

BREEDING & CALVES

Many dairy farmers regularly use hormone treatments to manipulate the breeding cycle of their cows, but not all understand exactly how and why they work. **Louise Hartley** asks vet Lee-Anne Oliver to explain.

Understanding cows' breeding cycle and hormone treatments

Understanding exactly what happens in a cow's oestrus cycle and the role of hormones involved can allow better diagnosis and treatment of reproductive problems in your herd, says Lee-Anne Oliver of Scott Mitchell Associates veterinary practice.

The cow's oestrus cycle is 21 days long but can range from 18-24 days. Heifers begin to cycle when they reach puberty, but this depends on a number of factors including breed, health status, growth rate and nutritional status.

Day zero of the oestrus cycle is considered to be the day of oestrus or 'heat' and ovulation, explains Mrs Oliver.

She says: "A cow will show oestrus behaviour by standing to be mounted, restlessness, transient milk drop, and an increased amount of clear vulval mucus.

"The oestrus period can last between eight and 12 hours and the 'bulling' behaviour is due to

Follicles develop in waves with three waves occurring during the 21-day cycle
LEE-ANNE OLIVER

oestradiol in the bloodstream being secreted from the ovary."

Oestradiol causes specific changes within the reproductive tract during oestrus such as relaxing the cervix, bulling slime and increased blood flow to the uterus, and it also triggers the release of a hormone called luteinising hormone (LH).

LH is secreted into the blood

from a gland close to the brain called the pituitary gland, says Mrs Oliver.

"LH causes a follicle to ovulate an egg in the oviduct, usually occurring about 32 hours after an 'LH surge' [sudden increase in LH concentration].

"If sperm are present, the egg will be fertilised and the embryo will travel down the oviduct arriving in the uterus about three to four days later."

A structure called a corpus haemorrhagicum forms where the egg is released from the ovary, which, over a few days turns into a corpus luteum (CL) and secretes progesterone.

Suppression

Mrs Oliver says: "Progesterone suppresses the amount of LH in circulation, while a hormone called follicle stimulating hormone prepares waves of follicles ready for the next ovulation.

"Follicles develop in waves with three waves occurring during the 21-day cycle in cows and two waves in heifers.



Hormones used in a cow's oestrus cycle can mean better treatment of reproductive problems.

"If fertilisation does not occur, the uterus releases prostaglandin into the bloodstream which removes the CL from the ovary.

"Progesterone levels reduce and LH and oestradiol levels rise,

resulting in heat behaviour, ovulation and the cycle continues."

If fertilisation and implantation was successful then progesterone is not released from the uterus and the CL continues to secrete progesterone, preventing further heats and ovulations.

Mrs Oliver says: "Progesterone is an essential hormone required to maintain pregnancy. "The CL is responsible for progesterone levels up until day 150 of pregnancy, and thereafter the placenta also secretes progesterone which takes over the maintenance of pregnancy."

Post-calving, the ovaries start to become active again within five days and follicles start to appear, explains Mrs Oliver.

"There has to be sufficient oestradiol to stimulate an LH

surge for ovulation to occur. The period when a cow is not cycling and ovulating is called anoestrus. There are several factors which reduce the LH surge, delaying ovulation and prolonging anoestrus.

"Negative energy balance post-calving can have a significant effect, ensuring an appropriate body condition score at calving is essential, as is maintaining dry matter intakes pre- and post-calving."

Interactions

Figure 1 (left) shows how complex hormone interactions which happen during the oestrus cycle can be manipulated by hormonal drugs.

Three hormones are used to treat problem cows or shorten the oestrus cycle—prostaglandin,

Figure 1: Complex hormone interactions during the oestrus cycle can be manipulated by hormonal drugs

