J. Dairy Sci. 95:5798–5803
http://dx.doi.org/10.3168/jds.2012-5625

Necropsy as a means to gain additional information about causes of dairy cow deaths

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ABSTRACT

High mortality among dairy cows constitutes a problem both financially and in relation to animal welfare. Knowledge about causes of death is a fundamental step toward reducing cow mortality. Several studies have evaluated causes of dairy cow deaths. However, the vast majority of studies describing causes of death are based on questionnaires with farmers or veterinarians. It is uncertain to what degree such information is sufficient and reflects the true cause of death or euthanasia. In this study, proximate causes of death were evaluated based on a thorough necropsy of a random sample of 79 Danish dairy cows at an incineration plant. The necropsy was combined with information about the farmer's perception regarding the cause of death and information about disease treatments from the Danish Cattle Database. Pneumonia and locomotor disorders were found to be the most predominant proximate causes of death. Often the death occurred after a prolonged period during which the cow suffered several different disorders, even though this was often not noticed by the farmer. Causes of death stated by the farmers agreed with the necropsy results in 50 to 64% of cases. Information about disease treatments from the Danish Cattle Database agreed with the necropsy results in 34 to 39% of cases. All 3 sources of information about cause of death agreed in only 1 out of 4 cases, and even when the farmer and the disease recordings did agree with the necropsy results, the latter often gave additional information about the cause of death. In many situations, therefore, a necropsy may be a valuable tool when trying to control excessive cow mortality in a herd.

Key words: necropsy, cause of death, dairy cow

INTRODUCTION

Dairy cow mortality has increased in both Denmark and the United States during the last decades. In Denmark, annual mortality rates have increased from approximately 2% in 1990 to 6% in 2011 (Thomsen et al., 2004; Danish Cattle Federation, 2012). In the United States, cow mortality has increased significantly during recent years to a level of 5 to 6% in 2005 (USDA, 2007; Miller et al., 2008). Such high levels of cow mortality constitute a major problem, both financially and in relation to animal welfare (Thomsen and Houe, 2006).

Knowledge about cause of death is a fundamental step toward preventing future deaths. Several studies have evaluated causes of dairy cow deaths. However, most studies with a focus on cause of death are based on questionnaires with farmers or veterinarians (e.g., Menzies et al., 1995; Esslemont and Kossaibati, 1997; Thomsen et al., 2004). It is uncertain to what degree cause of death as stated by the farmer (or the local veterinarian) in fact reflects the true underlying pathology leading to death. A necropsy can be defined as a thorough postmortem evaluation of an unassisted dead or euthanized cow with the objective to disclose any patho-anatomical findings. Only a few studies have carried out necropsies to evaluate causes of death in dairy cows. McConnel et al. (2009, 2010) evaluated causes of dairy cow deaths in 1 and 3 dairy herds, respectively, and concluded that, in many cases, necropsies could give valuable information about causes of death. Watson et al. (2008) reviewed diagnostic laboratory submissions of unassisted dead dairy cows in England and Wales. Out of 142 submissions from dairy cows, 84 were carcasses. The cows included in their study should be considered a biased sample, as cows are typically submitted to a diagnostic laboratory when no cause of death is evident or when mortality in a herd suddenly increases. The present study is the first to use necropsies to evaluate causes of death in a random sample of cows from many different herds. Our objectives were to evaluate (1) cause of death among a sample of dead and euthanized cows and (2) to what degree a necropsy would reveal information that was not already available

Received April 16, 2012.
Accepted June 5, 2012.
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based on the farmer's perception of cause of death and the cow's disease history.

MATERIALS AND METHODS

All cows that die on farm in Denmark (euthanized and unassisted dead cows) are processed at one incineration plant (DAKA, Assentoft, Denmark). Danish farmers are not allowed to dispose of dead cows in any other way. Farmers order pick-up of a dead cow via an automatic phone system or a webpage and are charged a fee for disposal of the cow. If the carcass is partly rotten, the farmer is charged an extra fee. Typically, cows arrive at the incineration plant the day after they have died. In most cases, cows are therefore relatively fresh when arriving at DAKA.

