ISVA VIRTUAL MEETING 2021

INTERNATIONAL SHEEP VETERINARY ASSOCIATION

23RD-25TH NOVEMBER

#ISVA2021

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Book of ABSTRACTS

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ISVA VIRTUAL MEETING

Meeting dates

23, 24, 25 and 26, November 2021

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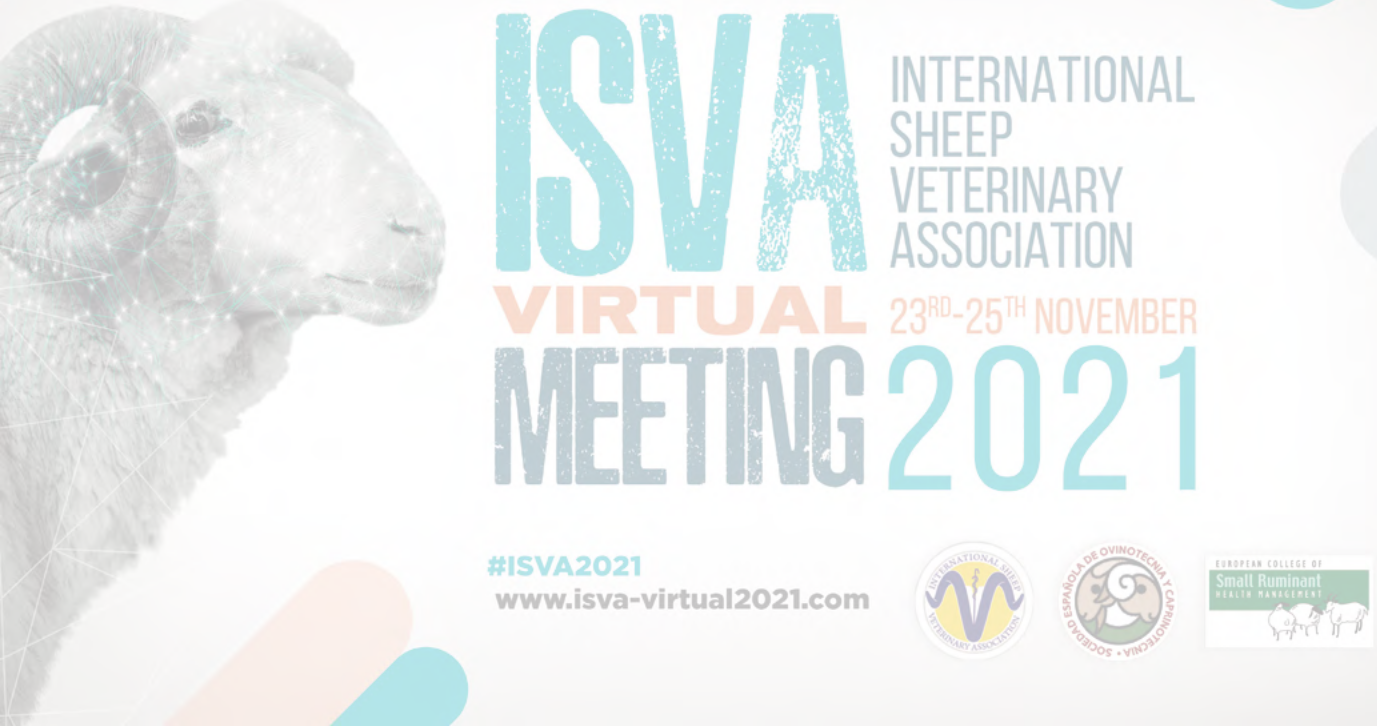
KEYNOTES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K-02

UPDATE ON PESTE DES PETITS RUMINANT GLOBAL ERADICATION PROGRAMME (PPR GEP)

Felix Njeumi

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Peste des Petits Ruminants (PPR) is a highly contagious and devastating disease, affecting sheep and goats in 67 countries across Africa, Asia, Europe and the Near East. More than 80 percent of the global 2.5 billion domestic small ruminants are at risk of PPR. PPR not only causes high economic losses, but also adversely affects livelihoods, exacerbating poverty, food insecurity and malnutrition. The annual global impacts of PPR have been estimated at up to USD 2.1 billion. PPR can also have major impacts on biodiversity, as shown by the 80% population reduction of the critically endangered Mongolian saiga antelope. Rinderpest, a disease caused by a closely related virus, was declared eradicated from the world in 2011.

Based on lessons learn from rinderpest eradication, in 2015, FAO, World Organisation for Animal Health (OIE), Member Countries and partners called for concerted efforts to achieve global eradication of PPR by 2030.

Key achievements to support the governance of PPR GEP included the establishment of (i) FAO-OIE joint Secretariat in April 2016 (ii) the PPR Advisory Committee in June 2017, (iii) the PPR Global Research and Expertise Network (PPR GREN) in 2018 and (iv) the advocacy group of Rome-based UN Agencies Permanent Representatives “Friends of PPR Eradication” in 2018.

FAO, OIE, and partners have provided support to countries and regions to formulate and implement their PPR National Strategic Plans (NSP) and Regional strategies. Regional road map meetings were organized at least twice in each regional Economic Community (REC) to assess their implementation using the PPR Monitoring and Assessment Tool (PMAT), tool that have 4 stages as stepwise approach.

Between 2015 and 2019, 12,757 outbreaks were reported to OIE by 59 countries. By 2020, this number had shown a marked decrease. Currently, 21 of the 67 infected countries have had no reported PPR outbreaks for more than 24 months, and 10 of these have had no outbreaks between 2015 and 2019.

The capacity of PPR vaccine production laboratories has been increased at least 5-fold: they are now able to supply neighbouring countries as well as meet national demands. Over 600 front line veterinarians have been trained in PPR control in 17 countries. Almost 15 000 copies of manuals and guidelines were produced and distributed to more than 20 000 veterinarians and para-veterinarians. Of the targeted 1.5 billion doses of vaccine to be used in the first phase of PPR GEP, over 60 percent was deployed for its intended purpose.

Between 2015 and 2021, from infected and at risk countries, in Stage 1 (epidemiological assessment) or below declined from 88 to 43 percent, with an increase in those (stages 2 and 3) in the control by vaccination stage (from 7.6 to 38 percent). In 2021, 15 percent are now in Stage 3 (eradication). Two countries reported they are in the final Stage 4 (verification), whereas no countries were in this position in 2015. In 2021, 59 countries, plus one zone in the country, are officially recognised as PPR-free and 138 countries are not recognised as free of which 67 countries have recent evidence of PPR-infection.

This supports a conclusion that there has been a significant positive impact of the control measures.

K-03

SENSOR FOR SENTIENT SMALL RUMINANTS

Gerardo Caja

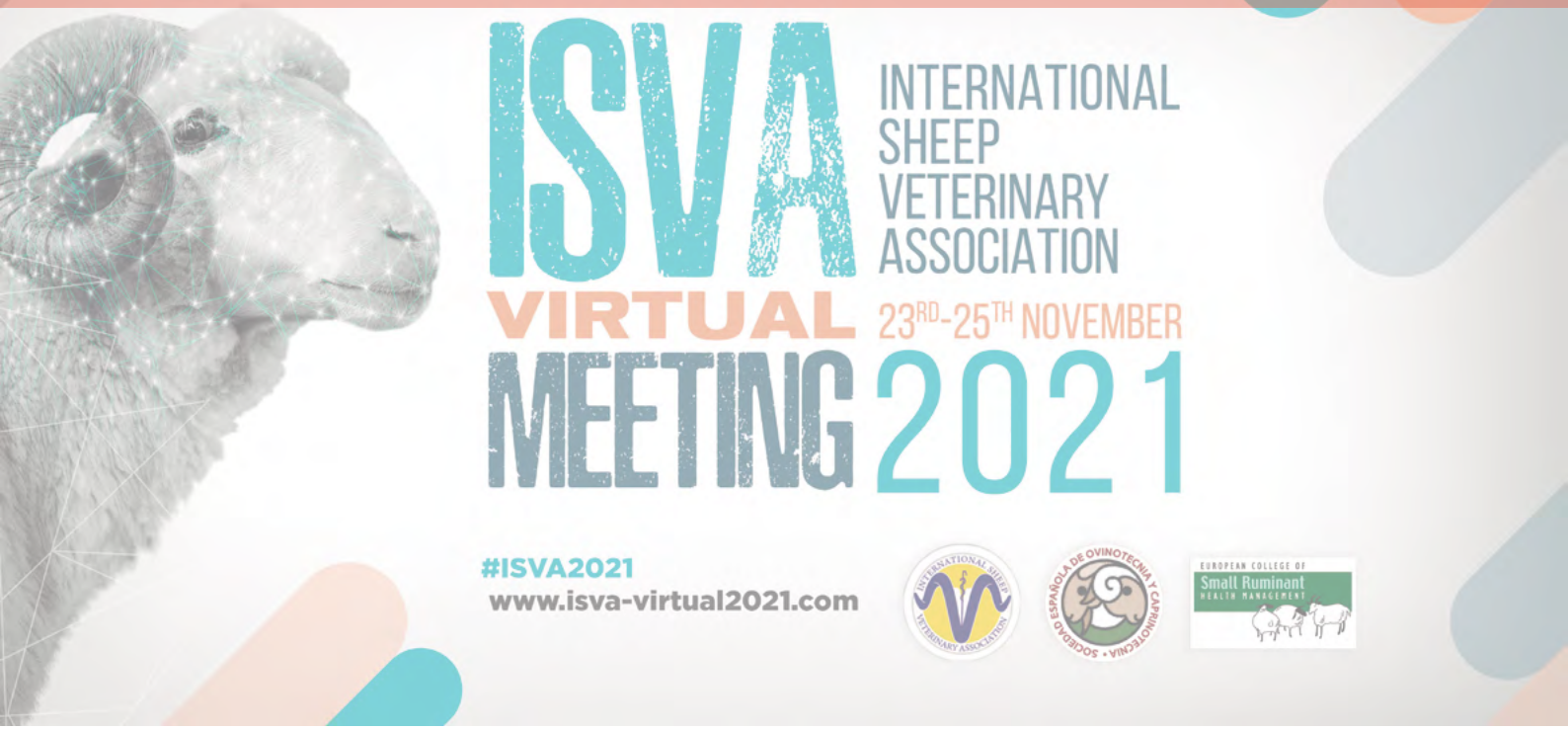
Grupo de Investigación en Rumiantes (G2R). Departamento de Ciencia Animal y de los Alimentos. Universidad Autónoma de Barcelona (UAB), Bellaterra (Barcelona), Spain.

The small ruminants (SR), sheep and goats, are the more numerous livestock species (excluded poultry) in the world. According to the Universal Declaration of Animal Welfare (UDAW, 2000), they are recognized as sentient beings and included in the legislation of many countries, as in the EU and Spain. The greatest populations of SR are located in Asia and Africa, although is in the EU where most SR are electronivcally identified (e-ID). This fact is an opportunity for the implementation of precision livestock farming, and particularly, for using sensors in the evaluation of SR welfare at the farm.

Compared to e-ID transponders, which send fix radiofrequency signals (output) (their e-ID code), the sensors send signals according to the type and intensity of the input (physical, chemical, or biological). There are many sensor classifications according to the technology used, although here they have been classified by the utilization mode, differencing between non-wearable and wearable. Several case-studies are described, thus: electric fences monitorization, virtual fence grazing (GPS), automated milk recording (e-ID and NIR sensors) and semi-automated performance recording (e-ID), online WoW weighing (e-ID and weight sensor), lameness detection (4 hooves weight sensors), grazing behavior (axial accelerometers) and rumen function (e-ID and temperature sensor). The current development of AWIN (Animal Welfare Indicators) protocols is still limited in SR and their results vary according to production conditions, needing deeper research. In this sense, the study of sensor applications for the objective evaluation of SR welfare is the aim of the Project TechCare funded by the EU and currently in progress (2020-2024). Its first results showed that, in Spain similarly to other countries, the prioritization of welfare problems vary according to the conditions and productive purposes, being: meat sheep (1, nutrition; 2, shelters; 3, stocking-rate or pen density), dairy sheep and goats (1, nutrition; 2, mastitis and milking management; 3, shelters), milk-fed lambs and kids (1, colostrum and peri-parturition; 2, hygiene and disinfection of facilities; 3, shelter and milk-replacer hygiene) and fattening lambs (1, shelters; 2, animal density; 3, respiratory issues and hygiene and disinfection of facilities). Similarly, the technologies of greater interest for the detection of welfare problems, in each case, were selected and prioritized, resulting: meat sheep (1, meteorological station; 2, automated scale; 3, high frequency ear tags and readers), dairy sheep (1, meteorological station; 2, milk meters; 3, automated scale), dairy goats (1 y 2, idem; 3, high frequency ear tags and readers), lambs and kids (1, meteorological station; 2, automated scale; 3, intake of feed and water monitorization).

In conclusion, all indicates that there is a wide market for sensors in SR, although not all the offered performances are warranted today. The wearable systems seems to be the ideal solution for animal-based indicators, although those non-wearable may be the current option of interest due to their cost-benefit. In any case, further research is needed to support the current results of using sensors in SR.

ORAL PRESENTATIONS



ISVA Communications: Infectious reproductive diseases

OP-01

EFFICACY OF A VACCINE TO CONTROL COXIELLOSIS IN GOATS 1 YEAR AFTER PRIMO-VACCINATION: ASSESSMENT OF THE DURATION OF IMMUNITY

Philippe Gisbert, Tamas Szalai, Jean de Foucauld, Eric Brunier, Georges Orszagh.

Ceva Santé Animale, Libourne, France.

Objectives:

In small ruminants, Coxiellosis also named Q fever is responsible for abortion, stillbirth and weak born. In addition, Q fever is a zoonosis which can cause flu-like syndromes in humans but also abortions or cardio-vascular disorders. It is therefore a major public health concern. Control of Q fever is therefore of main interest.

In this challenge study, the efficacy of an inactivated vaccine against Coxiella burnetii - Nine Mile strain phase I (Coxevac®, Ceva Santé Animale) one year after primo vaccination on goats was evaluated on two main criteria:

- Reduction of abortion rate.
- Reduction of shedding in milk, faeces and vaginal mucus.

Material and methods:

The study was conducted in compliance with the provisions of Directive 2010/63/EU relative of the protection of animals used for scientific purposes.

Forty 3 months old goats were vaccinated twice 3 weeks apart according to the product's label (Coxevac® 2 mL subcutaneously); forty goats of the same age were not vaccinated and were included as control. Eleven months later, goats were mated after oestrus synchronization. Finally, 14 pregnant goats in the vaccinated group and 7 from the non-vaccinated were selected.

At 75 +/- 7d of pregnancy (1 year and 27 days after the second injection of the vaccine), goats were challenged subcutaneously with a heterologous field strain of Coxiella burnetii (CbC1).

Abortion rate and number of live kids were assessed. Faeces and vaginal shedding were measured by qPCR from 14 days post challenge to 35 days post abortion/kidding. Milk shedding was measured by qPCR from the day of abortion/kidding to 35 days. For these three types of samples, both ratio of shedders animals and quantity of excreted Coxiella burnetii were measured.

Results:

Five out of seven goats of the control group aborted (71.4%) while there were only three out of 14 in the vaccinated group (21.4%). The difference between the two groups was significant ($p=0.0408$).

The rate of non-viable or aborted kids was 71.4% and 11.1% in the control group and in the vaccinated group, respectively ($p=0.0017$).

From d56 post challenge to d35 post kidding/abortion, the proportion of shedders in faeces and vaginal mucus was significantly higher ($p<0.003$ and $p<0.002$, respectively) in the control group than in the vaccinated group. The mean level of excretion in faeces (measured in bacteria per g) was reduced by 4 log10 between the control and the vaccinated group. This reduction was 5 log10 for vaginal mucus (measured in bacteria per mL).

Regarding the shedding in milk, the excretion of Coxiella burnetii was significantly higher in the control group than in the vaccinated group ($p<0.0002$). The mean quantity of bacteria excreted per milliliter was reduced by 4 log10 in the vaccinated group.

Conclusion:

This study showed that goat vaccination (Coxevac®) was effective for one year in reducing the abortion rate due to Coxiella burnetii and excretion of the bacterium. This is of main interest to control the disease in the flocks and to reduce the zoonotic risk.

ISVA Communications: Infectious reproductive diseases

OP-02

CONCEPT OF AN ACTIVE SURVEILLANCE SYSTEM FOR Q FEVER IN GERMAN SMALL RUMINANTS—CONFLICTS BETWEEN BEST PRACTICES AND FEASIBILITY

Fenja Winter[1], Clara Schoneberg[1], Annika Wolf[2], Ben U. Bauer[2], T. Louise Prüfer[3], Silke F. Fischer[4], Ursula Gerdes[5], Martin Runge[3], Martin Ganter[2], Amely Campe[1].

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Q fever in humans is closely associated with *Coxiella* (*C.) burnetii* shedding small ruminants [1]. In order to prevent outbreaks of this zoonosis and to protect humans from infection, an active early warning system for Q fever in German small ruminants was conceptualized.

The presentation will first describe the best approach to establish the system (best practice) before assessing feasibility, as the combination of these two aspects creates conflicts. The best practice approach implies vaginal swabs from all types of small ruminant husbandry systems with focus on reproductive females. Pooled samples analyzed by qPCR is the best practice to detect *C. burnetii* shedding animals. Multistage risk-based sampling should be carried out at the flock level and within-flock level. At the flock level, all flocks that are at risk to transmit the pathogen to the public must be included. At the within-flock level, all females shortly after lambing must be tested to increase the probability of identifying a *C. burnetii* positive flock. Sampling should be performed during the main lambing period and before migration in residential areas. If a flock tests positive in at least one individual sample, flock-specific preventive measures has to be implemented. It is important to discuss with stakeholders (e. g. farmers, human health professionals, policy makers, Animal Disease Funds) about the consequences of the implementation of an active surveillance system. Decisions about this concept are mainly driven by economic considerations affecting all different stakeholder groups.

Conflicts like huge financial costs for sample testing, action and control measures are main concerns. Hence, taking the step to develop more feasible and affordable preventive measures, e.g. vaccinating small ruminant flocks, should replace testing wherever justifiable [2].

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ISVA Communications: Infectious reproductive diseases

OP-04

HUMORAL AND CELL-MEDIATED IMMUNE RESPONSE TO COXIELLA BURNETII PHASE I VACCINE IN NAÏVE SHEEP

Ben Bauer[1], Kay Schwecht[1], Michael R. Knittler[2], Svea Matthiesen[2], Rico Jahnke[2], Martin Ganter[1].

[1]University of Veterinary Medicine Hannover, Foundation, Hannover, Germany; [2]Friedrich-Loeffler-Institut, Greifswald, Germany.

Objective:

An inactivated *Coxiella burnetii* Phase I vaccine (Coxevac®, Ceva Sante Animale, Libourne, France) is licensed in several European countries, including Germany, for goats and cattle to prevent *C. burnetii* infection. The recommended vaccine volumes for goats and cattle are 2 ml and 4 ml, respectively. The vaccine is also widely applied to sheep, although detailed information about the immune response in this species is missing. Moreover, the vaccine dose for sheep is still under discussion. Therefore, the present study investigated the humoral and cell-mediated immune response to a *C. burnetii* Phase I vaccine in naïve sheep using two different vaccine doses.

Material and Methods:

Eighteen gimmers from a *C. burnetii* unsuspected flock were randomly divided into three groups of six. Group Cox1 was vaccinated twice within a three-week interval with 1 ml of the *C. burnetii* Phase I vaccine (Coxevac®). The same procedure was applied with group Cox2 (2 ml Coxevac®) and group Cox3 (2 ml 0.9% NaCl; control group). A booster vaccination was performed after nine months. Blood samples were collected regularly from all animals. ELISAs detected phase-specific IgG antibodies. Activation of phase-specific T-cell activity was measured with an interferon-ɣ-(IFN-ɣ) ELISA. Neutralizing antibodies to *C. burnetii* in cell culture were determined by a neutralization assay. Procedures on sheep were licensed by the federal state government of Lower Saxony (Az. 33.8-42502-05-19A476) and were conducted following German animal welfare legislation and the EU Directive 2010/63/EU for animal experiments.

