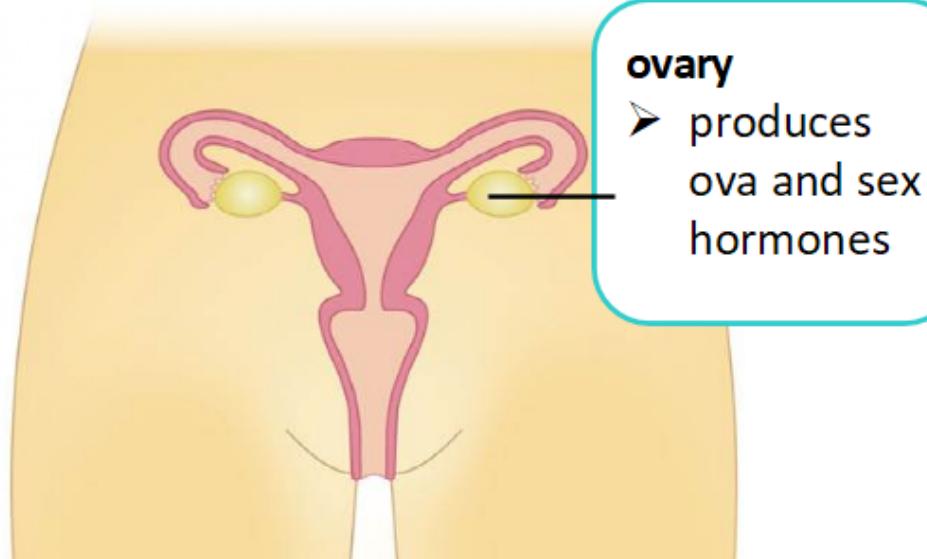
penis

- ejects semen to the female reproductive system during sexual intercourse

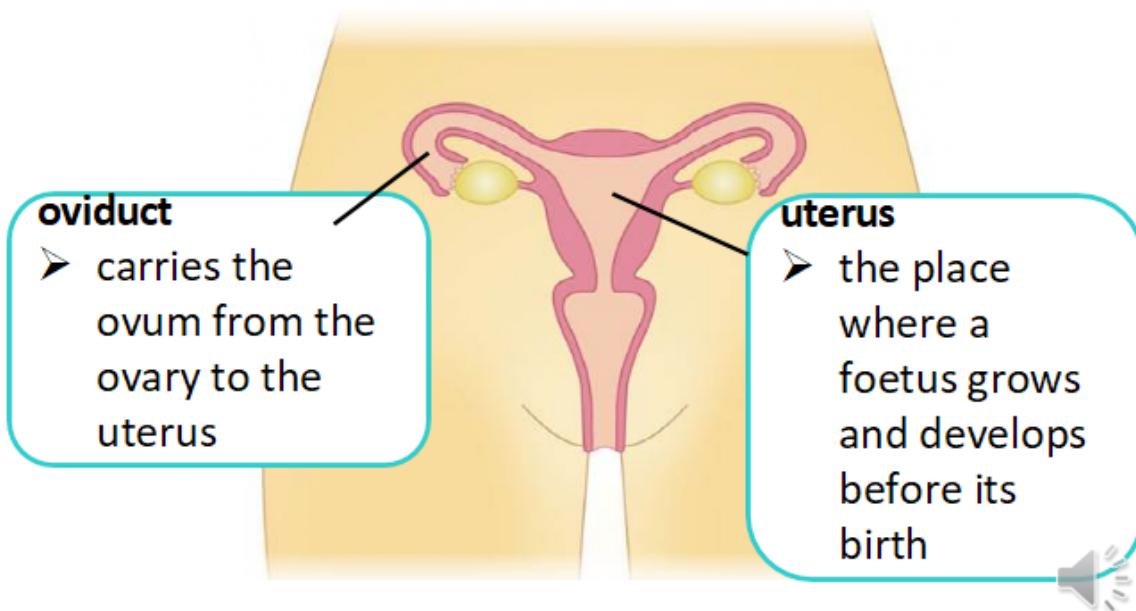
Side view of the male reproductive system



