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## Epidemiology of calf survival on dairy farms



### Key external stakeholders:

Dairy farmers, dairy industry, veterinary practitioners, DAFM, universities, AI industry.

### Practical implications for stakeholders:

- Under-reporting of calf loss was identified – better reporting will improve national disease surveillance and genetic management of calf health; lethal congenital defects were frequently identified in the project.
- The importance of co-mortality indicates the need for veterinary investigation of calf losses to ensure accurate diagnosis and appropriate recommendations; under-utilisation of local veterinary laboratories may contribute to their future closure.
- Good calving management was associated with better calf survival outcomes; targeted veterinary client education is indicated.
- Unexplained losses varied widely by herd; each herd requires individual investigation for risk factors and causes of calf loss.

### Main results:

- The protective factors associated with a low calf loss herd status were good calving management, AI-sired calves, non-HF or HFx dams and sires, easy calving, term gestation length, early month of calving, singletons and older pluriparae.
- Co-mortality (more than one cause of death) and abnormal calvings were the most significant causes of calf death and unexplained cause of death calves were lighter, died before or during unobserved or normal duration, easy calving with an excess of twin calves and calves from older cows.

### Opportunity / Benefit:

The results of this research have:

- Demonstrated the benefit of good calving management, AI-sired calves, non-HF or HFx dams and sires, eutocia, term gestation length, early month of calving, singletons and older pluriparae in reducing calf losses.
- Highlighted the lack of standardisation of both criteria and causes of death indicating an opportunity to address this knowledge gap by national and international collaboration.
- Identified previously underdiagnosed causes of calf loss and the prevalence of unexplained losses which has presented the opportunity for further collaborative research and surveillance nationally and internationally.

### Collaborating Institutions:

DAFM, UCD, ICBF

**Teagasc project team:**

Dr John Mee (Project Leader/PI)  
Dr Jim Grant  
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**External collaborators**

DAFM,  
UCD,  
ICBF

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**1. Project background:**

The changes in herd size post quota abolition will challenge farmers and their veterinarians to maintain and to improve animal health and welfare including calving performance and calf health. Calving problems affect cow production, fertility and health and calf health problems reduce subsequent heifer growth rate, milk production, fertility and survival in the herd. In addition, poor calving performance and high bovine perinatal mortality rates are indicator signs of an animal welfare 'deficit', whether they have sequelae or not. This may have even greater import in the future with new outcome-based animal welfare metrics benchmarks being used by major retail oligopolies. However, before one can attempt to improve calving performance and calf mortality figures one must be cognisant that they need to be improved. This blind spot exists when high mortality rates are normalised (*'bad becoming normal'*). The role of veterinarians in educating farm staff in calving management and calf care is critical and can significantly reduce loss rates.

Even when best practice is in place at farm-level, calving problems and calf losses still occur, much like mastitis, lameness and fertility problems. This is largely because all of the risk factors and causes of these problems are not fully understood; hence the 'unexplained stillbirth'. In addition to these knowledge gaps there are temporal changes in the presentation of these problems and large differences between dairy industries internationally and unknown differences between dairy and beef herds nationally. Hence, the aims of this research were to identify significant risk factors and investigate the causes of calf losses in dairy herds. Ultimately the goal of this project was to contribute to better understanding, investigation and management of calf survival.

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**2. Questions addressed by the project:**

- Can risk factors be identified as significant correlates with calf loss?
- Do high risk herds differ from low risk herds for significant risk factors?
- What are the common causes of calf loss?
- Do the causes of mortality differ between high and low risk herds?

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**3. The experimental studies:**

Utilising a population of 15,000 cows in thirty herds over three years in a longitudinal case-control study herds with either a history of low or high calf loss were monitored prospectively. Data were retrieved from the national cattle breeding database on risk factors and calf mortality rates. Two literature reviews of the epidemiology and the aetiology of calf mortality were conducted to identify the significant modifiable and non-modifiable risk factors associated with calf mortality. Farmer risk factor epidemiological questionnaires were used to collect detailed information on pre-calving and calving management practices at the beginning and at the end of the study. The criteria for cause of death were determined from an international Delphi survey. Detailed necropsy examinations (n=680) were used to establish both the timing and causes of calf death.

