ASSESSMENT OF THE CLINICAL EXAMINATION FOR THE DIAGNOSIS OF CORYNEBACTERIUM PSEUDOTUBERCULOSIS INFECTION IN SWISS GOAT HERDS

Schönmann M[1], Mühlherr J[1] and Doherr MG[2]

[1]Swiss Extension and Health Service for Small Ruminants (ESSR), P.O. Box, CH-3360 Herzogenbuchsee
[2]Institute of Animal Neurology, Bremgartenstrasse 109A, CH-3012 Bern

Corynebacterium pseudotuberculosis is causing a caseous lymphadenitis (CLA) in small ruminants world-wide. In Switzerland, only little information was available on the occurrence of CLA in goat herds. However, CLA is on the list of diseases to be monitored, and farms involved in exporting breeding goats and sheep have to provide an EU health certificate in which the owner and the veterinarian declare that the exported animals have not belonged to flocks suffering from a case of clinical CLA within the last 12 months. A pilot study was initiated by the Swiss Extension and Health Service for Small Ruminants (ESSR) that included visits with clinical examination of all adult goats on selected farms as well as bacteriological examination of abscess exudates and assessment of the CLA antibody status. The objective of the project was to assess whether the clinical examination of all adult goats during a farm visit could be used to classify herds with regards to their disease status in a CLA herd certification and control program.

Materials and Methods

The study population consisted of randomly selected goat farms without history of CLA infection (n = 97) and of goat farms either with general interest in the project or with known CLA-related problems (n = 25). In total, 122 goat farms from different areas of Switzerland were included in the study. During a farm visit by an ESSR-veterinarian, all adult goats present at the time of visit were examined clinically, and a questionnaire addressing epidemiologically relevant questions on management and animal health-related issues was completed together with the owner.
The clinical examination of the animals included palpation of the typically affected lymph nodes of the head, neck, shoulder, knee and udder. Enlarged lymph nodes (slightly enlarged: +; twice the normal size: ++; more than twice the normal size: +++), open (exudating) abscesses as well as scars indicating an old abscess were recorded. At least one sample per affected herd was collected and sent to the Institute of Bacteriology, University of Zurich, for bacteriological examination (culture). Serum samples were collected from all animals at the time of clinical examination, processed

and stored in two 1 ml aliquots at –16°C. Aliquots of serum samples were sent to an external laboratory for examination for CLA exotoxin-related antibodies using a double-antibody sandwich ELISA.[1,2] The ELISA was described as having an individual animal specificity of 100% and a herd-level sensitivity of 99.9%. Cross-tabulation and odds ratios were used to evaluate the prevalence of CLA as well as the sensitivity (SE), specificity (SP), positive and negative predictive values (PPV, NPV) at the individual animal and the farm level. Logistic regression was used to compare the importance of herd-related variables on the CLA status of the herd.

Results

Fifteen percent of all examined goats had clinical findings indicative of CLA (suspects) while 30% of all goats were sero-positive for CLA. Goats from the target group „Other farms“ had significantly higher odds of CLA than goats from farms without history of clinical CLA (clinical examination odds ratio 3.6; ELISA OR 8.0). Even on farms without history of clinical CLA, 9% of the goats were clinically CLA-suspect and 14% had antibodies against the bacterium. Farms in the target group „Other farms“ had significantly higher odds of having CLA-affected animals than farms without history of clinical CLA (OR 5.2 and 5.0, respectively). An important finding is that even among the farms without history of clinical CLA, almost 30% of the farms had at least one clinically suspect or one serologically positive animal in the herd. In the comparison group, this proportion was 68% (Table 1).
Larger herds and herds for which the owner reported a higher frequency of other health-related problems were significantly more likely to be categorised as (suspect) CLA case farms ($p > 0.05$; data not shown).

Table 1 – Frequency of clinically CLA-suspect or serologically CLA-positive test results by test and target group (farm type) at the individual animal and the farm level

	Clinical examination		**ELISA**	
Target group	**Animals**	**Suspect (%)**	**Animals**	**Positive (%)**
Farms without CLA history	934	82 (8.8)	933	129 (13.8)
Other farms	577	148 (25.6)	573	322 (56.2)
All farms together	1511	230 (15.2)	1506	451 (29.9)
Target group	**Farms**	**Suspect (%)**	**Farms**	**Positive (%)**
Farms without CLA history	97	28 (28.9)	97	29 (29.9)
Other farms	25	17 (68.0)	25	17 (68.0)
All farms together	122	45 (36.9)	122	46 (37.7)

A culture result was available for 27 of the 31 clinically suspect goats (from 20 different herds) were specimen could be collected. Four specimen were culture-negative for *C. pseudotuberculosis* but positive for *A. pyogenes* (2) or *Staphylococcus spp.* (2). One of these four was not examined serologically, but for two of the remaining three goats as well as for the 23 goats with a positive culture the ELISA was clearly positive (++). The SE of the clinical examination, when compared to the

ELISA, was 39% at the animal level, the SP ranged at 95%. The values at the herd level were 70% and 96%, respectively (Table 2).

Table 2 – Sensitivity (SE), specificity (SP) and predictive values (PV) of the clinical examination when compared to the ELISA; individual animal level and farm level

Target group	**Animals**	**SE %**	**SP %**	**PPV %**	**NPV %**
Farms without CLA history	933	32.6	95.0	51.2	89.7
Other farms	573	41.6	95.1	91.8	55.3
All farms together	1506	39.0	95.0	77.2	78.2
Target group	**Farms**	**SE %**	**SP %**	**PPV %**	**NPV %**
Farms without CLA history	97	58.6	97.1	89.5	84.6
Other farms	25	88.2	87.5	93.8	77.8
All farms together	122	69.6	96.1	91.4	83.9

A “worst-case” gold standard positive was defined that included all individual animals in the study that tested either clinically suspicious or positive for CLA by serology or culture. The clinical examination and the ELISA were compared to this new gold standard to assess the SE and the NPV of the two tests. At the herd level, the clinical examination had a SE of 76% (NPV 82%) while the ELISA had a SE of 78% (NPV 83%).

Discussion

The study results indicate that, for the worst case gold standard, the clinical examination, at the herd level, had similar sensitivity and negative predictive values as the screening ELISA. Therefore, even though the ELISA is currently not available in Switzerland, it was decided to initiate a herd certification and control scheme through the ESSR with annual visits of all participating farms (clinical examination of all adult goats) and requirements to report and investigate (clinically and by culture) all goats that, between two annual visits, develop abscesses indicative of CLA.

References

1. Ter Laak, E.A., Bosch, J., Bijl, G.C., Schreuder, B.E.C. (1992): Double-antibody sandwich enzyme-linked immunosorbent assay and immunoblot analysis used for control of caseous lymphadenitis in goats and sheep. American Journal of Veterinary Research, 53, 1125-1132.

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