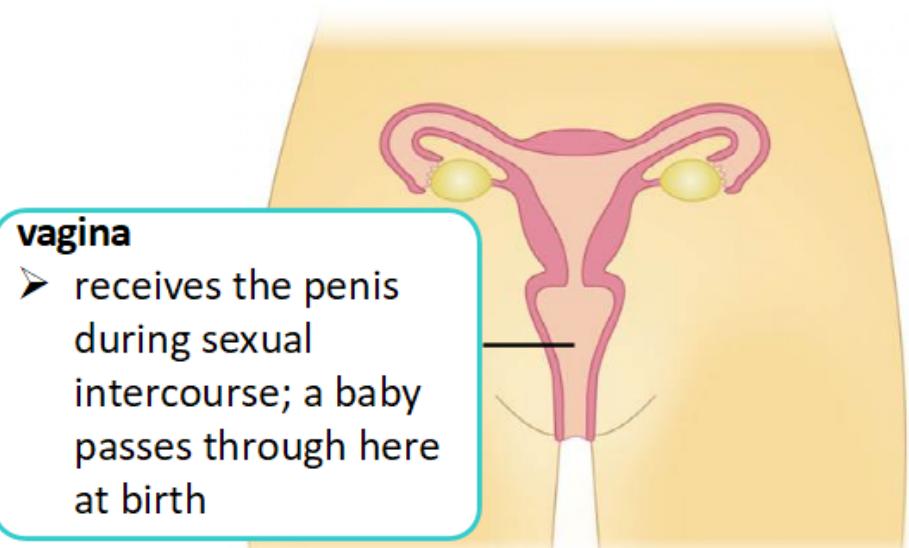
- Female reproductive system
 - ovaries (ovary) 卵巢
 - produces ova and sex hormones
 - Usually only one ovum is released into the oviduct each month
 - called ovulation 排卵
 - The ovum is then moved through the oviduct to the uterus
 -



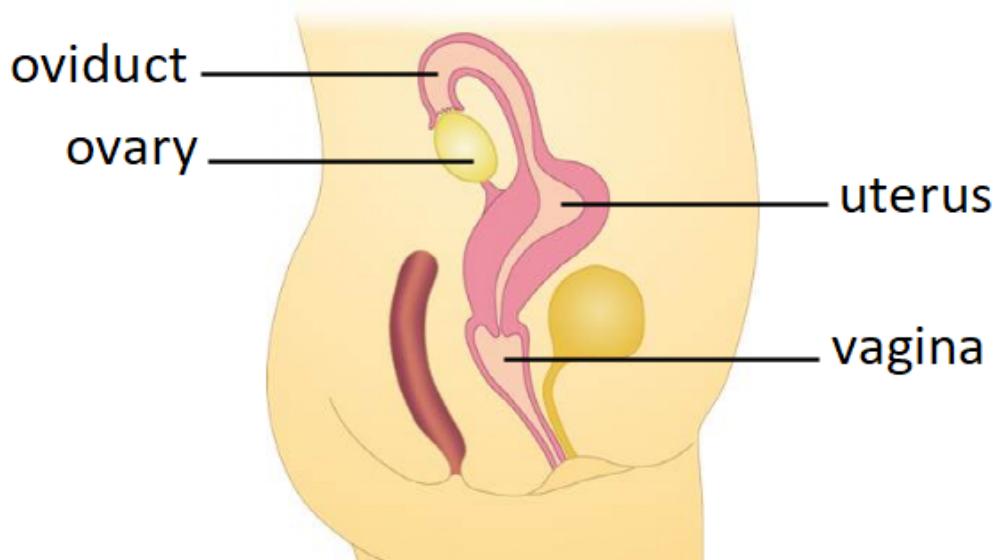
- oviduct 輸卵管
 - carries the ovum from the ovary to the uterus
- uterus 子宮
 - the place where a foetus grows and develops before its birth
-