Results:

Regardless of the vaccine volume, the vaccinated sheep reacted first with an IgG phase II response, although a phase I vaccine was applied. Three months after initial vaccination, IgG phase I antibodies predominated. Boosting nine months after primary immunization resulted in a substantial increase in IgG phase I antibody activity. The IFN-ɣ activity increased significantly only after this third vaccination. In total, both vaccine volumes induced a similar humoral and cell-mediated immune response ($p<0.05$). Results of the neutralization assay will be discussed in the presentation.

Conclusions:

After primary immunization, a third vaccination is necessary to stimulate the cell-mediated immune response. In the future, a challenge trial is required to verify the protective effect of 1 ml inactivated *C. burnetii* Phase I vaccine (Coxevac®) in sheep. The lower amount needed of vaccine per animal reduces the costs and results in a greater acceptance of the vaccine. High immunization coverage of sheep flocks is in line with the One Health concept.

OP-05

OUTBREAK OF CAPRINE ABORTION BY *LEPTOSPIRA NOGUCHII* SEROGROUP AUSTRALIS IN BRAZIL

Mário Felipe Alvarez Balaro[1], Maria Isabel Nogueira Di Azevedo[2], Luiza Aymée[2], Angélica Consalter[3], Rafaela Santos[3], Felipe Seabra Cardoso Leal[1], Mirela Balistrieri Dias[1], Paula Renata Cortat De Souza[1], Gabriel Martins[2], Walter Lilenbaum[2].

[1]Department of Pathology and Veterinary Clinics, Fluminense Federal University, Niteroi, Brazil; [2]Department of Microbiology and Parasitology, Fluminense Federal University, Niteroi, Brazil; [3]Hospital of Veterinary Medicine Professor Firmino Márcico Filho, Fluminense Federal University, Niteroi, Brazil.

Introduction:

Leptospirosis is prevalent in goats worldwide and leads to impaired fertility, neonatal deaths and abortions frequently, with important economic losses. Also, there is a lack of reports regarding the successful control of outbreaks in small ruminants. Lastly, molecular diagnostic methods have been increasingly employed for epidemiological and diagnostic purposes in small ruminants.

Objectives:

The present study aimed to report a clinical outbreak of leptospirosis in a dairy goat flock in Brazil in association with their diagnosis and control measures.

Material and methods:

At the beginning of kidding season, in August 2020, 50% (5/10) of dairy goats, from a small flock of 55 Saanen goats, showed abortions during late pregnancy. Necropsy of aborted fetuses showed jaundice, as well as mild subcutaneous edema and serosanguinous fluid in the thoracic and abdominal cavity. In addition, two newborn kids from different does showed pale mucous membranes, crackling on lung auscultation, intense hematuria and subcutaneous hematomas and petechiae. Even under treatment, both kids died three days after the onset of clinical signs. Goats were kept in a stable (intensive breed system) without rodent control. Over 10 days after the abortions, blood and vaginal fluid samples were collected from all early-lactating does (n=10). Vaginal fluid was chilled and transported to the laboratory for *lipL*32-PCR and sequencing of *sec*Y gene, as well as liver, lung and kidneys from aborted fetus. Blood samples were examined for anti-*Leptospira* antibodies by a microscopic agglutination test (MAT). Samples were also seeded for bacteriological culture. Due to the primary suspicion of leptospirosis, other potentially abortive infectious agents were not investigated.

Results:

All serum samples were non-reactive to weak (titres 50), mainly to serogroup Icterohaemorrhagiae. A total of 20% (2/10) of vaginal fluid samples and 100% (3/3) of kid organs were *lip*L32-PCR positive, but pure isolates of *Leptospira* were not obtained. From newborn kids, kidney and liver fragments and urine samples were *lip*L32-PCR positive. Finally, Pairwise/Blast/NCBI comparisons with GenBank *sec*Y gene dataset identified samples from urine and organs as *L. noguchii* with a 99 % of identity. After diagnosis, all goat flock was treated with a single dose (25 mg/kg) of dihydrostreptomycin and vaccinated using an inactivated commercial vaccine, with a booster dose after thirty days. Equally, a rodent control program was also implemented. Finally, no more abortions cases occurred after the prophylactic measures carried out in the farm.

Conclusion:

It was the first characterization of *Leptospira noguchii* serogroup Australis related to abortion in dairy goats and acute clinical signs in newborn kids. Such findings endorse the relevance of diagnosing reproductive infectious diseases in small ruminants, as well as the control and prophylaxis measures for each situation.

ISVA Communications: Infectious reproductive diseases

OP-07

INFLUENCE OF IN VITRO AND MURINE VIRULENCE OF *TOXOPLASMA GONDII* STRAINS ON THE OUTCOME OF EXPERIMENTAL OVINE TOXOPLASMOSIS

Raquel Vallejo[1], Julio Benavides Silván[1], Noive Arteche[1], Roberto Sanchez-Sanchez[2], Rafael Calero-Bernal[2], Mª Carmen Ferreras[1], Luis Ortega Mora[2], Valentín Pérez[1], Daniel Gutiérrez-Expósito[1].

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Objectives:

This study investigates how infection by 3 *T. gondii* isolates that showed variation in the *in vitro* (growth rate [GR] in trophoblast ovine cell line) and murine (mortality rate [MR] in outbred mouse) models, TgShSp1 (genotype ToxoDB#3; low GR; 0% MR), TgShSp16 (ToxoDB#3; low GR; 21% MR) and TgShSp24 (ToxoDB#2; very high GR; 18% MR) might influence the pathogenesis of toxoplasmosis in pregnant sheep.

Material and methods:

Fifty-six 90 days pregnant sheep , seronegative to *T. gondii* and of the same age and genetic background distributed in 3 groups according to the isolate used in the challenge were orally dosed with 10 sporulated oocysts. Sixteen pregnant sheep were kept as non-infected controls. Five animals from each infection groups and three from the control group were culled at 14 and 28 days post infection (dpi). The remaining animals from each group were left until abortion or delivery occurred. Rectal temperature, occurrence of abortions, serological antibodies, and histopathological lesions in placenta and foetus, as well as tissue distribution of *T. gondii* were analyzed and different non-parametric statistical tests were applied. All experimental procedures were approved by the local government after the recommendation from the CSIC Bioethics committee.

Results:

All isolates elicited early abortions (before 12 dpi) although they were more frequent, but not statistically significant, in sheep challenged with TgShSp24 (35 % vs. 20% in Sp1 and Sp16). Sheep dosed with TgShSp 24 and 16 showed hyperthermia (5 dpi) and specific serological antibodies (12 dpi) one day before those ewes challenged with TgShSp1 ($p>0.05$). Characteristic necrotic a non-purulent inflammatory histological lesions were mainly seen ($p<0.05$) at 28 dpi in the group infected with TgShsp1, while sheep infected with TgShSp16 scarcely showed any lesion and, when found, they were very mild. The detection of parasite in placentomes at 14 dpi was infrequent and only found in TgShSp1 group whereas its detection was confirmed in all infected sheep from all strains at 28 dpi with the exception of one sheep infected with TgShSp16 ($p>0.05$). However, at 28 dpi there were clear differences between the groups ($p<0.05$), as detection in both placental and foetal samples, was more frequent in the group infected with TgShSp1 (96% and 80% respectively) than in the groups challenged with TgShSp24 (55.5% and 80% respectively) and TgShSp16 (6% and 20%). Finally, a total of 6, 6 and 3 infected sheep with TgShSp1, TgShSp16 and TgShSp24, respectively lambed or aborted after 28 dpi and *T. gondii* was diagnosed in most of them (i.e. 100%, 72% and 100% respectively), through the finding of characteristic lesions or parasite DNA.

Conclusions:

These results showed slight differences in the body temperature, the outcome of infection and production of antibodies, and clear differences in the severity of the lesions and parasite tropism depending on the insolate. As no clear relation could be established between the severity of the lesions and parasites distribution with the occurrence of abortions, additional mechanisms must be participating on the pathogenesis of the disease.

OP-08

GENETICALLY MODIFIED *ANAPLASMA PHAGOCYTOPHILUM* DO NOT PROVOKE IMMUNOLOGICAL PROTECTION AGAINST CHALLENGE WITH THE WILD TYPE BACTERIUM

Erik Georg Granquist[1], Snorre Stuen[2], Ulrike G. Munderloh[3], Anthony F. Barbet[4], Kari Lybeck[5], Peter Wilhelmsson[6], Per-Eric Lindgren[7], Shokouh Makvandi-Nejad[5], Stig Tollefsen[8], Sveinung Eskeland[1].

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Objectives:

Anaplasma phagocytophilum is a tick-borne rickettsia that causes tick borne fever in sheep in Europe. The disease is associated with high fever, immune suppression, and secondary infections in young and naïve sheep. The disease is economically important to the sheep industry in several European countries and has serious animal welfare implications. Several attempts have been made, to produce a vaccine against the infection and experimental studies have showed lack of immunity upon challenge with live bacteria, with the use of inactivated whole cell organisms and recombinant surface proteins of the bacterium as vaccine candidates. The current study used transposon technology to produce random mutagenesis to the genome of a virulent sheep strain of *A. phagocytophilum* (M73220) in attempt to attenuate the bacteria.

Materials and Methods:

Three different infectious mutants (transposon insertions mapped to an intergenic region, a putative ankyrin repeat gene or a pseudogene of the surface protein p44) were inoculated intravenously to three groups of five unexposed lambs. One group (five lambs) received the wild type strain of *A. phagocytophilum* as a control. Four lambs were negative controls and received only uninfected cell culture. On day 28 after inoculation, all groups were challenged with the wild type *A. phagocytophilum*. Two of the four lambs in the negative control group received only physiological saline solution. Blood samples were collected daily for the first ten days after inoculation and challenge, and then every third day. Quantitative PCR targeting mutants- and wild type bacterium-specific genes, was used to monitor the bacteremia during the study. Rectal temperature and clinical observations were recorded daily during the study period of 51 days. Serological and cell mediate immune responses, as well as general hematology were assessed regularly throughout the study period. Ethical standards used in the study were approved by the Norwegian Animal Research Authority (protocol approval no. FOTSID12093) upon formal application and in accordance with the EU Directive 2010/63/EU.

Results:

After inoculation, all lambs that were inoculated either with the mutants or wild type bacteria developed fever and neutropenia. After challenge all sheep inoculated with the mutants, but not those lambs initially inoculated with the wild type strain, developed fever and neutropenia. In addition, there was a significantly increased bacterial load in the mutant groups compared with the wild type group after challenge.

Conclusions:

After challenge, the mutant groups and the wild type group developed significant differences in several clinical- and immunological outcomes. The most distinct results were the absence of fever and absence of neutropenia in the wild type group, which strongly suggest protection against the homologous variant in this group. All groups generated antibodies against *A. phagocytophilum* after inoculation and the mutant groups displayed elevated levels of anti-body titers after challenge. These results indicate that clinical immunity was achieved only in the group that was initially inoculated with the wild type bacterium and that the mutants used in this study were ineffective in producing clinical immunity against the wild type bacteria.

ISVA Communications: Viral diseases

OP-09

AN OUTBREAK OF MAEDI IN TRØNDELAG, NORWAY, IN 2019-2021

Grim Rømo[1], Johan Åkerstedt[1], Anne Bang Nordstoga[1], Anniken Jerre[1], Helene Wisløff[1], Britt Gjerset[1], Siv Klevar[1], Irene Skei Mjømen[2], Elisabeth Schei-Berg[2], Synnøve Vatn[3], Annette Hegermann Kampen[1].

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Objectives:

Maedi is a notifiable disease in Norway, and eradicating the disease is a national goal. Various national surveillance and control programmes have existed since maedi was officially reported in Norway for the first time in 1972. Several outbreaks have occurred, and the last case was reported in 2005. In July 2019, a new case of maedi was detected in a sheep herd in Central Norway. The diagnosis and management of this outbreak in Trøndelag county is described.

Materials and methods:

Serum samples were examined for antibodies against small ruminant lentivirus using commercial ELISA kits. Lungs and lymph nodes of sheep in seropositive herds were collected at slaughter, and macroscopic and histological investigations were performed. A nested PCR for the gag and env genes with subsequent sequencing was performed on selected lungs and blood samples.

Results:

More than 30 000 blood samples were serologically investigated for lentivirus during 2019 to 2021. Nine herds were diagnosed with maedi, and the maedi-visna virus was confirmed with PCR in six of the herds. In-herd seroprevalence showed large variation between herds. Sequencing and phylogenetic analysis of the virus showed a close genetic similarity to the virus found in the outbreak in the same area in 2002-2005. In total, 87 herds had restrictions imposed for maedi in 2019-2020. Six herds with more than 5% seropositive animals were stamped out by slaughter. In three diagnosed herds with less than 5% seropositive animals, the positive animals and their offspring were slaughtered.

Conclusions:

In total, nine infected herds were detected, all in the same county and with contact through livestock exchange. Genetic analyses of viral genes showed that the infection was probably linked to a previous outbreak in the same area. A lot of effort was put into the outbreak investigation. The spread of the infection to other geographical areas seemed to have been prevented by strict rules for movement of small ruminants. Still, the outbreak demonstrated the risk of disease spreading between herds by livestock trade and highlighted the importance of biosecurity measures and restricted livestock exchange. The outbreak investigation showed the need for sensitive and specific diagnostic methods, and for an improved and more targeted surveillance.

ISVA Communications: Viral diseases

OP-10

UNDERSTANDING SMALL RUMINANT LENTIVIRUS BIODISTRIBUTION: ALUMINUM- INDUCED GRANULOMAS AS A NEW TARGET TISSUE

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Objectives:

Small Ruminant Lentiviruses (SRLVs) are macrophage-tropic retroviruses responsible of highly prevalent chronic infections in sheep and goats. Recently, macrophages within aluminum (Al)-induced granulomas after vaccination have been described as a new SRLV replication site in naturally-infected sheep. Al is an effective and widely used adjuvant in commercial vaccines in ruminants which leads to granuloma formation. In sheep, these granulomas are persistent local reactions following every single inoculation of Al-based vaccines. The aim of this work is to study the specific role of Al-induced granulomas in SRLV biodistribution and tissue tropism.

Materials and methods:

Eighteen male SRLV-free lambs followed a vaccination protocol consisting in 8 subcutaneous injections with two different commercial vaccines. Saline solution was administered in six control infected lambs. Animals were further divided into four experimental SRLV infection groups: i) Intra-tracheally infected (n=6); ii) Intravenously infected (n=6); iii) Intratracheal (n=3) and intravenous (n=3) infected and non-vaccinated; and iv) non-infected. Lambs were experimentally infected twice with SRLV strain 496 at a multiplicity of infection (MOI) of 10^6 $TCID_{50}$/animal. SRLV proviral load quantification was performed in samples from Al-granulomas using real-time polymerase chain reaction.

Results:

Differences between experimental groups in proviral load were observed. Proviral DNA copies were detected in Al-granulomas from both intra-tracheally and intravenously infected animals. Al-granulomas from intra-tracheally infected lambs showed higher proviral load compared with intravenously infected animals. SRLVs were present in granulomas induced before the experimental infection but also in post-infection-induced granulomas with values typically belonging to main target tissues.

Conclusions:

These preliminary results suggest that the presence of Al-induced granulomas in sheep modify the SRLV body distribution and may lead to variation in viral pathogenesis. Route of infection plays a key role in the ability of SRLV to colonize Al-granulomas after vaccination.

Ethical Statement:

Experimental design and procedures were licensed by the Ethical Committee of the University of Zaragoza (PI42/18).

ISVA Communications: Viral diseases

OP-11

ASSOCIATION BETWEEN SEROPOSITIVITY FOR SMALL RUMINANT LENTIVIRUSES AND MILK PRODUCTION TRAITS IN INTENSIVELY REARED DAIRY SHEEP

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Objectives:

The objective of the study was to assess the seroprevalence of small ruminant lentiviruses (SRLV) and the association between seropositivity and milk production traits in intensively reared dairy sheep in Greece.

Materials and methods:

A total of 499 milking ewes at early lactation, from 4 representative dairy sheep farms, were randomly selected for the study. For each animal, lactation number was recorded and blood samples were collected and assayed for the detection of antibodies against SRLVs using a commercial indirect ELISA (IDEXX, CAEV/MVV Total Ab Test). Daily milk yield (DMY) was recorded and milk samples were collected and analyzed to estimate daily fat- (DFY), protein- (DPY), lactose- (DLY), and total solids (DTSY)- yield, as well as, Somatic Cell Counts (SCC). For milk analyses, an ultrasonic milk analyzer with fluorescent somatic cell counter, and protocols approved by the International Committee of Animal Recording (ICAR) were exploited. Descriptive statistics (mean ± SD) and analysis of variance were performed using SPPS v23, as described below: $Y_{ijkl} = \mu + F_i + P_j + S_k + SCC_l + P_j \times S_k + e_{ijkl}$ where, Y_{ijkl}= dependent variables (DMY, DFY, DPY, DLY, and DTSY), μ= overall mean, F_i= random effect of farm (i= 4 levels), P_j= fixed effect of lactation number (j= 5 levels, 1st to ≥5th), S_k= fixed effect of SRLVs individual serological status (k= 2 levels, 0= seronegative, 1= seropositive), SCC_l= fixed effect of SCC level (l= 4 levels, $<100\times10^3$, 100×10^3 to $<500\times10^3$, 500×10^3 to $<1{,}000\times10^3$, and $\geq1{,}000\times10^3$ cells/ml), $P_j \times S_k$= lactation number × serological status (10 levels), e_{ijkl}= residual error.

Results:

Seroprevalence at animal level was 58.1% (290/499), whereas at flock level ranged from 38.5% to 72.4%. Seroconversion rates increased with lactation number, ranging from 51.4% (37/72) for 1st lactation to 90.2% (46/51) for ≥5th lactation ewes. Mean values (± SD) of DMY, DFY, DPY, DLY, DTSY, and SCC were 2.5±0.97 kg, 113.3±55.84 g, 128.3±48.93 g, 123.7±46.03 g, 368.9±160.46 g, and $459.8\times10^3\pm1193.42\times10^3$ cells/ml, respectively. The interaction of lactation number and serological status, and the main effects of farm, lactation number, and SCC level on milk production traits were all statistically significant at the <0.01 level. Seropositive animals had significantly lower DLY (P<0.05) and tended to produce less milk (P=0.059), and milk protein (P=0.052). When only the main effects of serological status, farm, and SCC level were retained in the model and estimated for each lactation number separately, a negative association between seropositivity to SRLV and DMY (P<0.05), DPY (P<0.01), DLY (P<0.01), and DTSY (P<0.05) was evidenced only for the 1st lactation ewes (resulting in a decrease of ca. 16.7%, 16.2%, 15.4%, and 14.6%, respectively). On the contrary, DMY, DPY, DLY, and DTSY were increased in 3rd lactation seropositive ewes by ca. 7.1%, 10.5%, 9.5%, and 10.9%, respectively (P<0.05 in all cases).

Conclusions:

Our data suggest that a prospective study is warranted to elucidate potential age-dependent effects of seroconversion on milk production capacity, as premature, involuntary culling of low-yielding seropositive animals or delay in the development of neutralizing immunity may significantly confound the results.

