Improving conception rates in dairy cows

TEAGASC research is looking how a range of factors involved in artificial insemination impact on conception rates in dairy cows.

In cattle, artificial insemination (AI) plays a vital role not only in the successful establishment of pregnancy, which is a prerequisite for initiation of the subsequent lactation, but also in accelerating genetic improvement and facilitating the distribution of semen from genetically elite sires. The latter has been greatly facilitated by the ability to successfully cryopreserve semen. The objective of an insemination is to ensure that there is an adequate reservoir of competent, capacitated, motile sperm in the caudal region of the oviductal isthmus, the site of the main sperm reservoir in the cow, at the time of ovulation, to ensure fertilisation. This is a prerequisite to achieving a high embryo survival and pregnancy rate. There are many cow and semen factors that affect fertilisation rate. Other factors that impact on fertilisation include: inseminator competency; handling of semen; site of semen deposition; heterospermic insemination; and, timing of AI. These are the focus of this review.

The deposition of semen near the uterotubal junction would be hypothesised to reduce sperm loss either by retrograde flow of uterine mucus or by phagocytosis and would, therefore, be expected to enhance the reservoir of sperm in the caudal region of the oviductal isthmus and potentially improve conception rate. The objective of this study was to test this hypothesis.

Study of commercial inseminators

This study was carried out over two years with six commercial inseminators involved in each year, four of which were involved in both years. All inseminators were chosen by the AI Centre and trained prior to the start of the experiment in each year. The inseminators chose the co-operating herds. Each alternate cow presented for AI in co-operating herds was inseminated either by placing all of the inseminate in the body of the uterus (Body), or by placing 50% of the inseminate beyond the curvature in each uterine horn (Horn) (**Figure 1**). Frozen-thawed semen in 0.25ml straws was used throughout. Records were kept and data collected on a total of 1,860 inseminations in 37 herds in Year 1 and on 1,586 inseminations in 24 herds in Year 2. Conception rate (CR) was determined by ultrasonography at 28-60 days after AI. Data were analysed, with terms for AI treatment, year, inseminator, and their interactions included in the model.

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Best practice for AI

There were no AI treatment x inseminator x year, treatment x year, or inseminator x year interactions for CR ($P>0.05$). However, there was a significant effect ($P<0.02$) of AI treatment x inseminator on CR, with evidence of either an increase (+11.4%; $P<0.05$), decrease (-4 to -6%; $P<0.05$), or no effect ($P>0.05$) of Horn AI on CR for individual inseminators. Results are presented in **Figure 2**. A retrospective analysis of the data for each inseminator for each year showed that that there was an inverse relationship ($P<0.005$) between the improvement in CR recorded following Horn insemination and CR achieved

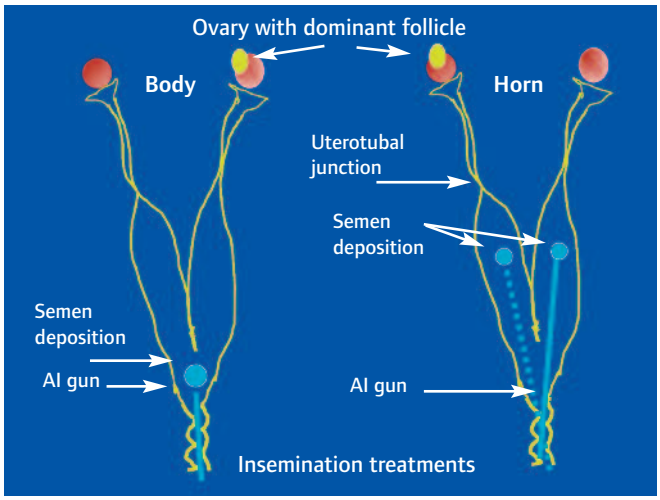

FIGURE 1: Each alternate cow presented for AI was inseminated either by placing all of the inseminate in the body of the uterus (Body), or by placing 50% of the inseminate beyond the curvature in each uterine horn (Horn).