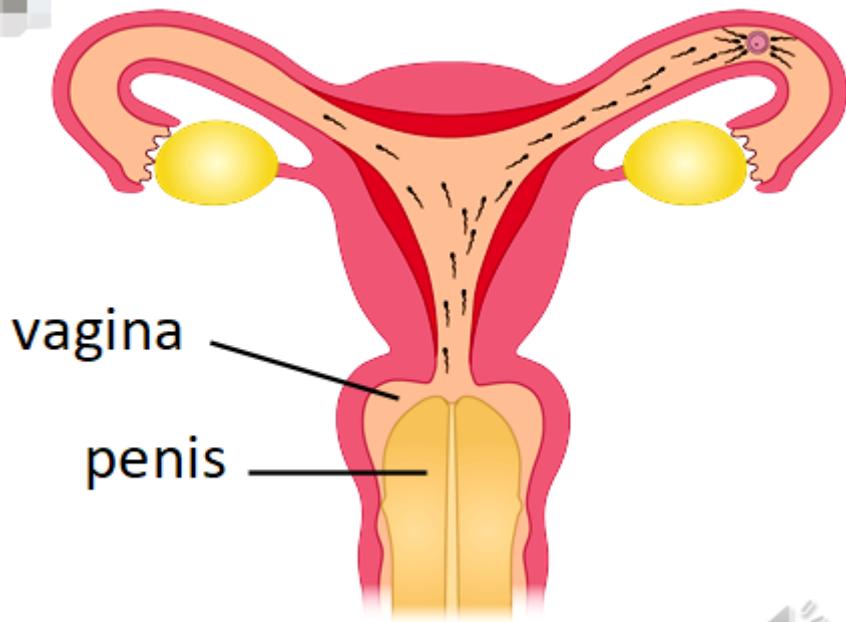
- vagina 阴道
 - The uterus opens to the vagina.
 - receives the penis during sexual intercourse; a baby passes through here at birth
 -



Side view of the female reproductive system

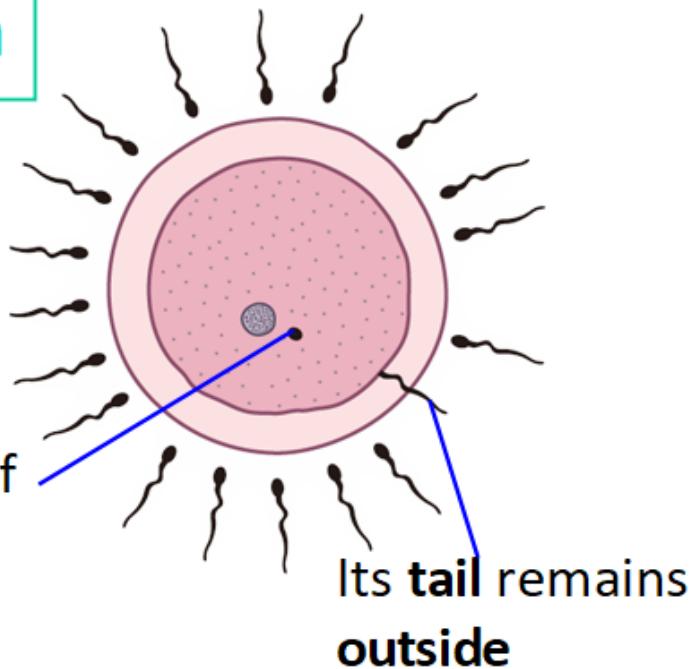


- Process of human reproduction
 - Fertilization 受精
 - A new life begins when a sperm fuses with an ovum.
 - sexual intercourse 性交
 - During sexual intercourse, the husband inserts his erect penis into the vagina of his wife.
 - Semen containing millions of sperms is ejected into the vagina.
 - Sperms swim up the uterus, and then enter the oviducts.



