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Follicular characteristics and pregnancy rates to AI in Holstein heifers treated with two protocols with prolonged proestrus and inseminated with sexed semen

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Application: High-fertility timed-AI (TAI) protocols facilitates the application of sexed semen in Holstein heifers.
Introduction: The widespread use of sexed semen requires the development of TAI programs with high fertility (Bo et al., 2018). Two experiments were designed to evaluate of the length of insertion of the progesterone (P4) device on follicular characteristics and P/AI in Holstein Heifers treated with the oestradiol/P4 based protocol, named J-Synch, and inseminated with sexed semen.
Materials and Methods: Holstein heifers (n = 14 in Experiment 1 and 336 in Experiment 2) were used. On Day 0, all heifers received 2 mg oestradiol benzoate (Over, Argentina) and a device containing 0.7 g P4 (Sincrover, Over). The P4 device was removed on Day 6 in the 6-d J-Synch group and on Day 7 in the 7-d J-Synch group. All heifers received 150 μg D(+) cloprostenol (Prostal, Over) at device removal and were tail painted for oestrus detection. In Experiment 1, heifers were scanned twice daily from device removal to ovulation. In Experiment 2, heifers with >30% of the tail-paint rubbed off by 72 h after device removal were inseminated at that time, whereas those without the tail-paint rubbed-off received 10 μg buserelin (Gestar, Over) and were inseminated 12 h later. All heifers in Experiment 2 were inseminated with sexed semen from 6 bulls (Sexcel, ABS, USA) that were equally distributed among groups and were examined for pregnancy 30 days after AI. Data were analysed using ANOVA in Experiment 1 and GLM mixed procedure for binary data with a logit link in Experiment 2.
Results: In Experiment 1, the interval from device removal to ovulation tended (P = 0.08) to be longer in the 6-d J-Synch group (96.0 ± 5.8 h) than in the 7-d J-Synch group (82.5 ± 5.0 h). The diameter of the largest follicle at the time of device removal and before ovulation did not differ among groups (8.1 ± 1.5 and 13.7 ± 0.7 mm vs 10.1 ± 1.5 and 1.9 ± 0.6 mm, for the 6 and 7-d J-Synch groups, respectively). In Experiment 2, although oestrus expression did not differ (86.4%, 146/1169 vs 87.4%, 146/167 for the 6 and 7-d J-Synch, respectively), P/AI was greater (P < 0.05) in those in the 7-d J-Synch (49.1%, 82/167) than those in the 6-d J-Synch group (37.9%, 64/169).
Conclusions: Delaying the removal of the P4 device by one day in the J-Synch protocol resulted in higher P/AI in Holstein heifers inseminated with sexed semen.
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Reference

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Nutrient restriction during early gestation in dairy cattle impairs ovarian development in the offspring

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Application: Bovine fertility may be enhanced by avoiding nutritional deficiencies in pregnant dams.
Introduction: Female beef calves born to mothers exposed to a nutritionally restricted diet in early gestation have been shown to have a reduced total number of ovarian follicles (ovarian reserve; Mossa et al., 2013). The aim of this work was to investigate the impact of maternal nutrient restriction from shortly before conception to early gestation on the development of the reproductive tract in female progeny in dairy cattle.
Materials and Methods: Holstein-Friesian heifers (n = 42) homogenous for age (14–17 mo) and weight (366.2 ± 41.1 kg) were randomly assigned to three experimental groups and, starting 10 days before artificial insemination (AI), were individually fed at: (i) 0.6 of their maintenance energy requirements (M) up to day 80 (Nutrient Restricted, NR80;n = 16) or (ii) 120 DG (days of gestation; NR120,n = 16), and (iii) 1.8 M until 120 DG (Control, C; n = 10). Estrus cycles were synchronized, and heifers were inseminated with sex-sorted semen from a single sire. Pregnancy was diagnosed and confirmed via ultrasound (MyLab Omega, Esaote, with 4–10 MHz sectorial probe) 28 and 55 days after AI, respectively. After the end of the differential diet, all heifers were group fed ad libitum until calving. Twenty-two single