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OP-12

THE USE OF BULK-TANK MILK TESTING FOR THE DETERMINATION OF WITHIN-HERD SEROPREVALENCE OF SRLV INFECTION

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Objectives:

Bulk-tank milk (BTM) testing seems to be a very useful and attractive option for monitoring dairy herds for different infectious diseases given the enormous cost reduction which can be achieved by using this matrix. However, there are some factors that can affect the level of antibodies in bulk tank milk with the individual-level seroprevalence in the herd being most important. Therefore, we aimed to ascertain the correlation between within-herd seroprevalence (individual whey samples) and the numerical results (%) of three commercial ELISAs performed on artificial BTM and to develop an equation allowing us to estimate the within-herd seroprevalence on the basis of numerical results of ELISA performed on BTM samples.

Materials and methods:

Three commercial ELISAs were used – two indirect ELISAs: wELISA (whole-virus antigen), TM/CA-ELISA (recombined transmembrane and capsid protein), and one competitive ELISA: SU-ELISA (surface glycoprotein). Numerical results of ELISAs were given as sample-to-positive control ratio (S/P%) and percentage inhibition (PI) for indirect and competitive ELISAs, respectively. Artificial BTM samples were prepared by mixing an equal amount of individual whey samples coming from each goat of known SRLV status. All the whey samples used in this study had been previously tested using the same ELISAs. In total, 200 individual whey samples were used: 100 whey samples from goats whose serum tested strongly positive in all 3 ELISAs, and 100 whey samples from goats whose serum tested strongly negative in all 3 ELISAs. By mixing 10 µl of 100 randomly selected individual whey samples in subsequent positive-to-negative ratios (from 1:99 through 100:0) a number of 100 artificial positive BTM samples of an ascending percentage of positive individual samples (from 1% through 100%, a proxy of within-herd seroprevalence) were prepared. Moreover, to determine the best cut-off for BTM testing, 95 artificial negative BTM samples were created by mixing whey from 10 randomly selected goats whose serum tested strongly negative in all 3 ELISAs. According to the Polish legal regulations, no permission from the Ethics Committee was needed for milk collection.

Results:

The correlation between the numerical result values (%) of BTM samples and the numerical result values (%) of whey samples was significant in all three ELISAs ($p < 0.001$). A very high correlation was observed for each ELISA: TM/CA-ELISA (R_s=0.95; CI 95%: 0.92 to 0.97) followed by SU-ELISA (R_s=0.93; CI 95%: 0.88 to 0.95), and wELISA (R_s=0.92; CI 95%: 0.87 to 0.95), The exponential function described this relationship considerably better than the linear function. The optimal cut-off value was S/P% = 6.0% for wELISA, S/P% = 120% for TM/CA-ELISA, and PI=30% for SU-ELISA.

Conclusions:

Our study shows a strong relationship between the numerical result of ELISA performed on BTM samples and the within-herd seroprevalence (proportion of individual positive whey samples) in the artificial setting. This observation constitutes a novel approach focused on using BTM samples not only to detect the presence of the infection in the herd but also to estimate (with some level of uncertainty) the percentage of infected animals in the herd.

ISVA Communications: Viral diseases

OP-13

STUDIES ON THERAPEUTIC PROTOCOLS FOR CONTAGIOUS ECTHYMA IN SHEEP

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Introduction:

The contagious ecthyma is usually self-limiting and there is no specific antiviral treatment, even though secondary bacterial infections can occur. Therefore, the periodic dressing of lesions has been indicated until clinical improvement.

Objectives:

In the study I, it was aimed to verify whether the crusts removal in the topical dressing and the levamisole application would reduce the clinical remission time. In the study II, the effect of ozonized oil as an antiseptic for wound healing was verified.

Material and methods:

Studies were conducted in two meat sheep farms during an outbreak of contagious ecthyma. At both sites, the viral agent was confirmed by molecular (PCR) and histopathological diagnosis. In the study I, Fourteen Santa Ines ewes (2.4 ± 0.7 years old, BCS: 3.0 ± 0.3) with similar pattern of lesion were selected and two groups were formed: G1 (n=7) crusts removal before dressing and; G2 (n=7) daily application (during two weeks) of levamisole (2.5 mg/kg; SC; immunomodulation dose). Regardless of the group, topical dressings were made daily using gauze moistened with 2% iodine in glycerine solution until clinical remission. Clinical remission time between groups was assessed by T test. In the study II, a total of four Santa Ines ewes (2.9 ± 0.5 years old, BCS: 3.0 ± 0.2) with similar pattern of lesion were selected to compare two topical treatments: G1 (n=2; control) treated with 2% iodine in glycerine solution, and G2 (n=2; test) treated with ozonized sunflower oil, daily, until clinical remission. From each ewe, clinical evaluation and skin biopsies were collected once per week (before [T0], during [T7] and after treatments [T14]) for histopathology.

Results:

In study I, there was a trend towards shorter clinical remission time in G1 when compared to G2 (18.3 ± 3.0 *vs.* 21.1 ± 3.2 days; P=0.09). There was no effect of levamisole on clinical remission time between groups (19.7 ± 4.5 = 19.7 ± 2.1 days; P>0.05). In the study II, at the first biopsy, all tissues had ulcers and inflammation. In the second biopsy, both groups presented half of animals with complete tissue re-epithelialization and the other half in an intermediate process. In the third biopsy, all animals had tissues totally re-epithelialized. In the clinical analysis, the G1 still had crusts after one week of treatment, differently from G2, which no longer formed crusts at that moment. Based on these results, the farmer chose to use ozonized oil in the dressing of other affected animals and, in the authors' experience, the outcomes (not quantified) were similar to that normally obtained by the iodine solution, however with faster resolution of the crusts.

Conclusion:

The application of levamisole, in the adopted posology, did not take rewards in the therapy against contagious ecthyma. However, associating crusts removal and the use of ozonized oil as an antiseptic gets benefits. Equally, ozonized oil facilitated the employee's work by the lower formation of crusts over the healing period, as well as avoiding tissue dryness (different from iodine), with greater safety for ocular and oral regions.

ISVA Communications: Viral diseases

OP-14

GENETIC CHARACTERIZATION OF ORF VIRUS ENABLES DEVELOPMENT OF BIOTECHNOLOGICAL CONTROL TOOLS

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Objectives:

Contagious Ecthyma (CE) is an eruptive skin disease that mainly affects mouth and nose of lambs, and nipples from ewes impairing animal production and sustainability of ovine and caprine farms across the world. Humans can be also infected and suffer from self-limiting painful skin lesions.

CE can be partially controlled trough vaccination with attenuated strains that, however do not confer sterilizing immunity.

The aim of this work is to isolate and genetically characterize Orf virus (ORFV) strains, causative agent of CE, in order to generate biotechnological tools that may contribute to the development of control strategies.

Material and Methods:

Genetic characterization of local strains was accomplished by isolating viruses from biological samples (scabs) collected by veterinarians in farms suffering from a CE outbreak in Spain. Subsequently, DNA extraction and PCR amplification of different regions (B2L and ORF109 genes) with specific primers followed by Sanger sequencing was carried out.

Genetic variability was parsed by retrieving every sequence of the candidate regions present in publicly available databases. MEGA X software was employed to construct maximum-likelihood phylogenetic trees to infer genetic distances among them.

Immunogenic regions were determined by analyzing hydrophobicity, antigenic index, surface location and probability of belonging to a B epitope through *Kyte-Doolitle, Jameson-Wolf* and *Emini* algorithms.

Results:

Viral DNA from scabs was successfully extracted, and PCR confirmed ORFV presence. Sequences were heterogenic among them, even when biological material was obtained from the same farm. Therefore, ORFV isolated here showed a spanned distrubution throughout the phylogenetic tree.

Comparison with GenBank sequences revealed on one hand the existence of two different clades, and in the other, the relatedness of some local and chinese sequences.

Immunogenic regions were identified along the genome, being B epitopes more present in surface proteins, such as ORF109.

Conclusions:

ORFV present in flocks from Spain may differ substantially from the previously described sequences, including those present in commercial attenuated vaccines.

ISVA Communications: Viral diseases

OP-15

WHOLE FLOCK TRANS-THORACIC ULTRASOUND EXAMINATION REDUCES THE PREVALENCE OF OVINE PULMONARY ADENOCARCINOMA BUT HAS NOT ELIMINATED DISEASE FROM FLOCKS AFTER FOUR YEARS

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Objectives:

Ovine pulmonary adenocarcinoma (OPA) is an infectious neoplastic lung disease of sheep caused by the Jaagsiekte sheep retrovirus (JSRV). Currently, there is no commercially available diagnostic test to identify all individual sheep in a flock with OPA tumours, and therefore no control strategy. Studies have shown the disease is widespread in UK sheep flocks with a prevalence commonly between 1-4 per cent in flocks referred to the author. This study investigated whether culling sheep with suspected ovine pulmonary adenocarcinoma (OPA), based upon rapid, 6-12 monthly flock screening of all adult sheep using trans-thoracic ultrasound examination, reduced disease prevalence.

Materials and Methods:

Both sides of the chest of all adult sheep in the flock were scanned using a 6.5 MHz microarray probe connected to a real-time, B-mode ultrasound machine at a rate of 90-150 animals per hour. Video recordings of all lung and pleural lesions were captured using Elgato software. The positive predicted value of this method for detecting macroscopic OPA lesions was reported as 0.79 in 2019 (Cousens et al., 2019) with values >0.85 achieved since that study (unpublished data).

Results:

490 of 28,900 sheep from 29 flocks had sonograms consistent with OPA at the first scan with 250 cases 12 months later. 153 OPA cases were identified in 26 of these 29 flocks 24 months after the first scan (the three missing flocks totalling 2,300 sheep have yet to be scanned with 17 OPA cases reported at 12 months). Data from 20 flocks totalling 18,150 show 326 OPA cases at first scan and 99 three years later. 14 flocks, totalling 13,700 sheep, from this subset of 20 flocks have been scanned for four years with 56 OPA cases identified at the latest screening (287 OPA cases at start of study with 132, 109, and 75 OPA cases at subsequent 12 month intervals).

Conclusions:

Whole flock trans-thoracic ultrasound examination has reduced the overall prevalence of ovine pulmonary adenocarcinoma but elimination of disease has not been achieved in any flock after four years. The reduction in OPA prevalence could be explained by reduced horizontal spread of JSRV achieved by culling sheep with moderate/advanced disease. The reduction in OPA prevalence between first scanning and subsequent years suggests that vertical/false vertical transmission of JSRV infection is not the major route of disease transmission.

References:

Cousens, C., Dagleish, M., Scott P.R. (2019).

Control of ovine pulmonary adenocarcinoma using transthoracic ultrasonography. Proceedings of the SRVO Conference, Guelph, Canada. 17-19 June 2019. p85.

ISVA Communications: Viral diseases

OP-16

EVIDENCE OF OVINE PULMONARY ADENOMATOSIS (RE-)INTRODUCTION INTO THE NETHERLANDS

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Objectives:

Ovine pulmonary adenomatosis (OPA) is a contagious neoplastic disease of the lungs of sheep caused by the beta retrovirus Jaagsiekte sheep retrovirus (JSRV). OPA has a long incubation period and is ultimately fatal through compromised lung function due to the growing tumours and/or secondary bacterial infections. This description is meant as a "heads up" to enlist Ovine pulmonary adenomatosis (OPA) as a possibility in areas where this disease is not endemic as is the case in the Netherlands.

Materials and methods:

October 2020 a shearling Scottish blackface ram from a renowned Scottish breeder was imported into the Netherlands. Upon arrival he successfully served the eight resident Scottish Blackface ewes. After some time the ram developed respiratory distress (dyspnoea and coughing), and was treated repeatedly with antibiotics only resulting is short revivals before relapsing. The rams health deteriorated, and it was decided to euthanise him after which he was send of for a post mortem at Royal GD.

Results:

Necropsy revealed focal chronic pleuritis and poorly collapsed firm greyish and oedematous lung lobes suggestive of progressive pneumonia. Upon microscopic examination, however, the parenchyma of the lung was infiltrated by multifocal to diffuse adenomatous nodules, in some of which the tumour cells clearly demonstrated secretion, surrounded by fibrous tissue and a mainly lymphoplasmacytic cell infiltrate. The remaining intact alveoli were filled with varying amounts of (large) macrophages. These findings were suggestive of OPA and material was sent to the Moredun Research Institute where the diagnosis was confirmed by means of a specific immunohistochemical staining.

Conclusions:

Ovine pulmonary adenocarcinoma was (re)introduced into the Netherlands by this imported Scottish Blackface ram. This is the second documented diagnosis of OPA in the Netherlands. In 1978, in a pregnant Scottish Halfbred ewe, with respiratory problems and anorexia, OPA was then also confirmed at post mortem (Herweijer 1978). At the time the authorities and sector representatives agreed to cull the entire flock, as well as all sheep that had been in contact with these animals. The 2021 diagnosis on the Scottish Blackface ram occurred 43 years later, without any notifications meanwhile, although the Netherlands imports between 32.000 and 57.000 sheep annually. This time the farmer reared the lambs motherless and culled the ewes. Contact ewes that were on the same transport are quarantined and under surveillance.

Herweijer, C. H. (1978). "Longadenomatose (jaagziekte bij geïmporteerde schapen [Pulmonary adenomatosis (jaagsiekte) in imported sheep (author's transl)]." Tijdschrift voor Diergeneeskunde **March 15**(6): 326-333.

ECSRHM Communications

OP-17

IMPORTANCE OF ANIMAL WELFARE IN FATTENING LAMBS. TOWARDS A WELFARE ASSESSMENT MODEL

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Objectives:

Animal welfare is a growing concern to society. The aim of this work is to evaluate a welfare assessment system for lamb feedlots under practical farming conditions. The system is based on a score (from 1 to 10) of 14 parameters grouped as factors of environment (temperature, airflow, ventilation and ammonia load), management (animal load, bedding, comfort, stress behavior and cleanness of animals) and facilities (feeders of concentrate, feeders of forage and watering). The composite variables environment animal welfare (EAW), management animal welfare (MAW) and facilities animal welfare (FAW) were calculated as the average of scores previously defined in each group and global animal welfare (GAW) was calculated as the average of the three composite variables.

Materials and methods:

Thirty-four feedlots were assessed using this system in Spain and Portugal from 2014 to 2019. A descriptive analysis was carried out for each parameter evaluating welfare for the composite variables (EAW, MAW, FAW and GAW). A regression analysis was used to assess the association between these continuous variables. A linear regression analysis between these composite variables and the mortality rate in twenty-eight farm assessments was also carried out.

Results:

The average values and coefficient of variation for EAW, MAW, FAW and GAW were 5.5, 5.6, 5.3, 5.5, and 11.8%, 9.2%, 11.9% and 8.1%, respectively. The SD, SEM and confidence interval (95%) for GAW were 0.44, 0.08 and 5.3-5.6, respectively. A statistically significant association between composite variables was observed between EAW and MAW (R^2= 15.5%; $p<0.05$) and MAW and FAW (R^2= 22.4%; $p<0.05$). A positive statistically significant association ($p<0.05$ in all cases) was also observed between GAW and EAW (R^2= 54.5%), GAW and MAW (R^2= 70.3%) and GAW and FAW (R^2= 45.6%).

In addition, significant negative correlations were observed between EAW, MAW, GAW and mortality in the feedlot lamb farms ($p<0.05$). Some formulas associating mortality with EAW, MAW and GAW are also defined in this work.

In addition, in order to illustrate the practical application of this animal welfare assessment method, the evolution of welfare over time in seven farms assessed at least twice in the current period studied is also detailed.

Conclusion:

This study provides reference values to define and benchmark the objectives of welfare on a farm. The system described can be used as a preliminary welfare-monitoring tool under practical conditions.

OP-18

THE AUSTRALIAN SHEEP SUSTAINABILITY FRAMEWORK – A WORLD FIRST

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Introduction:

The Australian Sheep Sustainability Framework (SSF) was launched by Sheep Producers Australia and Wool Producers Australia in April, 2021, after extensive consultation with key industry and customer stakeholders. It is the first sustainability framework for a sheep industry anywhere in the world.

The Framework:

The Framework was developed by an industry-led Steering Group, and followed a year of close consultation with industry stakeholders and the broader community. Using an AA1000 Assurance Standard for Materiality, the Framework was developed to report data on sustainability priorities identified as being important to stakeholders.

The Framework will enable the sheep industry to:

- demonstrate sustainable practices,
- identify areas for improvement, and
- better communicate with customers and consumers.

The framework lists 21 priorities across the four themes - *Caring for our Sheep*; *Enhancing the Environment and Climate*; *Looking after our People, our Customers and the Community* and *Ensuring a Financially Resilient Industry*.

The Framework will produce annual Reports, providing up-to-date and robust data on the 60 metrics identified to be reported. This will enable both the industry and its customers to track progress over time on the important areas agreed to during the extensive consultation period.

The Framework, through its regular reporting, will provide an opportunity for industry to further enhance trust and transparency around its sustainable practices, and provide a mechanism to show when improvement is occurring. The Framework will not influence or impact on individual arrangements farming business have to promote their sustainability practices with specific brands.

Importantly, the Framework is not a policy instrument – it will report on practices, but it will be up to the industry to decide if any changes to those practices are needed.

Relevance to Veterinarians:

For veterinarians, the Framework puts animal welfare and best practice sheep production, including the use of pain relief, front and centre. The theme Caring for our Sheep has 17 metrics, with two on pain relief (pain relief for mulesing, and pain relief for castration and tail-docking), and four metrics relating to on-farm best practice (scanning for twins, vaccination, and adoption of non-mulesing(2)). The Priorities are on husbandry practices, best practice management, preventing and managing disease, and on-farm euthanasia highlight how import these areas are to all stakeholders. While the Framework aims to increase trust and transparency around sheep industry sustainable practices, and does not specifically require individual producer action, it provides veterinarians with an increased understanding of the importance of their input into the sheep industry, and is likely into to the future to be indirectly promoting more veterinary input on sheep farms.

Final Comments:

The Sheep Sustainability Framework will be a living document, subject to review and refinement so that it remains relevant and meets the expectations of all stakeholders. This ongoing commitment to transparency, continual improvement, and engagement will ensure the Australian sheep industry remains a strong and sustainable industry for its participants and its customers.

The Framework can be found at www.sheepsustainabilityframework.com.au

ECSRHM Communications

OP-19

DATA ANALYSIS AS TOOL TO MONITOR TRENDS AND DEVELOPMENTS IN GOAT HEALTH IN THE NETHERLANDS

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Introduction:

Nowadays, monitoring and surveillance systems of livestock become more important in order to ensure high standards of the One Health concept. Over the years different systems for small ruminants have been developed. In the Netherlands, as part of the national monitoring and surveillance system, an annual data analysis is performed since 2006 to monitor trends and developments in the Dutch goat population using routine census data. The objective of this paper is to describe the process of data-analysis based on census data on goat farms in the Netherlands in 2019 as tool to monitor trends and developments in goat health.

Materials and methods:

By combining multiple data sources, like the official animal identification and registration (I&R) database, post-mortem submissions to GD, mortality data from the Dutch rendering facility Rendac, the Trade Control and Expert System of the Netherlands Food and Consumer Product Safety Authority, as well as available herd characteristics like location and production purpose, key monitor indicators are generated, forming the foundation of the national demographic scope of Dutch goat industry. Over a five year period, multivariate analyses are used to monitor trends in time as well as associations between herd health and potential confounders.

Results:

Data analysis provides information concerning animal and farm density, mortality rate, animal contact incidences, and import frequencies of the Dutch goat population in 2019, and results are discussed. In total, 667,950 goats were present on 14,160 farms, of which 509 farms were called professional (>32 goats and >25% adult goats) and 13,651 were small scale farms (<32 goats). On professional goat farms, an average of 1,134 goats was present. On small scale farms were on average 4 goats present. The average mortality rate was 2.8% per farm/quatre of a year. In total, 3,744 goats were imported, most of the imported goats came from Belgium (2,997), Luxemburg (598) and Germany (126). It is expected that with additional legislation on registration of dairy goat related data in the official national data-base, quality of data, and therefore the data-analysis, will increase in the near future.

