

Associations and agreement between deep nasopharyngeal swab and non-endoscopic bronchoalveolar lavage bacterial culture results in preweaned calves

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Introduction

- ↗ pressure intensive antimicrobial consumption food animals
- Reduction and rational antimicrobial use
=> **top priority!**
- Bovine respiratory disease (BRD): leading cause of antimicrobial use in calves
- Formularies selection antimicrobial
 - 1st choice products
 - Certain classes: request sampling, bacterial culture, susceptibility test



How should BRD outbreaks be sampled?

Introduction

Deep nasopharyngeal swab

Broncho-alveolar lavage

Transtracheal aspiration

Sampling site

Nasopharynx
mucosa

Bifurcation

Sampled surface

< 0,5 cm²

cm²

Easiness to perform

+++

Cost for sampling procedure

1,5

Representative for deep airways

NO

Possible contamination through nasal passage

Contamination
overgrowth

0

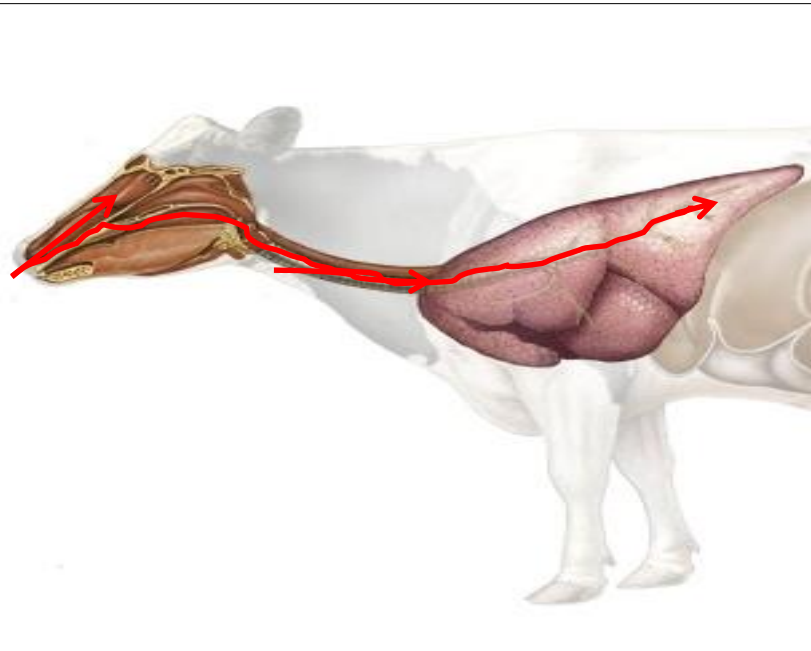
Animal welfare

+++

++

+

Sample quality???



Introduction

	Deep nasopharyngeal swab	Broncho-alveolar lavage	Transtracheal aspiration
Sampling site	Nasopharyngeal mucosae	Lung lobe	Tracheal bifurcation
Sampled surface	< 0,5 cm ²	>10 cm ²	5-10 cm ²
Easiness to perform	+++	++	+
Cost for sampling procedure	1,5 euro	10 euro (re-usable catheter)	15 euro (no reusable catheter)
Representative for deep airways	NO	More likely (nasal contamination)	More likely (aspiration possible)
Possible contamination through nasal passage	Contaminant overgrowth	YES	NO
Animal welfare	+++	++	+
Sample quality???			

Introduction

- BAL procedure

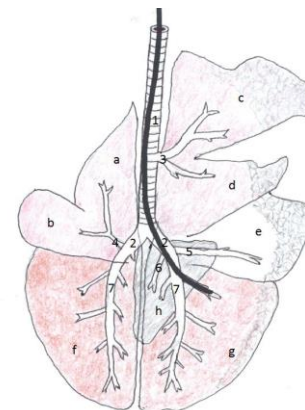
1. Endoscope guided

- + exact location
- + prevention nasal contamination
- - expensive material (risk of damage)
- - contamination between consecutive animals to sample



2. Non-endoscope guided (blind)

- + fast when trained
- + 1 sterile catheter per animal (no contamination)
- - possible nasal contamination
- - no information on exact location*



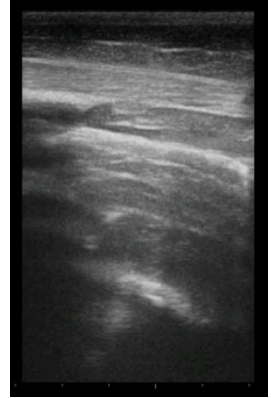
*Effect of sedation on the intrapulmonary position of a bronchoalveolar lavage catheter in calves

Objectives

1. To determine **sample quality, isolation rates and agreement** between **DNS and BAL** in healthy and diseased preweaned calves
2. To determine whether a **polymicrobial DNS result influences the polymicrobial nature** of the **BAL result**

Material and methods

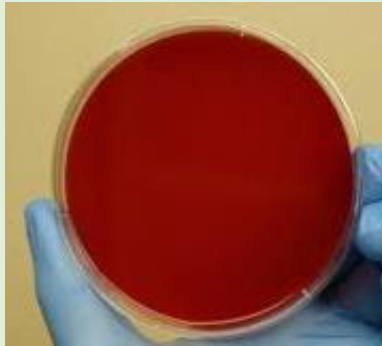
- Crosssectional study
 - Calves with BRD: 144 (2 veal, 9 beef herds)
 - Healthy calves: 39 (2 veal, 1 beef)
- To avoid subclinical BRD, healthy calves:
 - Normal clinical investigation
 - No visible lesions on thoracic ultrasound
 - No BRD outbreak in the last month
- Sampling: DNS and BAL sample from each calf