- If an ovum is present in the oviduct
 - one of the sperms may fuse with the ovum
 - form a zygote (also called a fertilized ovum)
-

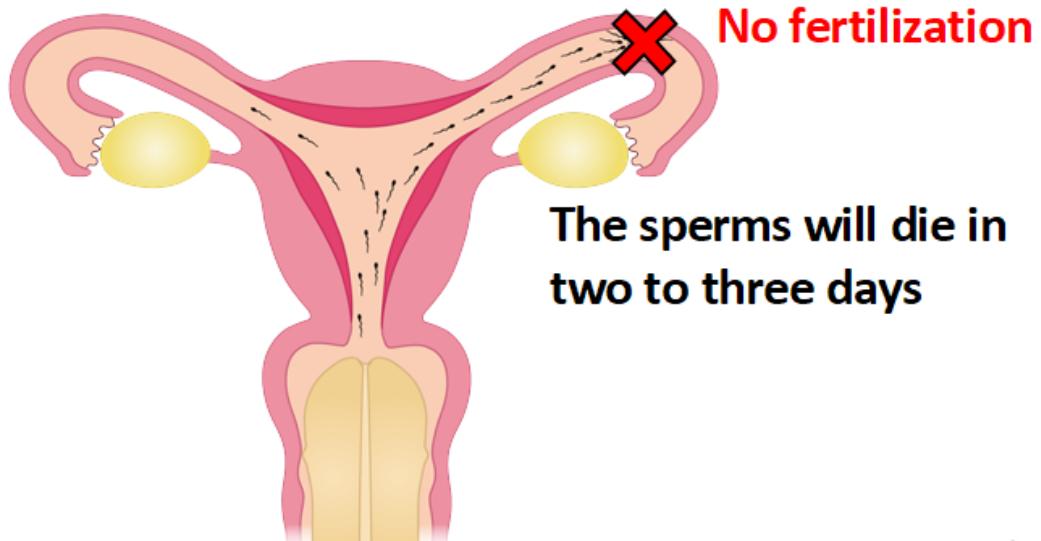
Fertilization



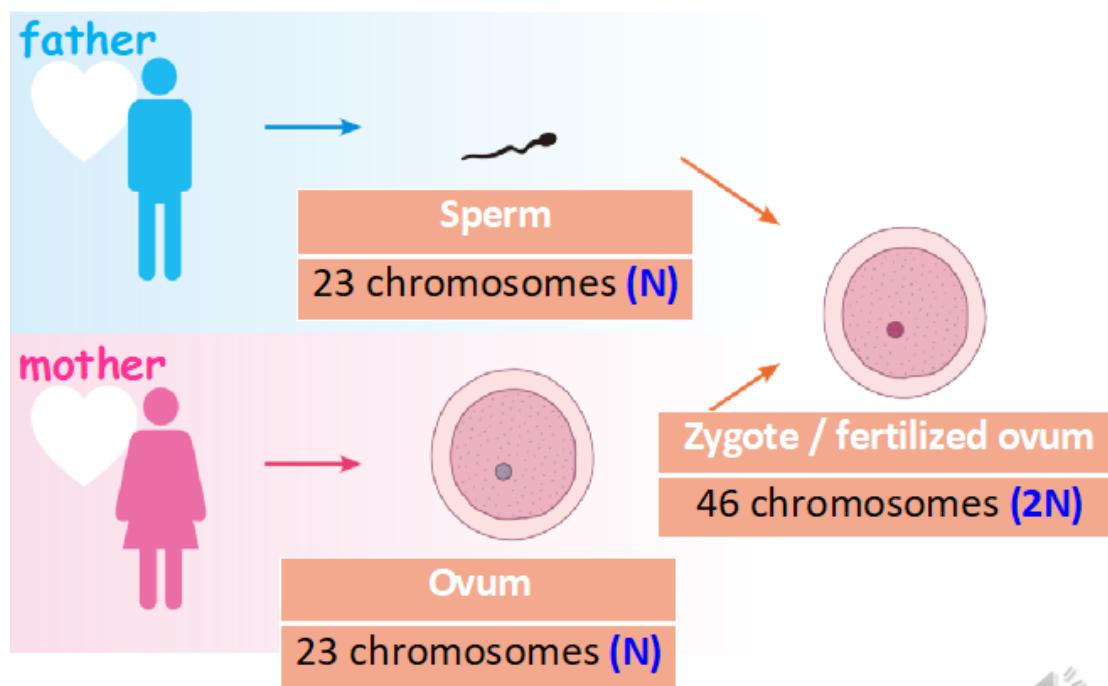
Only the **head** of sperm **enters** the ovum
Its **tail** remains **outside**