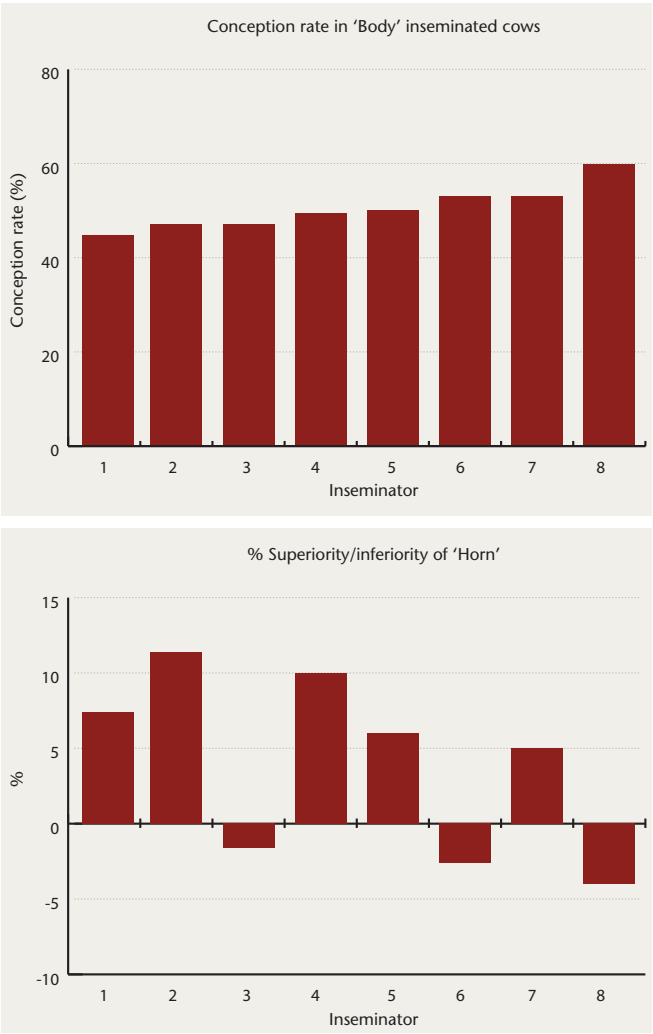

FIGURE 2: Conception rate following Body AI for each of the eight inseminators, arranged from lowest to highest conception rates (upper panel); superiority or inferiority of Horn AI, relative to body AI, for each of the eight inseminators (lower panel).

following Body AI (**Figure 3**). This study indicates that the effect of uterine horn AI on CR is not uniform, and may be inseminator dependent. For individual inseminators, there was an inverse relationship between the improvement in CR recorded following Horn insemination and CR achieved following Body AI. The results further suggest that non-return rates could be improved for individual inseminators by adopting the practice of placing half of the inseminate beyond the curvature of each uterine horn as opposed to body insemination, which is normal practice.

Improving conception rate

From the foregoing, if inseminators are achieving consistently high conception rates following body insemination, there would appear to be little benefit in switching to uterine horn insemination. However, if conception rates are low, uterine horn insemination will result in a modest increase (almost 5-11%) in conception rate.

Extra care is required with deep uterine body insemination to avoid trauma to the uterine epithelium. One possible explanation for the benefits of uterine horn insemination may be the avoidance of cervical deposition of the semen, which has been shown to reduce conception rates by 10 percentage points compared to uterine body deposition.

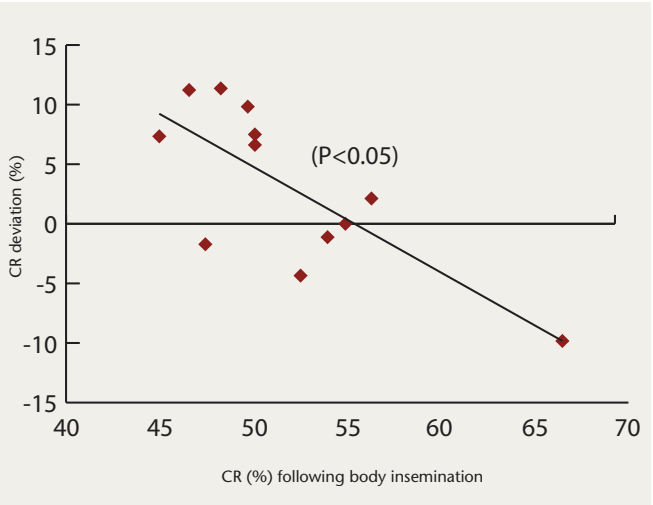

FIGURE 3: Conception rate deviation (CR following Horn AI-CR following Body AI) (y axis); and, CR for Body AI for each inseminator in each year (x axis).

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