Rules and methodology used to certify cattle parentage in France

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Introduction

- Sound Parentage is essential
  - To have an accurate genetic evaluation
  - To develop exchanges of genetic material
- Specificity of beef cattle
  - Using both Artificial insemination and Natural mating
  - Have a succession of mating events for the same cow during one mating period

French organisation for parentage certification

Data files

- 1 millions of calves
  - Born from July 2000 to April 2005
  - Beef breeds
- Data available
  - ID and pedigree
  - Mating events (AI and NM)
  - Results of certification of parentage and reasons for refusal
  - Validation of parentage by DNA typing

How to improve rules when there are several mating events?

- Have a good knowledge of
  - Mating events
  - Gestation length and distribution
  - Probability of fertilization
    - By AI
    - By NM
- Develop an appropriate statistical approach to determine the sire
  - Former rules were established in 1976 in case of 2 AI

Distribution of mating events

- One mating event (74%)
  - Natural mating : 56%
  - Artificial insemination : 16%
- Several mating events (22%)
  - 2 AI with different sires : 1%
  - 2 NM with different sires : 5%
  - 1 AI + 1 MN with different sires : 5%
Gestation length

Data to analyse gestation length

- 170,000 calves (15% of the data set)
  - Only 1 mating event by AI
    - between -62 d and +80 d around the supposed date of fertilization

Gestation length for single male calf

- Twins calves: -6 days
- Female calf: -1 day

Distribution of gestation length

- Curve used in parentage certification as
  - Probability that AI is the fertilizing event
  - Probability to fertilize a female

Data to analyse fertilization by NM

- 93,349 calves
  - Only 1 mating event by NM
    - between -62 d and +80 d around the supposed date of fertilization
    - with dam mating period of 6 month ± 15 days

Natural mating: probability of fertilization
Natural mating events

Curves used in parentage certification as:
- Probability that NM is the fertilizing event (when you know that a calf is born)

Data to define the rules
- 1,583 calves with:
  - 2 potential sires
    - 2 AI (223 cases)
    - 2 NM (537 cases)
    - 1 AI + 1 NM (823 cases)
  - Parentage certified by DNA typing
  - Considering the mating events between -62 d and +80 d around the supposed date of fertilization

The use of curves areas
- Distribution of fertilization around the average date
The use of curves areas

- Probability that AI is the fertilizing event
- Distribution of fertilization around the average date
- Potential Fertilizing date
- Gestation length
- Calf birth

Rules to chose the sire

- The fertilizing event is the event with the larger intersection with the fecundation curve (larger green area)
- To validate this event we use 3 rules
  - Fertilizing event curve must overlap a sufficient part of fertilization curve
    WA < 92% of fertilization curve area
  - The 2 mating events mustn’t be too close
    RA < 17% of fertilization curve area
  - The probabilities of the 2 mating events must be enough different
    |GA1-GA2| > 8% of fertilization curve area

Efficiency of this new rules (649 cases)

- New rules: 82%
- Old rules: 76%

Conclusion

- New rules are more efficient
  - Lower percentage of errors
  - Higher percentage of solved cases
- Since this studies
  - A complementary optimisation was made to obtain specific rules for specific cases
  - Studies was validated in dairy breed
  - Gestation length and decision rules
  - The new rules will be used in French parentage certification system up to September 2006
Thank you for your attention