Conclusions:

Learning from the past, confronted with multiple outbreaks of livestock diseases like bluetongue, and Schmallenberg virus disease, the importance of outbreak-free baseline data and demographic knowledge about goat farming is recognised. To be able to make accurate risks analyses, insight in the course of events within the industry should be valued as indispensable information. Therefore, and in addition to other surveillance components, data-analysis as tool to monitor trends and developments on goat health functions as a valuable tool, for national monitoring and surveillance programs.

Keywords: data analysis, goat farming, surveillance, mortality, contact incidences, import frequencies.

ECSRHM Communications

OP-20

DATA ANALYSIS AS TOOL TO MONITOR TRENDS AND DEVELOPMENTS IN SHEEP HEALTH IN THE NETHERLANDS

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Objectives:

Nowadays, monitoring and surveillance systems of livestock become more important not only to be able to improve animal health but also to minimize risks to human health, the so called One Health concept. In the Netherlands, Royal GD (GD) has been commissioned to lead the countrywide surveillance and this organization developed a national animal health monitoring and surveillance system. This system is an accessible and voluntary system, providing a broad safety net for the earliest detection of animal health signals. These signals originate from farmers, veterinarians, the processing industry, research institutes and public health authorities and can be obtained reactively and proactively. As part of this national system, an annual data analysis, using routine census data, is performed since 2006, aiming to monitor trends and developments in the Dutch sheep population. The objective of this paper is to describe the process of this analysis in the Netherlands in 2019.

Materials and methods:

By combining multiple data sources, like the official animal identification and registration (I&R) database, post-mortem submissions to GD, mortality data from the Dutch rendering plant Rendac, the Trade Control and Expert System of the Netherlands Food and Consumer Product Safety Authority, as well as available herd characteristics like location and production purpose, key monitor indicators are generated, forming the foundation of the national demographic scope of Dutch sheep industry. Over a five year period, multivariate analyses are performed to monitor trends in time as well as associations between herd health and potential confounders.

Results:

Data analysis provides a detailed description of the Dutch sheep population with information concerning animal density and characteristics of the sheep population, mortality rate, and animal contact incidences. It also gives insight in import frequencies and the countries of origin in the year 2020. These results will be presented and benefits, limitations and challenges will be discussed. Further refinements and potential points of improvement of future analysis, with special attention to the data sources used, and the quality of the data will be paid attention to.

Conclusion:

Learning from the past, confronted with multiple outbreaks of livestock diseases like bluetongue, and Schmallenberg virus disease, the importance of outbreak-free baseline data and demographic knowledge about sheep farming is recognised. To be able to make accurate risks analyses, insight in the course of events within the industry should be valued as indispensable information.

In conclusion, data analysis as tool to monitor trends and developments in sheep health functions, in addition to other surveillance components, as a valuable tool in the Dutch national monitoring and surveillance program aiming not only to improve sheep health but also to promote the One Health concept.

Keywords: data analysis, sheep farming, monitoring, surveillance, mortality, contact incidences, import frequencies.

ECSRHM Communications

OP-21

SMART SHEEP: PRECISION LIVESTOCK FARMING AND SUSTAINABLE SHEEP PRODUCTION

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Objectives:

The use of novel technologies to improve on-farm decision-making and monitor the health and welfare of animals is common in dairy cattle, pig and poultry industries, ranging from wearable sensors to detect fertility and health status, environmental monitoring and advanced CCTV. This approach is known as Precision Livestock Farming (PLF). The limited studies that have been conducted in small ruminants show that adoption of PLF approaches can reduce labour and time requirements, optimise feed and wormer use with economic and sustainability benefits. Previous work has developed and validated a tool, the Happy Factor algorithm, which uses short-term weight gain to effectively identify lambs that would benefit from wormer following a Targeted Selective Treatment (TST) strategy. The current uptake of TST by commercial sheep flocks is currently hampered by the lack of a practical method for farmers and advisors able to access the algorithm which this project hopes to address.

Materials and methods:

This project aims to develop and validate a user-friendly platform for the Happy Factor and validate this approach on commercial farms throughout the UK.

The Happy Factor algorithm has been integrated into a cloud-based platform through co-design with members of the farming community and farming advisors. This new platform is currently being validated on approximately 18 commercial sheep farms across the UK, covering a wide range of geographical locations and sheep breeds. Data will be collected on lamb weight, the number of worming treatments used, nematode faecal egg counts and including nematode species identification. A cost/benefit analysis and scrutiny of the carbon footprint resulting from the implementation of the new approach will also be carried out.

Results and Conclusions:

Results will show the accessibility of the new platform and the effects on animal production, nematode worm population and cost and environmental benefits of using an integrated pen-side TST approach on commercial farms across the UK.*Pending November 2021.*

ECSRHM Communications

OP-22

IMPLEMENTING FARM BENCHMARKING: EXPLORING A FARM-TEAM APPROACH TO PROVIDING AN ON-FARM BENCHMARKING SERVICE

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Benchmarking aims to identify strengths and weaknesses within a production system or business by comparing key performance indicators (KPI) derived from a business (e.g., sheep farm) to those collected from the industry. This allows for targeted intervention and resource allocation to areas where the greatest improvement can be made. Subsequent performance can then be objectively assessed to ascertain if implemented interventions have been successful.

Objectives:

In this context, collaboration between all stakeholders involved is essential when attempting to influence benchmark-rooted change on-farm. As such, a pilot study exploring a "farm-team" approach to delivering a benchmarking service was developed for sheep producers as part of a collaboration between the University of Glasgow School of Veterinary Medicine (UOG-SVM) and an animal nutrition company (HARBRO Ltd).

Materials and Method:

The service was developed by the author in consultation with employees (advisors, n = 12) from and two sheep producers serviced by the nutrition company. Through this process, KPIs for inclusion into the system were identified, and a data-capture questionnaire was created by the author to collect the information required to calculate and interpret each KPI. Advisors were then provided with a thirty-minute virtual training session before clients were enrolled. The criteria for enrolment onto the service included the producer's willingness to engage with a benchmarking service and their current lack of benchmarking activity.

Twelve producers were contacted by the advisors, eight of which engaged with the service. Initial baseline data was collected from each producer for the sheep production year beginning in autumn 2019 and ending in autumn 2020. A production year was defined as the time between the beginning of one breeding season and the next. Data was inputted into the questionnaire by producers, advisor, or a combination of both.

Results:

The data collected in the questionnaire was used to create a custom-made database that calculated and collated forty-three KPIs into a single page summary report. Within the database, KPIs were benchmarked against available published records of farm performance for the type of farm (lowland, upland, hill) enrolled.

Interpretation of the benchmarking results was performed by the author. Once results were interpreted, the author produced short reports which were discussed with each advisor before advisors returned to the producer. Further support was provided by the author to four advisors when presenting the results as multiple KPIs were significantly different from reference figures. All producers were advised to contact their private veterinary surgeon to aid in devising and implementing mitigation strategies.

Conclusions:

Of the eight producers enrolled, all have begun collecting data for the production year 2020 to 2021. In addition, in response to weaknesses identified in the data collected for the production year 2019-2020, four producers have agreed to make changes to management or investigate disease. Based on this pilot project, it is evident that uptake of the service has been successful in part because of the strong collaborative approach between stakeholders. Due to this success, the number of clients offered this service will be expanded.

ECSRHM Communications

OP-23

FURTHER WORK ON THE USE OF XYLAZINE-KETAMINE ANAESTHESIA FOR THE DISBUDDING OF GOAT KIDS

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Objectives:

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 (Hodgkinson & Dawson 2007), and evidence that local anaesthesia is ineffective at preventing disbudding pain (Alvarez et al. 2015). There is a relatively limited range of general anaesthetic agents that are permitted in food-producing animals within the EU, (van den Brom et al. 2016).

Further to earlier work on the efficacy of a ketamine-xylazine mixture presented to the ECSRHM previously (Crilly et al. 2019), modifications were made to the anaesthetic protocol. This study was a second clinical audit of the efficacy of the modified techniques.

Materials & Methods:

The basic anaesthetic mixture was made by the addition of 0.2ml of 20mg/ml xylazine to 10ml of 100mg/ml ketamine. In the previous study this was administered by intramuscular injection, at a dose rate of 0.1ml/kg bodyweight, leading to a dose rate of 0.04mg/kg xylazine and 10mg/kg ketamine.

Participating farmers were offered a choice of the administration of this mixture at the same dose rate but by intravenous (IV) injection, or by intramuscular (IM) injection, but at a dose rate that increased as the weight of the kid increased.

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:

163 kids were anaesthetised by IV administration, 486 were anaesthetised by IM administration. Both methods resulted in a higher proportion of G responses than the previously reported method. IV administration resulted in a higher proportion of G responses than the IM protocol. The correlation between bodyweight and non-G responses, previously reported, was abolished in the IM protocol here. Due to correlation between breed and location, and location determining the protocol used, these factors could not be analysed this time.

Conclusions:

Both of these two methods are superior to that previously reported by Crilly et al. (2019). The IV administration appears to be superior to the IM administration, even when the latter is used at a higher dose rate in heavier kids.

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OP-24

CIRCADIAN RHYTHMICITY OF TEMPERATURE, HEART RATE AND ACTIVITY OF SHEEP MAINTAINED UNDER INTENSIVE HOUSING CONDITIONS

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Objectives:
To determine the circadian rhythmicity of temperature (T), heart rate (HR) and activity (ACT) of ewes housed under intensive conditions by the use of biologgers.

Material and methods:
The experiment was conducted at University of Zaragoza, Spain (41°N 0°W), in accordance with the Spanish Policy for Animal Protection (RD 53/2013). In mid-Nov, 30 Rasa Aragonesa ewes were allocated in a communal pen (8 x 4 m), with an uncovered area (3 x 4 m), under natural photoperiodic conditions (sunrise: 07:51; sunset: 17:45). Five ewes were surgically implanted with a subcutaneous T, HR and ACT bio-logger (DST milli-HRT ACT, Star Oddi, Gardabaer, Iceland), programmed with data logging every 5 minutes for 13 days. After the experimental period, sensors were retrieved and data was downloaded using a communication box and the Mercury software v5.83 (Star Oddi, Gardabaer, Iceland). Ewes were placed in a cradle, in dorsal recumbence, and were sedated with 1.5 mg xylazine i.m., and 1 ml local anesthetic s.c. was injected. The biologger was placed subcutaneous on the left thorax, above the heart and with the sensor axis parallel to the heart axis. An incision on the skin was made, and a pocket to insert the sensor was created. The bio-loggers were sterilized by a 24-h immersion in 0.55% ortho-phthalaldehyde (CIDEX-OPA solution, Johnson & Johnson, New Jersey, USA). Circadian rhythms of T, HR and ACT were estimated by fitting the individual time series measurements of each sheep to a cosine curve of a 24-h activity rhythm (Cosinor on-line platform (https://cosinor.online). MESOR (Midline Estimating Statistic of Rhytm, the average value around which the variable oscillates), amplitude (the difference between the peak and the mean value of a wave), and acrophase (the time of peak activity) were determined for each variable in each individual. A $P<0.05$ indicates that the time series fit a 24-h rhythm. After that, data were polled and the mean 24-h cosinor curve for the three parameters was calculated. Comparisons of the bio-logger T, HR and ACT between day- and nighttime values were conducted using an analysis of variance.

Results:
Mean daytime T, HR and ACT were significantly higher ($P<0.0001$) during the daytime than during nightime (Table 1). The five ewes presented a cosinor curve which fitted a 24-h rhythm ($P<0.0001$) for T, HR and ACT. Mean MESOR, amplitude and acrophase are presented in Table 1. Thus, the earliest MESOR was observed for ACT in the morning, followed by HR and T in the afternoon.

Conclusion:
This study validates the suitability of these bio-loggers for monitoring circadian rhythmicity of sheep, as a previous step for designing simpler devices in Precision Livestock Farming procedures, and predict disease symptoms.

Table 1. Mean (±S.E.) values obtained in the experiment
(a,b indicate significant differences between day and night times)

	Temperature (°C)	Heart rate (bpm)	Activity (mg)
Mean	38.00±0.01	106.74±0.34	13.06±0.16
Maximum	39.84	246	230
Minimum	36.04	20	0
Daytime	38.06±0.01[a]	112.72±0.50[a]	16.16±0.25[a]
Nighttime	37.95±0.01[b]	101.77±0.45[b]	10.89±0.19[b]
MESOR	38	106.79	13.07
Amplitude	0.15	7.36	5.66
Acrophase (h)	16:30	13:51	10:37

ECSRHM Communications

OP-25

DEVELOPING A HIGH-THROUGHPUT MITOCHONDRIAL DNA MARKER FOR INVESTIGATING *TELADORSAGIA CIRCUMCINCTA* POPULATION GENETICS

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Objectives:

Teladorsagia circumcincta is one of the most significant parasites in sheep in temperate areas. Resistance to anthelmintics is also common is this species. The rate at which anthelmintic resistance spreads within and between farms is likely to depend on how freely nematode populations mix and interbreed. However, relatively little is known about the population dynamics of any gastrointestinal nematode species. This study aims to develop a mitochondrial DNA marker for *Teladorsagia circumcincta* that is compatible with metabarcoding, and therefore high-throughput sequencing. This marker will be used to assess the multiplicity of *T. circumcincta* infection and test for evidence of population structuring between multiple farms within the UK, and also within one farm over several years.

Materials and Methods:

PCR primers were designed for regions of the *T. circumcincta* mitochondrial ND-1 locus based on the results of a BLAST search. PCR was performed on laboratory *T. circumcincta* isolates using these primers and the resulting cDNA Sanger sequenced to check for sequence homology with the BLAST results. Illumina-MiSeq® adaptor sequences were then added to these primers to enable metabarcoded deep amplicon sequencing. PCR conditions were then optimised for these primers and specificity checked using both variable proportion admixtures of laboratory *T. circumcincta* and *Haemonchus contortus* isolates, and field samples known to contain variable proportions of *T. circumcincta* and other Clade V nematodes. This technique was then applied to archived field samples obtained from a commercial sheep farm in southern Scotland obtained over a four-year period.

Results:

Sanger sequencing of cDNA produced by the non-adaptor PCR showed high homology with BLAST results for *T. circumcincta* ND-1. Optimal PCR conditions for Illumina-MiSeq® adaptor primers were: denaturation at 98°C for 20s, annealing at 56°C for 15s, and extension at 72°C for 15s, repeated for 35 cycles. Positive results using variably proportioned admixtures of laboratory *T. circumcincta* and *H. contortus* isolates and field samples containing both *T. circumcincta* and various *Trichostrongylus spp.* confirmed sensitivity in the presence of non-target DNA. Negative results from pure *H. contortus* isolates and field samples containing varied Clade V nematodes (but not *T. circumcincta*) confirmed specificity for *T. circumcincta*. Analysis of sequence results from the archived field samples are outstanding at the time of writing but will be presented at the conference if available.

Conclusions:

A new high-throughput marker for the mitochondrial DNA locus ND-1 has been developed for *T. circumcincta*. This will be highly valuable for understanding more about the population structuring of this highly important parasite, and for advancing models that predict the spread of anthelmintic resistance within and between farms.

ECSRHM Communications

OP-26

CORRELATION OF SALIVARY ANTIBODY RESPONSE TO CARBOHYDRATE LARVAL ANTIGEN (CARLA®) WITH GASTROINTESTINAL PARASITISM IN ONTARIO SHEEP

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Objectives:

Gastrointestinal nematode parasites (GINs) of sheep are a significant cause of morbidity, mortality, and loss of productivity. Due to the rising prevalence of anthelmintic resistance, selection of animals with a superior immune response to GINs has received considerable attention. In New Zealand, measurement of salivary antibody to a carbohydrate larval antigen (CarLA®, AgResearch Inc.) is used to identify sheep with superior immunity. However, climate and GIN epidemiology in Canada are different from New Zealand, and sheep are generally not exposed to GINs for several months during winter. The purpose of this study was to determine whether CarLA® levels correlate with parasite burden under boreal grazing conditions in Ontario - the first evaluation of CarLA® testing in North America.

Materials and Methods:

Rideau cross ewe lambs (n=107) were recruited at 4-6 weeks of age at a commercial farm in Eastern Ontario with a history of GIN parasitism, and followed through their first lambing and lactation (18 months in duration). GIN faecal egg count (FEC) was monitored every 6-8 weeks through two grazing seasons (May-November) in 2016 and 2017, and at mid-gestation in March 2017, using a diagnostic method with a minimum level of detection of 8.33 eggs per gram of feces (epg). In order to prevent morbidity due to GINs, anthelmintic treatment was administered to any animal with a FEC above 500 epg. Salivary CarLA® was measured at the beginning, middle, and end of each grazing season, as well as at mid-gestation. Spearman's rank correlation coefficients were calculated to assess for correlation between CarLA® levels over time, and the relationship between CarLA® and FEC was modelled via general linear mixed modelling. All animal work was approved by the University of Guelph Animal Care Committee.

Results:

The mean CarLA® titre of the group followed a similar seasonal pattern to FECs with a 6-8 week delay. Both gradually increased during the 2016 grazing season, declined over the winter, and rapidly increased during the 2017 grazing season. The proportion of the flock with detectable antibody levels peaked at 68.3 % at the end of the first season, declined over winter to 43.9 % the following spring, and reached 99.1 % by the middle of the second season. CarLA® titres were much higher in the second grazing season and consistently positively correlated over time, with correlation coefficients ranging from 0.2-0.6. CarLA® titre was also consistently negatively associated with FEC ($p < 0.001$).

Conclusions:

The results of this study indicate that Ontario sheep mount a detectable salivary antibody response to GINs within the normal boreal grazing season (April to November), and can maintain this response without ongoing GIN exposure for several months during winter. Moreover, animals with higher antibody levels have reduced FECs. Since more than half the lambs developed detectable antibody titres by the end of the first grazing season, assessment of salivary CarLA® titre prior to selection of breeding stock appears to be a promising tool for identification of sheep with superior GIN immunity grazing in boreal climates.

ECSRHM Communications

OP-27

FIRST IDENTIFICATION OF *CRYPTOSPORIDIUM PARVUM* ZOONOTIC SUBTYPE IIAA15G2R1 IN DIARRHEAL LAMBS IN FRANCE

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Background:

Cryptosporidium is a parasite infecting a wide range of vertebrate hosts including humans and poses a significant threat to public health. Molecular approaches to genetically characterize *Cryptosporidium* spp. has enhanced an improved understanding of cryptosporidiosis epidemiology. Clinical signs of *Cryptosporidium* infection in young ruminants (calves, lambs, and goat kids) include diarrhea, dehydration, delayed growth, and weight loss, often leading to death, thus resulting in economic losses associated with morbidity and mortality. In addition, young ruminants have been considered as a potential source of human cryptosporidiosis infection in several outbreaks. Little is known about the presence of *Cryptosporidium* spp. in sheep in France, nor the role the animals may play as reservoirs for these parasites.

Objectives:

The present work aimed to identify *Cryptosporidium* at a molecular level in lambs from two different French departments (Tarn and Haute-Vienne). Furthermore, through genetic characterization, this study led us to investigate the potential of lambs as a zoonotic reservoir for human infection.

Material and Methods:

A total of 23 fecal samples were collected from diarrheic lambs (< 11 days old) from 7 randomly selected farms. They have been previously identified as having issues with diarrheic lambs. The frequency of samples per farm are as follows : F1 (n=1), F2 (n=1), F3 (n=9), F4 (n=1), F5 (n=5), F6 (n=1) and F7 (n=5). *Cryptosporidium*-oocysts were detected microscopically with Direct Immunofluorescence Assays (DFA) in 23/23 (100%) of fecal samples. PCR-RFLP of the *18S rRNA* gene was used to determine species in all samples, and only *Cryptosporidium parvum* was identified. Isolates were subtyped by sequencing the 60 kDa glycoprotein (*gp60*) gene.

