

Dairy Cow Mortality Data Management: The Dairy Certificate of Death

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Dairy cow mortality levels in the United States have been increasing over time. This is both a financial concern and an important animal welfare issue. Summary studies of dairy cow removal have been in the literature for decades but information specifically related to dairy cow mortality has been sparse. The increase in dairy cow mortality has generated concern within the industry, yet no standard exists by which to define what might be considered the 'natural' or 'normal' level of mortality in dairy cow production. Historical data suggest that dairy cow mortality ranged between 1 and 5% of rolling herd inventory per year into the 1970's, while current estimates suggest an average of 8 to 10% mortality in dairy herds across the U.S. with a range between 2 and 15%.

Decreasing cow death losses logically requires that management needs to be directed at minimizing those factors that increase risk of death. But this requires information gathering and analysis that identify those risk factors on an individual dairy. Such systems appear to be lacking on most U.S. operations. The limited published information available to describe specific causes of cow mortality has mostly been derived from on-farm records. Unfortunately these descriptors of the causes of death are almost exclusively based upon owner or farm worker impressions with very limited veterinary input. The most recent national dairy survey from the National Animal Health Monitoring System reports that <5% of cow deaths are evaluated by necropsy.

Thorough necropsy-based postmortem evaluations are an underutilized but important means for defining the pathologic explanation of dairy cow deaths. The value of a postmortem evaluation is directly related to the accuracy and maintenance of data collected and its application to operational management. There are invariably a set of circumstances or events that underlie the development of specific pathology and this pathology ultimately results in the death. Therefore a necropsy examination can reveal the pathology, but needs to be matched with other information about the individual to understand why that pathology occurred. Such information might include descriptors of age, preceding health events, weather, location near time of death, diet, and so on.

To prevent future deaths requires that the underlying cause of death is identified and mitigated to reduce risks for other individuals in the future. Very importantly, much of this additional information must be gathered at, or near, the time of death, because many of the details are lost or cannot be identified at a later time. This reasoning has served well in human medicine for many years. It is incorporated into Death Certificates. These formal documents combine information about the specific assessment of the proximate cause of death, commonly including autopsy information or results of ancillary testing, plus other historical assessments and characteristics of the individual, that lead the health official to define an underlying cause-of-death (COD).

Whereas human cause-of-death statistics generally rely on a sequence of data captured in a standardized Death Certificate, dairy cow deaths have been poorly defined, marginally recorded, and rarely analyzed. The lack of uniform COD statements clearly limits the ability of the dairy industry to monitor mortality in relation to variables such as diseases and other health problems, and characteristics and circumstances of the animals affected. Incorporating death certificates with COD statements into dairy systems is achievable. As with human COD statements, the dairy death certificate should record the estimated chain of events leading up to a death. Although the details defining the various causes of death (immediate, intermediate, and underlying) may rely on incomplete data, focus on this challenge can provide the impetus to enhance dairy- and cow-related data acquisition including postmortem evaluations. Importantly, shifting the focus away from the immediate cause of death to the process underlying a death affords an opportunity to improve communication between the various health care providers on a dairy, nutritionists, veterinarians, and owners.

The process we are proposing with the use of dairy cow death certificates may look somewhat complex or time consuming, but the process can be relatively fast. We believe using mortality investigation to assess dairy health management outcomes represents an opportunity for veterinary investment in cow well-being that is currently underutilized. Not all cows need to be examined by necropsy to utilize this approach. Heightening awareness of farm personnel of the nuances that underlie healthy cow management has benefits beyond just mortality management.

