EUROPEAN COLLEGE OF
Small Ruminant
HEALTH MANAGEMENT

ANNUAL CONFERENCE

WARSAW 2019

Faculty of Veterinary Medicine
Warsaw University of Life Sciences – SGGW
Warsaw, 11.05.2019

Conference organizers

European College of Small Ruminant Health Management

Faculty of Veterinary Medicine
Warsaw University of Life Sciences –SGGW

Polish Society of Veterinary Sciences – PTNW

International Goat Association

Warsaw Chamber of Veterinary Surgeons

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That's no ordinary goat! That's the Matołek [MATOƆ:EK] Billy-Goat!

The Matołek Billy-Goat is a main character of one of the first Polish comic books for children. The comic was written in 1933 by a couple of Polish authors – a cartoonist Marian Walentynowicz and a writer Kornel Makuszyński. Since the very beginning the comic has become one of the most popular books for children. Many generations of Polish children grew upon them. And so did we!

The comic tells the story of the Matołek Billy-Goat, half-man, half-goat creature, who sets off in quest of a town called Pacanów. The town is rumored to be the only place around the world where such a Billy-Goat may get shoes made just for him. Pages of the comic are filled with amusing, breath-taking and often surrealistic adventures of the Billy-Goat who visits many corners of the Earth, from Africa to the Wild West, before he reaches his desired destination. The titular hero shares many features with other popular children's story characters like Winnie-the-Pooh or Paddington Bear – he is nice and cheerful but often clumsy and not very keen. The Billy-Goat is, however, determined to overcome all the pitfalls and succeed in attaining the goal he is dreaming about. Under the cover of a simple children's story the comic refers to many important virtues such as friendship, helpfulness, optimism and love for the homeland.

By the way, Pacanów, the setting of the comic, is a real town in Poland. One day in a bar the authors spotted a man sipping a drink in a gloomy mood. When asked about his story, the man told them that he came from Pacanów, a one horse town somewhere in the middle of nowhere, and he would love to figure the way to help his hometown flourish. Inspired by this story, the authors decided to popularize the town in their books. Funny is that the name of the town means in Polish, of course in a very loose translation, a town of not too bright people… and Matołek means slightly goofy ☺

Together with the Matołek Billy-Goat we wish you a pleasant stay in Warsaw!

Organizing committee

Program of the conference

11.05.2019

8:00 – 8:45 REGISTRATION OF PARTICIPANTS

8:45 – 9:00 OPENING ADDRESS

9:00 – 11:10 SESSION I

moderator – Dr. Michał Czopowicz

9:00	CONTRIBUTION IN DIFFERENTIAL DIAGNOSIS OF CHRONIC PROLIFERATIVE RHINITIS ASSOCIATED WITH *SALMONELLA ENTERICA* SUBSP. *DIARIZONAE* (IIIB; SED) IN SHEEP	Evangelia D. Apostolidi
9:10	ATYPICAL PNEUMONIA IN ICELAND	Björn Steinbjörnson
9:20	GENOTYPING OF *COXIELLA BURNETII* ORIGINATING FROM SMALL RUMINANT FLOCKS	Benjamin U. Bauer
9:30	INVESTIGATION UPON THE *BRUCELLA* SPECIES DETECTED IN TISSUES OF ABORTED FETUSES AND SLAUGHTERED SEROPOSITIVE RUMINANTS IN GREECE	Evanthia Petridou
9:40	MOLECULAR EVIDENCE FOR THE PRESENCE OF *ANAPLASMA PHAGOCYTOPHILUM* IN ABORTED GOAT KID FETUSES AND PLACENTA	Nektarios D. Giadinis
9:50	EPIDEMIOLOGY OF PESTIVIRUS INFECTION IN GOATS IN POLAND	Adrian-Valentin Potârniche
10:00	FLOCK LEVEL ANTIBIOTIC USAGE IN UK SHEEP FLOCKS	Fiona Lovatt
10:10	ANTIMICROBIAL RESISTANCE OF *TRUEPERELLA PYOGENES* STRAINS ISOLATED FROM GOATS IN POLAND	Ewelina Kwiecień
10:20	LAMINITIS IN A DAIRY GOAT HERD ON A LOW FORAGE DIET; POST MORTEM RESULTS	Margit Groenevelt
10:30	IMMUNE PROFILE OF LAMBS DURING THE FATTENING PERIOD IN FEEDLOTS	Aurora Ortín
10:40	ACUTE PHASE RESPONSE AND CONCENTRATIONS OF IRON IN SERUM – A COMMON RISK OF MISINTERPRETATION	Esther Humann-Ziehank
10:50	*ANAPLASMA PHAGOCYTOPHILUM* MEMBRANE PROTEINS ASP14 AND OMPA – A VACCINE TRIAL IN SHEEP	Erik G. Granquist
11:00	SALMONELLOSIS IN DAIRY GOAT KIDS: RESULTS OF A FOLLOW-UP STUDY	René Van den Brom

11:10 – 11:20 COFFEE BREAK

11:20 – 12:50 SESSION II

moderator – Dr. Katja Voigt

11:20	INCIDENCE, POSSIBLE RISK FACTORS AND THERAPIES FOR PSEUDOPREGNANCY ON DUTCH DAIRY GOAT FARMS: A CROSS-SECTIONAL STUDY	René Van den Brom
11:30	REPRODUCTIVE MANAGEMENT OF INTENSIVELY REARED DAIRY EWES IN GREECE	Sofia Termatzidou
11:40	SOMATIC CELL COUNT AS A TOOL TO CONTROL SUBCLINICAL MASTITIS IN SERRANA GOATS	Hélder Quintas
11:50	MILK AMYLOID A AS A TOOL TO MONITORING UDDER HEALTH IN SERRANA GOATS	Hélder Quintas
12:00	IMPACT OF HARD TICKS (*IXODIDAE*) INFESTATION ON MILK PRODUCTION AND UDDER HEALTH OF DAIRY GOATS IN LOW-INPUT PASTORAL FARMING SYSTEMS IN GREECE	Sotiria Vouraki
12:10	FACTORS AFFECTING XYLAZINE-KETAMINE FIELD ANAESTHESIA OF GOAT KIDS FOR DISBUDDING	James Patrick Crilly
12:20	THERMAL DISBUDDING IN GOAT KIDS: CURRENT PRACTICE, COMPLICATIONS AND CONSIDERATIONS	Mark van der Heijden
12:30	FOREIGN BODY IN THE RUMEN OF A GOAT – A CLINICAL CASE REPORT	Lucie Marie Grimm
12:40	OCULAR DISEASES IN SHEEP – AN OVERVIEW	Johanna Maria Meilwes

12:50 – 13:30 LUNCH

13:30 – 15:40 SESSION III

moderator – Dr. Teresa Navarro

13:30	RECRUDESCENCE AND VERTICAL TRANSMISSION OF PERSISTENT INFECTION OF *NEOSPORA CANINUM* IN SHEEP	Julio Benavides
13:40	DIARRHOEA IN GOAT KIDS AGED 2 MONTHS OLD ATTRIBUTED TO CRYPTOSPORIDIOSIS	Nektarios D. Giadinis
13:50	ZOONOTIC CRYPTOSPORIDIUM SPECIES AND SUBTYPES IN LAMBS AND GOAT KIDS IN ALGERIA	Karim Tarik Adjou
14:00	THE APPLICATION OF DEEP AMPLICON SEQUENCING AND MICROSATELLITE MARKERS TO STUDY GASTROINTESTINAL NEMATODE POPULATION STRUCTURES AND THE PREVALENCE OF BENZIMIDAZOLE RESISTANCE SNPS ON A UK SHEEP FARM	Mike Evans
14:10	EPIDEMIOLOGY OF ANTHELMINTIC RESISTANCE IN GOATS IN POLAND	Marcin Mickiewicz
14:20	CHRONIC COPPER INTOXICATION IN A SHEEP FLOCK – A CASE REPORT	Carolin Reckmann
14.30	THE EFFECT OF COBALT SUPPLEMENTATION AND EARLY WEANING ON LAMB GROWTH RATES IN THE FACE OF COBALT DEFICIENCY – A CASE REPORT	Kim Hamer
14:40	MESOTHELIOMAS AS CAUSE OF ASCITES IN SMALL RUMINANTS	Martin Ganter
14:50	RIGHT ATRIAL OSTEOCARTILAGINOUS METAPLASIA IN SHEEP: PERSONAL EXPERIENCES AND POTENTIAL ETIOPATHOGENESIS	Sebastian Alessandro Mignacca
15:00	EPIDEMIOLOGICAL STUDY OF JAW OSTEOMYELITIS IN SHEEP	Delia Lacasta
15:10	OVINE LARYNGEAL CHONDRITIS IN A TEXEL RAM	Teresa Maria Punsmann
15:20	WOOLFAIR: WOOL FUELS THE RESILIENCE AND COMPETITIVENESS OF SHEEP FARMING IN EUROPEAN MARGINAL LANDS	Sebastian Alessandro Mignacca
15:30	MORBIDITY AND MORTALITY OF DAIRY GOAT KIDS IN SOUTHERN GERMANY – PRELIMINARY RESULTS OF A RETROSPECTIVE POSTAL SURVEY	Viktoria Balasopoulou

15:40 – 15:50 COFFEE BREAK

15:50 – 16:50 ECSRHM ANNUAL MEETING

Entertainment

16.50 – 19.00 WARSAW SIGHTSEEING BY BUS (ROYAL ROUTE, OLD TOWN)

19.00 – 20.15 BACK TO 1950s – SIGHTSEEING OF THE PALACE CULTURE AND SCIENCE – GIFT OF JOSEPH STALIN FOR WARSAW, PANORAMIC VIEW OF WARSAW FROM 30TH FLOOR

20.15 – 23.00 DINNER IN THE PALACE CULTURE AND SCIENCE

23.00 BUS TRANSFER TO HOTELS

Conference abstracts

CONTRIBUTION IN DIFFERENTIAL DIAGNOSIS OF CHRONIC PROLIFERATIVE RHINITIS ASSOCIATED WITH *SALMONELLA ENTERICA* SUBSP. *DIARIZONAE* (IIIB; SED) IN SHEEP

Evangelia D. Apostolidi[1], Nektarios D. Giadinis[2], Serafeim C. Chaintoutis[3], Taxiarchis Chassalevris[3], Victoria I. Siarkou[4], Ioannis Vlemmas[1], Vassilios Psychas[1], Chrysostomos I. Dovas[3]

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Introduction

Chronic proliferative rhinitis (CPR) associated with *Salmonella enterica* subsp. *diarizonae* (IIIb, SED) serovar 61:k:1,5,(7) has been sporadically described in sheep (USA, Spain and Switzerland). CPR produces severe respiratory distress with thick mucus nasal discharge, accompanied with progressive weight loss. Pathological findings of SED infection are non-specific (chronic-hyperplastic) and gram staining, microbiological cultures and electron microscopy immunogold labeling for *Salmonella* spp. have been used for etiological diagnosis. However, diverse agents including *Oestrus ovis* larvae, fungi and *Enzootic nasal tumor virus-1* (ENTV-1) are involved in upper respiratory tract diseases with similar clinical signs. Therefore, the aim of this study was to contribute in the differential diagnosis of SED rhinitis, which remains challenging [1-3].

Materials and methods

Twenty-seven sheep with history compatible with CPR were submitted to gross examination of their nasal cavities. Presence of the several agents was evaluated histopathologically using different staining techniques (H&E, Gram and GMS stain), while ENTV-1 provirus presence, the causative agent of ovine Enzootic Nasal adenorcinoma (ENA), was investigated using a specific PCR. Microbiological cultures were also performed. Specific Salmonella antisera and VITEK®2 automated system were used for serological and biochemical identification of the isolated bacteria, respectively. Additionally, a real-time PCR coupled with melting curve analysis that targets the β-galactosidase gene of SED was developed.

Results

Gross inspection revealed absence of *Oestrus ovis* larvae and nasal lesions presented as enlargement of the ventral turbinates or multiple small polypoid structures, were located constantly (N=27) in the ventral nasal turbinates. Histopathologically, all animal were exhibiting severely expanded mucosa and submucosa of the nasal turbinates and the hyperplastic epithelium was forming papillomatous-like projections towards the lamina propria, occasionally giving rise to dilated pseudo-acinus structures. Dots or rods were observed within many epithelial cells by H&E staining, where Gram staining co-localized numerous Gram-negative bacilli. GMS and PCR demonstrated absence of fungal hyphae and ENTV-1, respectively. The isolates were identified as SED, and all animals were real-time PCR-positive.