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**4. Main results:**

- Of the 14,805 calves born in these herds over the three years, 5.3% died (1-26/herd), 90% of which were singletons, 79% correctly presented and 55% male.
- The main effects associated with a high calf loss herd status were primiparity and young pluriparae, dystocia, unknown, short and prolonged gestation length, natural service sires, late month of calving, HF and HFx dams and sires and male and twin birth.
- The main effects associated with a low calf loss herd status were older pluriparae, non-HF or HFx dams and sires, term gestation length, early month of calving, early year of calving, singletons, eutocia, long previous calving interval and AI-sired calves.
- The results from the farmer questionnaire showed that most of the significant management factors associated with high calf loss herd status were found in calving, rather than pre-calving, management.
- The Delphi survey identified consensual definitions of causes of death and highlighted discordance particularly where diagnostic criteria are unclear. The survey highlighted the need for standardisation of both criteria and causes of death in cases of perinatal calf mortality.

- The necropsy examinations established that the three most frequent causes of death categories were, in descending order, co-mortality, dystocia and eutocia.
- An unusually high incidence of congenital defects, in particular, blocked bowel (intestinal atresia) was found; an unexpected and previously unreported outcome
- The carcass submission rate was significantly higher during the study period (5.5 carcasses/herd) than during the previous 30 years (<1 carcass/herd) when passive surveillance was employed indicating widespread under-reporting.
- The majority of dead calves were correctly presented, male, singletons bred by AI. Two-thirds of calves died before, during calving or within one hour thereafter.
- Significant exposure variables associated with cause of death included the degree of calving assistance, fetal plurality, gestation length, death weight and dam parity.
- Calves from high risk herds were more likely to die from a combination of causes of death, the main component of which was dystocia and congenital defect.
- Between 10 and 15% of cases remained unexplained but this varied widely by herd (0-33% calves); these calves tended to be lighter; they died before or during unobserved or normal duration, easy calving with an excess of twin calves and calves from pluripara.

#### 5. Opportunity/Benefit:

- The results clearly demonstrate the benefit of good calving management, AI-sired calves, non-HF or HFx dams and sires, eutocia, term gestation length, early month of calving, singletons and older pluriparae and in reducing calf losses.
- This project highlighted the lack of standardisation of both criteria and causes of death indicating an opportunity to address this knowledge gap by national and international collaboration.
- The unusually high incidence of congenital defects has shown the benefit of detailed investigation of the causes of calf loss and has stimulated a joint national surveillance program through ICBF, Teagasc and DAFM.
- The degree of under-reporting found here indicates that national estimates of calf loss may underestimate true loss rates and present the opportunity to increase awareness of such loss to enhance national animal disease and genetic surveillance.

#### 6. Dissemination:

##### Main publications:

Mee, J.F., Sanchez-Miguel, C. and Doherty M. (2014) Influence of modifiable risk factors on the incidence of stillbirth/perinatal mortality in dairy cattle. *The Veterinary Journal*, 199: 19-23.

Mee, J.F., Sanchez-Miguel, C. and Doherty M. (2013) An international Delphi study of the causes of death and the criteria used to assign cause of death in bovine perinatal mortality. *Reproduction in Domestic Animals*, 48: 651-659 (doi: 10.1111/rda.12139).

Mee, J.F. (2013) A novel, illustrated classification system to define the causes of bovine perinatal mortality internationally. In: *Dairy Cows: Reproduction, Nutritional Management and Diseases*, Nova Science Publishers, Inc., New York, USA, p. 1-52.

##### Popular publications:

Mee, J. F. (2013) Successful management of the dairy cow and calf at calving. *Proceedings of the 13<sup>th</sup> Congreso Internacional de Medicos Veterinarios Zooteenistas Especialistas en Bovinos de la Coma*, Coahuila, Mexico, p. 170-193.

Mee, J.F. (2013) Prevalence and types of bovine congenital defects, disorders, malformations and anomalies in a dairy calf population. *Proceedings of the 31<sup>st</sup> World Veterinary Congress*, Prague, Czech Republic, p. 19.

Mee, J.F. (2013) Holsteinization and neonatal calf losses – a worldwide perspective. *Proceedings of the 30<sup>th</sup> Annual South Western Ontario Dairy Symposium*, Ontario, Canada, p.19-23.

#### 7. Compiled by: Dr. John Mee