Figure 1: Dairy Certificate of Death with Cause-of-Death Statement

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CERTIFICATE OF DEATH: Final Mortality Code _____			
1. Dairy	2. Animal ID/Tag	3. Date of birth (M/D/Y)	4. Date of death (M/D/Y)
5. BCS	6. Lactation Number	7. Lactation status <input type="checkbox"/> Lactating <input type="checkbox"/> Dry	8. Days in milk or Days dry
9. Fresh Date (M/D/Y)	10. <input type="checkbox"/> Aborted this lactation DCC at abortion:	11. Pregnancy status <input type="checkbox"/> Open <input type="checkbox"/> Pregnant	12. Days carrying calf
13. Calving ease score	14. Pen number	15. Location at time of death	16. <input type="checkbox"/> Down prior to death Days down:
17. Manner of death <input type="checkbox"/> Unassisted <input type="checkbox"/> Euthanasia	18. Was a necropsy performed? <input type="checkbox"/> yes <input type="checkbox"/> no Relevant findings:		19. Were adjunct diagnostics performed? <input type="checkbox"/> yes: _____ <input type="checkbox"/> no
<p style="text-align: center;">20. CAUSE OF DEATH. Part I.</p> <p style="text-align: center;">Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition resulting in death) →</p> <p style="margin-left: 40px;">a. _____ Due to (or as a consequence of):</p> <p style="margin-left: 40px;">b. _____ Due to (or as a consequence of):</p> <p>Sequentially list conditions, if any, leading to the cause listed on line 'a'. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) on line 'd'.</p> <p style="margin-left: 40px;">c. _____ Due to (or as a consequence of):</p> <p style="margin-left: 40px;">d. _____</p>			Approximate interval: Onset to death _____ _____ _____
<p>PART II. Enter <u>other significant issues or conditions contributing to death</u> that are not outlined in Part I.</p> 			
21. Did injury play a role in death? <input type="checkbox"/> yes <input type="checkbox"/> no	22. Date of injury (M/D/Y)	23. Location of injury on body	
24. Place on farm the injury occurred	25. Describe how the injury occurred		

MORTALITY CODES

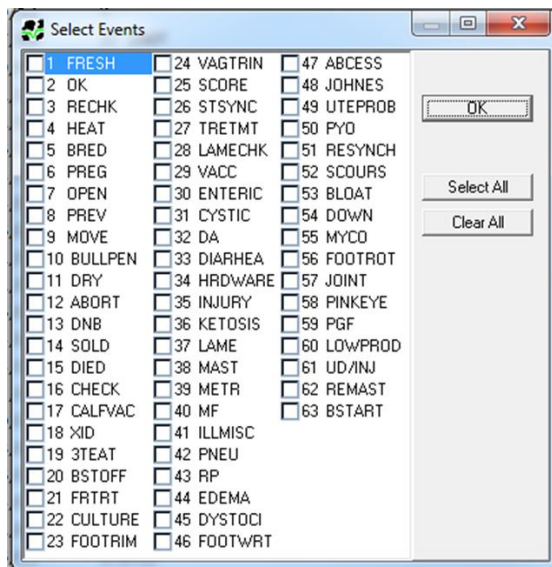
Mortality Alphanumeric Code: letters 1-8

- 1-2) Category related to target area for intervention
- 3) Euthanized versus Death by natural causes (E/D)
- 4) Death certificate (Y/N)
- 5-6) Immediate/proximate disease related to cause-of-death
- 7-8) Underlying or intermediate disease process or causative factor if known

Death Themes & Categories

- Specific disease process as a stand alone problem
DZ: Specific disease such as HBS, metritis, etc.
- Traumatic injury
IC: Injury related to calving trauma
IJ: Injury such as spinal, stifle or hip damage
HE: Trauma due to human error
- Multifactorial failures linked to transition period
TN: Multifactorial transition/early lactation disease
or negative energy balance issues
- Feed management
FD: Feeding error
- Miscellaneous events not conducive to prevention
MS: Miscellaneous
- Undetermined
UN: Undetermined