Discussion

Histopathological findings of SED infection were non-specific (chronic-hyperplastic), while Gram staining contributed in the preliminary identification of the pathogen. However, microbiological cultures and real-time PCR testing were necessary for the confirmation of the disease. Regarding differential

diagnosis, early ENA stages appear grossly as small polypoid formations and main distinguishing feature is the localization of lesions on ethmoidal conchae. Early ENA histopathological lesions of low grade adenocarcinoma can be confused with pseudo-acinus structures formed by hyperplastic epithelial projections in SED rhinitis. Therefore, presence of Goblet cells can indicate the epithelial projection and distinguish it from real acini. Exclusion of fungal rhinitis and nasal myiasis due to *Oestrus ovis* larvae can be performed by histopathological identification of granulomatous reaction along with GMS staining and gross inspection, respectively.

Conclusions

This is the most extensive study of CPR associated with SED, suggesting that this pathogen may be underreported and should be included in differential diagnosis of sheep with upper respiratory tract symptoms. Definitive diagnosis cannot be reached based on gross and histopathological findings and real-time PCR can provide rapid confirmation of SED infection.

Keywords: chronic proliferative rhinitis, real-time PCR, *Salmonella enterica* subsp. *diarizonae*, sheep

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ATYPICAL PNEUMONIA IN ICELAND

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Iceland is an island and an import of animals is forbidden. The Vikings brought the first livestock to Iceland in the 9th century.
A more acute and a chronic pneumonia was prevalent in sheep in Iceland over decades and even centuries. Descriptions were published in scientific Journals from 1931 to 1976 [1-4]. Friis, Pálsson and Pétursson [5] isolated *Mycoplasma ovipneumoniae* in a sheep in Iceland for the first time in 1976.
Maedi/Visna, and Paratuberculosis were imported with sheep from Germany (Halle) in 1933. Later Maedi/Visna was vacated with eradication of the livestock in certain parts of Iceland. Despite Maedi/Visna eradication an atypical pneumonia and Paratuberculosis is still prevalent in the flocks. Aypical Pneumonia is spreading within the island in the last years. To understand the spread of lung-affected-diseases in sheep in Iceland, we have to focus on the management of sheep by the sheep farmer, which is very different from the management in Great Britain or on the Continent. During the winter most sheep are housed and stall-fed over a period of four to five months according to the severity of the weather. In the spring they graze on the pastures in the proximity of the farms, but in the latter part of June, they are driven into the mountains on pastures in the interior parts of the country, where they remain until September. At that time, they are rounded up, a procedure taking several days, and gradually driven towards the large collecting fences, which are situated at the heads of the main valleys, having a capacity of up to 4,000 sheep. Here the sheep are closely penned together for one or two days while being separated according to the ear tags into the smaller fences belonging to individual farmers and are afterwards driven to the individual farms. These great collections appear to play an important role in the spreading of the diseases from one farm to another, and the crowding of the sheep during the winter, maybe with bad ventilation, appears to be almost ideal for the dissemination of an infectious respiratory disease.
In the last two decades farmers watched more and more frequently coughing in the lamb herds after collecting them in September. That cough got worse as the lambs were housed over winter. Morbidity and mortality rates increased, and weight gain decreased. Income of the farms can be reduced by 12-15%, due to the disease. Treatment with antibiotics had no sustainable effect. When an infected sheep introduced into a healthy flock, the whole flock coughs within 4-6 weeks.
To identify the infectious agent lung samples and lung swabs from dead lambs and slaughtered lambs were taken and cultured under anaerobic conditions on Mycoplasma specific agar. The lung swabs, taken in the slaughterhouses on Iceland were transferred immediately to Friis-Medium and send by air mail to the Institute for Microbiology of the University of Veterinary Medicine in Hannover, Germany. *Mycoplasma ovipneumoniae* (M. ovi.) could be isolated in 90% of the samples. Aerobical culture was not routinely done, but even if it was performed *Mannheimia haemolytica* or *Pasteurella multocida* were isolated in exceptional cases. The isolated *Mycoplasma ovipneumoniae* strains will be sequenced to identify epidemiological relationships and differences in virulence. The most virulent strains are used for production of a vaccine.
The results show that Atypical Pneumonia is a wide-spread and significant problem in the sheep flocks of Iceland with a severe impact on productivity

The investigations were sponsored by the Ministry of Fisheries and Acricultur, Agricultural Productivity Fund.

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GENOTYPING OF *COXIELLA BURNETII* ORIGINATING FROM SMALL RUMINANT FLOCKS

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Q fever is a zoonotic threat in many European countries. The main reservoir for the pathogen *Coxiella (C.) burnetii* are ruminants. This bacterium is shed in high quantities either at normal birth or at abortion with amniotic fluid and placenta. Furthermore, the pathogen is also shed in milk, faeces and urine. Contaminated aerosols and dust can lead to human disease by inhalation. Although *C. burnetii* infections are reported more in cattle than in small ruminants in Germany, most of the human cases are linked to small ruminant flocks.

Genetic differentiation is an important tool in forensic microbiology and supplies information about epidemiologic correlation of infectious diseases. Multi-Locus Variable-number tandem repeats Analysis (MLVA/VNTR) was first described in 2006 [1,2]. Since that time this method has been widely used to examine samples from animals and the environment [3-5]. The advantage of this method is that cultivation of field samples is not necessary for genetic examination. Furthermore, it has a higher discriminatory power compared to other typing techniques like Multispacer Sequence Typing (MST) [6,7].

In Germany the two genotyping clusters A and C were identified by MLVA [5]. Cluster A was mainly found in small ruminant population. Genotype A1 was detected in goats whereas genotype A2 was found in sheep. Additionally, differences in the geographic distribution were also observed. Genotype A1 was found mostly in Northern Germany whereas genotype A2 was detected in South-West Germany. Cluster C is associated within the cattle population and largely found in Central and Southern Germany. Various genotypes can occur on the same farm unit simultaneously [4,8].

Within the research consortium Q-GAPS (www.q-gaps.de) *C. burnetii* samples from sheep and goat farms were examined using the MLVA-14-method. In samples from Northern Germany a new genotype belonging to cluster C was detected from a goat farm which has a close relationship to genotype C1. Furthermore, genotype C7 was identified from a sheep flock in Southern Germany. Both genotypes, C1 and C7, were primarily described in German cattle herds [5]. On both farms involved cattle were also kept and tested positive for *C. burnetii* by PCR. Potentially, the infection on both farms was of bovine origin.

Further ovine samples were examined from Southern and Northern Germany. Genotype A4 was identified. This rare genotype was previously found in a caprine sample from Southern Germany as well as in an ovine sample from Central Germany [5]. Obviously, genotype A4 is widely distributed in Germany.

With the MLVA method, it is possible to obtain detailed information about the potential origin and distribution of *C. burnetii* isolates. However, the interaction of different genotypes within the ruminant population needs more investigation. It is still not possible to assess the pathogenicity of single genotypes.

This work was funded by the Federal Ministry of Education and Research (BMBF) under project numbers 01Kl1726B and 01Kl1726G as part of the Research Network Zoonotic Infectious Diseases.

Keywords: goat, MLVA, sheep, Q fever

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INVESTIGATION UPON THE *BRUCELLA* SPECIES DETECTED IN TISSUES OF ABORTED FETUSES AND SLAUGHTERED SEROPOSITIVE RUMINANTS IN GREECE

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Introduction

Brucellosis is a worldwide infectious disease. Ruminants and other species of productive animals as well as many wild mammals can be affected [1]. The disease can be transmitted to humans, usually through the food chain or by direct contact with infected animals. The economic loss in a herd is important especially due to the abortions. The disease in most European countries has been eradicated [2]. In Greece, eradication programs are applied concerning small ruminants (sheep and goats) and bovines.
The aim of the study was to investigate the *Brucella* species presence in tissues of seropositive slaughtered ruminants or aborted fetuses in Greece.

Materials and methods

Fifty-nine (59) tissue samples originated from 40 bovines and 19 sheep and goats, were subjected for further investigation. Of the bovine samples 16/40 were lymph nodes and 24/40 were samples from aborted fetuses (stomach content or other tissues), while of the ovine/ caprine samples 4/19 were testicls and 15/19 were samples from aborted fetuses.
From all samples DNA was extracted using the High Pure PCR template preparation kit (Roche, Basel, Switzerland) as per the manufacturer's instructions. The followed protocol was based on a multiplex PCR assay for the identification of *B. melitensis*, vaccine strain Rev1, *B. abortus* and strain RB51 [3].

Results

The results have shown that of bovine samples 23 fetuses and 16 lymph nodes were PCR positive for *B. abortus* while only one spleen sample was positive to the vaccine strain RB51. Moreover, of the ovine/caprine samples 14 fetuses and 4 testicls were positive for *B. melitensis* while one stomach content was positive to the vaccine strain REV-1.

Discussion

The PCR analysis indicated that the majority of the bovines were positive to *B. abortus* infection while the majority of the sheep and goats were positive to *B. melitensis* infection. Only in two cases vaccine strains RB51 and REV-1 were detected. The samples were originated from fetuses of a dairy cattle and a dairy sheep, respectively. In both cases the females that aborted were accidentally vaccinated at the age of 12 months when they were already pregnant.

Conclusions

Despite of the current reservations that part of the bovine population is *B. melitensis* affected due to the high prevalence of the microorganism in sheep and goats' populations and mainly due to the use of common pastures, the present study indicates that such concern is not documented while further investigation is needed.

Keywords: brucellosis, ruminants, vaccines

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MOLECULAR EVIDENCE FOR THE PRESENCE OF *ANAPLASMA PHAGOCYTOPHILUM* IN ABORTED GOAT KID FETUSES AND PLACENTA

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Introduction

Anaplasma phagocytophilum, transmitted by *Ixodes* ticks, is an intracellular pathogen of zoonotic interest. Regarding animals of veterinary importance, infection by this agent has been linked mainly to high fever, neutropenia, reduced milk production, but hemorrhagic diathesis, abortion and impaired spermatogenesis have also sporadically been reported [1,2]. In Greece, *A. phagocytophilum* has been detected in dogs, ticks and humans, while so far only *A. ovis* had been detected in farm animals [3].

Our case

Following the recording of multiple abortions in two goat farms in Northern Greece, samples were drawn from aborted animals. Stomach contents (two from each farm) and placental tissue from aborted animals were tested positive for *A. phagocytophilum* by molecular means and negative for other infectious and parasitic agents. Treatment with oxytetracycline LA stopped the abortions. Clinicians in tick risk areas should consider *A. phagocytophilum* as a cause of abortion in goats.

Keywords: abortion, *Anaplasma phagocytophilum*, goats, treatment.

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SEROPREVALENCE OF PESTIVIRUS INFECTION IN GOATS IN POLAND

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The aim of the study was to evaluate the seroprevalence of Pestiviruses in the Polish goat population and the possible influence of the co-habitation with cattle on the serological status of goats. Blood samples from 910 goats (128 males and 782 females) were collected between 2014 and 2017 from 62 goat herds from different voivodships of Poland and were tested for bovine viral diarrhea virus (BVDV) infection with a competitive ELISA kit. Between 10 and 13 adult female goats were randomly selected from each herd, assuming individual-level seroprevalence for pestiviruses in a herd of at least 10% and the level of confidence of 95%. All males were tested in each herd. As an expected prevalence of the infection in goat population was expected to be low, serological testing was performed according to the serial procedure i.e. positive samples were retested with the same test to increase the predictive value of the positive result. At least one seropositive goat was found in 4 herds (1 goat in 2 herds, 3 goats, and 5 goats), however, in one herd, the only positive goat tested negative in serial retesting. Finally, 3 herds were considered as seropositive which yielded apparent herd-level seroprevalence of 4.8% (CI 95%: 1.7%, 13.3%). After adjusting for sensitivity and specificity of the ELISA the true herd-level seroprevalence was 6.0% (CI 95%: 2.3%, 14.9%). No males tested positive.
In all herds considered as seropositive the goats had contact with cattle. Given that transmission of pestiviruses between small ruminants and cattle is possible, serological surveillance of small ruminants should be considered in any pestivirus control programs.

Keywords: BVDV, goat, Pestivirus

FLOCK LEVEL ANTIBIOTIC USAGE IN UK SHEEP FLOCKS

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In 2016, the UK government identified reducing antibiotic usage as a priority and called for the implementation of sector-specific targets on antibiotic use with progress developed and implemented via the Responsible Use of Medicine in Agriculture (RUMA) Target Task Force (TTF https://www.ruma.org.uk/targets-task-force/). The TTF sheep group identified that though sheep sector usage was low, there was limited accurate data on actual antibiotic usage on UK sheep farms. Hence they set targets that concentrated on disease 'hotspots' and aimed to improve communication with farmers with respect to preventative measures such as vaccination.
This study aimed to evaluate the magnitude and variation in antibiotic usage on sheep-only farms and to assess key factors that might impact on farm level usage such as disease prevalence and vaccine uptake. Veterinarians supplied antibiotic usage data from sheep-only farms and engaged farmers through a questionnaire which collected vaccine usage data, farm level disease and management information.
Data was collated from 152 flocks via 12 veterinary practices across Britain, contributing a total of 526 'flock years' and allowing a comparison of usage data from the same flocks for 2015, 2016 and 2017.
Over half the sheep flocks in this study had entrenched usage patterns with a quarter defined as 'low users' with a usage that was below the median for each year and a quarter defined as 'high users' with a usage that was above the median each year. However there was no significant difference between low and high users in the proportional usage of antibiotic classes or in the route of administration suggesting that there are not necessarily defining practices that are associated with high use.

