



Hormonal feedback is a key mechanism in the regulation of the hypothalamic-pituitary-ovarian (HPO) axis, allowing a fine-tuning of hormone secretion according to physiological needs. It is based on the principle of a feedback loop, where the hormones secreted by the target glands (ovaries) in turn exert a stimulatory or inhibitory effect on the regulatory structures (hypothalamus and pituitary gland). There are two types of hormonal feedback: negative feedback and positive feedback.

Negative feedback is the most common mechanism, which maintains stable hormonal secretion and avoids excesses. In this case, the secreted hormone exerts an inhibitory effect on its own secretion, by slowing down the activity of the regulatory structures. This is the case for estrogens and progesterone, which exert negative feedback on the hypothalamus and pituitary gland to regulate the secretion of GnRH, FSH, and LH.

During the follicular phase of the menstrual cycle, the progressive increase in estradiol levels secreted by the dominant follicle exerts negative feedback on the hypothalamus and pituitary gland, slowing down FSH secretion. This mechanism allows the selection of the dominant follicle, which continues its growth despite the decrease in stimulation by FSH, while the other follicles, deprived of FSH, undergo atresia.

Similarly, during the luteal phase, the progesterone secreted by the corpus luteum exerts a powerful negative feedback on the HPO axis, inhibiting the pulsatile secretion of GnRH and LH. This negative feedback prevents the recruitment of new follicles and ovulation during the luteal phase, thereby ensuring mono-ovulation in women. It is lifted at the end of the luteal phase when the corpus luteum involutes in the absence of fertilization, allowing the start of a new cycle.

Positive feedback is a rarer mechanism, where the secreted hormone stimulates its own secretion by activating the regulatory structures. This is the case for estradiol at the end of the follicular phase, which exerts positive feedback on the hypothalamus and pituitary gland to trigger the ovulatory peak of LH. When estradiol levels reach a critical threshold for a sufficient duration (200 pg/mL for 50 hours), they stimulate the secretion of GnRH and LH, causing a massive discharge of LH responsible for ovulation.

This positive feedback of estradiol on the LH peak is a unique event during the menstrual cycle, which requires perfect synchronization between follicular maturation and the HPO axis. It is finely regulated by paracrine and autocrine factors, such as inhibin and activin, which modulate the sensitivity of the pituitary to GnRH and the synthesis of gonadotropins.

Disturbances in hormonal feedback can lead to menstrual cycle disorders and fertility problems. A resistance to the inhibitory effect of estrogens, for example in polycystic ovary syndrome (PCOS), can lead to hypersecretion of LH and chronic anovulation. Conversely, hypersensitivity to the negative feedback from progesterone, observed in some cases of luteal insufficiency, can shorten the luteal phase and compromise embryonic implantation.

Understanding the mechanisms of hormonal feedback is therefore essential to apprehend the pathophysiology of ovulation disorders and to adapt therapeutic strategies. Ovarian stimulation treatments used in assisted medical procreation aim to bypass the negative feedback from estrogens to achieve multiple follicular growth. The use of GnRH antagonists allows to block the premature peak of LH and prevent spontaneous ovulation, while the administration of hCG mimics the effect of the LH peak to trigger ovulation at the optimal time.

In conclusion, hormonal feedback is a sophisticated mechanism that allows for fine and dynamic regulation of the HPO axis during the menstrual cycle. Its proper functioning is essential to ensure quality ovulation and balanced secretion of ovarian hormones, thereby guaranteeing fertility and reproduction. Its understanding is a prerequisite for the diagnosis and management of endocrine disorders of female reproduction.

Key points:

1. Hormonal feedback is a key mechanism in the regulation of the hypothalamic-pituitary-ovarian (HPO) axis, allowing for fine-tuning of hormone secretion according to physiological needs.
2. There are two types of hormonal feedback: negative feedback, where the secreted hormone exerts an inhibitory effect on its own secretion, and positive feedback, where the secreted hormone stimulates its own secretion.
3. During the follicular phase, the progressive increase in estradiol levels exerts negative

feedback on the HPO axis, slowing down FSH secretion and allowing the selection of the dominant follicle.

4. During the luteal phase, the progesterone secreted by the corpus luteum exerts a powerful negative feedback on the HPO axis, preventing the recruitment of new follicles and ovulation.

5. At the end of the follicular phase, estradiol exerts positive feedback on the HPO axis to trigger the ovulatory peak of LH, a unique event during the menstrual cycle.

6. Disturbances in hormonal feedback can lead to menstrual cycle disorders and fertility problems, such as polycystic ovary syndrome (PCOS) or luteal insufficiency.

7. Understanding the mechanisms of hormonal feedback is essential for the diagnosis and management of endocrine disorders of female reproduction, as well as for adjusting therapeutic strategies in medically assisted procreation.