Disease codes	Immediate/Intermediate/Underlying Disease or Causative Factors
AB	Abomasitis
BK	Back injury
BL	Bloat (53)
BO	Bleed out/hemorrhage
CA	Cancer
CH	Choke
CC	Concrete flooring
CE	Cancer eye
CL	Clostridial leg
CN	Congenital defect
CT	Cecal torsion
DA	Left displaced abomasum (32)
DI	Diarrhea/Infectious gastrointestinal disease (33)
DW	Down cow (54)
DY	Dystocia (45)
ED	Edema (44)
FL	Fatty liver
FR	Footrot (56)
FS	Freestall/facility issues
FW	Footwart (46)
HB	Hemorrhagic bowel syndrome
HP	Hip displacement
HW	Hardware disease (TRP) (34)
HT	Heart pathology
IC	Ice
IN	Indigestion (30)
JN	Johnes disease (48)
KE	Ketosis (36)
LG	Leg injury
LI	Listeria
LM	Generic lameness--needs attributed to specific causative factor (37)
LV	Liver abscesses
MA	Mastitis (38)
MC	Malignant catarrhal fever
ME	Metritis (39)
MF	Milk fever/Metabolic (40)
MV	Mesenteric root volvulus
PA	Parlor issues
PE	Peritonitis
PN	Pneumonia (42)
RD	Right displaced abomasum
RN	Renal disease/failure
RP	Retained placenta (43)
SA	Sole abscess (47)
SE	Septicemia
SH	Shoulder injury
SJ	Septic joint
ST	Stifle injury
UI	Udder injury (61)
UL	Perforated gastrointestinal ulcer
UT	Uterine tear (49)
VT	Vaginal trauma



Example 1: Hemorrhagic bowel syndrome sudden death

DZDYHBxx

- DZ = Specific disease to target for intervention
- D = Died of natural causes
- Y = Death certificate completed with necropsy findings
- HB = Hemorrhagic Bowel Syndrome as the immediate cause of death
- xx = No relevant underlying or intermediate disease processes

Example 2: Failure to treat/heal lameness due to a chronic sole abscess

DZENLMSA

- DZ = Lameness failure related to hoof care
- E = Euthanized
- N = No death certificate completed
- LM/37 = Generic lameness as the immediate cause of euthanasia
- SA/47 = Sole abscess as the disease process underlying the lameness

Example 3: Severe calving trauma leading to euthanasia

ICEYVDY

- IC = Injury related to calving trauma
- E = Euthanized
- Y = Death certificate completed with necropsy findings
- VT = Vaginal trauma as the immediate cause of death
- DY/45 = Dystocia as the underlying cause of death

Example 4: Back injury leading to euthanasia

IJEYBKFS

- IJ = Traumatic injury
- E = Euthanized
- Y = Death certificate completed detailing sequence of events underlying the injury
- BK = Back injury affecting the spinal cord
- FS = Injury related to freestall issues

Example 5: Early postpartum death related to multiple diseases

TNDYSEDA

- TN = Multifactorial transition cow/early lactation disease problems
- D = Died of natural causes
- Y = Death certificate completed with necropsy findings and history of disease
- SE = Septicemia as the immediate cause of death
- DA/32 = Displaced abomasum representing an intermediate disease process

Example 6: Late lactation death due to choking on foreign material

MSDYCHxx

- MS = Miscellaneous event
- D = Died of natural causes
- Y = Death certificate completed with necropsy findings
- CH = Choke
- xx = No relevant underlying or intermediate disease process

CULLING CODES

Culling Alphanumeric Code: letters 1-8

- 1-2) Category related to target area for intervention
- 3) Economic cull versus underlying Biologic reason for removal (E/B)
- 4) Destination code (sale barn, slaughter plant, etc.)
- 5-6) Immediate/proximate disease or reason related to cause-of-removal
- 7-8) Underlying or intermediate disease process or causative factor if known

Culling Categories

- AB:** Abortion
- AG:** Aggressiveness or belligerence (kickers)
- DZ:** Other specific diseases besides those listed
- IC:** Injury related to calving trauma
- IJ:** Injury such as spinal, stifle or hip damage
- JN:** Johne's Disease
- LM:** Lameness
- MA:** Mastitis problems

- PD:** Poor production not related to above problems

- RE:** Reproductive problems
- RT:** Sold as replacement animals to another dairy
- UD:** Udder conformation (excepting mastitis)