

What's wrong with my cows? Reproductive failure in ruminants

Over the last few decades, average milk production per cow has steadily increased due to advances in breeding, feeding and management. However, this improvement has come at the cost of decreased fertility, with many farms struggling to achieve the ideal calving interval of 365 days.

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Reproductive failure in dairy cattle has a dramatic impact on the economic success of farms. According to a 2014 estimate, a farmer loses approximately \$US 5.2 for every extra open day. Reproductive failure is also the number one reason for culling. This requires the farmer to raise more heifers, which has negative economic as well as environmental consequences. Reducing the need for replacement heifers lowers costs and improves the environmental footprint of each kilogram of milk or meat produced, as the emissions from the development until first calving are spread along a higher number of lactations. With a modest improvement in fertility, methane emissions from a herd can be reduced by 10% to 25%.

Causes of reduced fertility

There are many potential causes of fertility problems in cows. Often there is no singular cause; instead, a combination of factors culminates in a loss of reproductive performance. Most potential causes fall into one of four groups: management, nutrition, diseases and mycotoxins. This article will pay particular attention to mycotoxins, as they are often overlooked as a potential cause of reproductive problems.

Management

● **Inflammation:**
Although necessary for uterine involution, restoring damaged tissues and mammary



gland involution, excessive inflammation can lead to decreased feed intake, excessive fat mobilisation, poor reproduction and lower milk yield. Relevant sources of inflammation include:

- Uterine infections.
 - Mammary gland infections.
 - Bacteria coming through the gastrointestinal tract (intensified by leaky gut syndrome).
 - Inflammation induced by mycotoxins or endotoxins among others.
- **Calving difficulties:**
Difficulties with calving may lead to tissue damage, excessive inflammation, subsequent uterine disease and poor reproductive performance.

● **Insemination:**
Poor heat detection, inadequate insemination technique, as well as stressful conditions during insemination can lead to a lower insemination success rate..

Diseases

- **Clinical and subclinical uterine infections:**
Up to 50% of dairy cows are affected by metritis, purulent vaginal discharge, endometritis or cervicitis after calving. The main causes are
- Impaired immune function.

- Excessive inflammation.
- Calving difficulties.
- Poor hygiene.
- Retained placenta.

● **Different infectious diseases:**
Numerous diseases can reduce reproductive performance of dairy cows, among the most relevant are: bovine viral diarrhoea (BVD), leptospirosis, neospora caninum, IBR/IPV and many others.

● **Lameness:**
Lameness causes a general alteration of the wellbeing of the cow and impedes the clear expression of heat.

Nutrition

● **Excessive negative energy balance (NEB):**
High energy demands and low DMI around parturition result in NEB, a common condition in mammals. However, when too severe and prolonged, NEB can lead to excessive body fat mobilisation, ketosis, fatty liver, depressed immune function and relevant hormonal disorders that impair cow fertility.

● **High blood urea levels:**
High blood urea levels can result from excessive nitrogen feeding or inadequate protein/energy balance of the diet. High blood urea concentrations can impair oocyte formation at different stages, which

can delay the ovarian cycle or compromise oocyte quality.

● **Mineral and vitamin imbalances:**

The correct vitamin and mineral balances are essential for physiological functions such as immune function or antioxidant status. Inadequate mineral and vitamin supply negatively impact reproductive capacity.

● **Phytoestrogens:**

Phytoestrogens are compounds produced by plants that can mimic the effects of oestrogen in the body and, as a result, impair normal reproduction function.

IMPACT OF DIFFERENT MYCOTOXINS

ZEARALENONE (ZEN)

In prepubertal heifers:

- Hypertrophy of genitalia and udder development.

In cows:

- Difficulties to detect oestrus (false heats create confusion)
- Changes in uterine morphology
- Ovarian cysts.
- Decreased embryo survival, abortions.

In males:

- Decrease in testosterone production, feminisation.
- Decreased testicle weight and general infertility.

AFLATOXINS (AFLA)

In females

- General hormonal imbalance leading to general failure in reproduction.
- Follicle atresia and damage.
- Ovarian cysts.

In males:

- Sperm DNA damage, impaired fertilisation.

ERGOT ALKALOIDS

In heifers and cows:

- General endocrine imbalance.
- Vasoconstriction that limits the transfer of nutrients to the foetus thus impacting negatively on the birthweight and development of the foetus.
- Can lead to abortion.

In males:

- Reduced fertilising capacity of the semen.
- Decrease in sperm concentration and endurance to frozen storage.

DEOXYNIVALENOL (DON)

- May inhibit oestrogen and progesterone secretion in granulosa cells.
- Can inhibit steroidogenesis in bovine granulosa cells and increases cell death rate in vitro.

T-2 TOXIN

- Can cause delayed ovulation after prostaglandin treated.
- Toxic activity over granulosa and luteal cells.



Case of genitalia hypertrophy due to exposure to ZEN.

Mycotoxins

Mycotoxins are frequently over-looked as a possible reason for reproductive failure in cows. The table, left, shows the mycotoxins most likely to impact fertility. To determine whether a certain mycotoxin is a cause for infertility, regular sampling of the feed and an HPLC or LC-MS/MS analysis is recommended.

Either the TMR should be checked, as it represents the total risk at that moment, or the silage, which represents a large part of the risk, as it is the biggest portion of the TMR and gives information about year-round exposure. Good silage management practices, including the use of silage inoculants, is essential to reduce the potential for mould growth.

Finally, an effective mycotoxin deactivating solution that targets the specific mycotoxins in your feed or that can impact cow fertility and productivity is crucial to limiting the negative effects of mycotoxins.

Conclusion

There is no simple way to improve the fertility of cows, rather an integrated approach, in which all key factors are continually monitored and improved, is necessary. Mycotoxins can impact fertility in numerous ways and should always be considered as a potential cause of reproductive failure. By improving fertility, not only will the health status of the animals and the farm economics improve, the environmental impact of farm operations will be reduced. ■

More information is available from the authors on request