

Gonadal development

Gonads are formed in the medial (gonadal) part of the urogenital bar, which is separated from the rest (the mesonephric part) by a groove. The area in which they arise can be defined by the last thoracic and the first two lumbar vertebrae.

Gonads are essentially formed from three bases

1. **intermediate mesoderm** - forms the mesenchyme of the gonads;
2. **mesoderm of the lateral plate (somatopleura)** - proliferates as epithelial plugs into the mesenchyme at the end of the 4th week;
3. **primordial cells**.

Primordial cells

Primordial cells are located at the caudal end of the epiblast at the stage of the two-layer target. During gastrulation, they penetrate into the region of the primitive streak, from which part of the extraembryonic mesoderm arises. At the same time, they reach the wall of the yolk sac at the point where the allantois opens into it. With the retraction of the yolk sac, they find themselves in the wall of the cloaca and in about the 6th week of embryo development, their active migration through the dorsal mesentery to the **gonadal rails** begins. In the gonadal bar, they come into contact with the coelom epithelium and their union forms the **primitive genital cord**. Through this process, the so-called *indifferent gonad* is formed in about the 7th week.

Testis

The sex of the embryo is already determined at the moment of fertilization by the configuration of sex chromosomes. The basis for sexual dimorphism is the chromosome Y, which contains the gene SRY (sex-determining factor on Y) on its short arm. The product of this gene is a protein that starts the cascade leading to the formation of the testes. This protein binds to the stromal cells of the gonad, which begin to express the **SOX9 gene**. It acts on other cells and stimulates them to produce testosterone. Under its influence, the testicles, the genital tract and the external genitalia are formed. In addition, SOX9 has an inhibitory effect on WNT4, a major gene for female gonad development.

In the case of the development of the male gonad, the primitive sex cords formed at the indifferent gonad stage persist. They grow into the gonadal bar and are called **medullary cords** at this time. At the same time, a massive fibrous layer (future *tunica albuginea*) develops under the coelom epithelium, which prevents further proliferation of this epithelium. The cords gradually twist and give rise to **seminal ducts**. Derivatives of the coelomic epithelium are Sertoli cells. Derivatives of primordial cells are **spermatogonia**. These remain in an undifferentiated state until puberty. The cords then form a network of the rete testis in the area of the mediastinum testis, which forms the beginning of the genital ducts.

Ovary

In the absence of the SRY gene, the **WNT4 gene** is expressed. As a result, **primitive cords disappear** and female genitalia develop. A massive fibrous layer isn't even formed as it was in the case of testicular development, and therefore a second wave of **proliferation of the coelomic epithelium** can occur. **cortical cords** are formed. This wave also leads to the creation of **follicles**. These arise from the contact of oogonia with the epithelium. Oogonia, which become completely surrounded by epithelial cells (the basis for primordial follicles), enter the first meiotic division. Around the end of the 5th month, all primordial follicles stop in the **dictyotene** stage - at the end of the **prophase of the 1st meiotic division**.

Links

Related articles

- Menstrual cycle
- Ovarian cycle
- Gametogenesis

Used literature

- SADLER, Thomas, W. *Langmanova lékařská embryologie*. 1. české edition. Praha : Grada, 2011. 414 pp. ISBN 978-80-247-2640-3.