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New tools to improve beef cow fertility

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Summary

- Reproductive efficiency of beef cows is influenced by a multitude of factors but is generally accepted to be in decline in Ireland.
- Recent evidence suggests that there is a significant genetic component to this poor reproductive performance.
- Teagasc have commenced a number of new studies aimed at both understanding and improving the reproductive efficiency of beef cow herds as well as increasing the use of AI.

Reproductive efficiency is a major determinant of the profitability of beef cow enterprises. Despite this there is now clear evidence of a decline in the reproductive efficiency of Irish beef cow herds. For example, currently <0.8 calves are born per cow per year with <25% of cows producing a calf within a 12 month period; calving interval is increasing and now averages ~400 days; <10% of heifers calve for the first time at 24 months of age, with an average age at first calving of 32.5 months. Undoubtedly, while some of this inefficiency can be attributable to poor management practices, data from the Irish Cattle Breeding Federation show that this decline in reproductive efficiency of the national beef cow herd has a significant genetic component.

Advancing puberty of beef heifers

Central to reproductive efficiency is age at puberty, particularly when heifers are bred to calve as 2-year-olds and in systems that impose restricted breeding periods, such as in seasonal calving herds. Recent modelling studies at Teagasc, Grange showed that for spring-calving grass-based systems delaying age at first calving from 24 to 36 months of age decreased net margin per hectare by 50%. Consequently, breeding heifers to first calve at 24 months of age is a key target for beef cow herds. Ideally, replacement heifers need to reach puberty early, conceive early in the breeding season, calve with minimal assistance and rebreed early for their second calf. Research is on-going into the physiological and molecular control of puberty. One such project involves the identification of biomarkers by examining the expression of genes within the hypothalamic-pituitary axis during the onset of puberty. This research will contribute new information to our understanding of the biology of puberty and its regulation, and may provide genetic markers enabling the selection of animals which undergo sexual maturity at an earlier age.

Genes regulating uterine function and establishment of pregnancy

The worldwide decline in cattle fertility over the last four decades has largely been attributed to increases in early embryo loss. The period of greatest early embryo loss in cattle occurs before day 16 of pregnancy and has been shown to account for between 70 to 80% of overall embryonic and foetal mortality. Recent work by our group aimed at identifying molecular signatures associated with a uterine environment which is supportive of early pregnancy. This was based on studies that compared heifers that consistently became pregnant following successive inseminations with their reproductively inefficient contemporaries. Further work is now on-going to validate these genetic markers in order to aid selecting animals with higher fertility potential.

Early diagnosis of post-partum uterine infection

While mainly a problem with dairy cows, postpartum uterine infections can be a cause of compromised fertility in some beef herds, particularly those with higher rates of dystocia and/or where cows are in poor body condition at calving. While considerable progress has been made in understanding the etiology of uterine infection, no definitive early prognosis or intervention strategies exist to aid farmers in getting cows back in calf. Work at Teagasc has identified uterine biomarkers of infection which distinguish cows at risk of developing uterine disease. Further research will determine if such markers can reliably be used for early diagnosis and intervention in post-partum cows.

On-farm research

At Teagasc Grange, we have recently commenced a large-scale beef cow herd fertility research programme, funded by the Department of Agriculture, Food and the Marine and involving University College Dublin, The Irish Cattle Breeding Federation, The Agri-Food and Biosciences Institute of Northern Ireland. Particular emphasis will be placed on the role of specific minerals as well as the disease status of cows. This trial will run over two years with the aim of recruiting at least 200 herds and up to 4,000 cows in total.

Increasing use of AI

When compared with dairy herds, the use of AI in Irish beef cow herds is very low, with less than 20 calves born to AI sires per 100 cows calved. In order to make significant genetic progress, particularly in maternal traits, much greater usage of high genetic merit bulls, though AI, will be required. Recent initiatives in beef cattle genetic evaluations, including the development of the Replacement Index, have the potential to reverse the on-going trend towards poorer reproductive efficiency. However, in the absence of increased and sustained usage of AI, in both pedigree and commercial herds, its impact will be severely delayed. We have recently commenced a large on-farm study to evaluate various oestrous synchronisation programmes with the aim of developing a protocol to enable the use of fixed-time AI, thus obviating the considerable labour and management input associated with achieving high rates of heat detection.

Genomically assisted selection

Genetic gain for improved cow fertility through traditional selection is often slow due to the typical low heritability of the component traits; difficulties for accurate measurement and, in some instances, key traits may only be measured in mature females. However, the incorporation of genomic information into breeding programmes has the potential to significantly increase the rate of genetic gain in complex economically important traits, including fertility. The recent launch of the Beef Genomics Scheme by the Department of Agriculture, Food and Marine in conjunction with ICBF will put Ireland in prime position to implement a Genomic Selection programme for beef cattle which should accelerate the rate of genetic gain for improved reproduction efficiency. Teagasc research has underpinned the initiation and continued development of this technology.

Footnote comment from Simon Marsh, Principal Lecturer – Beef Cattle Specialist, Harper Adams University

Over the last few decades the beef suckler herd in Ireland has focused on terminal sire traits with home bred replacements. It is inevitable therefore that there has been a decline in beef cow fertility.