Impact of the Irish Johne's Control Programme on calf mortality

Dr Conor McAloon, PhD MSc MVB DipECBHM MRCVS, Dr John Mee, PhD, MVM, MVB, DipECBHM, FRCVS and Dr David Graham, MVB PhD FRCVS outline the impact of participation in the Irish Johne's Control Programme on calf mortality in dairy herds

Good calf health is important for production efficiency of a dairy farm. Research from UCD School of Veterinary Medicine has shown that calves in poor health grow at a slower rate (Rhodes et al., 2021) and are therefore expected to have negative fertility (Hayes et al., 2019) and production impacts as adults (Hayes et al., 2021). In addition, if replacement calves die, more calves need to be born to maintain a given replacement rate, exacerbating the environmental impacts of dairy production. The welfare of dairy calves is under increasing scrutiny from both industry and consumers. Calf mortality metrics are recognised as crude indicators of calf welfare: whilst low calf mortality alone should not be considered evidence of good welfare, high calf mortality is undoubtedly an indication of poor welfare.

QUANTIFYING CALF MORTALITY

To accurately measure calf mortality and to facilitate between-herd comparisons, it is important that it is measured using appropriate metrics. In epidemiology, the terms 'risk' and 'rate' have specific definitions but are often used incorrectly. Risk is the number of cases occurring over a specified time period, divided by the number at risk and therefore ranges from 0 to 1 (or 0% to 100%). On the other hand, rate is the number of cases occurring per unit time at risk (Dettori et al., 2021). As an example, 100-day *calf mortality risk* might be 5% (or 0.05), whereas *calf mortality rate* might be 0.06 deaths per 100 calf days at risk.

In Irish dairy systems, quantifying calf mortality using risk is problematic since a significant proportion of calves are sold from some farms. As a consequence, using the number of calves born on the farm as a denominator will invariably underestimate mortality on the farm. This is demonstrated in the schematic in Figure 1 which shows how mortality *risk* may be the same for four calves in each of two example farms, yet true mortality *rate* varies significantly. In the Netherlands, recent work comparing a range of calf mortality metrics has shown that results can change dramatically with slight differences in definitions, e.g., changing farm ranking in between-herd comparisons (Santman-Berends et al., 2019). Therefore, some herds will exceed a particular 'acceptable' threshold for calf mortality on one metric yet be below an 'acceptable' threshold for calf mortality when the definition is changed slightly.

JOHNE'S CONTROL AND CALF HEALTH

The Irish Johne's control programme (IJCP) led by Animal Health Ireland was introduced as a pilot programme in 2013, progressing to a voluntary national programme subsequently (Gavey et al., 2021). One of the four programme objectives of the IJCP is to improve calf health. This is possible since many of the interventions to reduce within-herd transmission of *paratuberculosis* are considered 'calf protective' measures that can benefit calf health generally (Field et al., 2022; McAloon et al., 2016). However, to date there has been relatively little peer-reviewed evidence to support and quantify this positive impact on calf health.

RECENT IRISH RESEARCH ON CALF MORTALITY

In 2017, the Department of Agriculture Food and the Marine funded the Surveillance, Welfare and Biosecurity (SWAB) research project led by UCD School of Veterinary Medicine and Teagasc. Recent research from this study (McAloon et al., 2023) has quantified calf mortality (from 1-100 days old) in Irish dairy herds using multiple metrics. In addition, this work has examined the relationship between paratuberculosis control measures on farm and calf mortality.

Overall, this study found a calf mortality rate of 0.041 deaths per 100 calf days at risk between 2016 and 2020. As expected,

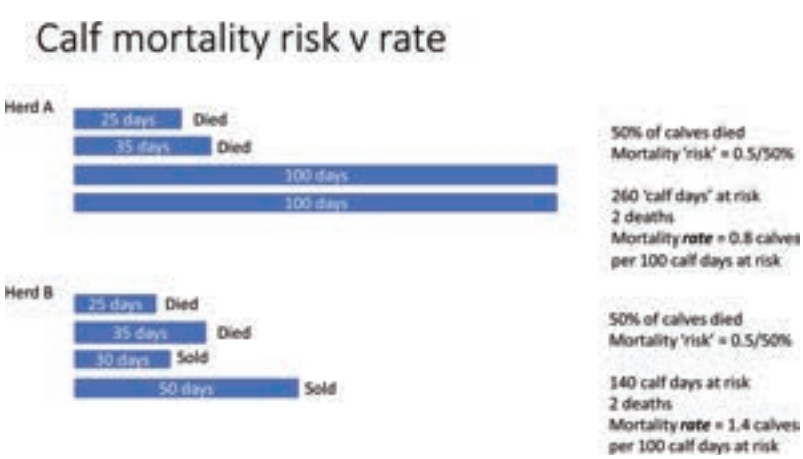

Figure 1: Example of how mortality risk may underestimate true mortality rate, using an example for 4 calves on two farms with different calf selling practices.

