

### Events in the hormone balance over the four phases of the 21-day cycle

#### Pre-oestrus:

Duration: approx. 2 days

Falling levels of the pregnancy hormone (progesterone) lead to the secretion of gonadotropin-releasing hormone (GnRH) from the hypothalamus into the bloodstream. This hormone acts on the pituitary gland (hypophysis), causing it to release stores of follicle-stimulating hormone (FSH) into the blood. FSH triggers growth of the dominant follicle on the ovary. Within 1 to 2 days, this large follicle (Graafian follicle) produces the oestrus hormone (oestrogen). This hormone in turn enters the bloodstream and triggers oestrus in the cow.

#### Oestrus:

Duration: 12-24 hours

Oestrus is triggered by rising levels of the oestrus hormone (oestrogen) in a complex pattern of hormonal interaction. During oestrus, levels of oestrogen remain high. Oestrogen is produced by the follicle and transported via the bloodstream, causing the typical oestrus behaviour and changes in the genitals. Towards the end of the main phase of oestrus or in early post-oestrus, rising levels of LH (luteinising hormone) trigger ovulation. Luteinising hormone is produced in the pituitary gland (hypophysis) and is carried to the ovary via the bloodstream.

#### Post-oestrus:

Duration: 1-2 days

After ovulation, luteinising hormone (LH) converts the follicle wall into yellow body tissue. The yellow body (corpus luteum) grows and produces the pregnancy hormone (progesterone) after around 6 days. The level of oestrus hormone (oestrogen) drops again.

#### Inter-oestrus:

Duration: approx. 15 days

From around day 6 of the cycle, the yellow body (corpus luteum) has developed enough for the pregnancy hormone (progesterone) it produces to cause effects in the animal via the bloodstream. The secretion of gonadotropin-releasing hormone (GnRH) in the hypothalamus is inhibited. This is called a negative feedback mechanism. Follicles not maturing fully during the

yellow body phase produce the oestrus hormone (oestrogen), which can cause oestrus behaviour during mid-cycle. However, ovulation does not take place because luteinising hormone is not secreted by the pituitary (an effect of the negative feedback mechanism).

If a successful insemination (and hence fertilisation) has taken place during oestrus, the embryo produces the hormone interferon-tau from around day 16. This embryonic hormone acts as a signal of “pregnancy” to the uterus, preventing it from producing prostaglandin F2 alpha. The yellow body persists and produces the pregnancy hormone progesterone, which is vital for foetal survival, for most of the gestation period. Without fertilisation and hence without a signal from the embryo’s interferon-tau, the uterus produces the hormone prostaglandin F2 alpha from around day 17 of the cycle, triggering resorption of the yellow body. As a result, the level of progesterone in the blood falls rapidly and GnRH is secreted by the hypothalamus (end of negative feedback). A new cycle gets underway.