TECHNICAL SNAPSHOT

SEXED SEMEN, SUSTAINABILITY AND PROGESTERONE



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BACKGROUND

Sexed semen is a rapidly growing alternative to conventional semen for the artificial insemination of dairy cows. By 2021, almost two-thirds of all semen sold into the dairy industry was sexed (Fig 1) and the number of dairy heifers born as a result of fertilisation with sexed semen was double those born to conventional semen[1] (Fig 2), demonstrating an increased willingness of dairy farmers to look at the impact of the dairy industry on male calves.

Initially, analogue machines were used to sort semen – these were slow and bulky and inefficient. New machines are 1000x more effective at sorting semen, resulting in improved purity and the production of straws each containing 4 million spermatozoa. As a result, sexed semen currently produces a 90% sex bias and vastly improved conception rates compared to those recorded when the technology was initially utilised[2].

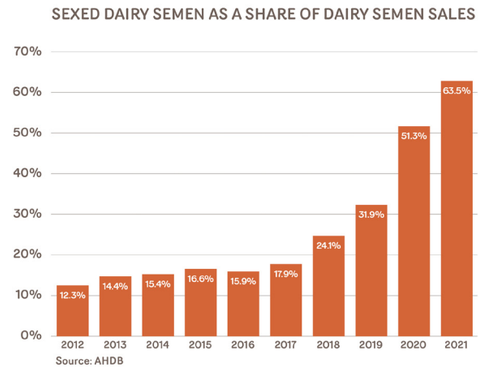

Fig 1: The growth of sexed semen as a share of dairy semen sales in the UK[1]

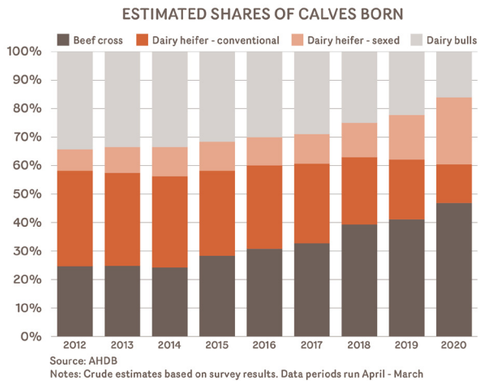

Fig 2: An estimate of the share of calves born to different insemination methods[1]

WELFARE, SUSTAINABILITY AND HERD BENEFITS

The drive for enhanced calf and cow welfare, alongside a demand for greater production efficiency and the focus on improved sustainability in agriculture means the use of sexed semen will continue to increase in the dairy sector.

Conventional semen leads to a surplus of unwanted male dairy calves, which are more likely to lead to dystocia compared to heifer calves (reducing welfare and incurring economic losses[3]) and also have a lower economic value so, historically, were often euthanised shortly after birth. Many milk buyers now prohibit farmers from euthanising calves under eight weeks old and the use of sexed semen has helped farmers to fulfil this requirement. In addition, this technology can reduce the live exports of unwanted male calves.

Sexed semen can be used to generate heifers for **dairy herd replacements** and herd expansion at a faster rate from within the herd, thereby minimising biosecurity risks associated with bringing in animals from different herds[3]. Heifers tend to have lower metabolic stress than lactating adults and so are associated with higher conception rates to AI[4], so using sexed semen in this group for replacements is economically beneficial[5].

Sustainable **herd expansion** and genetic gain can be delivered by inseminating high performing adults with sexed semen to produce genetically superior female calves[6] and use lower-cost beef semen on all dams that are not considered suitable to produce replacements. This results in increased genetic gain, increased value of any beef output from the dairy herd, and reduced greenhouse gas emissions from rearing unwanted beef calves.

CHALLENGES ASSOCIATED WITH SEXED SEMEN

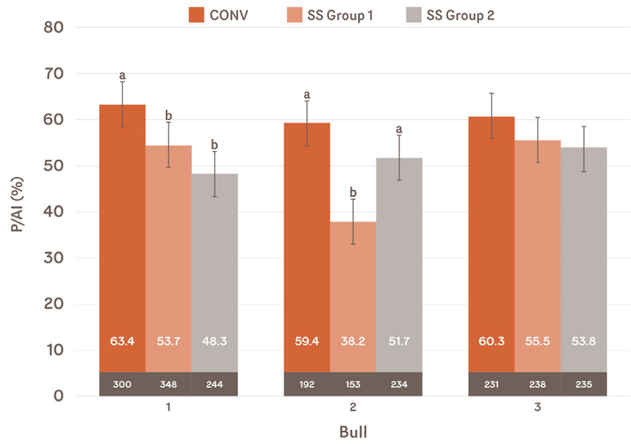

Fig 3: Graph showing the variability to sorting of semen from 3 bulls – whilst all three have a similar CRs with conventional semen, there is a range of CRs when sorted, showing bull variability[9].

It is well known that the conception rate (CR) for sexed semen is poorer than with conventional semen by about 5-10%[7] despite modifications to the sorting process. The semen may be viable for a shorter period of time and so timing is important, with insemination as close as possible to ovulation being advantageous[8].

