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## Important issues and current research on bull fertility

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### Summary

- 5% of bulls can be infertile while up to 25% experience subfertility.
- It is essential that vigilance for bull fertility and mating performance is maintained on an on-going basis throughout the breeding season.
- Current Teagasc research is examining the effects of genetics and nutrition on bull fertility as well as the potential for sexed semen use on beef cows.

### Bull fertility – be vigilant

In Ireland, in excess of 80% of calves born to beef cows are sired through natural service stock bulls with the remainder bred by an AI sire. In such situations, and particularly when a single sire mating is used in a herd of cows, the fertility of the stock bull is of major importance. There is little doubt that there are significant differences in fertility among individual bulls. While the reported incidence of sterility is generally low (<4%), subfertility, at a consistent level of 20-25%, is much more common in breeding bulls. Subfertility may be caused by low libido, sperm quality/quantity, defects or physical factors affecting bull mobility or mating ability. While a subfertile bull is capable of getting some cows pregnant it will result in low pregnancy rates, an extended calving interval, reduced calf weaning weights and higher involuntary culling of cows for barrenness, unless the bull is operating within a herd with a very low cow:bull ratio. Frequently, subfertile bulls go undetected and the suspicion of subfertility does not become apparent until much of the breeding season has elapsed or until such time that cows are checked for pregnancy. Furthermore, there is no guarantee that a bull will retain his fertility from season to season or even within a season. It is well established, that for the production of fertile spermatozoa the temperature of the testes must be 2-6°C lower than core body temperature. Increased testicular temperature, irrespective of the cause, reduces semen quality and is a common cause of infertility in bulls. The duration of the decrease in semen quality, following a thermal insult, would appear to be related to the severity and duration of the thermal insult, with sperm morphology returning to normal within 6 weeks of the end of the thermal insult, though resumption of normal fertility may take somewhat longer.

Because of serious implications of an infertile or subfertile bull on herd productivity Bull Breeding Soundness Evaluation (BBSE), or pre-breeding examination, has been put forward by a number of groups to help identify such bulls before the onset of the breeding season. The British Cattle Veterinary Association (BCVA) recently introduced a certification protocol for evaluating bulls for breeding purposes which involves 4 main steps: physical examination, semen examination, assessment of mating ability (not generally performed), and classification or overall prognosis. For each of the above examinations, bulls failing to reach a certain threshold will result in the bull being classified as "unsatisfactory". Bulls passing the physical and semen examination and/or assessment or mating ability examinations are classified as "suitable for breeding". While this does not classify a bull as "fertile" or "infertile", their objective is to reduce the risk of poor fertility performance in stock bulls. Those classified as "satisfactory" will have reached minimum criteria for semen motility, semen morphology and scrotal circumference, and no evidence of physical abnormalities will have been found. Bulls with serious semen or physical defects, or which fail to meet minimum criteria for scrotal

circumference, are classified as “unsatisfactory” for potential stock bulls. A number of Irish veterinary practices are BCVA-accredited and are offering this bull fertility assessment service to herds.

### **Observations during the breeding season**

During the breeding season it is important to check a bull for locomotion, any evidence of injury or arthritic problems, and that he is physically capable of mating cows. The best check of a bull's fertility is his ability to get cows pregnant. Therefore, it is advisable to record the identity of the first cows bred and to obtain confirmation of a bull's fertility by ultrasonically scanning these cows for pregnancy 28-35 days after breeding. This is particularly important for young bulls joining the herd. It is impossible to be precise regarding the exact number of cows to assign to a bull. For yearling bulls the general recommendation is 20-30 cows with up to 50 cows assigned to mature bulls of known high fertility.

### **Nutrition and bull fertility**

Although often overlooked in the past, there is now increased focus on the nutrition of bulls, and in particular young bulls, and its effect on both advancement of puberty or sexual maturity, and also on semen quantity and quality. Similar to heifers, young bulls well grown for age, will typically commence sexual activity earlier and have achieved a higher level of semen quantity and quality at the start of the breeding season than poorer performing contemporaries. A research programme, funded by the Department of Agriculture, Food and the Marine and involving the University of Limerick and University College Dublin has recently commenced at Grange with the objectives of better understanding (i) the effect of plane nutrition from birth on the advancement of puberty of young bulls and (ii) the effect of supplementary dietary fats on the quantity and quality of semen in sexually mature bulls. Ultimately, the project aims to define clear guidelines for the rearing of young dairy and beef bulls to consistently achieve high fertility in their first season.

### **Genetic effects of bull fertility**

The identification of genes in cattle which have been shown to regulate fertility in other species holds significant promise for understanding the regulation of fertility in bulls. Teagasc research has shown that these genes are expressed in the reproductive tract of the bull and are also present on the sperm themselves. The identification of variation in these genes may facilitate improved selection for fertility. Understanding the mechanisms involved in regulating fertility opens up additional opportunities to develop tools not only to treat sub-fertility but also to extend the function of sperm from elite sires during peak demand. Additionally and similar to current plans for female fertility traits, such information could be incorporated into national genomically assisted breeding programmes for beef cattle.

### **Sexed semen**

There is increased interest in recent years in the use of sexed semen in both dairy and beef herds in Ireland. The Replacement Index developed by the Irish Cattle Breeding Federation (ICBF), in conjunction with Teagasc, now provides farmers with a tool with which to identify proven AI bulls with the potential to breed replacement heifers with improved maternal traits. The use of sexed semen from bulls with increased genetic merit which to breed their replacement heifers while breeding the remaining cows either through AI or natural service to bulls with a high terminal index. Currently, a large on farm trial is being run by Teagasc, in association with ICBF, examining the efficacy of sexed semen use for beef cows under a fixed-time AI programme. The results of this trial will be available early next year.

### **Footnote comment from Simon Marsh, Harper Adams University on ‘Nutrition and bull fertility’**

Whilst it is stated above that “young bulls well grown for age, will typically commence sexual activity earlier and achieve a higher level of semen quantity and quality at the start of the breeding season than poorer performing contemporaries” it is acknowledged that excessive levels of concentrate feeding to young bulls can have a detrimental effect on semen quality and bull longevity.