Results & Conclusions:

Our data are consistent with multiple other sheep studies. In fact, it has been reported that the *C. parvum* IIa subtype family is dominant in countries such as the UK and Poland. The identified IIa subtypes pose a real risk to public health, as this family is known to include many potentially zoonotic subtypes. In this study, two zoonotic subtypes were identified, including IIaA15G2R1 (22/23) and IIaA16G3R1 (1/23). Our findings demonstrate that *C. parvum* commonly occurs in lambs. These data strongly suggest that lambs may be an important reservoir of zoonotic *C. parvum* subtypes in France for human infections.

This is the first report of *Cryptosporidium* spp. infections in French lambs, and could serve as baseline data for further investigations to better understand cryptosporidiosis epidemiology and *C. parvum* subtype diversity in France.

ECSRHM Communications

OP-28

FACTORS AFFECTING SHORT AND LONG TERM OUTCOMES OF OVINE CAESAREAN SECTION – A RETROSPECTIVE ANALYSIS OF 212 CASES

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Objectives:

Caesarean section is a common procedure in ovine obstetrics but information on subsequent fertility, lambing ease and factors associated with ewe and lamb survival is scarce. This study was thus undertaken to address these questions.

Materials and Methods:

Clinical records of all 212 sheep undergoing caesarean section due to uncorrectable dystocia (n=207) or medical indications (n=5) at a veterinary referral and teaching hospital between January 2008 and December 2019 were evaluated retrospectively. In all cases, a left flank incision was performed. Follow-up information was obtained between eight months and two years post surgery via telephone interviews. Statistical analyses were performed using R (version 3.6.3). Multiple logistic regression models with stepwise backwards selection by the Akaike information criterion (AIC) were used to identify potentially influential factors on ewe and lamb survival. The initial full models included the indication for caesarean section, observed duration of labour (≤6, 7-12, >12 hours), maternal history of concurrent disorders (yes / no), breed type (meat / extensive) and the number of lambs (single, twins, multiples). The presence of at least one dead (yes / no) or autolytic / emphysematous lamb (yes / no) and the presence of post-surgical complications were additionally included in the model exploring dam mortality. Age and parity of the dam were shown to be non-significant for ewe or lamb mortality by univariate analyses and were thus not included in the main models.

Results:

The most frequently diagnosed indications were insufficient cervical dilatation (n=94, 44.3%), uterine torsion (n=50, 23.6%), foetopelvic disproportion (n=31, 14.6%) and vaginal prolapse intra partum (n=11, 5.2%). Fifty-four (25.5%) of the 212 ewes additionally suffered from one or more concurrent, pre-existing conditions. Overall ewe mortality was 10.8% (23/212), but as low as 3.8% (n=6) for the 158 ewes without a history of concurrent disorders. Mortality increased to 31.5% (17/54) for those with pre-existing conditions. Total lamb mortality was 49.1% (173/352). Pre-existing conditions (p=0.001) and the presence of post-surgical complications (p=0.025) were identified as significant factors influencing dam mortality, while delayed presentation for veterinary attention with an observed duration of labour of >12 hours was identified as the most influential factor on total lamb mortality (p=0.010). The indication for caesarean section was not significant for either parameter. Similarly, the presence of dead or emphysematous foetuses did not influence ewe mortality. Follow-up information on further outcomes was available for 156 (82.5%) of the 189 discharged ewes. Eighty-nine animals (57.1%) were re-bred in the following season, and achieved a 93.3% (83/89) pregnancy rate, while the remainder had either been slaughtered (n=56, 35.9%), sold (n=5, 3.2%) or had died of unknown causes (n=3, 1.9%). The subsequent incidence of dystocia was 15.6% (n=12) in the 77 ewes with available information on lambing ease. No detailed information on causes of dystocia was available for most animals.

Conclusions:

Adequate management of underlying conditions and timely intervention are important factors for best possible short term outcomes. In the long term, the subsequent pregnancy rate was good and the incidence of subsequent dystocia was within the normal range.

ECSRHM Communications

OP-29

UTERINE TORSION AS A CAUSE OF DYSTOCIA IN SHEEP: CASE DESCRIPTIONS AND PREDISPOSING FACTORS

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Clinic for Ruminants with Ambulatory and Herd Health Services LMU Munich, Munich, Germany.

Objectives:

Uterine torsion is often considered a rare condition in sheep, and little is known on any potentially pre-disposing factors in this species. This study therefore aimed to generate detailed knowledge on the frequency and nature of uterine torsion as a cause of ovine dystocia, as well as identifying potentially influential factors on its occurrence.

Materials and methods:

The clinical records of all 302 sheep with dystocia treated between January 2008 and February 2021 were evaluated retrospectively. Information was gathered on age, parity, breed, husbandry, nutrition, cause of dystocia, treatment method, litter size and birth weight. For cases of uterine torsion, information on direction, degree and location of the torsion was also collected.

The treatment method was chosen on a case by case basis and included 71 manually corrected cases, 225 caesarean sections and six partial foetotomies. Cases of uterine torsion (60/302) were compared to other causes of dystocia.

Statistical analyses were performed in R (version 3.6.3), using simple and multiple logistic regression models to identify potentially pre-disposing factors. A p-value <0.05 was considered statistically significant. Animals with missing values on the studied parameters were excluded from the relevant analyses.

Results:

Maternal causes of dystocia accounted for the majority of the 302 cases (n=203, 67.2%), with insufficient cervical dilatation identified as the most common maternal cause (121/203; 59.6%), followed by uterine torsion (60/203; 29.6%). Caesarean section was required in 93.3% of the torsion cases. Animals with uterine torsion (n=60) carried single lambs in 63.3% of the cases (n=38), while 20 ewes (33.3%) had twins and two (3.3%) carried triplets. The direction of the torsion was recorded in 49 cases. Nearly two-thirds of these (61.2%; n=30) were counterclockwise. A pre-cervical torsion was diagnosed in 14 of 28 animals with available information (50%). The degree of uterine torsion was recorded for 51 animals, and ranged from 90° (n=1, 2%) to 720° (n=4, 7.8%), with 180° and 360° the most common presentations (each n=18, 35.3%). Lamb birth weights did not differ significantly between ewes suffering from uterine torsion and lambs born to ewes with other causes of dystocia (p=0.267, n=289 lambs with available information).

Univariate analyses were initially used to identify potentially influential factors. Simple logistic regressions identified the breed type (lower odds for meat breeds, OR 0.22, $p<0.001$), litter size (lower odds for twins, OR 0.49, p=0.020 or multiples, OR 0.19, p=0.013) and husbandry (higher odds for fully housed animals, OR 17.87, $p<0.001$) as significant and excluded age, parity, season and concentrate feeding as non-significant factors. Significant factors were included in the subsequent multiple logistic regression model, where year-round housing was identified as the most influential pre-disposing factor for uterine torsion (OR 10.71, $p<0.001$). The breed type remained significant (OR 0.38, p=0.025), while the litter size was no longer significant in this mixed model (twins: OR 0.63, p=0.191; multiples: OR 0.30, p=0.089).

Conclusions:

Uterine torsion was a frequently observed maternal cause of dystocia in our study cohort. Fully housed animals and extensive breeds showed higher odds of suffering from uterine torsion.

ECSRHM Communications

OP-30

SHYNCHONIZATION OF ESTROUS USING FGA INTERNAL PESSARIES AND CIDR IN CHURRA GALEGA BRAGANÇANA EWES

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The control of reproduction activity has a major impact in the management and profitability of sheep farms. There are several synchronization of estrous protocols. The progesterone/progestogens protocols are widely used all over the word. The long term protocols are the most commonly applied. Progestogens are synthetic hormones that mimics the effects of progesterone. The fluorgestone acetate(FGA) is the progestogen most used in Portugal. Progesterone is administered by controlled internal drug release device(CIDR) and FGA by vagina internal pessaries. Consumers sees less progesterone as a health threaten as it is a natural hormone. On the other hand, several investigators found CIDR harder to loss and to cause less vaginitis than the internal pessaries.

Objectives:

The main goal of this paper was to compare the efficiency of FGA and CIDR in the synchronization of estrous in Portuguese CGB ewes.

Materials and methods:

This study was performed at Braganza (latitude 41° 48’ 33’’N, longitude 6° 44’ 3’’W and Altitude 670 meters) between April 1stand June 5th. Forty-nine CGB ewes aging between 2 to 8 years were divided in two groups - FGA (n = 26) and CIDR (n = 23). Body condition was scored according to the Australian classification table. In April 12thFGA ewes received a FGA(20 mg) internal pessary and CIDR ewes receiveda CIDR (0.35 g) device. Twelve days later internal pessaries and CIDR devices were removed and all ewes were injected with 500 UI of eCG. All ewes were artificially inseminated with chilled semen 53 + 1 hours post eCG injection. Initial ovarian cyclicity and ovarian response to treatments were assayed by progesterone plasmatic levels. Pregnancy diagnosis was performed by ultrasonography 41 days after artificial insemination (AI).

Results:

About 87.8% (n = 43) of all ewes presented for at least once progesterone plasmatic level higher than 0.5 ng/ml in the two weeks prior to vaginal devices insertion. Neither age nor body score condition affected significantly the percentage of ewes initially cyclic (P>0.05). The percentage of ewes that did not loss the vaginal device (FGA: 88.5% *vs*. CIDR: 91.3%; c^2=0.5; P>0.05) or did not present vaginitis (FGA: 92.3% *vs*. CIDR: 95.7%c^2=1.4; P>0.05) was identical in those treated with internal pessaries and with CIDR. All ewes presented progesterone plasmatic levels higher than 0.5 ng/ml for the first five days’ post vaginal devices removal. About 81.6% of all ewes were pregnant 41 days after AI. The difference between treatments was not statistically significant (FGA: 84.6%*vs*. CIDR: 78.3%; c^2=1.6; P>0.05).

Conclusions:

FGA internal pessaries and CIDR devices are very effective in the synchronization of estrous in CGB ewes.

ECSRHM Communications

OP-31

ASSOCIATION OF MELATONIN ADMINISTRATION IN PREGNANT EWES WITH GROWTH, REDOX STATUS AND IMMUNITY OF THEIR OFFSPRING

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Objectives:

Potential effects of melatonin administration on prenatally stressed offspring have not been studied in sheep. We have recently indicated the positive effects of melatonin on redox status of heat stressed pregnant ewes. Melatonin treatment not only increased the mean number and bodyweight of lambs born per ewe but also led to higher milk production during the puerperium (1). Following the latter results, in this study the effects of melatonin treatment on growth, redox status and immunity in prenatally heat stressed offspring of sheep were evaluated.

Materials and Methods

Thirty seven newborn lambs were allocated into two groups (MEL and CON) based on whether their mothers were treated with melatonin implants or not, respectively. The lambs of MEL group consisted of 5 singletons, 5 twins and 1 triplet, while the CON group of 13 singletons and 3 twins. After lambs' birth no intervention was made. Their mothers were imposed to heat stress and treated with melatonin implants as was previously described (1). Conditions prescribed by legislation of the European Union in relation to animal experimentation procedures (Council Directive 86/809/EEC) were met during this work.

The body weight of lambs was recorded at birth (L0) and then on days 15 (L15) and 40 (L40) after birth. Redox biomarkers (TAC, GSH, TBARS) were assayed in blood samples collected from lambs on days L0, L1, L2, L5, L10 and L40. Chemical analysis and antioxidant capacity were assayed in colostrum and milk samples collected at the same time points. Cytokines (IL-1β, IL-6, IL-10, IFN-γ) and IgG were assayed in blood samples collected from ewes on days L0 and L1 and from lambs on L0, L1 and L2.

Results:

The results showed that bodyweight gain of newborn lambs did not differ between the two groups ($P>0.05$). Better redox status was found in MEL lambs, as well as higher antioxidant capacity in colostrum of MEL ewes compared with CON ones at parturition ($P<0.05$). In colostrum of MEL ewes higher protein content was found on day L0 and higher fat content on L1 compared with CON ewes ($P<0.05$). The highest level of IL-6 was found in MEL ewes at L1, with an increase of IL-10 level in MEL lambs in comparison with CON lambs at L2. Moreover, IL-10 in CON colostrum increased from L0 to L1, coupled with higher level of IgG in CON lambs at L2 ($P=0.04$).

Conclusions:

The present study indicates that the administration of melatonin throughout pregnancy in heat stressed ewes has antioxidant and anti-inflammatory effect on their offspring and on the produced colostrum. The colostrum analysis of MEL ewes showed that melatonin treatment overwhelmed the oxidative stress of parturition over antioxidant molecules and rendered MEL lambs more immune-competent irrespectively of lower IgG levels measured in MEL lambs. Thus, melatonin administration throughout pregnancy could be used as an antioxidant and immune-modulatory regime not only for the pregnant ewes but also for their offspring to overcome the oxidative stress just after their birth.

1. Bouroutzika et al., 2020. https://doi.org/10.3390/antiox9030266

OP-32

EMERGENCE OF CONTAGIOUS OVINE DIGITAL DERMATITIS IN MAINLAND EUROPE

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Contagious ovine digital dermatitis (CODD) is a significant disease of the ovine foot characterised by severe lameness and progressive separation of the hoof horn capsule from the underlying tissue. Similar to bovine digital dermatitis (BDD), pathogenic members of the genus *Treponema* including the *Treponema medium* phylogroup, *Treponema phagedenis* phylogroup and *Treponema pedis* are frequently found together in CODD lesions. Until 2019 CODD was only described in Ireland (1) and the United Kingdom (2).

Objectives:

In northern Germany, cases of an unusually severe lameness presented in a sheep flock that had been affected by footrot for several years. These cases were non-responsive to conventional footrot therapies, with some sheep exhibiting substantial lesions of the claw horn that resulted in horn detachment.

Material and Methods:

Lesion swab samples were collected from both clinically affected and asymptomatic animals and investigated for *Dichelobacter nodosus* and *Treponema spp.*

Results:

In all clinically affected sheep, CODD-associated *Treponema* phylogroups were detected by polymerase chain reaction.

Conclusions:

This is the first report of CODD in Germany and mainland Europe (3), indicating a wider geographic spread than previously considered. Most recently further cases were reported in southern Sweden (4). In cases of severe lameness attributed to claw lesions in sheep that fail to respond to footrot treatment, CODD should be considered irrespective of geographic location.

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ECSRHM Communications

OP-33

EPIDEMIOLOGICAL STUDY OF TRACHEAL INJURIES IN ADULT SHEEP

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The trachea is an organ that is often neglected in routine clinical examination. However, a few years ago, we noticed that a high number of adult sheep showed tracheal lesions. Therefore, it was decided to carry out research work on the study of the tracheal lesions and their prevalence that concluded in defence of a doctoral thesis.

Objectives:

The main objectives of this work were to know the incidence of tracheal lesions in meat sheep farms in Aragón (Spain), to create a profile of the tracheal lesions found in the examined animals and to determine the possible factors that may be related to the appearance of these lesions.

Materials and methods:

An epidemiological study was carried out involving a total of 17,245 sheep belonging to 41 meat sheep flocks located in Aragón, in the northeast area of Spain. Each sheep was examined individually by the same veterinarian, with a detailed clinical examination of the trachea performed by external palpation, searching for tracheal injuries.

During the clinical examination, all the tracheal rings were palpated, locating the lesions and classifying them as cranial, middle or caudal. Mixed lesions were called when they affected more than one area (cranial-medial, mid-caudal or cranial-caudal). This information was collected in clinical files created for the study, including the individual electronic identification number of each animal, plus the breed, gender, and age. The age of the animals was obtained from the electronic identification that indicated the year of birth.

Possible risk factors influencing the incidence of tracheal injuries in sheep were collected from each farm: flock size, breed, production system, grazing system, diet, type of feeder, mineral supplementation, water supply, and cleaning and disinfection of the facilities.

Statistical analysis of data was performed using IBM SPSS statistics version 20.0 software (IBM, Armonk, NY, USA).

Results:

The individual prevalence of tracheal injuries in the 17,245 examined sheep was 12%, and the disorder was found in all farms (100% collective prevalence). The lesion profile was characterized by an injury most frequently located in the middle area of the trachea, followed by the so-called mixed area and the caudal area. The most common type of lesion was characterized by the injury of two consecutive tracheal rings followed closely by the involvement of 3-4 rings.

The farm risk factor that most influenced the presence of tracheal disorders was age, with an increase in injury presence as age increased. This influence became visible from the age of seven years and much more noticeable from the age of ten. Other farm risk factors that influence the presence of tracheal lesions were how the culling animals were selected and the way of feeding sheep during the periods of housing.

Conclusions:

Tracheal injuries showed a high prevalence in our productive system, being an injury that should be taken into account in future studies of the prevalence of respiratory disorders in sheep.

ECSRHM Communications

OP-34

PITHOMYCOTOXICOSIS AS A NEW PHENOMENON IN SHEEP IN THE NETHERLANDS

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Introduction:

Between September and December 2019, multiple cases of photosensitivity in sheep were reported to Royal GD (GD). Both sheep and lambs on different farms showed clinical signs of photosensitization including oedematous facial swelling, erythema of eyelids, ulcerative skin lesions, hyperpigmentation, and in some cases icteric sclerae. Elevated serum liver enzymes and histopathological liver lesions were suggestive for hepatogenous photosensitization. Ingestion of sporidesmin containing spores of the saprophytic fungus *Pithomyces chartarum* was thought the most probable cause, based on the combination of clinical signs, seriously elevated GLDH, γGT, and total bilirubin, necropsy findings, course of events, and time of the year. Although pithomycotoxicosis or facial eczema is a significant sheep disease in various countries in the world, it is rarely seen in Europe, and has only once been reported in the Netherlands in cattle in 2006. However, since this disease has not been previously reported in sheep in the Netherlands, combined with the potential impact on animal welfare and economics, the present study was initiated to monitor this disease in 2020.

The aim of this study was to confirm the diagnosis of pithomycotoxicosis, to investigate the occurrence and clinical presentation of the disease, as well as possible risk factors.

Materials and methods:

In order to increase awareness amongst farmers and veterinarians, the previous findings from 2019 were widely communicated using various media. In case a suspicion of photosensitivity was reported to GD, a farm visit followed. Blood samples were collected from 24 affected and 32 non-affected animals. Nine severely affected sheep were euthanised and submitted for necropsy. Furthermore, liver tissue from nine less affected or recovered sheep was collected post slaughter. Pastures were checked for the presence of toxic plants and grass samples were taken for spore detection.

Results:

From August 2020 onwards, again several cases of photosensitization were reported, and fourteen sheep farms were visited, widely spread across the country. In most flocks, multiple sheep were affected, in variant stages of the disease. Skin lesions on the ears and head were characterized by thick serocellular crusting and multifocal ulceration, bordered by hyperplastic regenerating epidermis, covered with some desquamated remnants of coagulative necrotic epidermis. Histopathologic examination of the liver revealed centrilobular hepatocellular degeneration, variable fibrosis of the portal tracts, multifocal degeneration and necrosis of bile duct epithelium and mild ductular proliferation. Seriously elevated GLDH, γGT, and total bilirubin, were found both in diseased animals and healthy-appearing flock mates. Microscopic examination of grass samples revealed the presence of spores of *Pithomyces chartarum* in samples from ten out of fourteen farms.

Conclusions:

Results confirm that the reported hepatogenous photosensitivity on at least ten sheep farms was caused by sporidesmin. It remains unclear why pithomycotoxicosis is suddenly emerging since 2019. Although no clear risk factors could be determined, it is suspected that the suitable weather conditions, high humidity and ambient temperatures above 12°C, and pasture management might have played an important role in fungal growth. Further research on the distribution of *Pithomyces chartarum* and the re-occurrence of pithomycotoxicosis is recommended.