Conclusion

This study primarily highlighted the need for the collation of antibiotic usage data from a wider proportion of farms throughout the UK sheep industry. Although appropriate vaccine usage remains of key importance in responsible disease prevention, vaccine sales data and antibiotic usage data are not necessarily correlated variables.
Further work is required on veterinary and farmer attitudes and practices to identify why there are entrenched high antibiotic users and how they might be enouraged to emphasise on preventative flock health and develop more responsible use of medicines across all their management practices.

ANTIMICROBIAL RESISTANCE OF *TRUEPERELLA PYOGENES* STRAINS ISOLATED FROM GOATS IN POLAND

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Introduction

Trueperella pyogenes, a Gram-positive irregular rod, is an inhabitant of mucus membranes of the upper respiratory, urogenital and gastrointestinal tracks of animals. This bacterium is pathogenic for livestock and wild animals causing suppurative lesions in various organs and tissues [1]. In cattle and small ruminants breeding *T. pyogenes* infections lead to serious economic losses. The β-lactam antibiotics, tetracyclines, macrolides, fluoroquinolones and aminoglycosides are antimicrobials commonly used to treat *T. pyogenes* infections in animals [2]. However, improper and excessive use of antibiotics may be the reason of increasing bacterial resistance.

Materials and methods

A total of 8 *T. pyogenes* strains isolated from goats from various ferms in Poland were studied. Antimicrobial susceptibility of *T. pyogenes* was determined by the strip diffusion method using E-test strips. Twelve antimicrobials were tested: penicillin (PEN), amoxicillin/ clavulanic acid (AMC), cephalothin (CEF), cefotaxime (CTX), ciprofloxacin (CIP), enrofloxacin (ENR), tetracycline (TET), erythromycin (ERY), azithromycin (AZM), clarithromycin (CLR), rifampicin (RIF) and clindamycin (CLI). In addition, minimum inhibitory concentrations (MICs) of ERY, gentamycin (GEN) and streptomycin (STR) were determined using standard broth microdilution assay according to the guidelines of the Clinical and Laboratory Standards Institute (CLSI) [3]. Furthermore, the presence of genes *tet*(W), *tet*(M), *tet*(O), *tet*(K), *tet*(L), *erm*(X), *erm*(B), *msr*(A/B), *aad*A9, *aad*A11 and class 1 integron gene cassette was detected by conventional PCR with specific primers.

Results

Antibiotic susceptibility testing revealed that all isolates were susceptible to PEN, AMC, CEF, CTX, ERY, AZM, CLR, CLI, RIF and GEN. However, the resistance to TET, ENR and STR occurred in one strain (12.5%). Surprisingly, 5 strains (62.5%) were resistant to CIP. Most of resistance genes (*tet*(W), *tet*(M), *tet*(O), *tet*(K), *tet*(L), *erm*(X), *erm*(B), *msr*(A/B), *aad*A11) were not detected in the studied strains. However, the class 1 gene cassette was detected only in 1 *T. pyogenes* strain (12.5%) which was resistant to STR. The sequence analysis of this gene cassette revealed the presence of aminoglycoside resistance determinant, the *aadA9* gene, the first time described in *T. pyogenes*.

Discussion and conclusions

Most of *T. pyogenes* strains isolated from goats are susceptible to commonly used antibiotics. However, some caprine strain can be a reservoir of antimicrobial resistance genes. The detection of the gene cassette indicates that the class 1 integrons may play an important role in the dissemination of

antimicrobial resistance in this bacterial species. Therefore, further investigations are needed to assess other determinants and mechanisms of antimicrobial resistance in *T. pyogenes* strains occurred in goats.

Keywords: antibiotic resistance, antimicrobial susceptibility, genes, goats, minimum inhibitory concentration, *Trueperella pyogenes*

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LAMINITIS IN A DAIRY GOAT HERD ON A LOW FORAGE DIET; POST MORTEM RESULTS

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Introduction

Lameness is a problem in many dairy goat herds in the UK, due to a variety of diseases. Hill et al. [1] found lame dairy goats being affected by horn separation, white line lesions, slippering, abscess of the sole, foreign body, and granulomatous lesions. Footrot, caused by *Dichelobacter nodosus* and lameness due to an infection with treponemes have also been confirmed as causes of lameness in goats [2,3]. In cattle, laminitis has long been thought to be a major cause of lameness although this has been under discussion for some time [4]. In goats, a link between nutrition and lameness has not been made previously.

Case History

A dairy goat herd with 320 lactating animals had been under investigation for two years due to serious issues with lameness. The herd was housed indoors all year round and the goats were fed the same ad lib concentrate ration from weaning onwards. The lameness problem was only seen in the lactating animals and not in the youngstock.
Based on previous findings, a diagnosis of treponeme infection had been made [5]. Measures were taken to limit the spread of infection and some improvement was seen. However, the problem persisted and it was decided to perform a post mortem examination on five animals that were euthanased on welfare grounds.

Pathological findings

Table 1 summarizes the findings of the gross post mortem. Rumen pH measured between 5.26 and 5.46 on all five animals. The animals with abnormal hoof conformation showed an elongated, box-like claw with very hard horn and no open lesions. These animals had however been extremely lame on those legs. Apart from the abnormal shape there were irregular fissures over the solar and bulbar horn with the distal phalanx rotated downwards on two claws.
Microscopically, the feet showed irregular hyperplasia of the epidermal laminae with parakeratotic hyperkeratosis, especially in solar regions. Dense clusters of lymphocytes expanded the dermal laminae. The rumens showed moderate rumen mucosa hyperkeratosis, and ulcerative, mild lymphocytic rumenitis.

Table 1.

Goat (breed)	Feet with infected lesions	Feet with abnormal hoof conformation	Other pathological lesions
765 (Saanen)	right front and hind - medial claw	not applicable	bronchointerstitial pneumonia
84 (Saanen)	right hind - both claws	right front	No other findings

1130 (Toggenburg)	both hind - both claws	not applicable	bronchointerstitial pneumonia
96 (Saanen)	left front – both claws, right front – lateral claw	right front – medial claw	bronchointerstitial pneumonia
1174 (Toggenburg)	right hind - both claws	right front – medial claw	bronchointerstitial pneumonia

Discussion

Based on these findings, chronic laminitis was suspected. The full aetiology of the lameness on this farm is still unclear as treponeme spp. clearly played a role in the lame feet with open lesions. There was no immunohistochemistry preformed so we cannot be sure that treponeme spp. are not found in the claws without open lesions.
Rumen pH was below 5.5 on all animals which is considered acidotic. The ruminal hyperkeratosis was likely a result of prolonged periods of acidosis due to the lifelong feeding of ad lib concentrates. Although this feeding system is been used in the dairy goat sector worldwide, the consequences of feeding a high concentrate ration throughout the entire life of the dairy goat needs more research.

Keywords: dairy goats, lameness, laminitis, pathology

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IMMUNE PROFILE OF LAMBS DURING THE FATTENING PERIOD IN FEEDLOTS

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Introduction

The fattening stage of lambs in feedlots is a necessary tool to standardize productions and improve economic results. However, stress factors related to management practices associated with this production system (abruptly weaning, transport to the feedlot, regrouping of animals of different origins and adaptation to a new environment) could affect the functionality of the lamb immune system. The objective of this work was to evaluate the evolution of the stress level and the immune profile of lambs during the fattening period in a feedlot.

Materials and Methods

A total of 80 Rasa Aragonesa male lambs fattened in a feedlot located in Zaragoza (Spain) were selected for this study. Samples of blood (with EDTA and without anticoagulant) were taken in the farm of origin, at weaning (T0), at arrival to the feedlot after approximately 1 hour of road transportation (T1), after two weeks of fattening (T2), and at the end of the fattening period (T3) four weeks later. In whole blood samples, total and differential leukocyte numbers were evaluated and the neutrophils to lymphocytes ratio (N/L) was calculated. Furthermore, lymphoproliferation in response to the mitogens concanavalin A (ConA) and phytohemagglutinin (PHA) was assessed in vitro using a MTT assay. The percentages of lymphocyte T-helper ($CD4^+$) and lymphocyte T-citotoxic ($CD8^+$) cells were determined by flow cytometry and the ratio $CD4^+/CD8^+$ was calculated. Concentrations of the pro- and anti-inflammatory cytokines IL-1β and IL-10 (respectively), as well as cortisol, were measured in serum samples by ELISA. Statistical analysis of data was performed using the SPSS 22.0 statistical package (IBM, Chicago, USA).

Results and Discussion

High average values of the stress indicators, serum cortisol and N/L ratio, were measured at the beginning of the study, probably due to the weaning stress, and these values were only overcome by those found after the transport (cortisol $p=0.005$; N/L $p<0.001$). No differences were detected in the average $CD4^+/CD8^+$ ratio throughout the study with the exception of the post transport sampling in which a significant increase compared to T0 was observed ($p<0.05$) due to a reduction in $CD8^+$ ($p<0.05$). These results suggest that stress of transport induced an immunological dysregulation resulting in a reduced T-cytotoxic immune response. The lowest lymphoproliferative responses to mitogens ConA and PHA were observed at T0 and T1, indicating that weaning and transport stress negatively affected this T cells function. However, significant increases in proliferation of lymphocytes in response to both mitogens were observed at T2 (Con A $p<0.001$; PHA $p<0.01$) and at the end of the fattening period (Con A $p<0.01$; PHA $p<0.001$) compared to T0. These increases in lymphoproliferative responses were coincident with a significant increase in the average serum level of the pro-inflammatory cytokine IL-1β compared to T0 (T2 $p<0.001$; T3 $p<0.001$), whereas no differences throughout the period of study were observed in the average serum concentration of the anti-inflammatory cytokine IL-10. Stress

persisting for weeks (chronic stress) could reduce the suppressive effect of cortisol on immune functions and induce an enhancement of inflammatory responses which stimulate proliferation of T cells. A high exposition to pathogens along the stay in the feedlot could also explain these results.

ACUTE PHASE RESPONSE AND CONCENTRATIONS OF IRON IN SERUM – A COMMON RISK OF MISINTERPRETATION

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Iron (Fe) is an essential trace element. Its ability to bind and release electrons quite easily facilitates the important key role of iron in the metabolism of animals. The most common example is the reversible binding of oxygen to iron incorporated into hemoglobin. The range of dietary iron intake in farm animals is very high: feed and/or water (mostly overestimated) often contain high iron concentrations. On the other site, colostrum and milk for new-borns contain quite low iron concentrations. The bioavailability of Fe, for example for hem and hemoglobin synthesis, demands high efforts in iron homeostasis. The description of hepcidin as an iron-regulating protein in iron metabolism promoted attention of the scientific community in the last decade [1]. Hepcidin is synthesised in the liver and regulates the abundance of the trans-membranous Fe-transporter ferroportin. Thus, an increase of hepcidin concentration leads to an internalizing of iron into the reticulo-endothelial system (e.g. liver, spleen, bone marrow). Moreover, enteral absorption of Fe decreases due to a decline in baso-lateral export of Fe into the blood stream. Hepatic hepcidin synthesis can be induced via high Fe-transferrin concentrations in the plasma as well as via cytokines during an acute-phase-response. The so called "cytokine-hepcidin link" may explain the frequently observed decrease of plasma or serum Fe concentrations during acute phase response (APR), e.g. in the course of infectious diseases [2]. Moreover, it may be responsible for the so called 'anemia of chronic disease'. It is mandatory to avoid misinterpretation of these low Fe concentrations in serum or plasma. The process seems to be a reasonable reaction of the body e.g. to reduce Fe availability for pathogens, and it was assigned to be a part of the innate immune system [3]. Misinterpretation and subsequent supplementation of Fe might be counterproductive.