- The nucleus of the sperm fuses with the nucleus of the ovum to form a zygote.
- no ovum in the oviducts
 - sperms will die in two to three days

If there is no ovum in the oviducts...

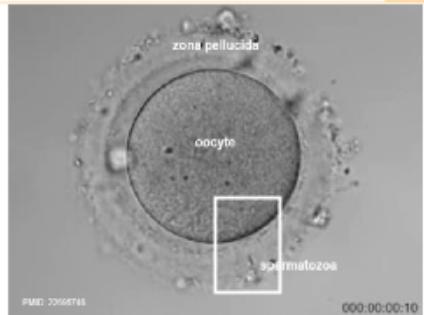
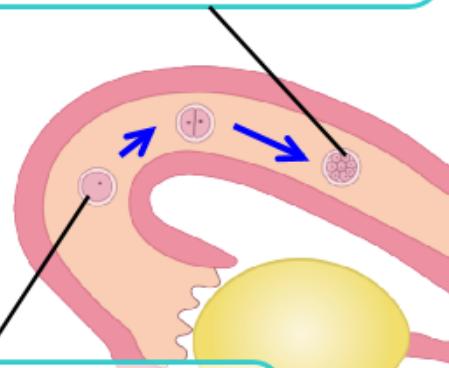


- chromosomes
 - The sperm and the ovum each carries 23 chromosomes (one set of chromosomes).
 - use 'N' to denote one set of chromosomes



- The zygote formed from fertilization carries 46 chromosomes (two sets of chromosomes).
- Implantation 植入
 - 1. After fertilization, a zygote is formed.
 - 2. The zygote divides and develops into an embryo

2 The zygote divides and develops into an **embryo**.



- 3. The embryo implants into the uterine lining (The woman is now pregnant)
 - embryo is moved through the oviduct to the uterus
 -

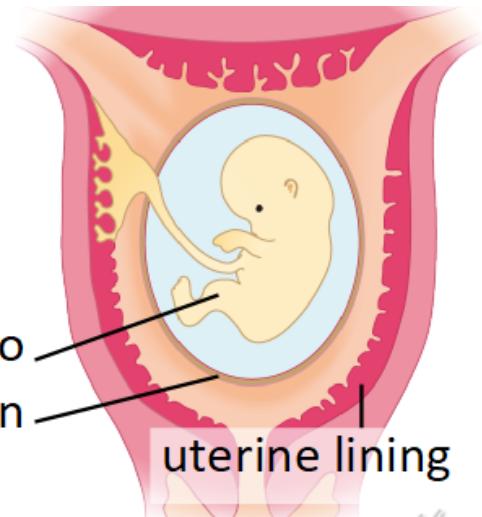
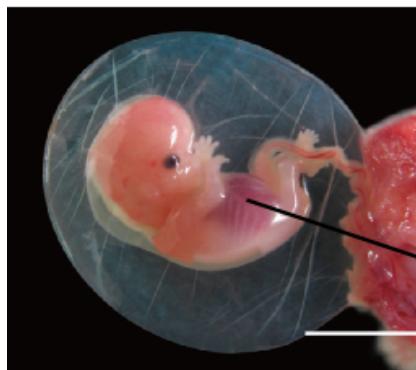
The woman is now pregnant.