female calves were born (NR80 = 8; NR120 = 9; C = 5); body weight (BW) and height at withers (H) were measured regularly until slaughter at 4.5 mo. Ovaries were measured, weighed, all visible antral follicles were counted, and cumulus oocyte complexes (COCs) were collected. Data were analyzed with R software with One-way ANOVA and mean contrast separated with Tukey post-hoc test. Results are expressed as mean ± SEM.
Results: BW at birth was lower in NR80 than C calves ($P < 0.05$) and similar between NR80 and NR120 (C = 41.4 ± 1.1; NR80 = 36.7 ± 0.6; NR120 = 38.3 ± 1.2 kg), while BW at slaughter and H were similar among groups. Ovarian volume was similar among groups. Ovarian weight was lower ($P < 0.05$) in NR120 compared to C and similar between NR120 and NR80 (C = 10.4 ± 1.3; NR80 = 7.4 ± 0.9; NR120 = 6.7 ± 0.5 g) and not correlated to BW at slaughter (R = 0.05). NR120 heifers had less ($P < 0.05$) visible antral follicles than C whereas no difference was detected between NR80 and C (C = 197.2 ± 36.5; NR80 = 150.1 ± 20.9; NR120 = 104.2 ± 10.7). Fewer COCs were retrieved ($P < 0.05$) from NR120 and NR80 compared to C ovaries (C = 75.8 ± 12.57; NR80 = 48 ± 3.5; NR120 = 48.2 ± 6.68).
Conclusions: Maternal exposure to undernutrition from preconception to day 120 of gestation resulted in a reduction of ovarian weight, visible antral follicles and retrieved COCs in their female offspring indicating a potential impairment of the size of the ovarian reserve.
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Heifers in large, high-producing dairy herds have lower age at first calving

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Application: Optimal age at first calving is an important key performance indicator for lifetime production and dairy farm profit, as well as for prospective health, fertility and longevity. Many herds have potential to decrease the age at first calving, thereby increasing profit and reducing greenhouse gas emission from the rearing of recruitment heifers.
Introduction: Despite long-term advisory efforts aiming for 24–25 months of age at first calving, improvements have been slow. The national, Swedish mean has been above 27 months for long, but in year 2022, it decreased below 27 months for the first time for heifers of both major dairy breeds, Holstein and Swedish Red. The objective was to improve reproductive herd health management based on identified risk factors.
Materials and Methods: Data from 2,024 dairy herds in the Swedish national dairy herd recording scheme were used to describe the current state and investigate associations between explanatory variables (herd size, housing/milking system, breed, organic or conventional production, milk yield and region) and the dependent variable age at first calving, using a multivariable linear regression model.
Results: The results showed that age at first calving was higher in herds with crosses of Swedish Red and Holstein (27.7 months, $P = 0.005$,) than in herds without a dominant breed (27.1 months). Herds with ≥200 cows had lower age at first calving (26.7 months, $P \leq 0.002$) than herds with <100 cows (27.8 months). Organic herds had lower age at first calving (27.1 months, $P = 0.02$) compared to conventional herds (27.6 months). Herds with free-stall systems, irrespective of milking system, had lower age at first calving (27.2 months, $P = 0.02$) than herds with tie-stall system (27.8 months). Age at first calving decreased with increasing herd milk yield ($P < 0.001$), 26.0 months in the highest-yielding herds (≥11,619 kg ECM) and 29.4 in the lowest-yielding herds (<9,791 kg ECM). There was substantial variation ($P < 0.001$) in age at first calving in herds in different Swedish counties, with a range from 26.0 months in the northernmost counties to 28.6 months further south.
Conclusions: In conclusion, although the national mean age at first calving recently has improved to below 27 months, there is still potential for improvement for most of Swedish dairy herds. Notably, in the largest and most high-yielding herds the age at first calving was lowest, implying that intensive production systems have successful management strategies to learn from in the reproductive herd health advisory service.

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