Keywords: acute phase response, hepcidin, iron

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ANAPLASMA PHAGOCYTOPHILUM MEMBRANE PROTEINS ASP14 AND OMPA – A VACCINE TRIAL IN SHEEP

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Anaplasma phagocytophilum is the most wide spread tick borne pathogen in farm animals in Europe and is known as the agent of tick borne fever in sheep. Lambs are especially susceptible to the infection, which leads to immune suppression and secondary infections such as septicemia, pyemia, arthritis and pneumonia. Vaccines are currently not available. Recent studies in cell cultures and mice have shown promising results of the infection-blocking effect by antibodies against the Asp14 and OmpA membrane proteins of *A. phagocytophilum*. However, studies in heifers, using the *Anaplasma marginale* analogues of the proteins did not produce protective immunity against challenge. The current study used recombinant Asp14 and OmpA as a vaccine in lambs as two injections, 21 days apart. Five lambs were vaccinated with each protein and five lambs were kept as unvaccinated controls. Experimental challenge with a wild isolate of *A. phagocytophilum* (Gen.bank M73220) was performed in vaccinated and controls, 21 days after the last vaccination and the animals were monitored for two further weeks. Lambs in both vaccinated groups responded with serum antibodies against OmpA and Asp14, detected from day 28 after the first vaccination. After challenge, both vaccinated and controls developed bacteremia and clinical signs consistent with *A. phagocytophilum* infection. Cellular immune responses showed similar patterns across the groups, which indicate lack of specific cellular responses to the vaccines. In conclusion, the analyses of serological, cellular and clinical responses revealed no protective effects of recombinant OmpA and Asp14 in lambs against challenge with *A. phagocytophilum*.

SALMONELLOSIS IN DAIRY GOAT KIDS: RESULTS OF A FOLLOW-UP STUDY

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Salmonellosis is a relatively uncommon detected disease in small ruminants in the Netherlands. Nevertheless, in 2016, an outbreak of salmonellosis in goat kids between one and four weeks of age on two related dairy goat farms was reported to GD Animal Health. At post mortem examination of goat kids of both farms and following bacteriological examination *Salmonella* Typhimurium was isolated as causal agent. Shortly later, the veterinarian mentioned illness in children from both farms. Typing revealed that salmonellosis in the goat kids and in the children from both farms was caused by the same relatively unknown MLVA-type of *Salmonella* Typhimurium, 03-15-05-00-311. Outbreaks of human salmonellosis and goats as source are rare.

In reaction to these findings, a follow-up study was performed on five (dairy) goat farms with a known history of salmonellosis in goat kids. For that purpose, the farms were visited and milk and stable samples were collected. Additionally, information about animal movements and disease and treatments history were collected and analysed.

Salmonella Typhimurium was isolated in four out of five rearing facilities. Only in one farm, *Salmonella* was found in the dairy goat stable. *Salmonella* was not found in the bulk tank milk samples. The main clinical symptoms were sudden death of goat kids, aged between six and 16 days. No clinical signs were seen in mature goats. The morbidity and mortality in goat kids were high, sometimes up to 80%, on these farms. The *Salmonella* Typhimurium cultured from goat kids were relatively highly resistance, which is of concern. The initial source of the infection remained unknown, although animal movement seemed to play a role in the distribution of the infection. On three of the farms, salmonellosis occurred in one or more family members of the household of the farmer.

Salmonellosis is a relatively uncommon zoonosis in sheep and goats in the Netherlands. Results from analysis in the past ten years indicate an increase of salmonella-enteritis caused by *Salmonella* Typhimurium in dairy goat farms. This follow-up study, shows the urgency for additional research, aiming to find the source and gain additional information about the epidemiology on the farm, the risks for human health, and to gain evidence for measures in order to prevent further spreading of salmonellosis among Dutch dairy goat farms, and to prevent human illness.

INCIDENCE, POSSIBLE RISK FACTORS AND THERAPIES FOR PSEUDOPREGNANCY ON DUTCH DAIRY GOAT FARMS: A CROSS-SECTIONAL STUDY

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Pseudopregnancy is a frequently diagnosed reproductive disorder in (dairy) goats. This cross-sectional study evaluates the incidence, possible risk factors and therapies for pseudopregnancy on Dutch dairy goat farms. Two questionnaires, one for farmers and one for veterinarians, were designed and included questions about general farm demographics, breeding management, hormonal oestrous induction, treatment, measures for reduction, and stress moments in dairy goats in the period 1 June 2016 – 31 May 2017. In total, 43 farmers (21.5 per cent response rate) and 27 veterinarians (22.5 per cent response rate) completed the questionnaire. The annual incidence varied between one and 54 per cent per farm, with a mean annual incidence of 17 per cent (95 per cent CI: 0.14-0.21). In this study, we found a significant association between incidence of pseudopregnancy and a higher percentage of goats with an extended lactation ($p<0.0001$), and between incidence of pseudopregnancy and the number of ultrasound examinations per year ($p<0.0001$). The recommended therapy in literature consists of two administrations of prostaglandins. This was only correctly applied by ten per cent of the farms. On fifty-two per cent of the farms, an overdose was used comparing to the recommended dose in literature.

Keywords: goats, hydrometra, incidence, pseudopregnancy, risk factors, therapies

REPRODUCTIVE MANAGEMENT OF INTENSIVELY REARED DAIRY EWES IN GREECE

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Dairy sheep reproductive efficacy, fertility and success of artificial insemination are influenced by a number of animal, management and environmental factors [1-3]. The objective was to evaluate reproductive management practices and to assess farmers' perceptions about their willingness to use artificial insemination (AI) programs in intensively reared dairy farms in Greece. A total of 23 farms located in North Greece were included in the study. A designated questionnaire was used to record reproduction management practices within each flock and record farmer's views. Mating season of adult ewes in the region is usually from May to October, 4-7 months post lambing; a period that is characterized by high ambient temperature. The results showed that evaluation and enough preparation of the animals with methods such as flushing of females (21.7% of farms), ram breeding soundness (0% of farms) examination and separation of males and females (60.8% of farms) are limited. The consequences of such practices are long mating periods (1-4 months), usage of large number of rams (1 ram per 25 females) and high percentage of barren ewes (6-10 %). The latter, if identified early, are either reintroduced in rams 3-5 months after first mating or culled. There is no grouping of ewes based on milk yield during lactation and hence the consequences are, high variability in Body Condition Score (BCS), overfeeding of low producers and high number of over-conditioned ewes (BCS>3.25) at time of mating. Ewe lambs are mated usually at 7-10 months old, without always taking into consideration their body weight. Replacement rate of adult ewes is relatively low (<20%), resulting in increase of average animal age. Despite preventive vaccination against chlamydial abortion being generally applied, abortion prevalence due to other reasons is not negligible (1-7% of pregnant animals). In conclusion, patterns of reproductive management vary greatly even in intensive dairy sheep flocks of Greece, indicating that there are margins of improvement that could ensure high conception rates. This research is carried out / funded in the context of the project "Recording and evaluation of factors affecting artificial insemination success using fresh ram semen in Greek breeding conditions" (MIS 5007366) under the call for proposals "Supporting researchers with emphasis on new researchers" (EDULLL 34). The project is co-financed by Greece and the European Union (European Social Fund-ESF) by the Operational Programme Human Resources Development, Education and Lifelong Learning 2014-2020.

Keywords: dairy ewes, management, milk production, reproduction

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SOMATIC CELL COUNT AS A TOOL TO CONTROL SUBCLINICAL MASTITIS IN SERRANA GOATS

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Introduction

Goat milk production is a dynamic industry and a substantial part of farm income to Serrana breeders. Subclinical mastitis is common and one of the most important diseases in dairy goat production with negative impact on animal and human health. Moreover, is responsible for high economic losses. The fight against subclinical mastitis requires the implementation of surveillance and control programs. Several methods to diagnose subclinical mastitis are available but Serrana goat farmers would mainly benefit from cheap and efficient diagnostic methods, as well as from diagnostic tools that can be used at the farm level.
The aim of the research presented in this work was to evaluate somatic cell count (SCC) as a monitoring tool of subclinical mastitis in Serrana goats. This study had mainly two objectives: (i) determine the influence of infectious and non-infectious factors (parity, stage of lactation, production level and number of kids born or weaned) in the SCC; and (ii) propose a physiological threshold of SCC in Serrana goats.

Materials and methods

In two consecutive lactations, after weaning of kids, 35 (1st year) and 32 (2nd year) Serrana goats was evaluated (n = 2233). Milk samples were aseptically collected from each half udder once a week and transported to laboratory, under refrigeration conditions (4ºC).
Samples for microbiological analyses were immediately processed. They were performed in Plate Count Agar (PCA, Biokar Diagnostics, Beauvais, France) according to ISO 4833:2003 ("Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of microorganisms - Colony-count technique at 30 ºC"). Samples exceeding 500 cfu/ml of milk (10^{-1} dilution) in PCA were considered positive to mastitis.
Samples to SCC evaluation were preserved with bronopol (10mg 2-bromo-2-nitro-1,3-propanediol; Panreac Quimica SA, Reixac, Spain) and assess by a fluoro-optoelectronic method (Fossomatic®, MilkoScanTM 6000, Hillerød, Denmark) at 40ºC.

Results and discussion

In udder half milk samples without bacterial growth (n = 1708), SCC increased with parity ($p < 0.05$). The SCC experienced a slight decrease during lactation while individual production of milk had a small increase during the same period ($p < 0.05$). Goats with ≥ 3 kids born or weaned have higher SCC throughout lactation ($p < 0.05$). The interaction between factors (parity x stage of lactation; parity x number of kids weaned) also affects SCC.

Conclusions

We propose a physiological threshold of 1254 x 10^3 cells / ml for individual SCC in Serrana goats farms, which must be interpreted according to lactation stage and parity (primiparous / multiparous). It is suggested to implement periodic bacteriological analyses for validation of SCC results. The CCS should be included as a parameter in the dairy contrasts in Serrana goats.

Keywords: goat, mastitis, somatic cell count

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MILK AMYLOID A AS A TOOL TO MONITORING UDDER HEALTH IN SERRANA GOATS

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Introduction

Acute phase proteins (APPs) may increase in concentration in the absence of macroscopic changes in the milk, or may precede the onset of clinical signs. APPs have been investigated as markers of milk quality and subclinical mastitis in cows and sheep. Milk amyloid A (MAA) is a APPs and a highly specific biomarker for subclinical mastitis identification and one of the first proteins generated in milk following mammary glands infection. Serum Amyloid A is indicated as the most sensitive APP in sheep but few studies are available in goats. The aim of this study was to evaluate the concentration of MAA as a tool to monitoring udder health in goats.

Materials and methods

Samples of each mammarian half were collected in 12 mid-lactation Serrana goats for 6 consecutive weeks in the morning before milking during two consecutive lactations (n = 288). The methodology used to collect milk samples was based on the one described by Corrales et al. [1]. The MAA concentration of the milk was determined using a commercial immunoenzymatic assay (Milk Amiloyd A Assay Kit-Tridelta Development Limited, Maymooth, Ireland) according to manufacturer's instructions. Absorbance's were read by spectrophotometry at 450 nm with 630 nm as reference (Gene 5® Data Analysis Software). Based on the microbiological results and somatic cell counts (Fossomatic®) the mammary halves were divided into 4 groups: healthy mammary halves (Hh), mammary glands with subclinical mastitis (SMh) and dubious subclinical mastitis: latent (Lh) and non-specific (NSh) as described by Miglio et al. [2].

Results and discussion

MAA appears to be associated with the amount of bacterial DNA in the sample (χ^2=58.3; $p<0.001$). Geometric mean MAA group values was affected by the health status of the goat mammary halves. Lowest MAA values were found in Hh (n=83; 6.2±1.1 μg/ml) and the highest in SMh (n=57; 11.5±1.1 μg/ml) and NSh (n=131; 14.3±1.1 μg/ml) groups. We found few cases of Lh (n=17; 8.46±1.25 μg/ml). Significant differences ($p<0.05$) were found between Hh and NSh, between Hh and SMh and between Lh and NST. No statistical differences ($p>0.05$) were found between: Lh and Hh, Lh and SMh or NSh and SMh groups.

Conclusions

The results of this study point MAA as a useful technique to distinguish healthy mammary halves from those with subclinical mastitis. However, this distinction is highly conditioned by "nonspecific subclinical" halves. Thus, further studies are needed to confirm the utility of this technique in goats and to understand that noninfectious factors may affect MAA concentrations.