Necropsies took place at DAKA from January to May 2011. The majority of Danish dairy cows (93%) are from herds in the Jutland and Funen regions, and DAKA is placed centrally in Jutland (which houses 87% of all Danish dairy cows). Cows from the rest of Denmark (Zealand and other islands) typically arrive at DAKA 1 d later after death compared with cows from Jutland and Funen. Therefore, we decided to include only cows from Jutland and Funen to evaluate carcasses as soon after death as possible. At DAKA, cows to be included in the study were selected randomly among cows from conventional (i.e., not organic) herds with at least 50 cows and Danish Holstein as the predominant breed. Additionally, only cows from herds with an annual herd-level mortality rate for 2010 among the worst 25% of Danish dairy herds (>7.6%) were sampled. Out of 3,990 Danish dairy herds, 3,031 were conventional and had ≥50 cows. Among these, 830 had an annual mortality rate >7.6%, and 788 of these were located in Jutland or Funen. Cows to be necropsied were sampled using systematic random sampling based on a list of these 788 herds.

Cows were subjected to a total necropsy based on the procedure described by Jensen (2011). The necropsy was performed by a veterinarian with specialist training in pathology. Necropsy of each individual cow took approximately 1 h and included external and internal inspection, palpation, and relevant incisions. All internal organs were thoroughly examined. All joints of all 4 legs were opened and inspected. All hooves, digital bones, and heads were sagittally sectioned for inspection using a bandsaw. Other bones were sectioned on indication. All lesions were recorded and documented by digital photos. Based on the amount of reparative changes (typically by the formation of granulation tissue and fibrosis), the durations of lesions were scored as short (<2 wk) or long (≥2 wk). Additionally, a specimen of ileum from all cows was sampled for histopathological examination for changes indicative of paratuberculosis, as described by Huda and Jensen (2003).

A proximate cause of death was established based on the necropsy findings. In many cases, the death of a dairy cow is caused by a continuum of events. However, the proximate cause of death has been defined as the most likely immediate cause of the death (McConnel et al., 2009). Proximate causes of death were grouped into 8 major groups as originally suggested by Thomsen and Houe (2006) based on an extensive review of the literature and later used by McConnel et al. (2009): accidents, calving disorders, digestive disorders, locomotor disorders, metabolic disorders, udder/teat disorders, other known reasons, and unknown reasons. Secondary findings were defined as pathological changes that did not directly cause the death of the cow but that may have contributed to the final outcome; that is, death or euthanasia.

Immediately after the necropsy at DAKA, the dairy farmer was contacted by mail. The letter explained the background and purpose of the study, guaranteed confidentiality, and informed the farmer that we would contact him or her within the next few days to ask a few questions about the death. During the subsequent phone interview, the farmer was asked whether the cow died unassisted or was euthanized and the farmer was asked his or her opinion regarding the cause of death using an open question. Additionally, the farmer was asked to estimate the duration of the disease leading to death. Duration was scored as short (<2 wk) or long (≥2 wk). Finally, the farmer was asked about housing system, milking system, and the use of grazing.

When a cow is medically treated in Denmark, the farmer or veterinarian (depending on who provides the treatment) must report the treatment to the Danish Cattle Database. Information about disease treatments for all cows included in the study was retrieved from the database for the entire life of the cow. Disease treatments for each individual cow were scrutinized manually and all treatments (excluding routine vaccinations and pregnancy tests) within a period of 3 mo before the death of the cow were regarded as relevant in relation to the death. In a few cases, disease treatments occurring more than 3 mo before the death were also considered if it was obvious that the treatments constituted a continuum. Information about parity, date of birth, calving(s), and death for all cows, and data on milk yield, herd size, and mean annual herd-level mortality rate for all herds were obtained from the Danish Cattle Database.