

# Predictors of Stillbirth for Cows Moved to Calving Pens when Calving is Imminent

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## Abstract

The objective of this study was to identify predictors for stillbirth in cows moved from freestalls to a calving pen when calving is imminent. The risk of stillbirth was modeled using multivariate logistic regression. The calving ease score (CES) was contracted to three levels of assistance (1: none, 2: light and 3+: required). The advance of parturition at moving time was scored as a) presence of only mucus, b) presence of a "water bag" or c) presence of feet. The other predictors tested were parity, total serum calcium, calf weight (CW) and BCS. A total of 495 single births were observed on a 2,500-cow dairy, with 15% stillbirths. The odds ratios adjusted for the other predictors are shown. Stillbirth was not associated with BCS. Compared to unassisted calvings (CES1), the odds of stillbirth were 2.9x higher for CES2 and 46x higher for CES3+. Stillbirth odds were reduced by 36% per 1% unit increase of CW relative to the dam (OR = 0.64), and by 22% per 1 mg/dL increase in calcium (OR = 0.78). The odds of stillbirth were 5.2x higher for heifers vs. cows. Cows moved to a calving pen earlier in the parturition process (mucus only) were 2.5x more at risk of stillbirth than those moved later with a "water bag", but presence of feet was not different from the "water bag" stage. The fact that advance of parturition, parity and serum calcium remained in the model after adjustment for CES could be due to an association with duration of calving.

## Résumé

Cette étude visait l'identification de signes indicateurs de mortinatalité chez des vaches sur le point de vêler, déplacées de l'aire de stabulation libre à l'enclos de vêlage. Le risque de mortinatalité a été analysé selon un modèle de régression logistique multivariée. La facilité de vêlage (*Calving Ease Score*, ou CES) a été cotée selon trois niveaux : sans aide = 1, avec un peu d'aide = 2 et aide requise = 3. L'état d'avancement de la parturition au moment du déplacement a été coté comme suit : a) présence de mucus uniquement, b) apparition des membranes foetales et c) apparition des onglons du veau. Les autres indicateurs testés étaient la parité, le

calcium sérique total, le poids du veau (*Calf Weight*, CW) et l'indice de condition corporelle (BCS). Dans une ferme laitière de 2500 vaches, 495 naissances simples ont été observées, avec un taux de 15 % de mortinatalité. Nous présentons les rapports de cote (*odds ratio*) ajustés en fonction de chacun des indicateurs. La mortinatalité n'était pas associée à l'indice de condition corporelle. Par rapport au vêlage sans aide (CES1), le risque (*odds*) de mortinatalité s'est avéré 2,9 fois plus élevé pour la cote CES2 et 46 fois plus élevé pour la cote CES3. Le risque de mortinatalité diminuait de 36 % à chaque 1 % d'augmentation relative du poids du veau par rapport à celui de la mère (OR=0,64) et de 22 % à chaque augmentation de 1 mg/L de calcium (OR=0,78). Le risque de mortinatalité était 5,2 fois plus élevé chez les taures que chez les vaches. Les vaches déplacées à l'enclos de vêlage avaient 2,5 fois plus de risque de mortinatalité à l'apparition du mucus seul qu'à l'apparition des membranes foetales, un peu plus tard. Toutefois, ce risque était le même à l'apparition des onglons du veau qu'à l'apparition des membranes foetales. Le fait que l'état d'avancement de la parturition, la parité et le calcium sérique aient gardé un effet significatif dans le modèle même après l'ajustement en fonction de la facilité de vêlage pourrait être dû à une relation de ces indicateurs avec la durée du vêlage.

## Introduction

The objective of this study was to identify predictors for stillbirth in cows moved from freestalls to a calving pen when calving is imminent (therefore potentially interrupting the parturition process).

## Materials and Methods

The herd was a 2500-cow dairy where pre-fresh heifers and cows were kept in two separate freestall pens and moved to individual pens for calving. Cows fresh from November 2003 to February 2004 were included in the cohort, excluding twin births. Stillbirth was defined as death of a calf at calving or within 24 hours of calving. The advance of parturition immediately prior to moving was scored as a) presence of only mucus or

blood at the vulva, b) presence of a “water bag” (allantochorion or amnion) or c) presence of feet or head. Other predictors were parity (1 vs. 2+), total serum calcium concentration of the dam after calving, calf weight (expressed as percentage of the dam’s weight) and body condition score (BCS). The calving ease score was reported on a five-point scale, later contracted to three levels of assistance (1: none, 2: light and 3+: required). The risk of stillbirth was modeled using multivariate logistic regression with the GENMOD procedure in SAS version 8 (SAS Institute Inc, Cary, NC).

### Results

A total of 495 parturitions could be videotaped (277 heifers, 218 cows). There were 15% stillbirths in the cohort. The odds ratios (OR) adjusted for the other predictors are shown with 95% confidence intervals. Stillbirth was not associated with BCS. Compared to unassisted calvings (calving ease score 1), the odds of

stillbirth were 2.9 times higher for calving ease score 2 (1.4 to 6.0) and 46 times higher for calving ease score 3+ (17 to 120). Stillbirth odds were reduced by 36% per 1% unit increase of calf weight relative to the dam (OR = 0.64, 0.47 to 0.89). Similarly, the odds of stillbirth tended to be reduced by 22% per 1 mg/dL increase in total serum calcium (OR=0.78, 0.57 to 1.06). The odds of stillbirth were 5.2 times higher for heifers vs. cows (2.2 to 12). Cows moved to a calving pen earlier in the parturition process (mucus only) were 2.5 times more at risk of stillbirth than those moved later with a “water bag” (1.0 to 6.0), but presence of feet was not different from the “water bag” stage.

### Significance

The fact that advance of parturition, parity and total serum calcium remained in the model even after adjustment for calving ease score could be due to a potential association with duration of calving, to be analyzed in another part of the study.