ECSRHM Communications

OP-35

AN UNUSUAL CASE OF INVASIVE LISTERIOSIS CAUSED BY *LISTERIA IVANOVII* IN A DAIRY SHEEP FLOCK IN CENTRAL ITALY

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Objectives:

Listeria ivanovii induces abortion in sheep and, less frequently, in other ruminants. Laboratory identification is not common, and rarely is detected in samples other than aborted fetuses. Moreover, in contrast to *L. monocytogenes*, *L. ivanovii* has not been associated with meningitis or encephalitis. The authors herein describe an outbreak of listeriosis caused by *L. ivanovii* in a flock of dairy sheep in Central Italy.

Materials and methods:

The outbreak started in late spring, with cases of diarrhea in ewes with a steep increase of cases over time. The flock was composed of about 1200 Sarda sheep reared under semi-intensive conditions. The animals grazed during the daytime and spent the night indoors. The diet was supplemented with hay, stray, and concentrate. The symptoms included profuse diarrhea, fever (41°C), loss of milk production, and occasional apathy; generally, appetite was maintained. Morbidity was approximately 25%, while death occurred in two animals only. The hoggets were kept and fed indoor and separated from the adults, and remained asymptomatic. Anatomo-histopathological investigation was performed on the two dead animals, and bacterial culture from the liver and intestine was carried out. In addition, fecal samples from 16 symptomatic ewes were collected, cultured and tested for parasites. The samples were cultured on MacConkey and blood agar plates at 37°C overnight. Suspected colonies were identified using the Rapid ID 32 Strep and API Listeria (BioMérieux, Lyon, France). The identification was confirmed using MALDI-TOF MS (Bruker Daltonics, Bremen, Germany).

Results:

Macroscopically, the ewes showed enteritis with a fecal liquid consistency and diffuse petechiae within the gastro-intestinal mucosa and epicardium. Histologically, diffuse, necrotizing, lymphocytic, and eosinophilic enteritis with marked submucosal and serosal blood vessels dilatation and mucosal hemorrhage was observed. The parasitological test reported a very low presence of GI nematodes and a moderate presence of *Eimeria spp* only. Bacteriological examination from liver, intestine and four fecal samples revealed greyish-blue colonies with beta-hemolysis zone on blood agar. Such colonies were identified and confirmed as *L. ivanovii*.

Conclusions:

Outbreaks of *L. ivanovii* in sheep are generally preceded by cold and wet weather and the feeding of hay or silage. Furthermore, a massive parasitic infestation is a risk factor for the disease. In this case, the real debilitating cause(s) remains unknown. However, in the previous weeks, abundant cold rainfalls were registered, and this could have caused a temporary lack of the immunity, and might have eased the spread of *L. ivanovii* within the flock. In this case, reproductive failures was not observed as the ewes were empty or at the very beginning of gestation. The authors suggest considering *L. ivanovii* as a possible agent causing fever and acute GI symptoms in sheep. This study was funded by the Italian Ministry of Health (Project RFER12017).

SEOC Communications

OP-36

MONITORING A GOAT HERD DURING FIVE LAMBING SEASONS AFTER AN OUTBREAK OF ABORTIONS BY Q FEVER

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Coxiella burnetii is an obligate intracellular bacterium, very resistant in the environment, which causes Q fever in animals and humans. Small ruminants are considered the most common source of human infection. The major clinical sings of Q fever in small ruminants are abortions and stillbirths. Besides, infected animals shed large amounts of the bacteria through fluids, faeces, milk, or urine, after abortion or normal lambing, contaminating the environment.

Objectives:

This study aimed to investigate the evolution of *C. burnetii* infection during five kidding seasons (2017-2021) in a goat herd that suffered 80% of Q fever-associated abortions in 2017. Animal infection and environmental contamination were monitored, viability of *C. burnetii* detected inside animal premises was assessed, and the genotype of the *C. burnetii* involved was identified.

Materials and methods:

Vaginal mucus, faeces and milk samples were taken from 30-35 goats during each kidding season, and dust was collected from different surfaces inside the animal premises, as well as indoor and outdoor aerosol samples. *C. burnetii* DNA was purified using a commercial kit, and subjected to real-time PCR for DNA detection (multicopy IS*1111* gene), and quantification (single copy *com*1). A commercial ELISA kit was used to investigate the presence of antibodies against *C. burnetii* in milk sera. Viability of the bacteria in environmental samples was assessed by cultivation on cell lines. Measures implemented to control the infection included vaccination with inactivated Phase I vaccine, among others. The genotype of the *C. burnetii* present in the farm was determined using SNP and MST genotyping techniques.

Results:

During the first kidding season when the abortions took place (2017), 100% of the animals shed *C. burnetii* through vaginal fluids, faeces, and milk, with the highest bacterial loads being shed through vaginal fluids, and lowest through milk. During the successive s there was a progressive and significant decrease in the percentage of *C. burnetii* shedders, but a low percentage of vaginal (19%) and faecal (10%) shedders still remained in the last kidding season (2021). The average bacterial load excreted by infected goats showed a significant reduction from the second kidding season, with a decreasing trend until the end of the study. As the infection in the animal population progressively decreased, there was also a decrease in environmental contamination inside the animal premises and outside the farm. Viable *C. burnetii* were detected in environmental dust during the first and third kidding season (results for the 2021 season, still in progress). In the first season (2017) 86% of the goats had antibodies against *C. burnetii*, and exposure was still high in 2019 (81%). Therefore, during the first 3 years vaccination targeted replacement animals, whereas from the fourth year onwards the entire herd was vaccinated. The genotype of *C. burnetii* identified in the Q fever outbreak was SNP1/MST13.

Conclusions:

C. burnetii strains causing a high percentage of abortions in goats and affecting a high percentage of animals can persist at a low level of infection in the herd for several years.

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SEOC Communications

OP-37

HEPATITIS E VIRUS IN SHEEP AND GOAT IN SOUTHERN SPAIN

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Objectives:

Hepatitis E virus (HEV; family Hepeviridae; species Orthohepevirus A) is one of the most common acute viral hepatitis worldwide, being responsible of more than 20,000 infections each year worldwide. During the last decade, the number of hepatitis E cases in industrialized countries has sharply increased, mainly associated to the consumption of undercooked animal products or contact with infected animals. Although swine is considered the main reservoir of this emerging pathogen, other animal species, including sheep and goat, have been shown to be susceptible to HEV infection. Nevertheless, their role in the epidemiology of HEV is still poorly understood. The aim of the present study was to assess HEV infection in sheep and goat in southern Spain.

Materials and methods:

Between 2015 and 2017, blood samples from 480 small ruminants from 32 farms (14 intensively and 18 extensively managed) wee collected in Andalusia (southern Spain). Sera were analysed in parallel using double-antigen sandwich ELISA and real time RT-PCR. A spatial statistical scan was carried out to detect significant clusters ($p < .05$) of high HEV seroprevalence using a Bernoulli model and the software SaTScanTM, v9.6. Associations between seropositivity and explanatory variables were initially screened using the chi-square test or Fisher's test, as appropriate. Variables with a p-value <.20 in bivariate analysis were selected for inclusion in the multivariate analysis. Cramer's V coefficient was computed to assess collinearity between pairs of selected variables. Finally, a generalized estimating equation model (GEE) was used to assess the effect of the variables selected in bivariate analysis. 'Farm' was included as a random factor, and the number of seropositive animals was assumed to follow a binomial distribution.

Results:

Antibodies against HEV were detected in 38 of 480 animals (7.9%; 95% Confidence Intervals (CI): 5.5-10.3). The individual seroprevalence according to species was 2.1% (5/240; 95%CI: 0.3-3.4) in sheep and 13.9% (33/240; 95%CI: 9.4-18.1) in goats. The farm prevalence was 59.4% (95%CI: 42.4-76.4), ranging between 31.3% and 87.5% in sheep and goat flocks, respectively. Seropositivity to HEV was detected in the eight provinces of the study area. One significant ($p < .001$) spatial cluster of high seroprevalence was identified in northwestern Andalusia. The generalized estimating equation analysis showed that species (goat) and farm size (< 348 animals and > 538 animals) were risk factors associated with HEV exposure in small ruminants. None of the 480 animals tested were positive to HEV active infection.

Conclusions:

Our results evidence widespread but not homogeneous circulation of HEV in small ruminant populations in southern Spain. The seropositivity detected in both sheep and goat may be of public health concern. Further studies are required to assess the susceptibility of small ruminants to HEV infection and to determine the role of these species in the epidemiology of this zoonotic pathogen.

OP-38

CONCOMITANT PATHOLOGIES IN GOAT FARMS WITH HISTORY OF PARATUBERCULOSIS IN CANARY ISLANDS

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Objectives:

Paratuberculosis (PTB) is a chronic emaciating disease caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP) which affects domestic ruminants such as cattle, sheep and goats worldwide. Goat livestock on the Canary Islands consists of 202.887 heads (ISTAC 2020). The islands are officially free of bovine tuberculosis ((UE) 2017/252)) and vaccination against paratuberculosis is permitted (Decree 51/2018) but a previous PTB diagnosis and tuberculosis-free status confirmation is required. The aim of the present study was to analyze the main concomitant pathological findings observed in goats with PTB symptoms.

Materials and methods:

Farms requesting authorization for vaccination with Gudair® vaccine (2014-2018) were sampled for PTB confirmation. Control strategy tools included: a comparative intradermal test (CIT) using purified protein derivatives (PPDs), MAP-antibody detection by enzyme-linked immunosorbent assay (ELISA) and anatomopathological study of the mesenteric (MS), retropharyngeal (RF), prescapular (PE) and mediastinal (MD) lymph nodes and ileocecal valve region (ICV) collected in slaughterhouse. Four different farms (F1, F2, F3 and F4) were studied. Their tuberculosis-free status (CIT negative) was confirmed, and MAP-antibody levels were determined (12%, 30%, 22% and 2,5%, respectively). A total of 34 animals with PTB clinical signs were necropsied. Main pathological findings were described. Microscopic analysis was also performed using routine staining techniques such as hematoxylin-eosin and Ziehl-Neelsen.

Results:

A total of 29 (85%) of the necropsied animals presented histologic lesions of PTB (granulomatous enteritis and/or granulomatous lymphadenitis of the MS lymph nodes). Furthermore, a variety of concomitant pathologies were observed in various organs and systems (e.g., lymph nodes, digestive tract, liver, respiratory tract, heart, and kidneys). The affected lymph nodes exhibited mainly inflammatory (caseous or purulent) (50%) or hyperplasic (41%) lesions. Caseous lymphadenitis were observed mainly in RF (18%) and MD (12%) lymph nodes, while MD (18%), tracheobronchial (12%) and hepatic (12%) lymph nodes showed predominantly purulent inflammation.

The main findings in the digestive system consisted of lymphoplasmacytic and/or eosinophilic enteritis (9%) and cysticercosis in abdominal cavity (6%). The most frequent hepatic pathologies exhibited were lymphohistiocitic hepatitis (59%) and lipidosis (26.5%). The main lesions observed in the respiratory tract were inflammatory (59%), including necrotic-purulent bronchopneumonia (12%), lymphohistiocitic pneumonia (12%) and bronchointerstitial pneumonia (12%). The heart was predominantly affected by parasite infection with *Sarcocystis* spp. (18%) and non-suppurative myocarditis (18%). Kidneys showed interstitial nephritis in 33% of the cases. Three animals presented neoplastic lesions (2 squamous cell carcinomas in the mammary gland, primary lymphoma of the iliac lymph node, and a mixed thymoma).

Conclusions:

In animals with PTB, other severe pathologies caused by different etiological agents can cause important losses. One of the mainly affected organs were the lymph nodes exhibiting lymphadenomegalia and a variety of inflammatory patterns which should be considered for adequate differential diagnosis. Furthermore, in a large proportion of the affected animals, respiratory pathological processes, enteritis and hepatitis coexisted alongside with the PTB lesions.

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SEOC Communications

OP-39

REPORT OF OVINE INTERSEX CASES IN MEXICO

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The objective of this study was to report the presence of seven clinical cases of intersex or hermaphrodites in sheep flocks in Mexico. For this, a series of cases of animals that showed intersex were documented.

The production conditions were different, were detected in private enterprise flocks (with access to technology) and three in flocks from the social sector (limited use of technology), all of them located in the Central Highlands of Mexico. Due to geographical locations where the animals were found and to pandemic, karyotype or pathological studies could not be done, so these cases were only recorded clinically or through photographs.

The cases show differences in the presentation of external anatomical alterations such as exposed or subcutaneous testicles (possibly ovotestis), broad or slightly elongated vulvas, and exposed clitoris. From the seven cases of intersex documented; two were Katahdin showing hyporchidism whit vulva and clitoris exposed; one in Hampshire with subcutaneous testicles, with vulva and clitoris slightly prominent; three Dorper crossbred, the first one with subcutaneous testicles, the second one with testicles, vulva and prominent clitoris and the third Dorper came from twins birth, the female showed hyporchidism in scrotum whit teats and vulva and clitoris exposed. Finally, one Dorset crossebred in a flock imported from New Zealand.

This case shows interesting differences such as the fact that in addition to hyporchidism, there was a prepuce - vulva in an abdominal position and a small phallic prolongation. The presence of sheep with intersex had not previously been documented in Mexico. It is noteworthy that it occurs in breeds such as the Katahdin, Hampshire or Dorper that due to their origins have little genetic variability. It has been documented that one cause of anatomical alterations can be freemartinism', but since most of the individuals reported here come from single births this does not apply.

It is necessary to continue detecting cases similar to those reported in this paper and to accurately determine the origin of these abnormalities.

Key words; sheep, intersex, hermaphrodites, México.

OP-40

EVALUATION OF TWO MATINGS SEASONS ON PRODUCTIVITY IN A FLOCK OF COLUMBIA SHEEP

Gabriela Castillo Hernández, Omar Salvador Flores, Laura Castillo Hernández, José de Lucas Tron.
UNAM, Ciudad de México, Mexico.

Objectives:

The present work was to evaluate two breeding seasons in two consecutive years, to determine the best productive indicators in a herd of 600 Columbia ewes from a production unit located in the Central Highlands of Mexico.

Materials and methods:

All the methods used, as well as the handling of the sheep and the young that made up this study are strictly adhered to the accepted guidelines for the ethical use, care and welfare of the animals used in International Research, according to the Federation of Societies. of Animal Sciences (FASS, 2010). 600 Columbia ewes from a production unit located in the Central Highlands of Mexico were used. Two flocks of 300 ewes (adult and young) were randomly allocated and exposed to a system of two breeding seasons within the year with repetition the following year. The seasons were in May year 1 (M1), May year 2 (M2), August year 1 (A1) and August year 2 (A2), the duration of all mating´s was of 36 days, in addition a series of technologies were applied, such as the evaluation of body condition, application of flushing (if applicable), use of male effect (introduction of vasectomized males 18 days before the breeding), supplementation at the end of pregnancy, use of mobile lambing pens and a lambing watcher at night. The parameters evaluated were: pregnancy rate (GR) as a percentage of pregnant sheep at 35 to 40 days; fertility (FE), ewes lambed of those exposed to the rams X 100; prolificity (PR), lambs born from lambed ewes; mortality from birth to weaning (MD), lambs dead from birth to weaning; weaning rate (TD), weaned lambs from ewes exposed to ram X 100; birth weight (PN) and 75-day adjusted weight (PA75). The IBM SPSS Statistics 2018 program was used for the analysis; year and season effects were included in the model.

Results:

The best % of GR ($p \leq 0.05$) were for M2 (88.3 a) and A2 (92.8 a) compared to M1 (74.2 c) and A1 (83.6 b). In FE, PR and TD, the A2 mating season (90.8%, 1.5 and 1.3 respectively) were higher than the others ($p \leq 0.05$); in MD, the M1 mating recorded the highest mortality with 16.7% ($p \leq 0.05$). Regarding the PN and PA75, the average weight was 5.37 kg and 24.87 kg. In A1, the lowest weights (4.9 kg and 22.9 kg) were recorded compared to the others ($p \leq 0.05$). In PA75, both males (27.0 kg) and females (26.4 kg) were heavier in A2 than in the other seasons ($p \leq 0.05$).

Conclusions:

This study shows two aspects that allow decisions to be made, the first a difference between years especially in the reproductive rate. The second, that the August mating season, which is inside the breeding season tended to be better. This was especially relevant in the second year, achieving good indicators which were reflected in a weaning rate of 1.3 lambs per ewe, higher than those obtained by other authors.

SEOC Communications

OP-41

DESIGN OF GUIDED MATINGS IN THE ASSAF BREED. POSSIBILITY OF IMPLEMENTATION AS A CORE OF FOR INCORORATION OF STALLIONS TO THE SELECTION AND TESTING CENTERS

Ruben Jimenez Rubia

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Objectives:

One way to increase the genetic value of a population is to select a limited set of high-quality parents and mate them with each other. But this continued practice can lead to close relatives crossing over, producing an increase in consanguinity. To prevent this, it is necessary to avoid crosses between related animals.

The Assaf breed has a genetic improvement program based, among other aspects, on artificial insemination. In 2012, a directed mating procedure was launched between the males of the insemination centers and the best ewes in the population. The objective is to obtain future stallions with a high genetic level, belonging to different families and with similar genetic values. The purpose is to analyze the performance results obtained between 2012 and 2019, with the aim of adopting this system to feed stallions in artificial insemination centers.

Material and methods:

It starts from the design of the matings, from the genetic evaluations using the BLUP methodology. The parents of the future stallions are selected from the males tested in the artificial insemination centers, representing different families. The mothers are selected from the best sheep in the population, belonging to genetically connected herds. The design of the matings has avoided the mating of related animals. The stallions with the highest genetic value are mated with the lowest value ewes and vice versa, thus obtaining families of stallions that will progressively reach similar genetic values. The list of selected females reaches the herds, to prepare the candidates. Once the lambs are born, they are selected based on genetic, genealogical, health and morphological criteria.

Each of the annual campaigns has been monitored, in the period between 2012 and 2019, assessing and quantifying the causes that have affected their level of compliance.

Results:

The analysis of the results of the different campaigns pointed out elements that had a negative impact on its efficiency. These situations have been corrected by implementing improvement measures from one campaign to another. The use of the laparoscopic route for insemination has been very useful, since it increases fertility and allows genetics to be expanded from the use of frozen semen from dead animals. The greater fertility of intrauterine insemination compared to cervical insemination, reduces the number of inseminations necessary to meet the objectives, improving the genetic levels obtained.

Regarding resistance to scrapie, at least one of the parents is homozygous ARR. This increases the number of homozygous ARR stallions in the Selection Centers.

Conclusions:

The number of males obtained is adapted to the needs of stallions based on the census of reproductive females, the number of inseminations carried out and the number of inseminations necessary for testing the stallions. Therefore, we consider this system very appropriate, since we obtain the required number of stallions while maintaining the objectives of matching genetic values and controlling consanguinity.

SEOC Communications

OP-42

EFFECT OF INBREEDING ON MILK YIELD IN ASSAF OVINE BREED

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Objectives:

In the framework of the Assaf sheep genetic program to improve dairy traits, a mating design among the AI rams and the highest genetic merit ewes were annually performed, preventing mating among related animals to avoid the increase of inbreeding. The aim of this work is to study the relationship between milk yield and the current levels of inbreeding in the Assaf sheep breed, to estimate the effect that a possible increase in the inbreeding levels might have on milk yield, which is the main source of income for Assaf breeders.