Keywords: goat, mastitis, milk amyloid A

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IMPACT OF HARD TICKS (*IXODIDAE*) INFESTATION ON MILK PRODUCTION AND UDDER HEALTH OF DAIRY GOATS IN LOW-INPUT PASTORAL FARMING SYSTEMS IN GREECE

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Tick infestation is a problem for animals reared under extensive farming systems. Production losses due to tick infestation have been reported in sheep and cows [1-3]. However, relative literature in dairy goats is scarce. The objective here was to assess the impact of hard ticks (*Ixodidae*) infestation on milk production and udder health of dairy goats in low-input pastoral farming systems. A cross-sectional study was carried out in two representative organic dairy goat herds in Central (Farm A) and Northern Greece (Farm B) in May and June, respectively. A total of 331 goats were randomly selected (n=167 and n=164 for farms A and B, respectively). Goats were thoroughly examined by the same veterinarian for the presence of hard ticks of the genus *Rhipicephalus* spp.; tick infestation was confirmed when two or more ticks were detected. Individual milk production was assessed through daily milk yield and its composition of fat, protein, lactose and non-fat solids. Udder health was assessed by somatic cell count (SCC) and total viable count (TVC) in milk. Goats producing milk with SCC $>10^6$/ml and TVC $>2\times10^4$/ml were considered as having impaired udder health status. Prevalence of tick infestation was calculated at farm level. Data regarding milk production and udder health were log-transformed prior to statistical analyses. Linear and mixed linear models using R packages "Stats" and "lme4" were used to analyze farm data separately and jointly. Prevalence, of tick infestation was 56.70% and 26.67% in farms B and A, respectively. Significant ($p<0.05$) effects of tick infestation on all studied traits, except for milk protein yield, were found only for Farm B. Between farms comparison, after adjusting for random effects, revealed significant effects ($p<0.01$) on udder health traits. Tick infestation resulted in an increase in milk SCC by 71.60±19.72% ($p=0.0024$) and TVC by 69.89±17.35% ($p=0.0014$). Moreover, infested goats were 2.97 times more likely to have impaired udder health status ($p=0.0015$). These results are consistent with previous studies in dairy cows [3] and may be indicative of an immunosuppressive impact of tick infestation. Overall, results suggest an adverse effect of tick infestation on udder health of dairy goats. Differences between farms indicate that effects on milk production could be also expected depending on infestation prevalence. Other sources of variation such as herd health and nutritional management, host-resistance and immunological status, severity and duration of infestation should be also investigated.

This work was funded by the SOLID project (FP7-266367).

Keywords: goats, milk production, somatic cell counts, ticks, udder health

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FACTORS AFFECTING XYLAZINE-KETAMINE FIELD ANAESTHESIA OF GOAT KIDS FOR DISBUDDING

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Introduction

Disbudding is an act of veterinary surgery in the UK, and must be performed under anaesthesia. It is commonly performed under general anaesthesia, due to the low toxic threshold of local anaesthetics in goats [1], and evidence that local anaesthesia is ineffective at preventing disbudding pain [2]. There is a relatively limited range of general anaesthetic agents that are permitted in food-producing animals within the EU [3].

Materials and Methods

A clinical audit of disbudding performed under general anaesthetic by intramuscular injection of a combination of xylazine and ketamine, 0.04 mg/kg and 10 mg/kg respectively. The response to disbudding of the anaesthetised kid was recorded as good (G), vocalised (V), moved (M) or vocalised and moved (VM). The recovery was subjectively rated as good (G) or slow (S). Kid weight, breed, sex, vet, location and air temperature were also recorded.

Results

There were a total of 851 usable records. 64% of kids had an anaesthesia quality score of G. 97% of kids were considered to have recovered uneventfully. Weight and breed were found to be statistically significant predictors of anaesthesia quality. Pygmy goats were more likely than other breeds to have a poor anaesthetic quality. When Pygmy goats were removed from the data set, only weight was a statistically significant predictor of anaesthesia quality ($p=0.005$), with heavier kids having a poorer anaesthetic quality. The number of cases of poor recovery was too small for statistical significance, but there were trends to slower recovery at low weights and low air temperatures.

Discussion

Pygmy goats appear to differ to other goat breeds in their susceptibility to this anaesthetic combination, and the dose-response curve does not appear to be linear. The study has many limitations, including very uneven distributions of kids between breeds, locations and vets, and correlations between these three factors. The subjective method of recording anaesthetic response and recovery, plus the absence of recording of other potentially relevant variables such as kid age, and interval between administration and disbudding, and length of time of disbudding iron application are all shortcomings.

Conclusions

The degree of anaesthesia produced by this combination and route of administration is not satisfactory, and further investigation is required to find an effective, safe, practical and legal method of anaesthetising goat kids for disbudding.

Keywords: kid, disbudding, anaesthesia

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THERMAL DISBUDDING IN GOAT KIDS: CURRENT PRACTICE, COMPLICATIONS AND CONSIDERATIONS

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Thermal disbudding in kids on dairy goat farms is, with the exception of some organic farms, standard practice in order to prevent injuries in adult goats caused by fighting. Because of rapid horn development, disbudding is preferably performed within the first two weeks of life. Thermal disbudding is an inherently painful procedure that requires particular attention to prevent potential welfare problems and complications. The current report details current practice, and complications noted following routine disbudding of goat kids in the Netherlands. Complications include failure to recover from anaesthesia as well as neurological symptoms and subsequent death up to two weeks after thermal disbudding. Considerations for optimal management of disbudding, including practical, legislative, technical, and anaesthesiologic concerns are discussed. There is a relative paucity of data on both the safety and efficacy of local anaesthetic injections for disbudding in goat kids. Therefore, follow-up studies for different local anaesthetics and use of NSAID's peri- and postoperatively are recommended.

FOREIGN BODY IN THE RUMEN OF A GOAT – A CLINICAL CASE REPORT

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Summary

Clinical disease caused by foreign bodies in the rumen occur only sporadically in small ruminants in Germany. In the following, we describe the case of an eleven-year-old goat buck, which was presented with inappetence, dehydration and reduced defaecation. An x-ray of the abdomen revealed a radiopaque foreign body. A rumenotomy was performed and a conglomerate of plastic parts and calcifications could be extracted from the rumen. The animal recovered without complications.

Preliminary report

The 11-year-old castrated goat buck caught the owners attention due to reduced feed intake for the last three days. After treatment by the local veterinarian achieved no longer-term improvement, the animal was presented in the Clinic for Swine, Small Ruminants and Forensic Medicine in Hannover.

Clinic of the individual animal

The buck showed a subdued behaviour but was able to stand and walk independently. The back was slightly hunched, the bulbi were highly sunk into the eye sockets on both sides and the capillary refilling time was delayed to more than 4 seconds. Defaecation of small amounts of very dry faeces and urination could be observed. Auscultation revealed no contractions in the rumen, the abdomen showed no tension during palpation.

Diagnosis, therapy and development

An ultrasound examination of the abdominal cavity was performed in which no urinary bladder and no free fluid could be detected. Bowel movements were visible. Examination of the blood revealed an increased haematocrit (0.53 l/l), as well as increased urea (50 mmol/l) and creatinine values (203 µmol/l).
Via a venous catheter, the animal was supplied with electrolyte solution (1l) and physiological saline solution (2l) vitamin B1, Amoxisel® (amoxicillin) and Buscopan compositum®. After two days, the haematocrit, creatinine and urea values were within in the reference range but as the animal deposited remarkably few faeces, an enema with paraffin oil and water was performed. Additionally a radiograph of the abdomen was performed, revealing radiopaque structures in the cranioventral area of the rumen.

Surgery

To perform a rumenotomy, the animal was placed under general anaesthesia and a lumbosacral epidural anaesthesia was administered. After opening the abdominal cavity in the left flank the rumen wall was opened, and a foreign body (2.2 kg) consisting of plastic threads/nets with calcifications could be extracted.

Recovery

The animal showed no increased rectal temperature during the hospital stay. The animal was discharged 10 days post-surgery. According to the owner, the animal shows no health problems three month after being released from the clinic.

Background

Due to the husbandry conditions in Germany, most animals do not have access to plastic material and the selective feeding behaviour of reduces the accidental swallowing of indigestible objects. Therefor the finding of foreign bodies in goats are rare.
A different situation can be found in developing countries, where the pollution of green areas and road sites with plastic and food waste is less regulated and many sheep and goats of livestock owners look for their food unrestrained and independently. There are numerous publications on sheep and goat examined at slaughterhouses where plastic was found in the forestomaches. The prevalence varies between 50% and 92% [1].
Plastic cannot be broken down in the rumen and accumulates in the ventral segment of the rumen [1]. This leads to atrophy of the rumen papillae [2] and, by stretching the rumen sac, to inappetence [1]. It can lead to an occlusion of the omasum or the oesophagus. The accumulation of indigestible foreign bodies in the rumen often remains undetected and only becomes noticeable after accumulations of large amounts. As in this case, salts can also accumulate and lead to pain and inflammatory reactions caused by mechanical irritation [1].

In the manufacturing process of plastics, diverse additives are used. These can dissolve in the rumen through mechanical and chemical processes. One example are bisphenols which can be absorbed in sheep via the mucosa of the mouth and the gastrointestinal tract [3]. Bisphenols act as endocrine disruptors in humans and animals, affecting oestrogen, insulin and thyroxine receptors. Their effects are also described as carcinogens, teratogens and allergens [1].

Conclusion

In animals with inconsistent appetite and reduced defaecation, partial obstructions of the gastrointestinal tract due to foreign bodies may occur. In individual cases, surgical removal of the foreign body via laparotomy in the left flank should be considered.

Keywords: foreign body, goat buck, rumenotomy

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OCULAR DISEASES IN SHEEP – AN OVERVIEW

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Congenital malformations and diseases of the eye have a significant relevance in sheep. Exogenous factors such as selenium or plant intoxication as well as infections like Border-Disease Virus or Schmallenberg Virus can impair the embryonic development of the eyes (ROSENFELD and BEATH 1947; BINNS et al. 1964). Genetic causes are known for different ocular malformation in sheep.
In clinical practice most common ocular diseases are acquired, like trauma and Infectious Ceratoconjunctivitis.

Congenital malformations

Entropion

Entropion is the inward rolling of the free edge of the eyelid. Friction of the eyelashes on the cornea causes irritation and erosion. The result is painful keratoconjunctivitis (DISTL 2019). Genetic causes for the occurrence of entropion are discussed, although the hereditary course has not been precisely clarified yet. However, selection against entropion can significantly reduce the intra-flock prevalence (LAMPRECHT u PFEIFFER 1989).

Microphthalmia

In sheep, microphthalmia is most often described in Texel sheep. Affected lambs show bilateral microphthalmia and are otherwise vital. There is no clinical association to other malformations. A missense mutation of the PITX3 gene located on chromosome 22 was detected as responsible. Commercial genetic tests are used to identify potential microphthalmic sires (BECKER et al. 2010).

Split Upper Eyelid Defect (SUED)

SUED is malformation of the upper eyelid and is described in four-horned sheep breeds. (GASGOICNE et al. 2017). The upper eyelid is split in the middle. Animals with a very pronounced split cannot close their eyes completely. Consequently, the eye surface cannot be protected adequately. Irritation by ingrowing hairs, injuries and infections may be the result (HENSON. 1981).

Congenital cataract

The term cataract (Greek = waterfall) describes the loss of transparency of the lens. In sheep affected lambs are born with a clear lens. At an age of 1 to 2 months the characteristic bilateral cataract evolves. Complete lense opacity and blindness develop within the first year. An autosomal recessive inheritance is known as cause (BROOKS et al. 1982). Due to the progressive nature of congenital cataract sheep are used as a model for cataract genesis studies (ROBERTSON et al. 2005).

Ocular Dermoids

Dermoids are generally assigned to the group of benign germ cell tumors. It is an overgrow of non-neoplastic tissue during organogenesis at different localizations possible. In the case of sheep, this is

usually a sporadic single animal disease. Depending on their localization and size, dermoids may be associated with painful irritation and blindness in the eye.

Acquired eye diseases

Trauma

Injures of eyelids, cornea as well as deeper ocular structures are common changes mainly after accidents. Depending on the severity and affected structures, an attempt is made to preserve the eye. If the eye cannot be preserved, an extraction of the eyeball can be performed.

Infectious keratoconjunctivitis

Infectious keratoconjunctivitis is the most common ocular disease in sheep worldwide. Most important causative pathogen is *Mycoplasma conjunctivae*. *Clamydophila pecorum* can also be the primary pathogen of this disease (BOILEAU et al. 2012). Gram-negative cocci (*Neisseria spp. Branhamella spp.)* occur more frequently in summer. 30% of a herd and all age groups can be affected, showing severe ceratoconjunctivitis. Corneal ulceration can occur (GANTER 2019).

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RECRUDESCENCE AND VERTICAL TRANSMISSION OF PERSISTENT INFECTION OF *NEOSPORA CANINUM* IN SHEEP

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Introduction

Neosporosis due to infection by *Neospora caninum* protozoan parasite is a major cause of reproductive failure in cattle worldwide that has been classically regarded as inconsequential in sheep. However, recent studies suggest that this disease should be considered as relevant in this species. However, it was not clear whether the parasite could, as happens in cattle, establish persistent infections in sheep which recrudesce during pregnancy and lead to the vertical transmission of the parasite and the infection of the foetus. The aim of the current study is to investigate whether recrudescence of natural chronic infection and vertical transmission of the parasite occur in ovine neosporosis. Besides, the occurrence of lesions, parasite burden and specific immune response of the host would be also analysed.

