

# Development of the reproductive system

## Sex System

Differentiation of sex is a complex process in which many genes are involved. The key to sexual dimorphism is the Y chromosome, which contains a testis-determining gene called SRY (sex region on Y). The protein product of this gene is a transcription factor that initiates a gene cascade that causes the reduction or even the disappearance of the genital tract of the opposite sex. SRY protein – determines the formation of the testicle, i.e. the male sex.

### Gonads

They develop their characters in the 7th week of development. Initially, they are established as elongated paired slats - plicae genitales, medially from the base of the kidneys (mesonephros).

#### 3 basics

- Intermediate mesoderm.
- Proliferation of the surface epithelium (coelomic) - a derivative of the somatopleura.
- Primordial cells – in the 5th week they migrate through the dorsal mesentery, in the 6th week they travel to the gonadal bar, where they come into contact with the cords of epithelial cells that are from the coelomic epithelium, forming a series of solid cell bands (medullary cords) = this stage called the Indifferent stage of the gonad. **!!!If the cells do not travel, the gonads will not develop!!!**

### Testis (=testicles)

An embryo is genetically male if it carries XY gonosomes.

Under the influence of the Y chromosome and the SRY gene, the following occurs:

- developing medullary cords,
- tunica albuginea – separates the medullary cords from the superficial coelom,
- cortical cords are not formed.

4th month - horseshoe-shaped cords contain primordial cells and supporting Sertoli cells, which are from cells of the surface, coelomic epithelium of the gland.

Week 8 - Leydig cells, which are derivatives of the original mesenchyme of the plica genitalis and lie between the medullary cords of the testis, produce testosterone, which affects the differentiation of the ejaculatory ducts and external genitalia.

The medullary cords of the testis remain compact until puberty, after which they develop a lumen and differentiate into tubules seminiferi contorti. These connect to the **rete testis**'. The rete testis opens into the **ductuli efferentes testis**, which are the remainder of the excretory tubules mesonephros. They connect the rete testis with the **ductus mesonephricus Wolffii**', from which the **ductus deferens** develops.

### Ovary (=ovary)

Chromosome equipment of gonosome XX. The absence of a Y chromosome causes that

- medullary cords degenerate,
- cortical cords develop,
- tunica albuginea does not develop.

In the 4th month, the cortical cords disintegrate into isolated islands of cells and each of them surrounds one or more primordial cells. Germ cells mitotically proliferate, surround themselves with a single layer of cells, and form primary follicles. The surface cells that arose from the cells of the surface epithelium are called follicular cells and the primordial cells are called oogonia.

## Genital ducts

### Indifferent Stage

Originally, both male and female embryos have both pairs of ducts (mesonephric, Wolffian duct and paramesonephric, Müllerian duct).

**Ductus paramesonephricus (Müller's duct)** arises as an elongated invagination of the coelomic epithelium on the anterolateral surface of the urogenital bar. At the cranial end, it has a funnel-shaped opening through which it opens into the abdominal cavity. Caudally, it first runs laterally from the mesonephric duct (Wolf's duct), then crosses it ventrally and continues to grow caudally and medially. In the midline, it comes into contact with the bilateral paramesonephric duct. The two ducts are first separated by the septum, but then merge to form the

uterovaginal canal. The common lower tip of the ducts continues to grow caudally to the back wall of the urogenital sinus, where it forms a small elevation - the paramesonephric Müller's tubercle. On the sides of this bump, the mesonephric duct opens to the right and left.

