FACTORS ASSOCIATED WITH DYSTOCIA IN BEEF HEIFERS

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Dystocia in heifers causes economic loss (Rutter et *al.* 1983) but attempts to identify a satisfactory predictor have produced conflicting results (cf Morrison *et al.* 1985; van Donkersgoed *et al.* 1990). For a model predicting a categorical result, such as dystocia score, a discriminant function is appropriate (Morrison *et al.* 1985). Stepwise discriminant analysis identifies those variables which allow the most accurate classification of the outcome of each individual in the population, systematically eliminates those variables which do not significantly contribute to the accuracy of the outcome and determines the proportion of outcomes correctly classified by the model.

Combinations of the pre-calving variables, liveweight at mating (MW, $n = 376$); heifer age at mating (MA, $n = 426$); pelvic area at mating (PAM, $n = 112$) and at pregnancy evaluation (PAP, $n = 297$) and post-calving variables calf birth weight (CBW, $n = 556$), heifer liveweight at calving (CW, $n = 559$); and gestation length (GL, $n = 167$) were applied to data from 564 mixed British x European crossbred beef heifers from the University of Saskatchewan herd at the Termuende Research Station, Lanigan, Saskatchewan, Canada between 1985 and 1990 by stepwise discriminant analysis (SAS 1990). Data set size varied between models because the analysis selects only heifers with a complete data set for the variables being tested in any model and some variables were omitted from measurement in all heifers during some years. Dystocia was scored as: 1, no assistance ($n = 188$); 2, light hand assistance ($n = 231$); 3, difficult delivery requiring force or mechanical intervention ($n = 90$) and 4, surgical intervention ($n = 55$). Heifers were mated at random to a total of 17 Angus and 18 Hereford bulls whose birth weights were below breed average. The objective was to rank the relative importance of pre- and post-calving traits related to dystocia and the accuracy with which they correctly classified the degree of dystocia.

Significant variables in the model with the largest multiple R^2 were CBW, CW and MW ($R^2 = 0.53$; $P < 0.0001$). This model classified the heifers into dystocia categories 1, 2, 3, 4 with accuracies of 85, 47, 17 and 45% respectively. The classification of heifers not requiring assistance was good but that of the other categories was unsatisfactory possibly because of the more subjective nature of the decision as to the degree of assistance given. However, the only pre-calving variable included in the model was MW (partial $R^2 = 0.11$; $P < 0.0001$). The partial R^2 for CBW and CW were 0.31 and 0.11 respectively ($P < 0.0001$), indicating that CBW had the greatest influence on dystocia. Mean CBW and MW were 34.0 ± 0.52, 36.5 ± 0.46, 41.6 ± 0.70 and 44.3 ± 0.90 kg and 383 ± 3.4, 374 ± 3.4, 38 2 ± 5.1 and 396 ± 5.7 for dystocia categories 1, 2, 3 and 4 respectively ($P < 0.05$ for the difference between each category for CBW and for the difference between category 4 and each of 1,2 and 3 for MW). Any model which was forced to omit CBW was only significant ($P < 0.05$) if it included MW (partial $R^2 = 0.08$) or CW (partial $R^2 = 0.07$) or both (multiple $R^2 = 0.09$). We therefore conclude that there is no reliable predictor of dystocia in beef heifers.

When we expressed MW as a percentage of the mature liveweight of each heifer 1 year later, all heifers in dystocia category 1 were 75–80% of their mature liveweight (487 ± 3.8 kg) at mating while all heifers in category 4 were > 80% of their mature liveweight (476 ± 7.2 kg) at mating. We suggest that heifers < 75% of their mature liveweight at mating did not grow satisfactorily during pregnancy and partitioned nutrients to calf growth during pregnancy, at the expense of the dam, falling into categories 2 and 3, while those > 80% of mature liveweight at mating reached a mature weight during pregnancy but did not decrease intake and partitioned a high proportion of nutrients to the calf, falling into categories 2, 3 or 4. Avoiding mating of the lightest and heaviest heifers in a beef herd may therefore reduce the incidence of dystocia problems.

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