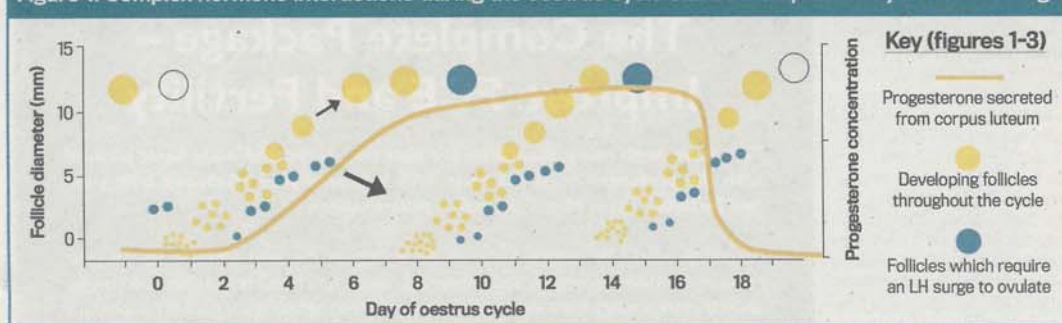


Figure 2: PG administered at the end of a wave

PG day 6/7 or 14-15 → Ovulation in 2-3 days

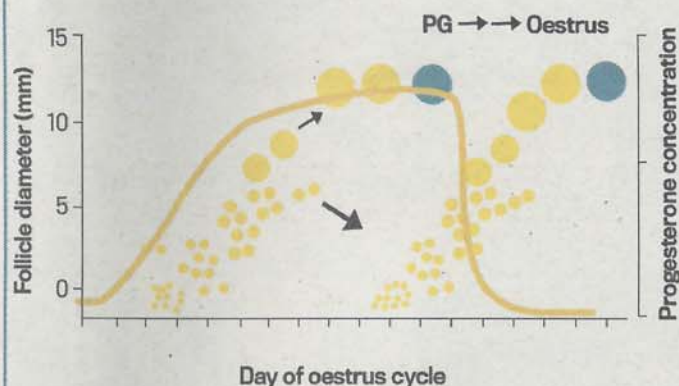
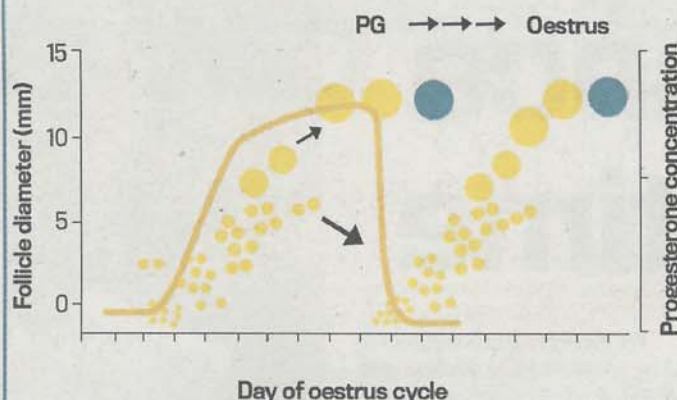


Figure 3: PG administered during a wave

PG days 9-13 → Ovulation 5-6 days later



an intravaginal progesterone device or injection of gonadotrophin-releasing hormone.

The three treatments listed can be used to manipulate the oestrus cycle and treat individual cow problems, says Mrs Oliver.

"Dairy cow fertility is a whole herd issue and by treating problem individuals alone, vets can only have a limited effect on whole herd performance.

"Balanced nutrition, infectious disease control and good transition cow management are crucial to the general health of the herd and form the foundations of good fertility."

If PG is injected as a wave is developing, another wave has to develop before ovulation occurs

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Prostaglandin injections

PROSTAGLANDIN (PG) injections can be used to shorten the dioestrus period and 'short cycle' a cow, says Mrs Oliver.

"A PG injection will remove the corpus luteum from the ovary, decreasing progesterone and LH, increasing follicle stimulating hormone and causing another follicle to develop and ovulate.

"The time of ovulation after an injection of PG depends on what stage of the cycle the PG was administered. If the PG is injected

at the end of a follicular wave, ovulation will occur two to three days after administration.

"If PG is injected as a wave is developing, another wave has to develop before ovulation occurs. Ovulation can then occur up to five to six days after administration of PG."

Figure 2 shows PG administered at the end of a follicular wave, while figure 3 shows PG administered during a follicular wave.

Intravaginal progesterone

CYSTIC ovarian disease can also be treated by using hormones, says Mrs Oliver.

"Cysts are defined as an ovarian structure greater than 25mm in diameter, present on the ovary for more than 10 days and are often diagnosed on ultrasound examinations.

"Cysts occur when a follicle fails to ovulate due to insufficient luteinising hormone (LH). Factors associated with cystic ovarian disease include high milk production, negative energy balance, twinning, calving difficulties, retained cleansings and older cows. A genetic predisposition has also been suggested."

Cysts are classified into luteal or follicular cysts depending on whether they produce progesterone or not, says Mrs Oliver.

"Luteal cysts are thick walled, secrete progesterone and can be treated with prostaglandin injections, similar to short cycling as described above.

"Follicular cysts are often thin-walled and can be treated with either a progesterone intravaginal device or gonadotrophin-releasing hormone."

An intravaginal progesterone implant can be inserted for 14 days. The cow absorbs the progesterone which causes the cyst to die off and a new wave of follicles to develop under the influence of a follicle stimulating hormone. As the progesterone is removed there is an LH surge and ovulation occurs.

Prostaglandin is often incorporated into this treatment to get rid of any luteal tissue which may be another source of progesterone other than the intravaginal device.

If prostaglandin was not used and luteal tissue remained, this may suppress the LH surge needed for ovulation.

As an alternative to an intravaginal progesterone device, gonadotrophin-releasing hormone (GnRH) followed by an injection of prostaglandin (PG) can be used to treat follicular cysts, says Mrs Oliver.

She says: "A GnRH injection causes an immediate LH surge, and this has one of two effects. It either ovulates the cyst and a CL forms or the cyst turns into a luteal cyst - either way PG is used 14 days after the GnRH injection to remove the CL and 'short cycle' the cow."