fertility hormones ...... infertility ...... in vitro fertilization

Hormones general
Fertility hormones
Infertility
In Vitro Fertilization

For internal use only
fertility hormones ...... infertility ...... in vitro fertilization

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1.1 Hormones → General aspects

What are hormones?

- Hormones are chemical messengers, produced and released by endocrine glands.
- Hormones are carried to its “target” by the blood.
- Hormones are attached to receptors either on the cell membrane (outside) or inside the cell.
- Hormones provide necessary information and control the function of glands and organs.
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1.2 Hormones → Tasks

Major hormones and tasks:

- Growth hormones → control the growth of the body
- Fertility hormones → control the reproduction of human being
- Sex hormones → control the phase of puberty and sexual maturity
- Pancreas hormones → control the level of glucose in the blood
- Thyroid hormones → control the body's overall metabolic rate
- Adrenalin → prepares the body for action in emergencies
1.3 Hormones → Structure of molecule

Two structures of hormones:

Protein derived hormone:
They bind to a receptor on the cell wall

Steroid hormone:
They bind to a receptor after passing the cell wall
1.4 Hormones → Regulation of level

The hormone concentration in blood is regulated via a Feedback mechanism.

A decreased (increased) hormone level can stimulate (inhibit) the production and release of hormones in the corresponding gland.
2.1 Fertility hormones → Females

**Hormones released from pituitary gland**
- FSH (follicle stimulating hormone)
- LH (luteinizing hormone)

**Hormones released from ovary**
- Estrogen (Estradiol = E2)
- Progesterone

- FSH (follicle stimulating hormone)
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- Estrogen (Estradiol = E2)
- Progesterone
2.2 Fertility hormones → Males

- Hormones released from pituitary gland:
  - FSH and LH

- Hormones released from testes:
  - Testosterone

Maintains male reproductive structures and secondary sexual characteristics.

FSH and LH regulate sperm production and testosterone levels in males.
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2.3  Fertility hormones / assays on the PATHFAST® analyzer

**Portfolio of hormones** *(origin)*

- **FSH** (Pituitary gland)
- **LH** (Pituitary gland)
- **E2** (Ovaries and corpus luteum)
- **Progesterone** (Follicle and corpus luteum)
- **Testosterone** (Testes)
- **Prolactin** (Pituitary gland)
- **hCG preg** (Developing embryo and placenta)
3.1 Infertility → Malfunction in reproductive system

Root causes

Males
- Disturbed or missing function of testes
- Bacteriological contamination of sperm
- Undescended testicle
- Immunological sterility
- Testes - tumor surgery
- Inherited malfunction e.g. anomaly of chromosomes

Females
- Hormonal disturbance in pituitary gland or ovaries
- Anomaly of ovaries, tubes or uterus
- Blocked tubes
- Immunological sterility
- Endometriosis
- Inherited malfunction e.g. anomaly of chromosomes
3.2 Infertility → Statistics

Data from Germany in 2008*:

- 12-15% of all couples → difficulties to conceive a child
- 150,000 couples → infertility diagnosis
- 100,000 females → intrauterine insemination
- 40,000 couples → IVF or ICSI therapy

Tendency increasing

*AGGEF 2008
3.3 Infertility → Root cause acc. to Lobo

- Female 30%
- Male 30%
- Both 25%
- Unknown 15%

50% of all cases
Endocrinological reasons
Hormonal disturbance
3.4 Infertility* → Counter measures for females

Medical and physiological options

- Consultation of a doctor / gynecologist
- Prescription and use of hormones (therapy)
- Regular monitoring of menstrual cycle
- Regular measurement of basal body temperature
- Precise identification of ovulation → time for conception
- Recommendation for in vitro fertilization (IVF)

* Infertility is the biological inability of a person to contribute to conception
4.1 In vitro fertilization (IVF) → General aspects

**IVF - medical background:**
In vitro fertilization was developed to overcome infertility problems = disorder in function of the reproductive system of a couple (man or woman or both)

**IVF - personal reason:**
Intensive desire of a couple to have children, however having difficulties to conceive a child

**Pre-condition:**
Consultation of a doctor or a specialized “children’s wish” hospital where detailed information and medical advice is provided

**Basis for successful IVF:**
IVF requires healthy ova, sperm that can fertilize and an uterus that can maintain pregnancy
4.2 In vitro fertilization (IVF) → in Petri dish: steps 1-3

1. **Ovarian stimulation:**
Medication (injection) with fertility hormones (usually FSH analogues) are used under close monitoring. Typically up to 10 days of injection are necessary. Spontaneous ovulation is prevented by the use of GnRH antagonists which blocks the surge of LH. The development of multiple follicles in the ovaries is stimulated.

2. **Monitoring:**
Check of estradiol concentration (immunological E2 assay) and follicular growth (gynecologic ultrasonography).

3. **Egg retrieval:**
In the adequate status of follicle maturation (prior to ovulation) up to 30 follicles are aspirated. The eggs in the follicle fluid are selected in the IVF lab.
4.2 In vitro fertilization (IVF) → in Petri dish: steps 4-5

4. Fertilization step:
Sperm cells and eggs are incubated in a culture media in a petri dish at a ratio of 75,000:1 (!) for about 18 hours. The fertilized egg is passed to a special growth medium and left there for about 48 hours.

5. Transfer:
An embryo that has reached the 6-8 cell stage is transferred into the uterus. In Europe transfers after 2 days are common. To improve chances of implantation up to three embryos may be transferred depending on patient’s age and country regulation.
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4.3 In vitro fertilization → Intra cytoplasmic sperm injection (ICSI)

Consecutive steps:

- Female injects fertility hormones to trigger ovulation
- Ovum is collected (puncture of follicle) to be fertilized outside the body
- Sperm cell is injected directly into the ovum with a microscopic needle
- Transfer of fertilized embryo (in a 6-8 cell stage) into the uterus
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Thanks for your attention