The semen from some bulls seems to be more susceptible to damage during the sorting process and so, to mitigate this risk, it is recommended to use mixed, sorted semen from a larger team of bulls (at least 5)[9].

As a result of the damage caused by the sorting process, semen straws should be handled very carefully[8].

Suggested process for straw handling on the day of AI[8]:

- Organise the required sexed-semen straws into one goblet
- Thaw a MAXIMUM of two SS semen straws at a time, ideally one straw
- Thaw straws at 35 to 37°C for 45 sec
- Load straws into a pre-warmed AI gun, and maintain the temperature as much as possible
- Deposit semen into the uterine body
- Complete inseminations within 5 min

The AI technician, and how they handle sexed semen, can make a big difference to the CR - experienced technicians should be selected where possible[9].

ECONOMICS OVERVIEW

Whilst the cost of sexed semen straws is higher than conventional semen, overall herd economic benefits are clear. A 2021 study, conducted by Synergy Farm Health, looked at 200 Spring block calving dairy heifers, which were synchronised before AI with sexed semen[5] and which achieved a 53.5% CR to first AI. The total costs were calculated (Table 1) and mitigated against the economic gain (Table 2). The results showed a net benefit of the synch programme of £88.55[5] per heifer.

Cost	Value £	Number/multiplier	Overall cost £
Sync protocol medicines	25.00	200	5,000
Vet time for synch protocol	7.00	200	1,400
Farmer time for synch protocol	3.00	200	600
Cost of semen per straw	25.00	200	5,000
Cost of extra feed for milking vs dry per day (6 days per synch heifer @0.50p)	3.00	200	600

Table 1: **Overall costs for synchronised heifers[5]**

Benefits	Value £	Number/multiplier	Overall cost £
Market value of extra AI vs homebred heifers	50.00	93	4,650
Market value of net extra heifer calves vs bull calves	110.00	41	4,510
Value of extra days in milk (15litres/day @30ppl)	4.50	200	900
Value of earlier calving heifers (benefits to future fetility) less dystocia with easier calving heifer calves	10.00	200	2,000
Genetic gain giving better milk (+10%), fertility, SCC of AI vs homebred heifer	150.00	93	13,950
Benefits of keeping 50% less bull power (5 instead of 10 bulls) - per bull	800.00	5	4,000

Table 2: **Overall benefits for synchronised heifers[5]**

	£
Benefits per heifer	151.55
Costs per heifer	63.00
Net benefit of sync program per heifer	88.55

Table 3: **Net cost benefit per heifer[5]**

Provided it is carefully selected and used, sexed semen is an economic way of delivering enhanced sustainability for dairy farmers[3].

PRID DELTA



HIGH PROGESTERONE SYNCHRONISATION BEFORE THE USE OF SEXED SEMEN FOR FTAI

Progesterone is a mainstay of fertility management and the use of P4 releasing devices in synchronisation protocols before the use of sexed semen for FTAI can have a benefit on CR.

High levels of circulating P4 prior to ovulation lead to:

- Improved quality pre-ovulatory follicles[10,11]
- A longer duration and enhanced expression of oestrus[12] enabling better detection
- Predicable ovulation[13,14]
- More competent oocytes[10]
- Enhanced endometrial function[15]
- Optimal embryo quality[16,17]

PRID® DELTA is the progesterone releasing device (in the U.K. market) with higher progesterone levels and a larger surface area, achieving greater circulating P4 levels in cattle[18].

PRID® DELTA contains 12% more progesterone in total and has 29% larger surface area in contact with the vaginal wall than other devices available in the U.K.[19].

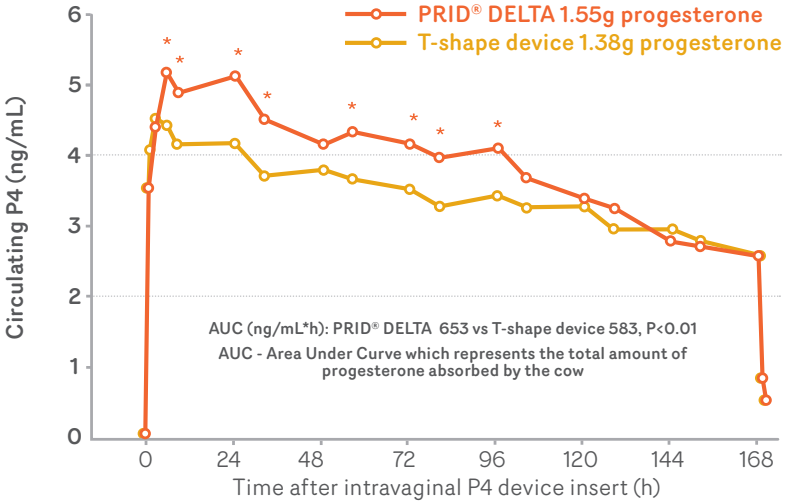

Fig 4: Progesterone release over time by product[18] *P<0.05

In order to gain the maximum efficiency from FTAI using sexed semen, choose a device which delivers high levels of P4 as part of the synchronisation protocol.

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