Material and methods

Thirteen naturally infected sheep were oestrus synchronized and their serological response against *N. caninum* was followed during gestation. The ewes were euthanized when an increase of the specific serological antibodies, measured through ELISA, was detected or, when this did not occur, at the end of gestation. Post-mortem studies were carried out to determine the presence of lesions, through histological analysis of tissue samples from placentomes and foetuses. Parasite burden in same samples was also analysed by PCR.

Results and discussion

Recrudescence of a persistent infection, detected by the increase of specific IgG, occurred between days 80 and 120 of gestation in ten out of thirteen ewes. Foetuses from those ten sheep were, in their majority (75%), alive at the time of detection of recrudescence. While lesions at the placenta from these ten animals, characterized by foci of necrosis and infiltration of mononuclear cells, were not frequent and of variable severity, lesions were found in 75% in the foetuses from these ewes, affecting mainly at the brain (multifocal non purulent encephalitis). Interestingly, similar lesions were detected in one foetus, out of six, from those three ewes where recrudescence was not identified nor placental lesions found. Vertical transmission of the parasite occurred in all the sheep where an increase of specific serological antibodies was found. These findings are very similar to those described in the recrudescence of natural cases of bovine neosporosis, suggesting that this disease could also be very relevant in sheep and should be included in the differential diagnosis of ovine reproductive failure.

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DIARRHOEA IN GOAT KIDS AGED 2 MONTHS OLD ATTRIBUTED TO CRYPTOSPORIDIOSIS

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Introduction

Cryptosporidiosis is a parasitic disease due mainly to *Cryptosporidium parvum*. It causes diarrhoea in goat kids aged 4-15 days old and can be zoonotic [1]. Treatment with halofuginone lactate for 7 days is effective [2], while also other drugs can be effective [3].

Our case

In the present case, a goat farm of northern Greece suffered from diarrhea in goat kids about 1 week old. Treatment with halofuginone (Halocur®-MSD Animal Health) for 3 days was effective, but the same cases relapsed after 1.5 month. Examinations for bacterial, viral and parasitic agents were generally negative, except for *Cryptosporidia*. Treatment with halofuginone for one week was conducted and the animals recovered easily.

Keywords: cryptosporidiosis, goat kids, 2 months old, halofuginone lactate.

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ZOONOTIC CRYPTOSPORIDIUM SPECIES AND SUBTYPES IN LAMBS AND GOAT KIDS IN ALGERIA

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Background

Little is known on the occurrence and identity of *Cryptosporidium* species in sheep and goats in Algeria. This study aimed at investigating the occurrence of *Cryptosporidium* species in lambs and goat kids younger than 4 weeks.

Material and Methods

A total of 154 fecal samples (62 from lambs and 92 from kid goats) were collected from 13 sheep flocks in Médea, Algeria and 18 goat flocks across Algiers and Boumerdes. They were screened for *Cryptosporidium sp*p. by nested-PCR analysis of the small subunit (SSU rRNA) rRNA gene, followed by restriction fragment length polymorphism and sequence analyses to determine the Cryptosporidium species present. *C. parvum* and *C. ubiquitum* were further subtyped by sequence analysis of the 60 kDa glycoprotein gene.

Results

Cryptosporidium spp. were detected in 17 fecal samples (11.0 %): 9 from lambs (14.5 %) and 8 from goat kids (8.7%). The species identified included *C. parvum* in 3 lambs, *C. xiaoi* in 6 lambs and 6 goat kids, and *C. ubiquitum* in 2 goat kids. *Cryptosporidium* infections were detected mostly in animals during the first two weeks of life (7/8 for goat kids and 7/9 for lambs) and in association with diarrhea occurrence (7/17 or 41.2% goat kids and 7/10 or 70.0% lambs with diarrhea were positive for *Cryptosporidium spp*.). Subtyping of *C. parvum* and *C. ubiquitum* isolates identified the zoonotic IIaA13G2R1 and XIIa subtype families, respectively. Minor differences in the SSU rRNA sequences were observed between *C. xiaoi* from sheep and goats.

Conclusions

Results of this study indicate that lambs and goat kids in Algeria are commonly infected with zoonotic *Cryptosporidium spp*. and *C. ubiquitum* and *C. xiaoi* are potential causes of neonatal diarrhea in these animals within the country.

Keywords: Algeria, *Cryptosporidium parvum, C. ubiquitum; C. xiaoi;* goat; sheep

THE APPLICATION OF DEEP AMPLICON SEQUENCING AND MICROSATELLITE MARKERS TO STUDY GASTROINTESTINAL NEMATODE POPULATION STRUCTURES AND THE PREVALENCE OF BENZIMIDAZOLE RESISTANCE SNPS ON A UK SHEEP FARM

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Introduction

Anthelmintic resistance (AR) is a global problem responsible for significant welfare and economic costs. Recommendations for reducing the development and spread of AR are largely based on modelling, with some evidence of efficacy in the field [1]. However, improved diagnostics are clinically necessary, and improved methods of studying parasite epidemiology are required to refine models and improve their application across different management systems and climates. This presentation describes the preliminary field application of genetic tools to study the dynamics of GIN populations and benzimidazole resistance SNPs.

Materials and Methods

During 2016-2018, faeces were collected at approximately three-week intervals from a low-ground, commercial (meat-producing) sheep flock in south-eastern Scotland. Each year, the sampling period ran from just prior to the lambing period, until the sale of lambs in the autumn/winter. At each sampling point, faeces were collected from 10 ewes and 10 lambs (except for the pre-lambing sample when only ewes were sampled). Individual faecal egg counts were performed on these samples using the cuvette method (sensitivity 3epg). Faeces were pooled into two coprocultures (ewe and lamb), and the resultant larvae (L_3) stored in ethanol. DNA lysates were produced from these stored larvae using a Proteinase K methodology.
Speciation of the larval DNA was performed using deep amplicon sequencing of the ITS2 region using primers conserved across the Clade V strongylid nematodes to produce a 'nemabiome' for each sample pool [2]. Deep amplicon sequencing was also performed using *Teladorsagia circumcincta* specific primers for the β-tubulin locus, which contains the three single nucleotide polymorphisms (SNPs) known to confer benzimidazole resistance [3]. Microsatellite analysis of the *T. circumcincta* larvae using four highly polymorphic markers (2066, 2467, 13604, 22274) will be used to assess *T. circumcincta* population structure across the years.

Results

The nemabiome data illustrate variation in the relative abundance of different strongylid species within and between years. These data also illustrate variations in species composition between ewes and lambs, and alterations after some anthelmintic treatments but not others.
The initial β-tubulin polymorphism data show relatively little variation with age group and time. The p200 resistant polymorphism predominates, suggesting it is approaching genetic fixation within this *T. circumcincta* population.
Microsatellite analysis by PCA plotting of F_{ST} values is not complete but preliminary findings will be presented.

Discussion

The nemabiome data from ewes and from lambs appear broadly similar but with notable exceptions, particularly in the relative abundance of *T. circumcincta*. This study cannot attribute causation for this variation, but it shows how the technology may be combined with climatic and management data in future studies to improve understanding of GIN epidemiology.
Changes in the nemabiome and in the abundancy of markers for AR following anthelmintic treatment may provide a sensitive test for AR at a species level. Furthermore, studying the repopulation of animals post-treatment will allow assessment of the efficacy of *refugia* based strategies.
Microsatellite analysis of the *T. circumcincta* population on the farm will provide information on population structure, which will further inform recommendations on GIN control plans and AR delaying strategies.

Conclusions

The application of deep amplicon sequencing and microsatellite markers to field populations illustrates the potential for further investigation of parasite epidemiology, and assessment of risk factors and strategies for reducing the development and spread of anthelmintic resistance.

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Keywords: anthelminthic resistance, Deep Amplicon Sequencing, nemabiome, nematode, sheep

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EPIDEMIOLOGY OF ANTHELMINTIC RESISTANCE IN GOATS GASTROINTESTINAL NEMATODES IN POLAND DETECTED BY IN-VITRO METHODS

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Introduction

Gastrointestinal nematodes are responsible for most important diseases of small ruminants. The emergence of anthelmintic resistance among gastrointestinal nematodes over the last three decades has become the main threat to goat farming around the world. Data on the prevalence and spread of anthelmintic resistance of gastrointestinal nematodes in Poland are still insufficient. The aim of this study was to assess the prevalence of anthelmintic resistance in goats in Poland by two in vitro methods: egg hatch test (EHT) and larval development test (LDT).

Materials and methods

The study was carried out in 30 goat herds from all over Poland. Faecal samples were collected directly from adult goats by owners and delivered to the laboratory within 24 hours. Pooled faecal samples for the in vitro tests were collected from randomly selected adult goats from each herd and stored in anaerobic conditions before the examination as described by Hunt and Taylor [1]. Individual faecal egg counts were performed by a modified McMaster method. EHT for detection of benzimidazoles resistance was performed in 30 herds according to the procedure described by Coles et al. [2]. The proportion of hatched eggs was recorded in each well. The concentrations of thiabendazole required to inhibit 50 and 99% of the eggs from hatching (ED50/ED99) were determined. LDT was used for detection of benzimidazoles, macrocyclic lactones and levamisole resistance was performed in 31 herds according to a modified procedure described by Várady et al. [3]. The proportions of eggs and L1, L2 and L3 larvae were determined for each well. The concentrations of thiabendazole (TBZ) that inhibited development to the third-stage larvae (L3) stage by 50 and 99% (LD50/LD99) were determined for each farm. Infectious L3 in the wells with high concentrations of each anthelmintic were isolated, and the resistant species were identified as described by Van Wyk and Mayhew [4].

Results

A total of 330 samples from 30 herds were examined by a modified McMaster method. The Trichostrongylidae eggs were present in 74% of samples. Resistance to TBZ was indicated in 26 herds (87%) and in 22 herds (73%) by EHT and LDT, respectively. The most common nematode species present at the highest concentration of TBZ was *H. contortus*. Resistance to ivermectin aglycone was indicated in 22 herds (73%), and the most prevalent nematode species that developed at the highest drug concentrations were *Trichostrogylus* spp. Resistance to levamisole was indicated in 4 herds (13%) and the most prevalent nematode species that developed at the highest drug concentrations were *Trichostrogylus* spp.

Discussion and conclusion

The anthelmintic resistance is widespread in gastrointestinal nematodes of goats in Poland. Resistance to anthelmintics from benzimidazole group which are most often used in Poland is the most prevalent type of anthelmintic resistance.

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Keywords: anthelmintic resistance, gastrointestinal nematodes, goats.

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CHRONIC COPPER INTOXICATION IN A SHEEP FLOCK – A CASE REPORT

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Case Presentation

In a pedigree breeding flock with shropshire sheep six of the weaned lambs died within 14 days. The flock included 21 ewes (15 of those had lambed), 8 gimmers, 4 sires and 27 lambs (14♂, 13♀). The lambs were weaned since 2-3 weeks from the ewes, were 2-3 month old and weighed 40-50 kg. The lambs were fed with mineralized sheep concentrates and hey ad libitum. The concentrates were fed for free admission, because there were not enough feeding places at the trough. The average intake was up to 2 kg concentrates per animal and day.
The first lamb attracted attention with anorexia and faintness. The clinical state got worse severely within 2 days, the mucous membranes became icteric, the breathing more intensive. The lamb became recumbent and died. One day later another lamb showed loss of appetite, general weakness and icteric mucous membranes and died within 24 hours. This animal was given to necropsy.
Within the next 12 days, four more lambs showed the same symptoms and died or had to be euthanized.

