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Estimating field conception rates for Holstein sires in US herds (ACE index) and conception rate correlation from the same sires used for AI after natural estrus and timed AI breedings

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INTRODUCTION

- Reproductive performance has a major impact on profitability of dairy herds
- Fertility parameters = declined in the last decades. Thus, modern breeding strategies tend to consider not only sire genetic value, but also sire fertility to maximize number of pregnancies
- Lab analysis of semen quality ~ poor correlation with field fertility
- Thus, to comply with industry demands, some sire fertility indexes based on field conception results have been developed in recent years (i.e. SCR, ATA).
- Sire Conception Rate index (AIPL-USDA) is well accepted as the industry gold standard for sire fertility in US
- Because synchronization of cows with Ovsynch-like protocols is widely used in dairy herds, it is important to find out whether a subpopulation of sires can potentially produce better conception results when used following synchronized ovulations (timed AI breedings) as compared to breedings performed after naturally detected estruses

OBJECTIVES

- **To estimate field conception rate for Holstein sires used in dairy herds in US**
- **To compare and validate the Accelerated Conception Evaluation field fertility index(ACE) using for comparison the Sire Conception Rate index (SCR, AIPL-USDA) as the industry official standard for sire fertility classification**
- **To compare conception rate (CR) rankings from same sires used for AI after natural estrus (NS) and timed AI (TAI) breedings**

HYPOTHESES

- **ACE will be significantly well correlated with SCR**
- **There will be a significant variation in conception rankings when same sires are used during timed AI breedings or AI after natural estrus**
- **This will allow the identification of sires more suitable to be used in synchronizations/timed AI routines**

MATERIALS AND METHODS

- Confirmed conception rate records from three national data centers (Agsource, ATA, DRMS) and farm backups from non-testing herds were merged and used as basis for this data analysis
- Criteria edits in the dataset were:
  1. Breedings from last 4 years
  2. Only confirmed conception results included
  3. Sires with 300 breedings minimum
  4. Herd's CR within 20 and 60% and minimum of at least 30 breedings per herd
  5. Sires used in a minimum of 10 herds with no more than 40% breedings in one of the herds
  6. Only used 1st to 5th postpartum breedings occurring within 45 to 375 DIM
  7. Only cows within 1 to 5 lactations
- After data edits: 1,142,859 breeding records available for analysis of sire fertility and 801,636 for fertility rankings following natural estrus and timed AI breedings
- The procedure GLIMMIX of SAS took into account effects of state, farm, cow id, breeding month, year, parity, DIM at breeding, and service sire. BLUP-ILINK used to calculate predicted field conception results
- Proc CORR of SAS was used to calculate Spearman correlations between SCR and ACE as well as conception results for same sires used on NS and TAI breedings
- Final ACE sire fertility index was based on number of standard deviations from predicted mean conception (mean pred. CR minus sire pred. CR/STDEV)

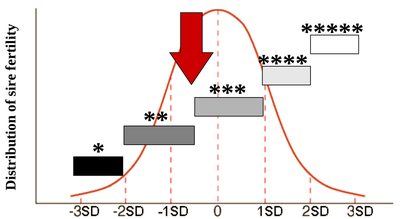

Figure 1. ACE: star system based on standard deviations from the predicted field conception was developed to group sires and avoid overinterpretation .

RESULTS

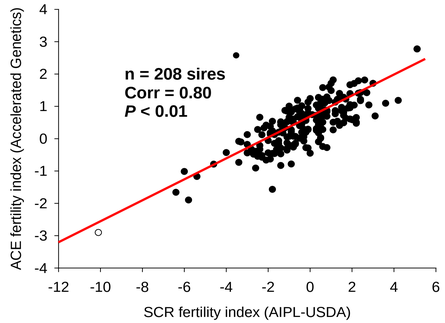

Figure 2. Overall correlation between ACE fertility index (Accelerated Genetics) and SCR (Sire Conception Rate, AIPL-USDA).

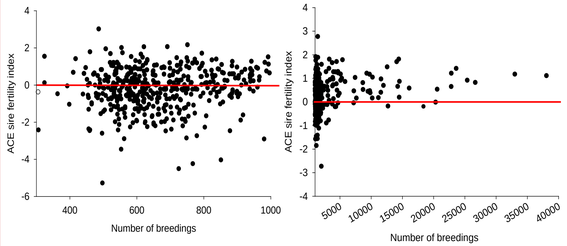

Figure 3. ACE index according to number of breeding records per sire.

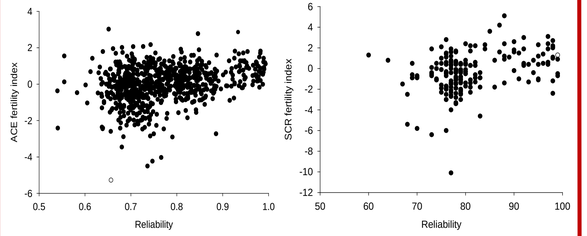

Figure 4. Distribution of ACE and SCR according to reliability (n/n+260).

Fertility classification based on ± 1 SD	% rank agreement >700 AI	% rank agreement >1000 AI
High NS and High TAI	60%	70%
Average NS and Average TAI	83%	94%
Low NS and Low TAI	53%	60%

Table 1. Percent rank agreement and Spearman-correlation for sires used in NS and TAI breedings.

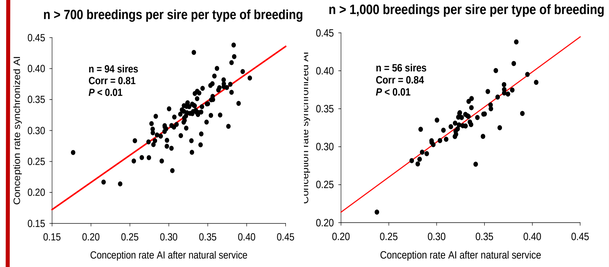

Figure 5. Conception rate correlation for sire used on NS and TAI breedings.

CONCLUSIONS AND SPECULATIONS

- **In conclusion, a significantly good correlation was found between ACE and the industry gold standard index-SCR**
- **ACE only applies to 14H sires**
- **Because correlation between conception results when same sires are used for AI after natural estrus (EAI) and timed AI (TAI) is significant high, we have to reject our initial hypothesis that some sires would produce better conception results when used during synchronization/TAI breedings**
- **However, further randomized studies need to be performed to more properly test whether there is significant variation among sires in terms of conception when used following natural estrus or synchronized ovulations**