Rules and methodology used to certify cattle parentage in France

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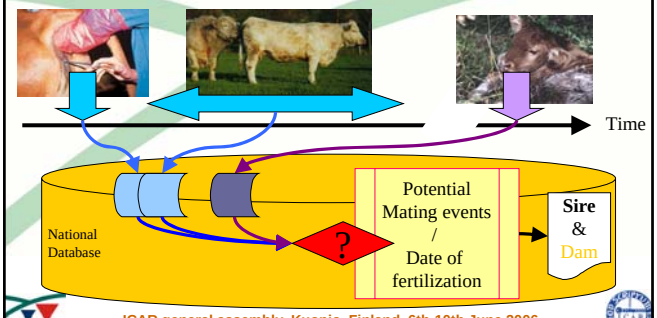
Introduction

- ✓Sound Parentage is essential
  - To have a 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



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 was established in 1976 in case of 2 AI

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

Distribution of mating events

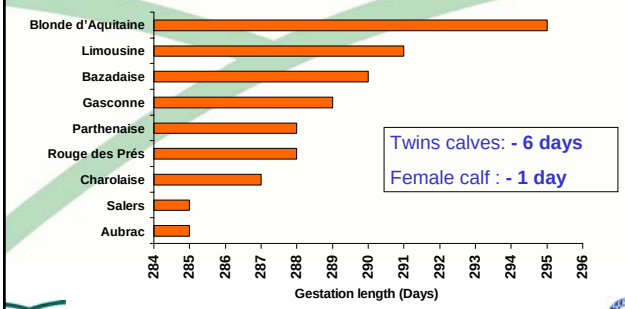
- ✓One mating event (74%)
  - Natural mating : 56%
  - Artificial insemination : 16%
- ✓Several mating events (22%)
  - 2 AI with different sires : 1%
  - 2 NM with different sires : 5%
  - 1 AI + 1 MN with different sires : 5%

Gestation length

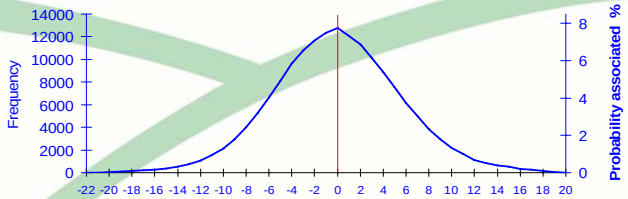
Data to analyse gestation length

- ✓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



Distribution of gestation length



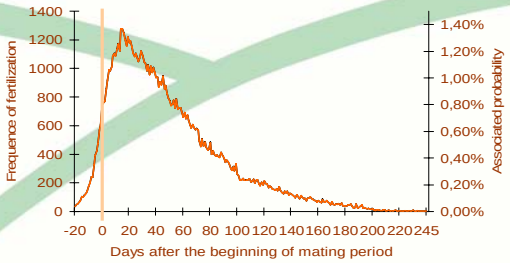
- ✓Curve used in parentage certification as
  - Probability that AI is the fertilizing event
  - Probability to fertilize a female

Natural mating : probability of fertilization

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 events



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

Maxime the number of solved cases

Have an % of errors less or equal to 5%

Solve the cases of 2 potential sires

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

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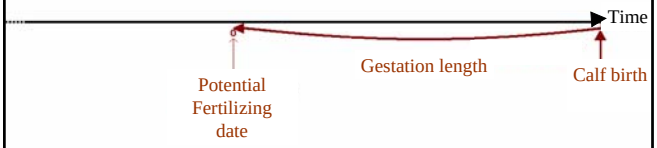
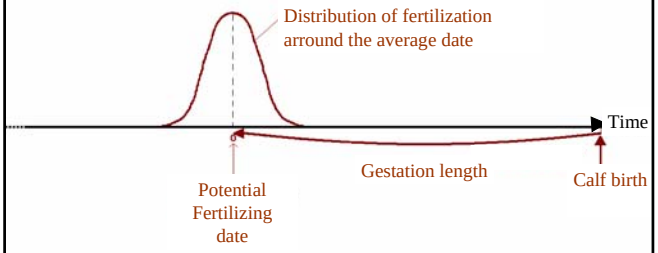


The use of curves areas



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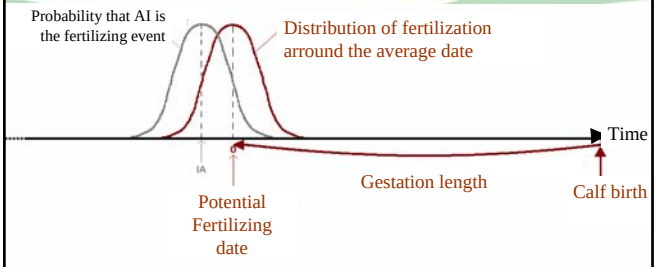

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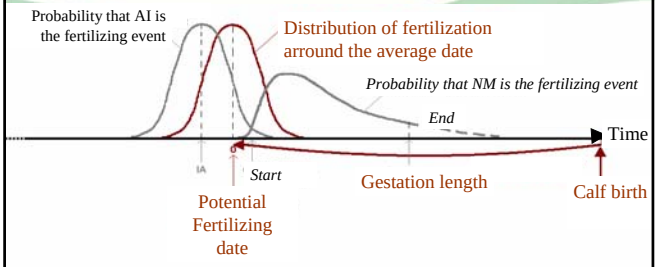
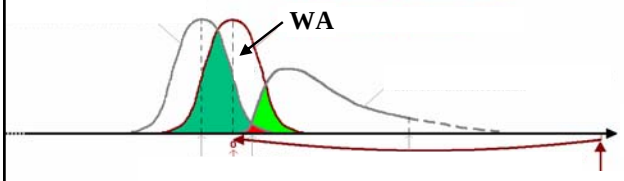


The use of curves areas

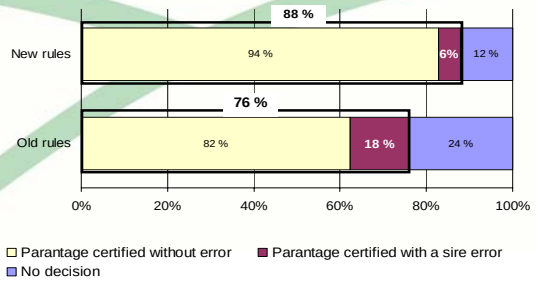


GA1	Intersection between AI fertilizing probability and fecundation curve
GA2	Intersection between NM fertilizing probability and fecundation curve
RA	Intersection between 2 fertilizing probabilities and fecundation curve

Rules to chose the sire

- ✓ The fertilizing event is the event with the larger intersection with thefecundation curve (larger green area)
- ✓ To validate this event we use 3 rules
  - Fertilizing event curve must overlap a suffisant 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 probabilties of the 2 mating events must be enough different
    |GA1-GA2| > 8% of fertilization curve area

Efficiency of this new rules (649 cases)



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
      ie 2 AI, 1 AI 1 NM and 2 NM
  - Results was validated in dairy breed
    - Gestation lenght and décision rules
  - The new rules will be used in French parentage certification system up to september 2006

Thank you
for your attention