Materials and methods:

Productive and pedigree data used came from the genetic evaluation conducted in December 2019. Due to the widespread use of DNA testing to assign affiliations, there are a high degree of pedigree knowledge concerning young animals for replacement. The inbreeding coefficient (F) has been estimated by using the Wright methodology and its relationship with standardized milk yield to 150 days (L150) from 354,261 dairy records of 138,843 animals born since 2011, was assessed by using the GLM procedure of the SAS statistical package. The linear model fitted, in addition to the fixed effects used in the milk yield genetic evaluation, included individual F values as linear and quadratic (F_2) covariates (GLM1 model) and as a four levels fixed effect, F=0; 0> F≤ 2.5; 2.5> F≤ 25.0 and F>25.0 (GLM2 model).

Results:

Results highlight a slight increase of the average F from animals born in recent years. The widespread use of DNA testing and a greater depth of the pedigree have allowed to have a greater number of animals available to estimate individual F. However, the proportion of animals with low F values has grown due to the minimum inbreeding mattings designed annually.

All factors included in the GLM1 model have a highly significant effect on milk yield (($P < 0.0001$) except F^2. A negative relationship between F and L150 (a decrease of 1.46 kg of milk per a 1% of increase of F) has been assessed. Also significant differences in milk production have been found for the levels of F when was included as fixed effect in the model (GLM2), particularly important for F values greater than 2.5%.

Conclusions:

In the Assaf sheep breed, the proportion of animals with low inbreeding values has been increasing in the last few years, largely due to the minimum inbreeding mattings performed annually and a better knowledge of the pedigree relationship of young animals for replacement. However, a negative relationship between inbreeding and milk yield has been found, particularly important for values of F higher than 2.5%. Therefore, any action aimed at preventing the increase of inbreeding levels will have a positive impact on ewe milk production and the overall selection process.

SEOC Communications

OP-43

HOW DOES THE INCLUSION OF CAROB PULP (*CERATONIA SILIQUA*) IN LAMBS' DIET AFFECT APPARENT NUTRIENT DIGESTIBILITY AND FAECAL PROANTHOCYANIDINS COMPOSITION?

Jonathan Pelegrin-Valls[1], Beatriz Serrano-Pérez[1], Ester Molina[1], Daniel Villalba[1], Margalida Joy[2], Juan Ramón Bertolín[2], Javier Álvarez-Rodríguez[1].

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Objectives:

Carob pulp, which is a source of proanthocyanidins (PRO) are easily available in the Mediterranean area. This study evaluated the effect of carob pulp inclusion in lambs' feed on the coefficient of total tract apparent digestibility (CTTAD) of nutrients and the faecal PRO composition.

Material and methods:

A total of 144 weaned male and female crossbreed lambs (15.0 kg of body-weight) were used. The lambs were raised in two batches and were allocated in 12 pens in each batch (mixed sex per pen). They were randomly submitted to three isoenergetic and isoproteic concentrates: C0 (without carob inclusion), C15 (15% of carob) and C30 (30% of carob), and wheat straw. Individual faeces samples were collected by rectal stimulation in all lambs of each pen at 50, 65 and 80 days of age and pooled per pen to analyse acid-insoluble ash to estimate the apparent digestibility of dry-matter (DM), organic matter (OM), crude protein (CP), ether extract (EE), phosphorus and PRO by the nutrient-marker ratio method. Furthermore, the PRO fractions (eq-g CT of carob pulp/kg DM) in faeces were analysed by Terrill method (1992): extractable CT (ECT), protein-bound CT (PBCT) and fibre-bound CT (FBCT). The data were analysed through mixed models including the effect of diet, batch, age and their single interactions as fixed effects and pen as a random effect.

Results:

No diet x batch interactions were observed in any variable ($P>0.05$). The overall CTTAD of DM and CP were greater in C0 and C15 than in C30 (85.9 and 82.5 vs. 76.8±1.26%, means±standard error, $P<0.05$; 60.6 and 55.5 vs. 43.3 ±2.77%, $P<0.05$; respectively). The CTTAD of OM did not differ among treatments at 50 days of age (64.4, 58.0 and 59.4±1.94%, $P>0.05$), but it was higher in C0 and C15 than in C30 at day 80 of age (69.6 and 66.4 vs. 52.3±1.94%, $P<0.05$). The CTTAD of EE did not differ among treatments at 50 and 65 days of age ($P>0.05$), but it was higher in C0 and C15 than in C30 at 80 days of age (57.3 and 47.6 vs. 31.1±6.59%, $P<0.05$). The CTTAD of phosphorus did not differ among treatments, but in C0 it decreased from 50 to 65 and 80 days of age (45.2 vs. 29.4 and 30.3±6.59%, $P<0.05$) whereas it remained steady throughout the fattening period in the two treatments fed carob ($P>0.05$). The overall faecal ECT was not affected by carob inclusion and age (1.5±0.09 eq-g CT/kg DM, $P>0.05$). The overall faecal PBCT and FBCT increased linearly with carob inclusion (6.6, 8.6, 15.8±0.47 eq-g CT/kg DM, $P<0.05$; 5.5, 21.7, 66.2±3.77 eq-g CT/kg DM, $P<0.05$; respectively). The disappearance of PRO throughout the digestive tract was greatest in C15 compared to C0 and C30 (35.3 vs 14.8 and 26.8±4.89%, $P<0.05$), and also greatest at 65 days compared to 50 and 85 days of age (31.5 vs 22.6 and 22.7±3.44%, $P<0.05$).

Conclusions:

Overall, a 15% inclusion of carob pulp did not impair total tract digestibility of OM and CP, and it may improve the dietary PRO uptake.

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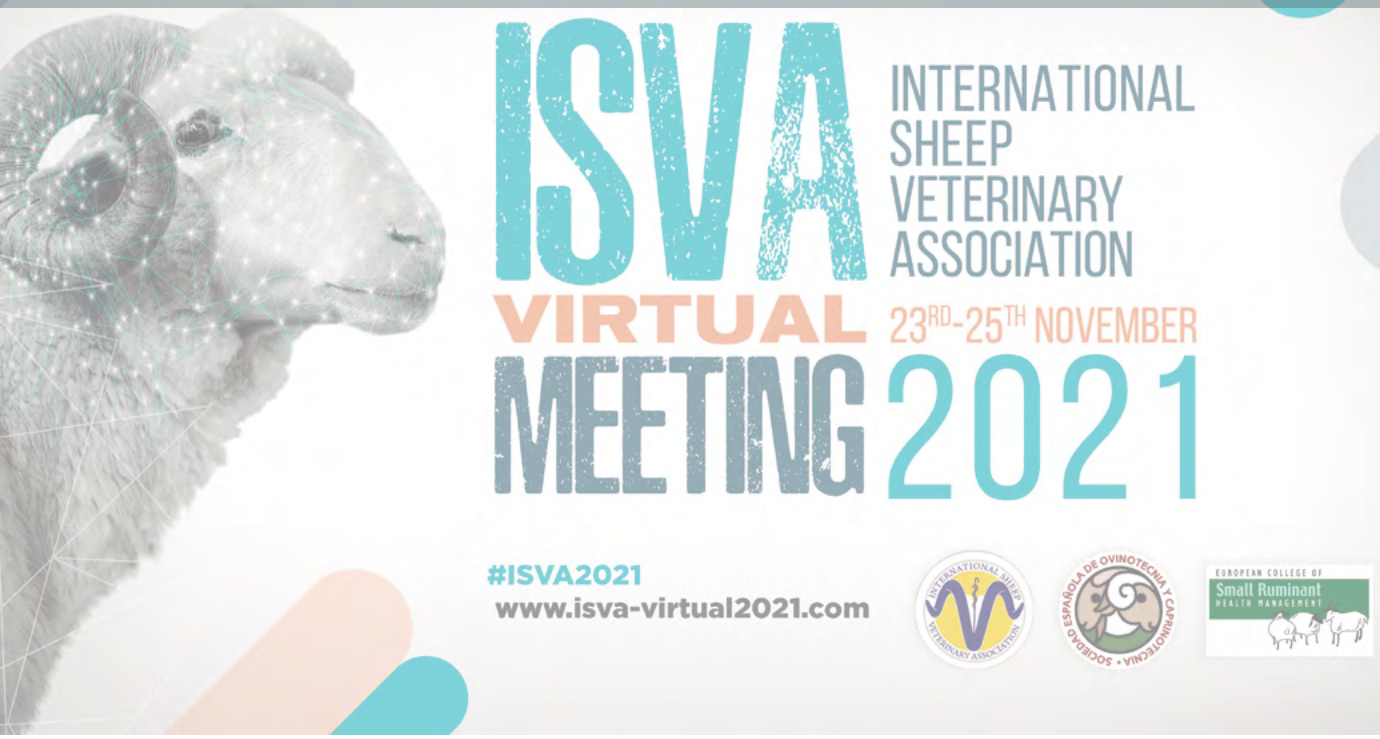
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P-01

PROTEIN PATTERN OF THE ANTIGEN PRESENT ON A NEW INACTIVATED VACCINE AGAINST *CHLAMYDIA ABORTUS*, THE AGENT CAUSING OVINE ENZOOTIC ABORTION

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[1]Laboratorios HIPRA S.A., Amer, Spain; [2]Murcia University, Murcia, Spain.

Objectives:

Ovine enzootic abortion (OEA) is one of the most important ovine disease, which aetiological agent is *Chlamydia abortus*. OEA prevention has been based on vaccination, and the protection conferred is related to the proteins named COMP (Complex of Outer Membrane Proteins). The available live-attenuated or inactivated vaccines raise some concerns in their safety and efficacy, respectively. A new inactivated vaccine (INMEVA®) has been developed with a modified procedure for inactivation of chlamydia antigen to improve efficacy and resolve the safety concerns. The aim of this study was the characterization of chlamydia proteins that are preserved on this new inactivated vaccine.

Materials and methods:

The new inactivated vaccine (INMEVA®) includes the reference strain A22 of *C. abortus*. For the efficacy studies of this vaccine, the AB7 heterologous strain (reference challenge strain) was used as described in Montbrau et al. The evaluation of chlamydia proteins was performed using sodium dodecyl sulphate–polyacrylamide gel electrophoresis (SDS–PAGE). For that, equivalent amounts of protein from reference challenge strain (AB7), antigen on new inactivated vaccine (INMEVA®; post-inactivation process), antigen on new inactivated vaccine (INMEVA®; pre-inactivation process) and antigen on another commercial inactivated vaccine (post-inactivation process), were boiled for 10 min in sample buffer (SDS reducing buffer) and were separated on 12.5% gel using Mini Protean II electrophoresis cell (Bio-Rad). Molecular weights were calculated by use of Precision Plus Protein™ All Blue Prestained Protein Standard (Bio-Rad). The results of the different analysed samples were compared with the reference challenge strain (AB7) by qualitative analysis of protein patterns.

Results:

The qualitative analysis of the SDS-PAGE of the reference challenge strain (AB7) allowed to identify proteins corresponding to the predicted mass of MOMP (Major Outer Membrane Protein; 38 kDa), POMP (Polymorphic Outer Membrane Protein; 90 KDa), OMP2 (Outer Membrane Protein 2; 57-62KDa) and OMP3 (Outer Membrane Protein 3; 12 KDa). Similarly, the same proteins were identified in new inactivated vaccine (INMEVA®) antigen pre and post-inactivation process. The other commercial inactivated vaccine only allows the identification of proteins corresponding to the predicted mass of OMP2, without MOMP, POMP, or OMP3 proteins fraction.

Conclusions:

In this study, we used a gel electrophoresis (SDS–PAGE) method to identify the different antigenic proteins presented in the new inactivated vaccine (INMEVA®; previously and post-inactivation process) and the other commercial inactivated vaccine (post-inactivation process) against *C. abortus,* as well as in the reference challenge strain (AB7). Result of new inactivated vaccine (INMEVA®) showed a similar complex protein pattern based on predicted mass to the antigen before inactivation, as well as to the reference challenge strain. In contrast, the other commercial inactivated vaccine showed a more diffuse post-inactivation pattern of proteins, probably associated with protein degradation during the inactivation process used for this last vaccine.

The results observed suggest that the protection conferred by this new inactivated vaccine (INMEVA®), previously reported by Fontseca et al., could be associated with an adequate chlamydial proteins conservation.

ISVA Communications: Infectious reproductive diseases

P-02

THE IMPORTANCE OF SCHEDULED MONITORING FOR THE PREVENTION OF INFECTIOUS ABORTION ON SHEEP FARMS

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Objectives:
In Italy, infectious abortions are a serious problem on sheep farms, causing considerable financial losses. Chlamydia and Salmonella account for more than 55% of bacterial abortions in sheep. As they tend to occur most frequently in the second stage of gestation, diagnostic strategies are characterized by a number of critical issues: timing, non-pathognomonic findings, suitability of samples and diagnostic success rate less than 55%.
The "Sementusa Protocol" for serological and instrumental monitoring on the farm, when tailored to individual production cycles, may enable abortifacient diseases to be detected at an early stage and appropriate vaccination strategies to be put in time, minimizing financial losses and avoiding the indiscriminate use of antibiotics.

Material and methods:
The "Sementusa Protocol" involves adding a series of activities to the routine management of the farm; the prevention of infectious abortion entails scheduled examinations of rams and ewes.
Rams: Clinical testing is carried out two months before mating:

- Ultrasound exam of external genitalia (testicular parenchyma, head, body and tail of the epididymis; ampullae of the vas deferens).
- Ultrasound examination of internal structures (bulbourethral glands, prostate and seminal vesicle).
- Serological testing for abortive diseases and a PCR for Border Disease.

Ewes: Testing of non-pregnant females:

- Gynecological examination.
- Serological testing for abortive diseases.

Based on the results of the examinations and serological tests, it is decided whether to implement a vaccination plan for any abortive disease detected, before the breeding season.
The "Sementusa Protocol" also includes a gynaecological examination of the ewes fifty days after the introduction of the rams with:

- Early pregnancy diagnosis.
- Identification of anestrous ewes with corpus luteum.
- Identification of abortions in ewes without external manifestations.

Serological tests are performed and uterine cervical swabs are taken from these ewes to quickly diagnose and implement a vaccination plan for abortive diseases (<2 months of pregnancy).
These procedures were carried out on 27 sheep farms examined in 2018 and 2019, considering serum-positive results for Chlamydia and/or Salmonella as abortive diseases.

- CHLAMYDIA: serum antibody titers detected by ELISA (MI IZSSI/20 Rev.01 2012).
- SALMONELLA: Slow agglutination serum in *Salmonella* Abortusovis antigen for the detection of antibodies in ovine sera (IZSSI/12). Positive if > 1:80.

Results:

- 25 farms: positive for Chlamydia and/or Salmonella (95.60%).
- 2 farms: negative (4.40%).

The 25 positive farms were advised to adopt a vaccination plan:

- 24 farms vaccinated.
- 1 farm did not vaccinate (decision of the owner).

Very few or no abortions were reported in the vaccinated flocks (< 1%).
The unvaccinated flock reported significant abortion issues (>20%).

Conclusions:
On farms where protocols such as the "Sementusa Protocol" are not implemented, there is a risk of detecting abortive diseases too late, generating financial and epidemiological consequences.
This protocol, supported, if necessary, by effective vaccination, contributes to a more rational flock management, generate excellent financial results and reduce the use of antibiotics and the greater professional appreciation of the veterinarian.

P-03

ABORTIONS IN GOATS CAUSED BY *CHLAMYDIA ABORTUS* CONTROLLED BY AN INACTIVATED VACCINE IN THE SOUTH OF SPAIN

Francisco Martínez Martínez[1], Miquel Ángel Sanz Franco[2], Pablo Nuñez[2], Tania Peralvarez[2].

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Objectives:

Chlamydia abortus is the primary cause of abortions in goats in Spain, causing great economic losses (Navarro et al., 2009). The infection induces an immune response that protects infected females against successive abortions, but they continue to excrete *Chlamydia abortus* when giving birth and during oestrus in the three subsequent years. This results in a trickle of abortions every year and an outbreak every 3 or 5 years.

The use of antibiotics to control this is being called into question. Antibiotics do not cure but reduce the multiplication of the bacterium when it is in the blood (Hogan et al, 2004).

The objective of this study was to evaluate the use of an inactivated vaccine against Chlamydia (INMEVA®) in an emergency and on exceptional prescription, on a goat farm.

Materials and methods:

The evaluation was performed on a farm of 350 goats of the Murciano-Granadina breed in the province of Granada, where there was a history of chlamydial abortions and a system with 5 kidding seasons per year.

In March 2019, an abortion outbreak occurred in which *Chlamydia abortus* was diagnosed. When it started, 128 goats that were due to give birth on 24th April, were given injectable oxytetracycline 200mg L.A. (one 5 ml intramuscular dose). In the following kidding season, in June, 90 animals were given the same dose of oxytetracycline on 30th May.

In August, 4 animals aborted before the anticipated birth date (19 September). It was then decided to vaccinate using an inactivated Chlamydia vaccine (INMEVA®). All the animals on the farm were given a double primary vaccination (17th August and 7th September).

Serum samples and vaginal swabs from aborted animals were sent from the June and August kidding seasons to confirm *Chlamydia abortus* diagnostic.

Results:

The history of aborted animals since 2017 shows the trend in abortions on the farm. The farmer reported an outbreak at the start of 2016. Since then, there have been a trickle with every kidding until the outbreak of 2019.

In March 2019, a new outbreak occurred which was attempted to control with antibiotic, but the rate of abortions was 13.3% (17 out of 128). Antibiotic was used again in the following kidding season and the abortion rate was 8.9% (8 out of 90). Serum and swap results confirmed *Chlamydia abortus* as the cause of the abortions.

In the August kidding season, it was decided to use an inactivated vaccine (INMEVA®). Only 2 abortions occurred after the vaccination and before the end of the November 2019 kidding season.

In the November kidding season, the percentage of abortions was reduced to 1.9%.

Conclusions:

Although vaccination against *Chlamydia abortus* is a preventive measure, in this case it was seen that its use during an outbreak can be a valid weapon and more effective than antibiotics.

In this study, a reduction of 80% in the rate of abortions was observed, from over 10% to below 2%.

ISVA Communications: Infectious reproductive diseases

P-04

SAFETY OF TWO *BRUCELLA MELITENSIS* VACCINE CANDIDATES IN PREGNANT SHEEP

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Objective:

To evaluate the safety of *Brucella melitensis* BGV1 and BGV2 live vaccine candidates in ewes at different stages of pregnancy.

Materials and Methods:

BGV1 and BGV2 attenuated mutants were developed by in-frame deletion of a specific gene implicated in O-polysaccharide biosynthesis. Both were selected for safety experiments in sheep because of their good properties in a pregnant murine model. Churra-breed ewes from *B. melitensis* and *B. ovis* free herds were synchronised for pregnancies at Instituto de Ganadería de Montaña (IGM; CSIC-Universidad de León) and, on day 50DG (Days of Gestation) they were moved to the VISAVET-Universidad Complutense de Madrid (UCM) BSL3 facilities (ES280790000154). Animal experiments were supervised by UCM Committee (CEA/OH-UCM-32-2018) and authorised the competent authority of Comunidad de Madrid (PROEX 187/18) and Agencia Española de Medicamentos y Productos Sanitarios (AEMPS, codes 194/PIV, 432/ECV). Groups of 6 pregnant ewes were subcutaneously inoculated in the left elbow with $2´10^{10}$ colony forming units (CFU) of BGV1 or BGV2, at mid (75DG) or final (130DG) pregnancy.

Animals were followed-up for clinical symptoms, serological response and bacterial excretion, until necropsy (4 weeks after parturition). Serological analysis against smooth and rough Lipopolysaccharide (S/LPS and R/LPS, respectively) included standard Rose Bengal (RBT) and Complement Fixation (CFT) Tests, and commercial indirect ELISA-R/LPS. Eventually, all ewes and lambs were euthanised and necropsied to determine the persistence and distribution of BGV1 or BGV2 in the organism of ewes as well as the transmission to lambs. Lymph-nodes and organ samples were removed, individually homogenised and cultured by duplicate in selective medium, at 37°C for 2 weeks.