100-day calf mortality risk (0.032) significantly underestimated mortality. The top 5% of herds achieved a mortality rate of 0 deaths per 100 calf days at risk, whereas in the worst 5% of herds the rate was 0.106 deaths per 100 calf days at risk. Mortality was associated with several animal and herd-level factors including calf sex and breed, and herd size and type. Comparing calf mortality between countries is notoriously difficult owing to differences in methodology and definitions. Nevertheless, this Irish value (0.041 deaths per 100 calf days at risk) is among the lowest reported recently in major dairy producing countries. The reasons for this difference are unclear: it could simply reflect differences in methodology and/or data capture but may also reflect a lower disease burden in Irish dairy calves. Recent work from our group has shown that the prevalence of respiratory disease in pre-weaned Irish dairy calves is approximately 4% (95% Bayesian probability intervals 0-8%) which also appears to be lower than dairy systems in other countries (Donlon et al., 2023). However, while these findings are positive, the large disparity between male and female mortality (male calves were 1.45-times as likely to die after correcting for all other factors), in the absence of reasonable biological rationale for this difference, indicates that there is substantial room for improvement in the management and health of our male dairy calves.

Between 2016 and 2020 there was a decline in calf mortality on Irish dairy farms nationally: calves born in 2020 were 0.83-times as likely to die compared with those born in 2016, after correcting for other variables. For IJCP herds, initial calf mortality was higher than for non-IJCP herds. However, the decline in calf mortality observed nationally occurred to a greater extent in IJCP herds. In addition, for those farms conducting Johne's disease Veterinary Risk Assessment and Management Plans (VRAMP), higher risk assessment scores (poorer biosecurity) were associated with increased mortality. This suggests that implementation of recommended biocontainment practices to control paratuberculosis in IJCP herds was associated with a reduction in calf mortality. For the first time, this work has provided robust evidence that efforts to reduce the transmission of paratuberculosis, through veterinary-led risk assessments leading to agreed management plans, result in reductions in calf mortality beyond what is generally achieved in non-IJCP herds.

ACKNOWLEDGEMENTS

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The studies by Rhodes et al. (2021) and Donlon et al. (2023) were funded by Dairy Research Ireland.

REFERENCES

Available on request

Reader Questions and Answers

1. **CALF MORTALITY IN IRELAND APPEARS TO BE:**
   - **A.** similar to other countries
   - **B.** somewhat higher than other countries
   - **C.** considerably higher than other countries
   - **D.** somewhat lower than other countries

2. **WHEN MEASURING CALF MORTALITY, COMPARED TO MORTALITY RATE, MORTALITY RISK WILL USUALLY:**
   - **A.** considerably overestimate mortality
   - **B.** slightly overestimate mortality
   - **C.** correctly estimate mortality
   - **D.** underestimate mortality

3. **RECENT IRISH WORK SUGGESTS THAT HERDS IN ICJP:**
   - **A.** had lower calf mortality than those that weren't in the IJCP
   - **B.** increased calf mortality over time
   - **C.** had a higher mortality to begin with but decreased/improved calf mortality faster than herds not in the programme
   - **D.** had a lower mortality to begin with but increased/disimproved calf mortality faster than those not in the programme.

4. **FOR THOSE HERDS IN THE IJCP, THOSE WITH HIGHER VRAMP (ASSOCIATED WITH GREATER JOHNE'S TRANSMISSION RISK) SCORES HAD:**
   - **A.** higher calf mortality and this increased further if their score increased over time
   - **B.** higher calf mortality and this decreased if score increased over time
   - **C.** lower calf mortality and this increased further if their score increased over time
   - **D.** lower calf mortality and this decreased further if their score increased over time.

5. **IRISH WORK HAS SHOWN THAT:**
   - **A.** calves with respiratory disease grow at a slower rate, and that reduced weight gain is associated with reduced fertility
   - **B.** calves with respiratory disease grow at a slower rate, and that there is no association between weight gain and fertility
   - **C.** there is no association between respiratory disease and growth rate, but that reduced weight gain is associated with improved fertility
   - **D.** there is no association between respiratory disease and growth rate, and that there is no association between weight gain and fertility.

ANSWERS: 1D; 2D; 3C; 4A; 5A.