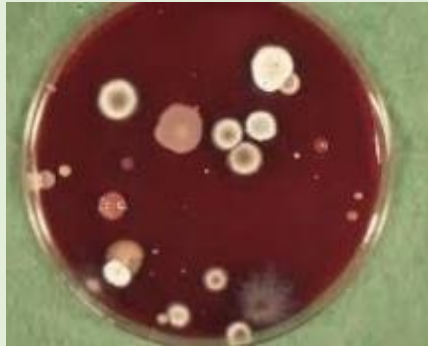
Material and methods

- Interpretation culture results
 - Macroscopic (sample quality)

Negative culture



Polymicrobial culture



Pure culture



Dominant culture



Results: sample quality

Bacterial culture result	Cases			Controls		
	DNS (n=144)	BAL (n=144)	<i>P-value</i>	DNS (n=39)	BAL (n=39)	<i>P-value</i>
Pure culture	12 (8,3%)	42 (29,2%)	<0,001	0 (0%)	5 (12,8%)	0,02
Dominant culture	12 (8,3%)	14 (9,7%)	0,68	2 (5,1%)	2 (5,1%)	1,0
Polymicrobial	99 (68,8%)	30 (20,8%)	<0,001	32 (82,1%)	15 (38,5%)	<0,001
Negative	21 (14,6%)	58 (40,3%)	<0,001	5 (12,8%)	17 (43,6%)	<0,01

- BAL: significantly less polymicrobial, more negative and more pure cultures of respiratory pathogens in healthy and diseased calves
- Good interpretable result: 79% BAL, 31% DNS

Results: isolation rates

- More isolates from diseased than healthy calves ($P < 0,01$), with DNS and BAL

	Cases	Controls
DNS	31.9% (46/144)	5.1% (2/33)
BAL	37.5% (54/144)	17.9% (7/39)

Results: isolation rates

Bacterial culture result	Cases			Controls		
	DNS (n=144)	BAL (n=144)	<i>P-value</i>	DNS (n=39)	BAL (n=39)	<i>P-value</i>
<i>M. haemolytica s.l.</i>	12 (8,3%)	18 (12,5%)	0,21	0	0	-
<i>P. multocida</i>	31 (21,5%)	30 (20,8%)	0,87	2 (5,1%)	4 (10,3%)	0,40
<i>H. somni</i>	2 (1,4%)	9 (6,3%)	0,01	0 (0%)	2 (5,1%)	0,15
<i>M. bovis</i>	18 (12,5%)	20 (13,9%)	0,68	0 (0%)	1 (2,6%)	0,31
<i>M. bovirhinis</i>	31 (21,5%)	25 (17,4%)	0,27	0	0	-

No differences in isolation rates of specified respiratory pathogens between DNS and BAL, with exception of *H. somni*

Results: agreement

Culture result	Kappa	95% CI
<i>M. haemolytica s.l.</i>	0.52	0.36-0.69
<i>P. multocida</i>	0.48	0.25-0.71
<i>H. somni</i>	0.16	0-0.46
<i>M. bovis</i>	0.58	0.38-0.78
<i>M. bovirhinis</i>	0.51	0.34-0.69
Pure culture	0.28	0.12-0.43
Dominant culture	ND	
Polymicrobial	0.12	0.03-0.21
Negative	0.05	0-0.18

Moderate agreement (0,41-0,60) between DNS and BAL results in diseased animals, except *H. somni* (slight)

Results: effect of polymicrobial swab

Species	Percentage (number) of positive cultures		OR	95% CI	P-value
	No	Yes			
<u>Diseased (n=144)</u>					
<i>M. haemolytica s.l.</i>	31.1% (14/45)	4.0% (4/99)	0.23	0.08-0.64	<0.01
<i>P. multocida</i>	44.4% (20/45)	11.1% (11/99)	0.20	0.05-0.83	0.03
<i>H. somni</i>	2.2% (1/45)	0.0% (0/99)	ND		
<i>M. bovis</i>	24.4% (11/45)	7.1% (7/99)	1.34	0.33-5.62	0.67
<i>M. bovirhinis</i>	15.6% (7/45)	18.2% (18/99)	1.75	0.48-6.37	0.39
Negative	22.4% (13/45)	45.5% (45/99)	1.36	0.53-3.5	0.52

Polymicrobial DNS:

- not affect the probability of a negative BAL result
- reduced the probability of a pure culture for *Pasteurellaceae*, not for *M. bovis*
→ Important herd or sampler effect (hygiene/ technical skills)?

Interpretation and conclusions

- **Non-endoscopic BAL:** less polymicrobial, **better interpretable** culture results than DNS (79% vs. 31%)
- Isolation rates: higher in diseased animals → **sample sick calves**
- Isolation rates not different between DNS and BAL, except *H. somni* → **BAL!**
- Polymicrobial nature of DNS negatively influences recovery of *Pasteurellaceae*, but not negative cultures or Mycoplasmata: **hygiene, technical skills**

Non-endoscopic BAL: higher return on investment

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Thank you for your attention