Diagnostic measures and results

In the necropsy of the second animal in the Chemical and Veterinary Investigation Office Münsterland-Emscher-Lippe (CVUA-MEL) the main finding was a diffuse lipidosis of the liver with disseminated single cell necrosis and infiltration with neutrophilic granulocytes. Additional finding was a catarrhal enteritis with evidence of *Clostridium perfringens* and coccidia. The kidneys were in incipient rot and autolysis.
From the same animal a blood sample was taken one day before its death and a clinical-chemical analysis was conducted. The results are shown in table 1 (Animal 2).
The severely increased liver enzymes and the increased bilirubin indicated a severe liver damage. Due to these results, chronic copper poisoning was suspected, therefore serum copper concentration and the copper concentration in liver tissue were determined. The serum copper concentration was 75.8 µmol/l (ref.: 7.0-24 µmol/l), the copper concentration in the liver tissue was 212 mg copper/kg fresh weight (ref.: 10-120 mg/kg FW).
After the third case of death, also from this animal a liver sample was taken and examined for copper (330 mg/kg FW ref.: 10-120 mg/kg), selenium (1.269 mg/kg FW ref.: 0.25-1.5 mg/kg) and cobalt concentration (0.033 mg/kg FW ref.: 0.025-0.085 mg/kg) and from all remaining lambs blood samples were taken and CK, AST, GLDH activities, and bilirubin, as well as copper concentrations were determined (table 1).
Due to the significantly increased copper content in the liver tissue and also in the serum of the dead animals the diagnosis chronic copper intoxication with haemolytic crisis was made. As in all lambs the GLDH and AST values were minimal to severely increased, it can be assumed that in all lambs even without clinical symptoms the liver is damaged more or less.
To identify the copper source, the hey as well as the currently fed concentrates (fed since one week) and the previously fed concentrate batch (fed over 4 weeks) were examined. The copper contents of the feed samples were 10.1 mg copper/kg dry matter, 18.1 mg copper/kg fresh matter and 58.4 mg copper/kg fresh matter respectively. The total ration is supposed to be between 6-10 mg copper/kg dry matter [1].
The high concentrate intake and the significantly too high copper content in this provoked the gravity of the illness and the high number of affected animals.

Discussion

The presented case deals with a chronic copper poisoning due to a significantly too high copper content in the total ration for at least four weeks.
Copper is an essential trace element and is necessary for the formation of specific enzymes like cytochrome c oxidase or superoxide dismutase and some transport proteins. The main storage organ is the liver [1].
Copper is taken in with the feed and absorbed by the intestine. The absorption can be reduced by higher molybdenum and sulfur contents in the ration, because molybdenum, sulfur and copper form copper-thiomolybdate-complexes in the rumen, which reduce the enteral copper absorption [2]. The copper to molybdenum ratio should be 10:1. The information regarding the recommended copper content in the total ration differ in the literature. Humann-Ziehank [3] summarizes them to 8-10mg copper/kg dry matter.
Is this content – like in the described case – exceeded over a longer period, the excessive copper is stored in the liver. It is bound intracellular to metallothionein or stored in the lysosomes [2].
Even if the source of the copper intake is eliminated, the storage in the liver stays and is reduced only slowly. If the storage capacity of the liver is exceeded, high amounts of copper ions are released. This step can be triggered by stress situations, however in the presented case no provoking stress factor could be determined. Through oxygen radicals hepatocyte- and erythrocytemembranes are destroyed whereby it comes to massive hepatic cell necrosis and intravasal haemolysis. The free copper additionally oxidates haemoglobin to methaemoglobin, which can not bind CO_2 or O_2. Due to the haemolysis it comes to chromoproteinaemic nephrosis with acute renal failure [4].
Treatment attempts are often futile. A therapy with ammoniumtetrathiomolybdate is recommended [5], but this is not permitted in Germany. Otherwise there is only the possibility of supporting fluid therapy and if applicable blood transfusion and the application of antioxidative substances. The most important measure is the elimination of the copper source and the prevention of stress. In the presented case directly after copper intoxication was diagnosed, feeding of concentrates was stopped.
Other possible reasons for too high copper contents in the ration are for example feeding minerals licensed for other animal species, contaminated feed from the surrounding of copper mines or after the usage of copper containing pesticides; furthermore, feedstuff from fields fertilized with pig- or poultry manure can contain high copper levels.
If the molybdenum and sulfur content in the ration is low, the enteral absorption of copper is increased and can lead to copper storage in the liver.
Drinking from copper sulfate foodbaths leads to an acute copper intoxication.
In the presented case the feed producer could not reproduce how it came to the wrong mixture.
This case report should show, that even if selected feedstuff for sheep is fed, chronical copper poisoning is an important differential diagnosis in icteric patients and losses can be considerable.
In case of insurance claim, it should be considered that also the surviving lambs show verifiable liver damage which can lead to significant loss of performance.

Table 1. Results of the clinical-chemical analysis of the blood samples

Animal	total bilirubin [µmol/l] (≤10)	CK [U/l] (10-230)	AST [U/l] (30-80)	GLDH [U/l] (2-12)	copper [µmol/l] (7.0-24.0)
2†	24.92	125	5906	10104	75.8
4†	42.61	104	3139	>1000	144.6
5†	7.37	283	955	>1000	33.7
6†	5.68	309	502	314	24.7
7	4.38	201	216	271	20.8
8	5.28	204	59	11	16.2
9	4.78	207	63	23	18.3
10	5.57	1280	150	102	15.9
11	4.28	235	363	155	17.3
12	4.11	322	71	105	16.3

13	5.56	536	401	409	21.1
14	6.95	388	375	401	18.9
15	2.64	446	70	122	15.9
16	5.51	277	95	102	16.4
17	6.19	311	57	75	26.8
18	5.23	263	353	244	20.1
19	5.46	208	67	75	16.7
20	5.29	974	939	1171	27.1
21	3.88	153	163	262	17.0
22	4.84	193	63	29	15.7
23		3150	124	66	16.5
24	4.95	2091	138	144	17.6
25	3.21	156	53	59	21.6
26	2.42	124	98	76	17.8
27	6.53	468	44	19	21.4

† died

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THE EFFECT OF COBALT SUPPLEMENTATION AND EARLY WEANING ON LAMB GROWTH RATES IN THE FACE OF COBALT DEFICIENCY – A CASE REPORT

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Dietary cobalt deficiency is known to be associated with 'pine' in growing lambs [1], a production limiting condition recognised in many pasture-based sheep systems. Production loss is due to reduced growth rates [2]. On a hill farm in the east of Scotland a diagnostic supplementation trial was undertaken, due to poor post-weaning lamb growth rates and a suspicion that trace element deficiencies were implicated. In late June 2018, 795 Scottish Mule cross lambs were weighed, 409 were treated with a Downland Essential Lamb bolus (T), containing cobalt, selenium and iodine; 386 were left untreated (C). The lambs were weighed regularly until either they were sold for slaughter or the end of the trial in mid-September. The lambs were weaned on one of two dates, 355 (C = 175, T = 180) on 9th July 2018 and 440 (C = 211, T = 229) on 31th July 2018. Univariate selection of explanatory variables in linear regression modelling was used to assess the effect of pertinent variables on post-treatment daily live weight gain (DLWG). Trace element bolus supplementation was associated with a DLWG increase of 49 grams per day ($p<0.01$), whilst delayed weaning was associated with a reduced DLWG of 24 grams per day ($p<0.01$). Blood sampling in late August showed that C lambs had vitamin B_{12} levels at which growth rates would be expected to respond to cobalt supplementation [3], while all apart from one of those from T lambs showed adequate recent cobalt intake. Glutathione peroxidase activity in C and T lambs showed that dietary selenium was adequate in both groups at that time. This case confirms that cobalt supplementation on deficient farms can be associated with a significant improvement in growth rates of growing lambs, and the timing of weaning is also important for achieving optimum lamb growth.

Keywords: cobalt, growth rates, lambs, supplementation, weaning

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MESOTHELIOMAS AS CAUSE OF ASCITES IN SMALL RUMINANTS

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Mesotheliomas are malignant tumors that develop from the mesothelial cells of the peritoneum, pleura, pericardium and *Tunica vaginalis testis*. In humans these rare tumours have strong association with previous exposure to asbestos. In animals mesotheliomas occur with greater frequency in dogs and cattle, but there are also reports in cats, horses and guinea pigs. In small ruminants only singular cases reports are published [1-6].

In the Clinic of Swine and Small Ruminants 16 cases of mesotheliomas were clinically diagnosed and confirmed post mortem between 1998 to 2019. Seven pygmy goats, four goats of large breeds (1xPfauenziege, 1xToggenburger, 2xBunte Deutsche Edelziegen), and six sheep (2x Black Headed Mouton, 1x Coburger Fox Sheep, 2x Merinos). With the exception of one ram and one castrated buck all affected animals were female. The mean age at the time of presentation was 9.4 ± 2.8 (5-15) years.

In two pygny goats numerous small tumoros were widly distributed over the whole peritoneal surface in the abdominal as well as in the cest cavity. In all other animals tumors were only found in the abdominal cavity diffusely distributed over the visceral and perietal surface of the abdominal cavity. These tumors produce large amounts of fluids with the consequence of a severe ascites. Some of the affected animals became recumbent due to the ascites. Beside these large amounts of fluid in the abdominal cavity the small tumours distributed over the whole surface of the abdominal cavity can be shown by transabdominal ultrasound investigation. X-ray pictures of the abdomen give in general no clear indication for a tumorous disease due to the small size of the singular tumors

Cytological and biochemical investigations of blood samples gave also no indications on the reason for the ascites. Deviations from the reference limits were in general due to secondary effects, e.g. if a uraemia was induced by a tumour who obliterated the ureter, or a secondary peritonitis induced a granulocytosis and monocytosis.

In alive animals the diagnosis mesothelioma bases on the detection of tumour cells or cell syncytia in the puncture fluid from the abdominal or cest cavity. Singular tumour cells are several folds larger than a blood leucocyte. The tumor cells often form syncythia. In some singular tumor cells as well as in syncythia mitoses are seen . The cell count and the protein concentrations in the abdominal fluid are in general low in mesotheliomas. a. Due to secondary diseases neutrohilic granulocytes and monocytes can influx into the abdominal cavity and can induce a severe increase in the cell count and in the protein content of the abdominal puncture fluid.

As differential diagnosis a peritonitis, due to a primary pyogenic inflammation of the abdominal cavity or acute and subacute fasciolosis have to be considered. ‘Both diseases induce a protein rich exsudate. A protein poor transsudate (like in mesotheliomas) can be found in congestive heart failure, due to hypoproteinaemia, in an uroperitoneum after rupture of the urinary bladder, and in the course of other abdominal tumorous diseases, e.g. intestinal carcinomas or metastatis of tumours of other originThere is no therapy available. Due to animal welfare reasons it is necessary to make the diagnosis before the animals are in torment.

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RIGHT ATRIAL OSTEOCARTILAGINOUS METAPLASIA IN SHEEP: PERSONAL EXPERIENCES AND POTENTIAL ETIOPATHOGENESIS

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Introduction

Many investigators consider sheep to be the most appropriate animal model for heart valve research, but, although several investigations about its morphology and physiology were made, few data on osteocartilaginous metaplasia of the myocardial right atrium are reported [1].
The authors describe right atrial myocardium ossifications (MO) observed in hearts of adult sheep, and advance etiological hypotheses about their presence.

Materials and Methods

The survey was made during routinary offal and meat hygiene inspection of healthy adult sheep regularly slaughtered in the United Kingdom. Animals were English meat breed of both sexes, housed in intensive livestock farming or reared in extensive conditions. After gross evaluation of hearts, selected samples were submitted to radiographic exams and histological investigation.

Results

Macroscopically, multiple foci of bone and cartilage within the wall of right atria were detected. On the epicardial surface, the lesions were appreciated only as focal thickening, instead, on the endocardial surface, they were partially projected into the lumen and were appreciated as irregular areas whitish and easily fracturable. When MO extended to occupy large areas of the atrium it appeared increased in size. Sometimes MO foci were small, isolated and less evident, especially when mostly composed by cartilage.
Radiographic evaluation confirmed the presence of MO of different size and shape. Histological investigations revealed the morphology of MO composed by osseous trabeculae/mineralisations surrounded by cartilaginous metaplasia and fibrosis in the myocardic tissue. Cardiomyocytes adjacent to this MO were sometimes compressed.

Discussion and Conclusions

Occurrence of cardiac bone or cartilaginous metaplasia has been described in Syrian hamster, otter, dog, and other species of animals. There are few reports about the presence of cartilage or bone in the atrial myocardium of sheep not associated with the *os cordis* [1,2]. Osteocartilaginous metaplastic lesions can occur in areas subjected to intense mechanical stress, with blood circulation disorders, or in some infectious diseases. Metaplasia represents in fact an adaptive lesion due to stressing factors. Ingestion of calcinogenic plants can also produce mineralization of the myocardium, but other areas of the heart, not only right atrium, and other organs can be involved [3].
Aberrant migration of neural crest cells deposited in the atrial myocardium and subsequently differentiated into hyaline cartilage/bone was also hypothesized [1]. Moreover, the remark of these lesions in adult sheep suggests the development from undifferentiated mesothelial tissue in the atrial wall according to the hypothesis of Anderson [2].

In a survey to evaluate the prevalence of *Cysticercus ovis* in Sicily in adult small ruminant hearts of different Italian breeds [4], the authors have not observed the presence of osteocartilaginous metaplasia in none of 1769 sheep and 144 goat hearts examined.
Considering that this lesion was found only in sheep belonging to English meat breeds, and mineralization from dietary would also have involved other organs, the authors do not exclude a potential genetic relation. Further studies are needed to better know the aetiopathogenetic mechanism underlying these lesions.

