

➤ HORMONAL CONTROL OF THE MALE REPRODUCTIVE SYSTEM

- There are two basic tissue compartments within the testes:

1. THE SEMINIFEROUS TUBULES

- There are no blood vessels or nerves in the seminiferous tubules. The **blood-testis barrier** is formed by tight junctions between adjacent Sertoli cells near the boundary tissue in the tubules. These tight junctions pull the cell membranes of the Sertoli cells very close together to prevent large substances from entering the inner portions of the tubules and affecting the developing sperm cells. The seminiferous tubules contain the developing sperm cell types (**spermatogonia, spermatocytes, spermatids**) and the **Sertoli cells**. The Sertoli cells are found interspersed between the developing sperm cells. As spermatids mature into sperm, they are carried through the seminiferous tubules to the rete testis by a fluid which is produced by the Sertoli cells. The Sertoli cells provide the developing sperm cells with the nutrients and hormones which they need in order to mature into spermatozoa. **FSH** from the anterior pituitary **binds to the Sertoli cells** and helps stimulate spermatogenesis in the seminiferous tubules. **The more FSH that is released by the anterior pituitary, the more sperm that are produced.**

- The Sertoli cells release a protein hormone called **inhibin**. **Inhibin is produced by the Sertoli cells in direct proportion to the amount of sperm that are produced by the seminiferous tubules.** That is, if many sperm are produced by the seminiferous tubules, then there will be high levels of inhibin released by the Sertoli cells. If few sperm are made by the seminiferous tubules, then little inhibin will be released by the Sertoli cells. **Inhibin travels from the testes to the anterior pituitary (adenohypophysis) and hypothalamus to inhibit (decrease) the release of FSH.** So, there is a negative feedback between inhibin and FSH. Inhibin is the hormone that "tells" the brain how many sperm are being produced by the testes.

So:

If sperm production is high, then inhibin production is high and FSH release from the anterior pituitary is decreased.

If sperm production is low, then inhibin production is low and FSH release from the anterior pituitary is increased.

2. THE INTERSTITIAL TISSUE

- The interstitial tissue in the testes contains all the blood vessels, nerves and lymphatics that supply the testes. A special cell type in the interstitial tissue called a **Leydig cell** is responsible for producing **testosterone**. Testosterone is a type of androgen (male sex steroid). LH from the anterior pituitary (adenohypophysis) stimulates the production and release of testosterone from the Leydig cells in the testes.

- Testosterone has the following effects in males:

1. maintenance and development of the secondary (accessory) sexual organs (e.g. the penis, scrotum, seminal vesicles, bulbourethral gland, prostate, vas deferens, epididymis).
2. maintenance and development of the secondary sexual characteristics (e.g. hair growth on the face and chest, skeletal muscle growth, deeper voice, etc).
3. travels to the seminiferous tubules to help stimulate spermatogenesis.
4. inhibits the release of LH from the anterior pituitary (adenohypophysis).
5. responsible for libido (sex drive).

- **Testosterone enters the blood and can travel to the anterior pituitary and hypothalamus to inhibit (decrease) the release of LH.** So, there is a negative feedback between testosterone and LH. Testosterone regulates its own production by regulating the amount of LH which is released from the adenohypophysis. So:

If testosterone production and release is high, then LH release is decreased.

If testosterone production and release is low, then LH release is increased.

MALE INFERTILITY

- A male is considered sub or infertile if he produces fewer than 50 million sperm per milliliter of ejaculate. The first test performed to determine whether a male is infertile is to do a **sperm count** (count the number of sperm per cc in the ejaculate).

Male infertility is usually caused by one of two reasons:

1. ANATOMICAL OBSTRUCTION IN THE DUCTS THAT CARRY SPERM OUT OF THE TESTES.

This can be congenital or caused by trauma to the male reproductive tract and can sometimes be corrected surgically. *These men usually have normal plasma testosterone levels and normal plasma FSH levels.*

2. A DEFICIENCY IN THE PRODUCTION OF SPERM BY THE TESTES.

This can also be congenital or caused by exposure to environmental toxins or radiation and is usually not treatable. *These men usually have normal plasma testosterone levels, but abnormally increased plasma FSH levels.* If sperm production is low, then inhibin production is low and FSH release is increased.

So, often the second test to determine the cause of infertility, after the sperm count, is to test the plasma FSH level. If the FSH level is normal, then the man probably has an anatomical blockage in the duct system which may be treatable. If the FSH level is elevated above normal, then the man probably has a condition which decreases the level of spermatogenesis and is probably untreatable.