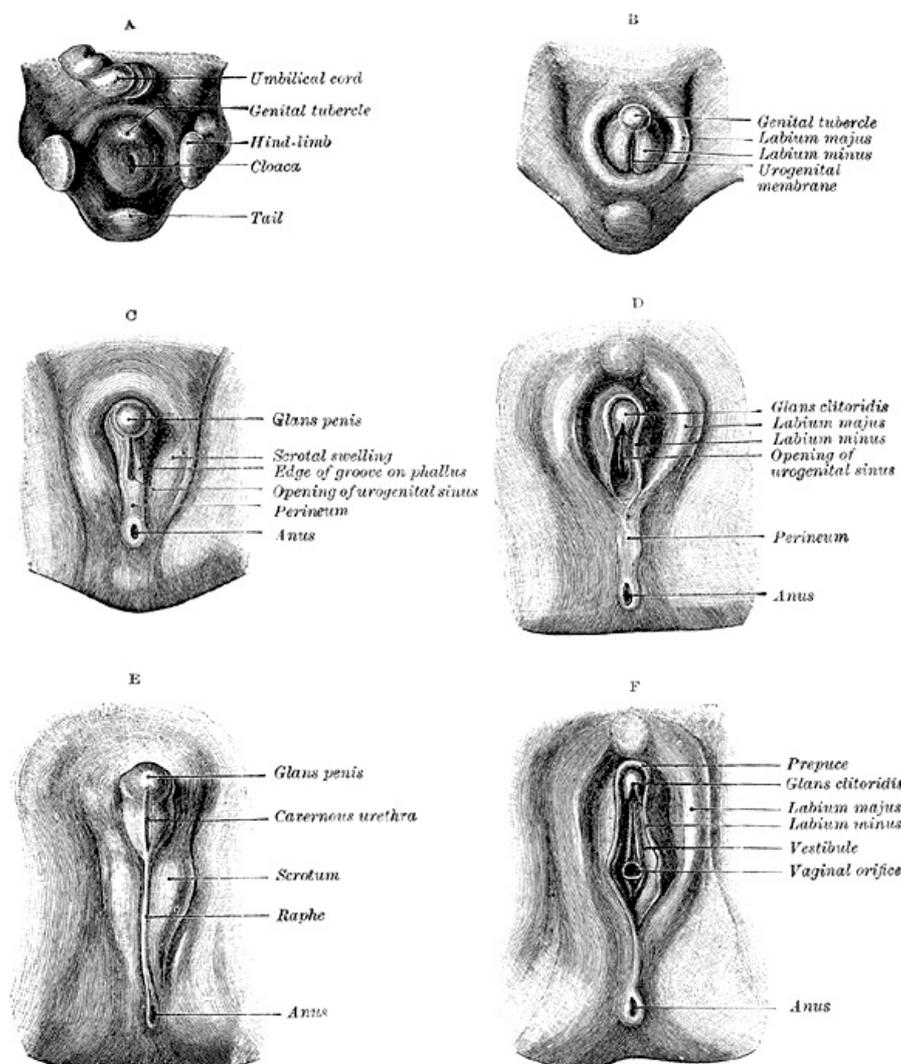
## Male genital tract

When the mesonephros dies, some of its ducts join the rete testis and subsequently differentiate into the testis efferent ductuli. The ducts in the region of the caudal pole of the testis do not connect with the rete testis and the remnants persist as the paradidymis. The mesonephric duct persists in the appendix epididymidis (the most cranial part) and in the main part of the male ejaculatory ducts - ductus epididymidis (epididymis), ductus deferens and ductus ejaculatorius. Müller's duct in males degenerates with the exception of a short section, the appendix testis.

## Female genital tract

The female ducts develop from the ductus paramesonephrici Mülleri. The paramesonephric ducts are contained in the edge of the urogenital bar, which gradually curves into the transverse plane until they join in the midline to form the plica lata uteri. tubae uterinae arise from Müller's ducts and after the connection of both canals - canalis uterovaginalis. Canalis uterovaginalis gives the base of the uterus and the upper third of the vagina. The lower two thirds arise from two buds in the wall of the sinus urogenitalis - sinovaginal bulbs. From them, the vaginal plate is formed through gradual development, which differentiates in the vagina.

## External genital organs



## Indifferent Stage

The external genitalia develop from paired cloacal cilia formed around the cloacal membrane. These join in the anterior part at the tuberculum genitale. At week 6, the cloacal cilia divide into anterior urethral and posterior anal cilia. Meanwhile, raised mounds, tori genitales, form on the outer edge of the urethral folds.

## Male external genitalia

They arise under the influence of androgenic hormones, which are produced in the fetal testicles. Development is characterized by rapid growth of the tuberculum genitale, which is the basis for the corpus penis and glans penis. Together with it, the urethral cilia grow, which are the basis of the corpus spongiosum penis and the raphae penis, and which subsequently delimit the urethral groove. This groove elongates along with the base of the penis. In the third month, the urethral cilia fuse in the midline and form the corpus spongiosum penis, but do not reach the pars

glandis penis. The glandular part of the urethra is formed from an epithelial plug, which is formed from the ectoderm on the surface of the glans penis. The cord luminates and forms the pars glandis urethrae and ostium externum. The tori genitales merge, move caudally, and differentiate into the scrotum.

### **Female external genitalia**

The development of this part of the female reproductive system is stimulated by estrogens. The tuberculum genitale elongates minimally to form the clitoris. The urethral cilia do not fuse to form the labia minora. The tori genitales form the labia majora. The urogenital groove remains open and forms the vestibulum vaginae.

## **Links**

### **Related Articles**

- Development of the Urinary System
- Developmental defects of the uterus and vagina

### **References**

- SADLER, Thomas W. *Langman's Medical Embryology*. 1. edition. Grada, 2011. 432 pp. ISBN 978-80-247-2640-3.
- MOORE, Keith L. *The Birth of Man : Embryology with a clinical focus*. 1. edition. 2000. 564 pp. ISBN 80-85866-94-3.