Keywords: sheep, heart, osteocartilaginous metaplasia

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EPIDEMIOLOGICAL STUDY OF JAW OSTEOMYELITIS IN SHEEP

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Introduction

It is essential for herbivores to grind their food properly in order to correctly perform digestion. However, the examination of the mouth and, in particular, the inspection of the premolars and molars is not easy in sheep. Oral disorders lead to an important weight loss that can dispose animals to be culled. A study on the prevalence of maxillary and mandibular osteomyelitis in sheep has been conducted, analysing the possible risk factors that predispose animals to suffer these oral pathologies.

Materials and Methods

The jaws of 36,033 sheep belonging to 60 meat sheep flocks located in Aragon region, a Northeast area of Spain, were examined by external palpation. Further, an epidemiological survey was carried out to each of the farmers in order to gather information on the management and feeding systems of each farm. All data collected were statistically analyzed with the programme IBM SPSS Statistics for Windows, Version 20.0.

Results and Discussion

Out of the 60 analyzed farms, 98.33% had animals with mandibular or maxillary affection in their flocks and only one farm had no affected animals. Moreover, 1,972 out of the 36,033 examined animals (5.47%) showed some kind of jaw injured with a great variability of prevalence from one flock to another (0.86% to 13.89%). This is in concordance with the prevalence found by Hoefs and Bunch [1] in European domestic sheep (5.00%). However, high prevalences were found in clinical outbreaks of the disease. Thus, Amorim et al. [2] reported 29.16% of mandibular lesions in a herd of Brazil and Rasooli et al. [3] described a sheep flock in Iran with 20.00% of ewes affected of a purulent mandibular osteomyelitis.

Jaw lesion profile revealed an evident inflammation detected by palpation, with an increase in thickness in the area of the affected body. The mandible was much more frequently affected than the maxilla (97.85%), in similar proportions on both sides (46.78% on right side vs 53.22% on left side), generally in the middle area (71.58%), and most of the lesions were closed and without content inside (98.32%).

All the farm risk factors were analyzed jointly by means of a binary logistic regression and it was obtained a model (Nagelkerke $R^2 = 0.295$) showing that the occurrence of mandibular lesions was conditioned, fundamentally, by the age and type of supplied feeding. A diet with maize straw, a rude and sharp food, has a great influence on the appearance of mandibular lesions. In the opposite direction, dehydrated alfalfa pellets offer a protective effect. Animals that grazed on rainfed land had fewer jaw injuries than those grazing on irrigated areas (3.63% vs 7.82%, $p<0.001$), probably because the latter ones based their food mainly in alfalfa and wastes from the maize crops. Additionally, feeding silage (8.47% vs. 4.91%, $p<0.001$) and hard products (6.93% vs 4.76%, $p<0.001$) during the stabling periods favoured the presence of lesions and increased the occurrence of jaw injuries. Thus, it can be established that the hard foods with edges and sharp areas and acid food, such as silage, can cause wounds in the gums that are responsible for producing more serious and chronic injuries in the oral cavity. Finally,

mineral supplementation in diet decreased the likelihood of mandibular damage (4.93% vs. 5.93%, p=0.002).

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OVINE LARYNGEAL CHONDRITIS IN A TEXEL RAM

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Description of the Case

A 2.5 year-old Texel ram was presented at the Clinic for Swine, Small Ruminants and Forensic Medicine and Ambulatory Service, University of Veterinary Medicine Hannover, Foundation. The owner of the ram noticed respiratory problems three days before. An antibiotic treatment (benzylpenicillin-natrium, neomycinsulfate) had no success. In the clinic the ram showed a stretched neck and head as well as severe difficulty in breathing. During in- and exspiration an intense laryngeal stridor was audible.The mucous membranes in the eyes and the mouth were cyanotic. Palpation of the larynx showed no asymmetry, but after this manipulation the breathing of the ram worsened considerably. The respiration rate was 36 breaths per minute with an abdominal breathing type.

Therapy

The animal was treated with 20 mg dexamethasone i.v. Nevertheless the condition of the ram deteriorated significantly, therefore a tracheotomy was made and a tracheal tube was inserted. An endoscopic examination revealed a narrowed glottis due to an oedematous swelling of the mucous membrane of the right arytenoid cartilage. Dexamethasone was applied locally on the glottis and a systemic antibiotic treatment was started (oxytetracycline i.v., 20 mg/kg). After this treatment the breathing was clearly facilitated. Despite this improvement the ram died in the following night.

Pathological and histopathological examination

The pathological examination revealed a severe swelling of the arytenoid cartilage. The glottis was, identical with the endoscopic image, narrowed considerably. The right arytenoid cartilage showed a purulent melting with caverns. The most probable cause of the death was a sepsis.

Microbiological examination

Low unspecific germ content (coagulase-negative *staphylococcus*, alpha-haemolytic *streptococcus, Bacillus* species) was proven.

Ovine laryngeal chondritis

In contrast to infectious respiratory diseases only individuals suffer from laryngeal chondritis [1]. Mostly affected are rams at an age of 18-24 months [2]. By comparing case descriptions of ovine laryngeal chondritis of the years 1943 to 1956 [1] no predisposition of one breed was recognisable. Frequently affected were the breeds Hampshire, Corriedale and Southdown. These breeds have in common that their heads are relatively short. In recent literature ovine laryngeal chondritis is mainly present in Texel

sheep [1-3]. Corresponding to the former mentioned breeds Texel sheep are characterized by a short and compact head and neck.
Injuries of the larynx, for example caused by awns or drench pistols, are discussed as causes of the chondritis [1,3].
In general young male sheep of breeds with a short and compact head are affected, therefore an interaction of special anatomical characteristics of the upper respiratory tract and the presence of sexual hormones is another possible explanation [2,3]. It was shown, that Texel rams compared to Bluefaced Leicester rams have some special characteristics such as a significant shorter and narrower larynx, a trachea with a 'funnel' shape and a disproportional large epiglottis and arytenoid cartilage [3].
Under the influence of sexual hormones the mucous membranes get oedematous. The oedematous membranes lead to turbulences in the breathing air and can lead to irritations of the mucous membranes. On one hand the swelling of the mucous membranes increases, on the other hand these lesions are entry ports for pathogenic germs, which can cause inflammations of the arytenoid cartilage [2]. Common bacteria causing an inflammation of the cartilage are *Fusobacterium*, *Trueperella pyogenes*, *Streptokokken*, *Bacteroides*, *Pasteurella* and *Escherichia coli* [4]. A recommended therapy includes application of dexamethasone and broad-spectrum antibiotics [1,2]. In case of emergency a tracheotomia may help to avoid the death of the animal. A cure rate of 80% is possible. Nevertheless, many recurrences occure. These animals show a considerably lower cure rate [2].

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WOOLFAIR: WOOL FUELS THE RESILIENCE AND COMPETITIVENESS OF SHEEP FARMING IN EUROPEAN MARGINAL LANDS

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Along with milk and meat, wool is a product traditionally linked to sheep farming all over the world, providing low cost and handy fiber. However, the intensification of the farming sector in the last decades, and the growing demand for synthetic fibers determined a radical shift in the wool production line with wool systematically collected from few breeds and from large flocks only. This mined even more the economic viability of sheep farms located in marginal lands, often considered as area of major environmental essential to preserve this natural heritage.

Woolfair is a 3-years project started in early 2018 with the cooperation of 6 Italian Institutions involved in research and field activities concerning animal welfare and health.

The project is aimed at generating a sustainable production model with a threefold impact on: 1) the resilience and competitiveness of small sheep farms expanding the range of marketable products; 2) the preservation of the environment on a multiple scale, minimizing the carbon footprint of wool disposal and preventing the abandon of marginal areas; 3) the demand of consumers for an eco and animal friendly product.

The survey is carried out in Central Italy, mainly in the Gran Sasso and Monti della Laga National Park, a protected reserve extended over 150,000 hectares on the Apennines. This area is characterized by the presence of several mixed farms of ruminants and horses and several wildlife species.

Ninety-five sheep farms have been enrolled, for a total of approximately 18,000 sheep. The farm consistency ranged from a minimum of 6 to a maximum of 1200 animals, with an average of 187 heads per farm.

Only 16 farms raised Italian wool purebreds sheep (Gentile di Puglia, Sopravissana, Merinizzate).

The first phase of the project was a questionnaire-based cross-sectional survey. The questionnaire was aimed at collecting information on the following areas: management and husbandry, animal welfare, health and nutritional status, use of drugs, biosecurity, and economics. Two sections on shearing and wool harvesting were also included.

At the same time, pools of fecal samples for parasitological analyses and cutaneous swabs/skin scrapings were collected twice in order to complete information on health status described by the questionnaires.

Data from the cross-sectional survey were analyzed and the farms were clustered in three groups, according to their management and economical features.

The collected information allowed us to improve health and management of sheep raised in this area, e.g. with ameliorating the treatment regimens for parasites and footrot.

In the second phase of the project, analyses will be focused on subsamples of farms representative of each cluster, investigating dietary protocols in farms, fleece for wool quality, and economics to assess Life Cycle (LCA). Moreover, in order to standardize and optimize the wool supply chain, a H.A.C.C.P. plan for shearing, packaging and selection was prepared and it will be regularly implemented.

In conclusion, the multi-actor approach adopted in this project will generate a model for a sustainable sheep farming system in marginal lands of Central Italy, which could be applied in similar European areas.

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Keywords: welfare; animal health; wool; sustainability.

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MORBIDITY AND MORTALITY OF DAIRY GOAT KIDS IN SOUTHERN GERMANY – PRELIMINARY RESULTS OF A RETROSPECTIVE POSTAL SURVEY

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Introduction

A rising demand for dairy goat products has led to an increase in dairy goat farms in Southern Germany in recent years. The majority of these farms are intermediate-sized family farms operating organic systems with a median herd size of 110 dairy goats [1]. While organic farming is widely perceived as being associated with higher animal welfare standards [2], high kid mortality is being observed on some farms. Few studies have so far been undertaken to determine the status quo of morbidity and mortality in dairy goat kids in Germany [3].

Materials and Methods

As part of a wider study, which will also include the prospective analysis of kidding and kid mortality data plus herd health data gathered during farm visits, a questionnaire has been sent to all (approximately 100) commercial dairy goat farmers in Bavaria and regions of Baden-Württemberg via organic and breed associations and dairy companies in autumn 2018. In total, 32 farmers responded to the questionnaire and 20 of these were willing to participate in the prospective field study. The postal survey focused on kidding management and kid rearing practices, as well as retrospective information concerning kid health and mortality. Preliminary data analysis was performed using Microsoft Excel 2016.

Results

Of the 32 respondents, 62.5% were full time farmers, with the majority being organic farms (93.8%). Keeping between 15 to 365 (median: 112) milking goats and a median of 129 kids (range: 18 to 600). Goats were dried off before kidding by 96.9% of the farmers with a dry period between 4 to 14 weeks (median: 8 weeks). 62.5% of farmers practiced extended lactation periods. Kidding records were kept by 93.8%, and 68.8% kept kid mortality records. Only 3.1% had submitted any dead kids for pathological examination. On 25% of the farms motherless rearing was practiced from day one, while 75% of the farmers initially left the kids with the dam and later changed to artificial rearing systems, with the suckling period ranging from 1-14 days. The average weaning age was 10 weeks (range: 7 to 14). In motherless rearing, the kids were supplied with colostrum during the first three hours of life on 75% of the farms, with an average total amount of 390 ml (range: 100 to 1400) colostrum given during the first 24 hours of life. Diarrhoea in kids older than 14 days was mentioned as the most prevalent problem (87.5% of farms), followed by poor growth (75%) and respiratory diseases (75%). Sudden death in kids older than 14 days was observed on 65.6% of the farms, with 62.5% of farmers seeing sudden deaths in kids under 14 days. Diarrhoea in kids under two weeks was observed on 59.4% of farms, followed by Orf (50%) and Omphalitis (37,5%). Stillbirths varied from 1.3% to 13.8% (median: 4.8%) of kids born and the abortion rate ranged from 0% to 30.9% (median: 1.95%) of parturitions. Median goat kid mortality did not show obvious differences between male and female kids. The median overall mortality rate for male kids was 5% (range: 0.6 to 41.5) and 4.8% (range: 0 to 26.9) for females.

Discussion and conclusions

The value of the data may be limited as it is entirely based on farmer observations, and the answers may have been influenced by memory, comprehension of the questions and at some point secrecy. Further statistical evaluations and the results of the prospective study are needed to gain additional information and to further evaluate the situation. Further analyses are also needed to evaluate potential risk periods and risk factors for goat kid morbidity and mortality in Southern Germany.

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