embryo is moved through the oviduct to the uterus

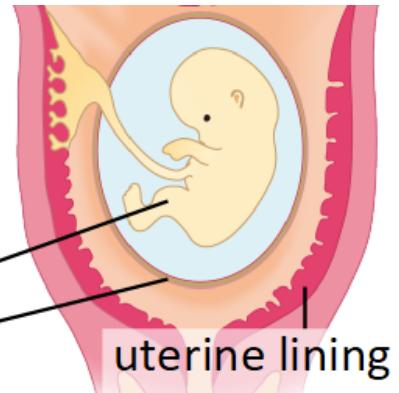
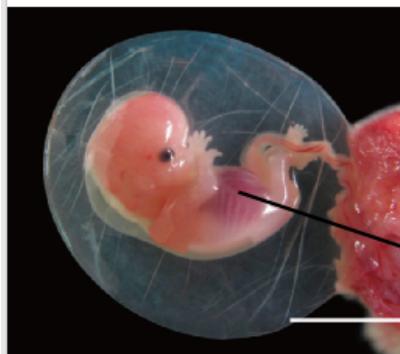
3 The embryo **implants** into the **uterine lining**.

uterine lining

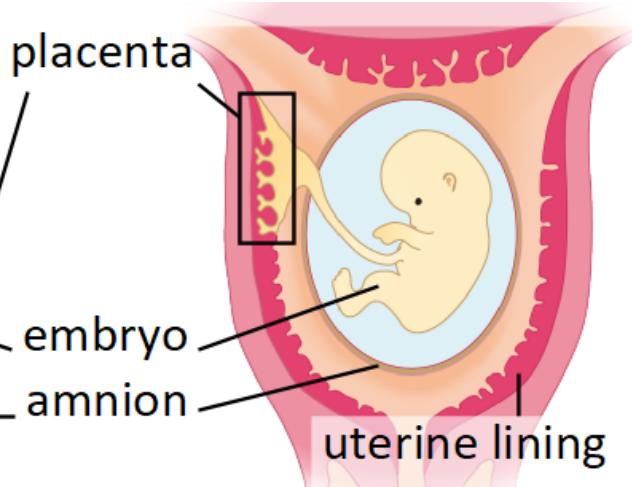
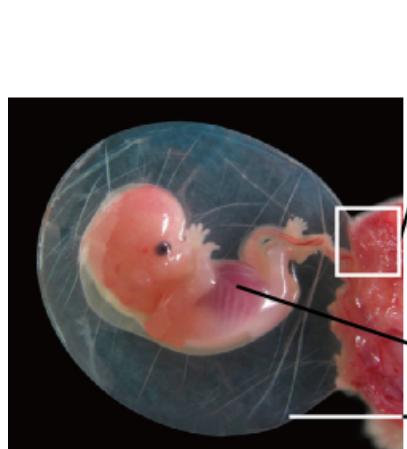
- Development of the embryo
 - After implantation, the embryo begins to develop in the uterus of its mother
 - develops inside a bag called the amnion 羊膜
 -



