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Bronchoalveolar lavage in calves: assessment of sampling location

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Introduction:

Although bronchoalveolar lavage (BAL) is frequently used as a diagnostic tool for infectious bovine respiratory disease, no information is available about the specific sampled lung location in vivo. The aim of this study was to investigate if catheter intromission length could be used to predict the sampling location.

Materials and methods

Repeated BAL catheter introductions (minimum ten times) with custom made catheters (Teflon, inner diameter 2.0mm, outer diameter 4.0mm, VWR, Belgium, adjusted with 12G catheter stylet) were performed on 11 male Holstein Friesian calves. Eight calves were 5 months old, three calves were between 11 and 14 months old. The animals were sedated to allow repeated measurements using xylazine (Xyl-M®2%, V.M.D., Arendonk Belgium). Endoscopy and/or contrast enhanced radiography were used to determine the exact catheter location.
Influencing factors (calf, measurement, weight, wither height, introduction side) of the sampling place were analyzed by logistic regression with calf as a random factor. A linear regression model based on intromission length of the catheter was built to predict whether cranial or caudal lung parts were sampled.

Figure 1. Intromission of custom made catheter.

Results

Table 1. Probability of sampling place	
Left lung 39,4% (9,1- 70)	Right lung 60,6% (20-90,9)
Ventral 1,8% (0-20)	Dorsal 98,2% (80-100)
Cranial 3,0% (0-20)	Caudal 97,0% (80-100)

The probabilities of sampling a specific lung part are given in Table 1. In 97% (range (R)= 80-100) of the cases , the catheter was introduced in the dorsocaudal lung parts. The probability of sampling the accessory lobe (1,8%; R= 0-20) or the dorsocranial lung parts (1,2%; R= 0-7,7) was very low and these events were only observed in the three older calves.
The individual calf was the only factor which significantly influenced (P<0,001) the sampled lung part. A formula to predict if the cranial or caudal lung parts had been sampled based on the measured intromission length of the catheter could be obtained from a linear mixed model. Both the models based on weight and wither height were useful, explaining respectively 77% and 87% of the variation of the intromission catheter length between the calves.

Conclusions

1. The predominant sampling place by BAL is the dorsocaudal lung part. Most lesions caused by bovine respiratory disease are found in the ventrocranial lung parts, which implies that BAL does not sample the most affected part of the lungs.
2. Repeated catheter intromissions showed little variation in the sampled lung part within a calf but significant differences between calves.
3. Based on a mixed linear model, the sampling place (cranial or caudal) can be estimated from the introduction length of the catheter in relation to weight (Fig. 2) or wither height (Fig. 3).

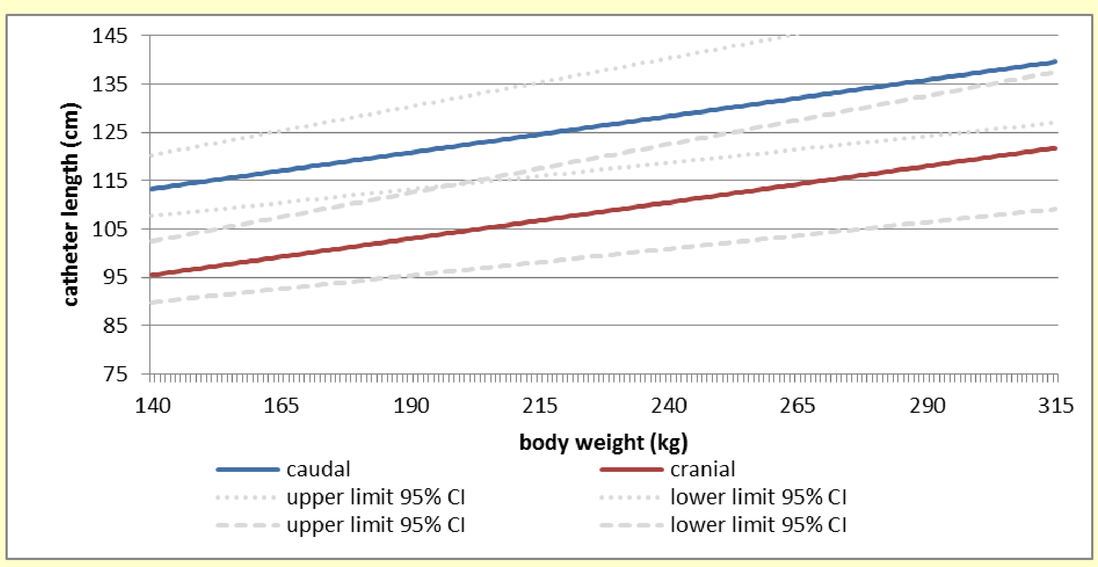

Figure 2. Assessment of cranial or caudal location from body weight (BW) and Catheter Intromission Length (CIL). CL= 92,3 + 0,15*BW – 17,8*(0=cranial/1=caudal)

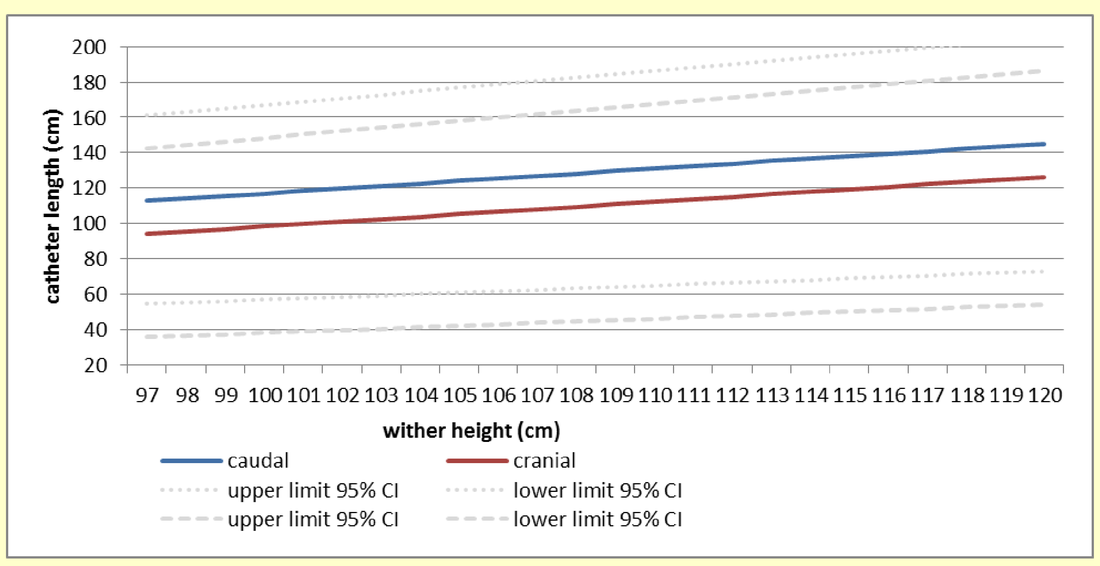

Figure 3. Assessment of cranial or caudal location from Whither Weight (WH) and Catheter Intromission Length (CIL). CIL= -22,9 + 1,4*WH – 18,7*(0=cranial/1=caudal)