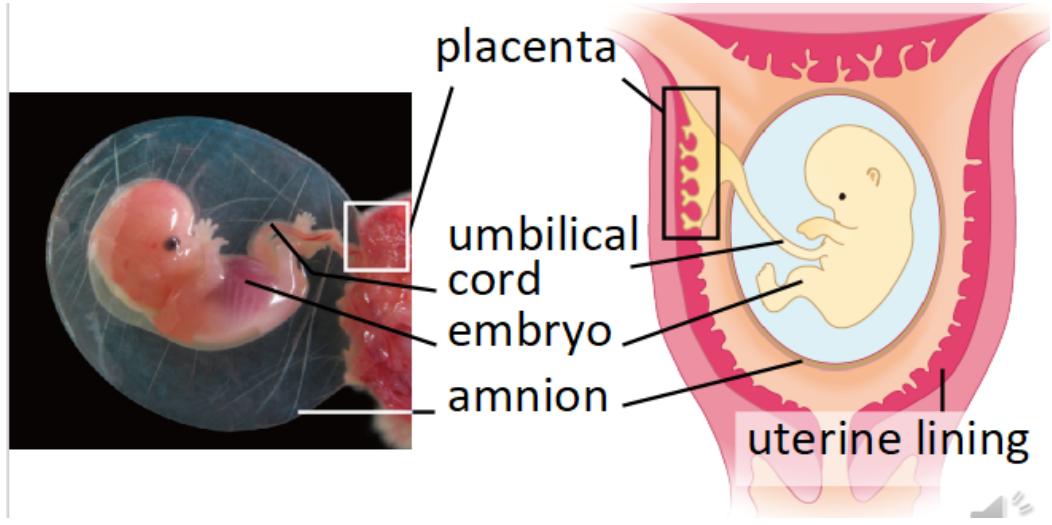
- The amnion is filled with a watery liquid
 - a cushion to protect the embryo against shock
 -



- At the site where the embryo is implanted
 - a placenta 胎盤 begins to form
 -

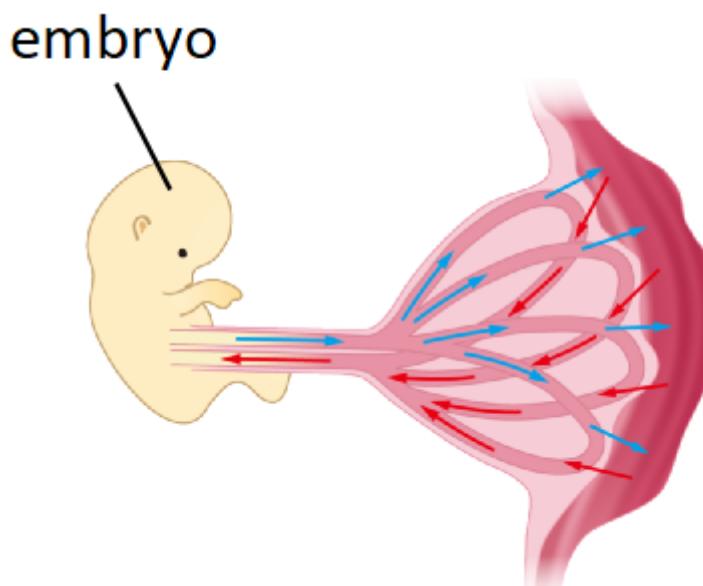


- The placenta is attached to the embryo by an umbilical cord
 -



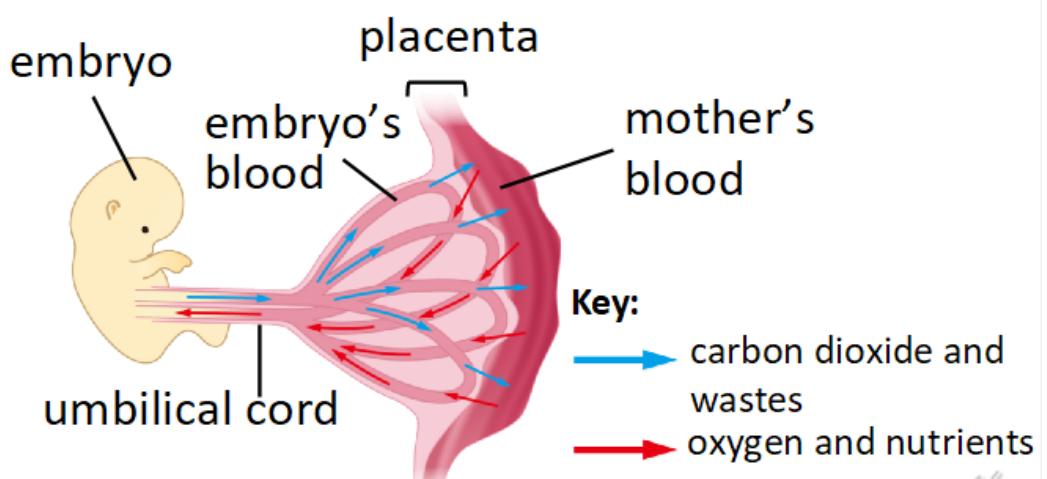
- The embryo gets oxygen and nutrients from its mother & gets rid of carbon dioxide and other wastes

-



- placenta allows this exchange of materials

-

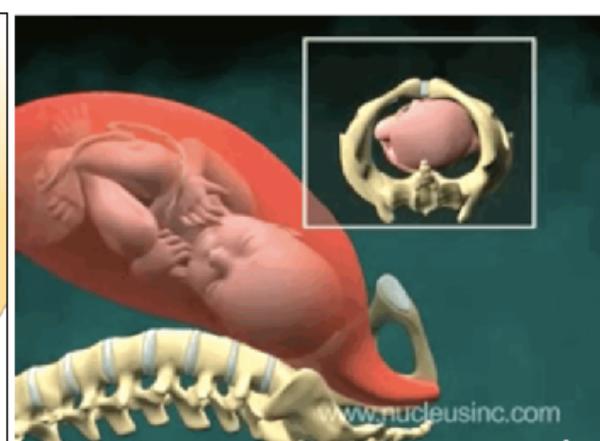
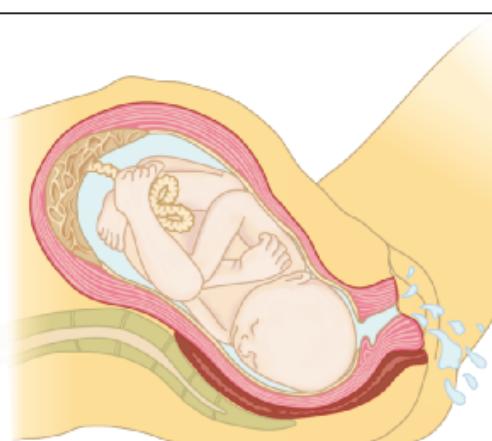


- About 8 weeks after fertilization

- The embryo develops into a foetus with all the major organs formed.
- About 38 weeks after fertilization
 - The foetus is ready to be born.
- From embryo to foetus before birth
 - Embryo: 1 week [~ 0.1 cm]
 - embryo is about to implant into the uterine lining
 - Embryo: 5 weeks [~ 0.4 cm; ~ 1 g]
 - heart beats
 - backbone formed
 - Foetus: 8 weeks [~ 3 cm; ~ 3 g]
 - all major organs formed
 - arms and legs begin to form
 - Foetus: 12 weeks [~ 10 cm; ~ 48 g]
 - head, neck, arms and legs continue
 - to develop and are more clearly seen
 - Foetus: 20 weeks [~ 20 cm; ~ 380 g]
 - arms and legs grow well
 - may begin to suck thumb
 - Foetus: 38 weeks [~ 36 cm; ~ 3 kg]
 - ready to be born

- Birth of a baby

- When the foetus is about to be born
 - normally changes its position and lies with its head downwards.
 -



- Labour (the birth giving process) begins with a sign of pain in the abdomen
 - 1. Muscles of the uterus contract strongly.

- 2. Amnion breaks.
 - 3. Watery liquid flows out to lubricate the vagina.
 - 4. Opening of the uterus becomes wider.
 - 5. Baby is pushed out with the head coming out first.
- After birth,
 - the baby cries for the first time
 - takes its first breath.
 - The doctor then clamps and cuts the umbilical cord.
 - remains will dry up and fall off. The scar left behind is the navel.
 - The placenta is expelled after the baby is born.