Results:

No sheep presented clinical symptoms nor fever after vaccination. BGV1 and BGV2 induced similar serological responses, which were more perdurable in ELISA-R/LPS than in S/LPS tests. Most sheep (90% of BGV1 and 100% of BGV2) showed transient RBT reaction (<8 weeks) and only one ewe of each group displayed confirmatory results in CFT, showing low antibody titre (1/4). None of the sheep excreted BGV1 or BGV2 during pregnancy and all animals delivered healthy lambs. However, after parturition BGV2 was found in the placenta, vaginal fluid and/or milk from two ewes inoculated at 75DG and one ewe at 130DG. This bacterial excretion was accompanied by RBT and CFT seroconversion, which confirmed a vaccine infection reactivation. Furthermore, a widespread infection was showed at necropsy in those animals that excreted BGV2. This strain was also isolated from lymph nodes, spleen, vaginal fluid and milk from one sheep vaccinated at each stage. None of the ewes vaccinated with BGV1 excreted the strain at any moment.

Conclusions:

Subcutaneous vaccination with an overdose of BGV1 or BGV2 during pregnancy do not induce abortions nor bacterial excretion, however BGV2 was excreted at parturition and during lactation. BGV1 raises as a safer vaccine candidate to be evaluated for efficacy against virulent challenge.

P-05

SEROPREVALENCE AND RISK FACTORS ASSOCIATED WITH SMALL RUMINANT LENTIVIRUS INFECTION IN NORTH-EASTERN PORTUGAL - PRELIMINARY RESULTS

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The small ruminants lentiviruses (SRLVs) are a group of viruses responsible for Maedi-Visna (MV) in sheep and caprine arthritis encephalitis (CAE) in goats. Those diseases result in progressive and persistent infections that affect animal health and cause severe economic losses of production. In northeast of Portugal, the small ruminants farming has great economic and social importance. The typical farm uses traditional methods of animal production, carrying out year-round roaming grazing. Until now there is little information on the seroprevalence of SRLVs in Portugal, as well as about risk factors to these type of farming system.

Objectives:

The aim of our study is quantify the seroprevalence and risk factors associated with small ruminant lentivirus infection in north-eastern of Portugal.

Materials and methods:

A SRLV seroprevalence study was performed in the northeast of Portugal based on a stratified sample proportional to the number of sheep and goats per municipality. The small ruminant farmers were randomly selected and invited to participate and were submitted to a questionnaire to obtain information about the farm system. Between 14 and 19 blood samples were collected per farm according to the proportionality with the number of animals in each farm.

To this study we received samples from 38 sheep farms, 12 goat farms and 7 mixed farms.

Results:

The goat farms and mixed farms showed a seroprevalence of 100 % and the sheep farms showed a seroprevalence of 81.58%. The estimated animal seroprevalence in goats was 62.1% and in sheep was 35.1%. In mixed farms only blood samples were collected from sheep. The results obtained from the questionnaire given to farmers will be presented later.

A high seroprevalence of small ruminant lentivirus has been demonstrated in herds in north-eastern Portugal. It was also shown that individual and farm seroprevalence is higher in goats than in sheep.

Conclusions:

With this preliminar results, we conclude that lentivirus infection is a serious problem in small ruminants system of production in this region. In this sense, information campaigns should be carried out to small ruminant farmers about the existence of this group of viruses and its consequences for the health of their animals and the economy of the farm. We believe that government authorities should promote voluntary control and eradication programmes to reduce the prevalence of this disease in small ruminant herds in Portugal.

ECSRHM Communications

P-06

OCCURRENCE OF ENDOPARASITES IN SHEEP FLOCKS IN THE ALPINE REGION DEPENDING ON MANAGEMENT FACTORS AND THEIR IMPACT ON CLINICAL PARAMETERS

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Objective:

The aim of the study was to investigate the prevalence of endoparasites in sheep from the alpine region depending on management factors and their impact on clinical parameters.

Infections with endoparasites are one of the most prevalent health issues in small ruminants worldwide (Hertzberg and Sager, 2006). In Austria prevalences of gastrointestinal strongylids (GiSt) infections are reported between 65.6% (Lambacher et al., 2019) and 100% (Schoiswohl et al., 2017a, c). In the literature the prevalence of *Fasciola hepatica* in sheep in Austria is reported to be between 0 (Tix, 2012; Schoiswohl et al., 2017b; Lambacher et al., 2020) and 14.10% (Schoiswohl et al., 2018) and the prevalence of *Dicrocoelium dentricum* in sheep is reported to be between 0.06% (Schoiswohl et al., 2017a) and 14.68% (Lambacher et al., 2020). In Austria neither Lambacher et al (2020) nor Schoiswohl et al (2017a) nor Feichtenschlager et al (2014) detected *Dictyocaulus filaria* in small ruminants. The prevalence for Protostrongiliedes in Austria is reported to be between 2.30% (Lambacher et al., 2020) and 54.20% (Schoiswohl et al., 2017b).

Material and methods:

20 farms in the alpine Region of Tyrol, a federal state of Austria, were used for this study. The farms are breeding farms as well as finishing farms, dairy farms and some kept their animals as companion animals. Some farms are full-time and other farms are part-time smallholders. We tried to include different farmingtyps to represent typically farms in Austria. Most of the farms are not intensive farms, the animals were kept in stable in winter and were pastures in summertime. Especially in alpine regions many farms use alpine pastures in summer. Parasitological examination is not very popular and so most farmers use anthelmintic drugs without a previous investigation.

Results:

The results showed a high prevalence of GiSt, *Dicrocoelium dentricum* and Protostrongiliedes. Significant correlations between management factors, clinical parameters and prevalence of endoparasites could be detected.

Results are not published until yet and so all result will be presented in detail at the meeting.

Conclusion:

All grazing animals are at risk from infections with endoparasites with substantial morbidity as a possible consequence. This study shows the importance of faecal investigations because farmers should know about the endoparasite status of their animals to take action if necessary.

ECSRHM Communications

P-07

RIGIDITY OF TRACHEAL STRUCTURE PROMOTES TRACHEAL LESIONS IN OLDER SHEEP

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Very little research has been done on sheep tracheal lesions as they do not seem to be a factor that significantly influences the productive performance of affected animals. However, a study carried out by our group in Aragón (Spain), involving 41 sheep commercial farms and 17245 animals, showed a high prevalence of this disorder (100% collective prevalence and 12% individual prevalence) which mainly affected older animals, with more than 60% of cases found in sheep aged 7 years or more.

Objectives:

The objective of this work was to evaluate the resistance of the ovine trachea to compression forces according to age in order to elucidate possible reasons for a higher incidence of tracheal lesions in older sheep.

Materials and methods:

Thirty-five tracheas, without any lesion, from sheep of different ages, ranged from less than 1 year to more than 9 years (homogeneously distributed), were used in this study. Animals were euthanized, and at necropsy, tracheas were obtained and divided into three equal-sized portions (cranial, central and caudal). Using an Instron 5548 MicroTester machine, specifically designed to perform tests on biological tissues, the 105 tracheal portions were submitted to compression forces until the total occlusion of the trachea was achieved. The force needed to halve the tracheal diameter and the maximum breakage load (the force at which tracheal rings break) were registered and analyzed according to the age of the animals. Statistical analysis of data was performed using IBM SPSS statistics version 20.0 software (IBM, Armonk, NY, USA).

Results:

The force needed to halve the diameter of the central portion of the trachea was significantly higher ($p=0.047$) in sheep aged ≥ 9 years than in any other age group, although no significant differences according to the age were found for cranial and caudal tracheal portions. When the full length of the trachea was considered, also a greater force had to be applied in the group of animals aged 9 years or more, but in this case, a higher degree of significance was obtained ($p<0.001$).

About maximum breakage load, only 3 out of the 35 tracheas were broken before reaching full occlusion. The rupture occurred in the three portions of each affected trachea, so 9 out of the 105 tracheal portions analyzed were broken. All the broken tracheas belonged to sheep aged ≥ 9 years.

These results indicate the greater rigidity of the trachea in sheep older than 9 years, which could contribute to the higher incidence of tracheal lesions in older sheep. This could be related to the structural changes experienced by tracheal tissue over time, affecting the structure of the proteoglycan and the collagen content.

Conclusions:

Resistance of the trachea to compression forces is significantly higher in sheep older than 9 years and could be an important factor for the development of tracheal lesions.

ECSRHM Communications

P-08

CASEOUS LYMPHADENITIS. ATYPICAL CLINICAL PRESENTATIONS OF A COMMON DISEASE

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Caseous lymphadenitis (CLA) is a common disease widespread in most sheep-farming countries. The disease is associated mainly with two clinical presentations depending on the location of the pyogranulomatous lesions. If the development of the pyogranulomas is located in the superficial lymph node, it is known as superficial form, while if the granulomas are located in internal lymph nodes or even in organs, it is known as visceral form. However, over the last few years, atypical clinical signs associated with this disease have been detected.

Objectives:

The main objective is to collect clinical cases of atypical presentation associated with this pathology.

Materials and methods:

During the past three years, two fattening lambs and three ewes were diagnosed with atypical presentations of CLA after necropsy, and microbiological isolation of *Corynebacterium pseudotuberculosis* in the pyogranulomatous presentations found.

Each animal was subjected to a rigorous clinical examination, and a preliminary differential diagnosis was established. Subsequently, the necessary ancillary tests were performed in order to reach a final diagnosis (haematology, ultrasonography, thermography, computed tomography, etc.). Finally, all the animals were humanely sacrificed to conclude with the post mortem study, and lesions were sampled both for microbiological and histopathological analysis.

Results:

Both fattening lambs and one ewe were lame, reluctant to move and had an evident stunted growth. The animals came from different farms of origin. The lambs came forma multi-origin feedlot, while the ewe came from a farm with a high prevalence os *Caseous Lymphadenitis*. Haematology revealed leukocytosis with neutrophilia and thermography demonstrated an increased temperature of the affected joints. A computed tomography scan performed in one of the lambs revealed swelling with the destruction of joint structures and an important enlargement of the popliteal lymph node. Finally, an arthrocentesis of the affected joints was carried out in the three animals before they were humanely sacrificed to conclude with a complete pathological examination with a new sampling of affected joints. Massive and pure isolation of *Corynebacterium pseudotuberculosis* was obtained in the affected joints of the three animals in both samples.

The two remaining ewes were affected by different nervous clinical signs. One ewe was affected by clinical signs associated with a vestibular syndrome, like ataxia, difficulty to rise, circling, etc. This animal was subjected to neurological examination and computed tomography scan, which revealed a mass pressing the cerebellum. In the *post-mortem* study, a pyogranulomatous lesion was found and sampled, showing positive isolation to *C. pseudotuberculosis*. The other sheep was unable to rise, and after the neurological examination, it was revealed severe damage to the spinal cord. During the *post-mortem* study, a necrotic-looking material was observed enveloping the spinal cord. This material was sampled, and massive and pure isolation of *C. pseudotuberculosis* was also obtained.

Conclusions:

In addition to producing productivity losses in the flock, CLA can produce atypical clinical presentations, which can be confused with other diseases making it remain as an underdiagnosed disease.

P-09

PRESENCE OF DIFFERENT SEROGROUPS OF *DICHELOBACTER NODOSUS* AND ON-FARM MANAGEMENT STRATEGIES ON DUTCH SHEEP FARMS

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Objectives:

Lameness caused by footrot is considered to be one of the diseases with the highest impact on animal welfare and economic performance of sheep flocks. Although vaccination regimes can be very useful in control programs, the currently available multivalent vaccine seems to provide insufficient control and protection in some farms with footrot. Farm specific mono- or bivalent vaccines are likely to be more effective in those situations. As a feasibility study for use of specific vaccines this study was conducted in order to establish the presence of different *D. nodosus* serogroups on Dutch sheep farms.

Materials and Methods:

In March, April and May 2021, 24 farms were visited, 2 in each province. On all those farms, 20 sheep were sampled (one foot each) with footrot lesions ranging from 0-4.

For even representation of all clinical foot lesion scores, 10 swabs from each farm were selected for PCR analysis. For PCR testing, an initial D. *nodosus* specific RT-PCR targeting the polynucleotide phosphorylase *(pnpA)* gene was used. If a sample was positive in this RT-PCR, a *fimA* serogroup specific PCR was carried out to test for different serogroups (A-I). In addition, all farmers were asked to fill in a questionnaire regarding their footrot management strategies.

Results:

A total of 176 samples (73%) tested *pnpA* positive. Only 2 farms had all swabs negative and on the 22 farms with positive swabs the number of positives ranged between 1 and 10. Using the *fimA* PCR, 13 farms tested positive for a specific serogroup. Out of those 13 farms, 10 farms tested positive for one serogroup and the other 3 farms for 2, 3 or 4 serogroups. Serogroup B was found on 8 farms, serogroup A on 3 farms, serogroups D, F and I were each found on 2 farms and serogroups C and H were found on one farm each.

Out of the 19 farms that filled in the questionnaire, 5 farms used the multivalent vaccine against footrot and all tested *pnpA* positive. Using the *fimA* PCR, 2 of these farms tested positive for serogroup B and one tested positive for serogroup F. Four farms had vaccinated in the past, but with little effect. One of those farms tested *pnpA* negative, the other 3 farms tested 10 out of 10 samples positive.

Conclusions:

In the Netherlands serogroups A-I of *D. nodosus* are present (serogroup M was not tested). On the 13 farms where a serogroup could be detected, serogroup B showed the highest prevalence on farm level (62%). All of the 5 tested farms that are vaccinating using a multivalent vaccine tested PCR *pnpA* positive. As most farms (77%) tested only positive for one serogroup, the use of a farm specific monovalent vaccin could be an effective tool for the control and management of footrot on those farms. Because only 59% of the *pnpA* positive farms also tested positive on a serogroup using the conventional PCR, further development of a real-time PCR to detect *D. nodusus* serogroup/s in foot samples would be useful.

ECSRHM Communications

P-10

ARTIFICIAL INSEMINATION WITH TWO DIFFERENT VAGINOSCOPES OF CHURRA GALEGA BRAGANÇANA EWES

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Artificial insemination (AI) is the oldest reproductive technology used in animal production. It consists in the artificial deposition of semen in the female reproductive tract. The dissemination of this technic in sheep has been limited by the ewe cervix morphology and the difficulties to cryopreserve semen. AI efficiency depends on several factors as genetic, environmental conditions, feed, female energy status, production system, reproduction control protocol, semen collection and preservation methodologies, seminal doses volume and concentration, number of parturition, lambing-AI interval, AI technic, equipment's and materials, semen deposition site and inseminator skills.

Objectives:

The main goal of this paper was to compare the efficiency of two vaginoscopes in the AI of Portuguese Churra Galega Bragançana (CGB) ewes.

Materials and methods:

This study was performed at Braganza (latitude 41° 48' 33''N, longitude 6° 44' 3''W and Altitude 670 meters) between April 1stand June 5th. Forty-nine CGB ewes aging between 2 to 8 years were used. Body condition was scored according to the Australian classification table. In April 12thewes estrous was synchronized by long term FGA (20 mg) or CIDR (0.35 g) treatments and the injection of 500 UI of eCG at vaginal devices withdraw. Ovarian response to treatments were assayed by progesterone plasmatic levels. Blood samples were collected for 5 days' post eCG administration.Ewes were artificially inseminated 53 + 1 hours after eCG injectionwith chilled semen using a IMV vaginoscope (n = 23) or a new vaginoscope developed by Ovígén (n = 26). Ejaculates were collect by artificial vagina. Semen analysis was performed using a computer-assisted sperm analysis (CASA) system.

Results:

Selected ejaculates presented a volume ≥ 2.0 ml, a sperm concentration ≥ 3.0 x 10^9cells/ml, a motility ≥ 75% and a percentage of normal sperm cells ≥ 75%. Insemination doses contained at least 200 x 10^6sperm cells. Pregnancy diagnosis was performed by ultrasonography 41 days after AI. All ewes presented progesterone plasmatic levels higher than 0.5 ng/ml for the first five days' post eCG injection. About 81.6% of all ewes were pregnant 41 days after AI. Neither age nor body score condition affected significantly fertility rate (P>0.05). The synchronization protocol had not statistically significant on fertility rate (FGA + eCG: 84.6%*vs*. CIDR+ eCG: 78.3%; c^2=1.6; P>0.05). The type of vaginoscope had also not statistically significant on fertility rate (IMV: 87.0%*vs*. Ovígén: 76.9%; c^2=3.4; P>0.05).

Conclusions:

In conclusion both vaginoscopes result in high fertility rates. However, the Ovígén vaginoscope is easier to use since it allows to pin the vaginal opening of the cervix.

ECSRHM Communications

P-11

CESAREAN SECTION VIA PERINEAL REGION IN A EWE WITH HERNIATED UTERUS

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Objectives:

In small ruminants, diaphragmatic, umbilical and perineal hernias are rare, while the inguinal or inguino-scrotal ones are occasional and usually involve male animals; on the other hand, the most common would be represented by the ventral hernias. Among the herniated viscera, the uterus can be one of them and this can occasionally lead to dystocia although delivery can take place through the vagina. In these two species, the incidence of dystocia due ectopic uterus is low, but when it occurs caesarean section represents an emergency intervention that has the double aim to correct the dystocia and treat the hernia. Thus, this intervention attempts to avoid the loss of the dam and its offspring, and safeguard the animal welfare by preventing perioperative pain.

The authors herein describe an unusual perineal access for caesarean section in a dairy multiparous 5-year-old sheep affected by dystocia and recumbency because of the ectopic location of the pregnant horn within an abdominal hernia.

Materials and methods:

Local anesthesia was performed by injecting lidocaine 2% into both the ischial cavities (4 ml each side); reinforced by another one alongside the incision line (7 ml), vertically, about 10 cm in length and about 4-6 cm below of vulva. During the dissection of the anatomical layers, an important point was the identification of both the external pudendal arteries and veins since accidental sectioning can be fatal. Following the extraction of the fetuses (one alive and one dead), the uterus was saturated with two inverting layers using 1-0 PDS, and positioned into abdominal cavity. A herniorrhaphy of the lateral suspensor mammary ligament with simple knots using 1-0 PDS was performed. Subcutaneous tissue and skin were approached, individually in two layers, by using simple knots using 0 PDS. Postoperative care included 1,5 grams of dihydrostreptomycin and 1,5 million UI of penicillin G procaine (IM, OD, for 7 days), 2,2 mg/Kg bw of flunixin meglumine (IV, OD, for 2 days), and a shot of 30 UI of oxytocin (IM). The wound was treated with tetracycline-based spray for 7 days.

Results:

A follow-up was carried out at 10, 30, and 38 days after surgery, showing a complete recovery of the animal, and neither a relapse of the hernia, nor any vaginal discharge were registered. On the 38th day, a complete healing of the suture was observed.

Conclusions:

In the case here described, the hernia was probably the result of a trauma or a failure of the pelvic muscle-tendon structures, and the progression of gestation, increasing the volume of the hernial sac, played an important role on the dystocia itself.

Caesarian section is often a salvage procedure and do not requires complex surgical set, although basic anesthetic and surgical principles, and fundamental anatomic knowledge should be applied. The authors conclude that, although the small ruminants reared for food have, unfortunately, a low economical value that cannot always justify the cost of some veterinary assistance, in the case of herniated uterus and dystocia, a caesarean section represents a valid approach at an accessible price.

ECSRHM Communications

P-13

HIGH INCIDENCE OF RECTAL PROLAPSE IN A MEAT SHEEP FLOCK

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Objectives:

During the rectal prolapse, the rectum protrudes and remains exteriorized from the anus suffering circulation disturbance and exposes the mucosa to infections and wounds. The animals suffer loss of appetite, premature culling or, alternatively, death.

Rectal prolapse is observed in meat flocks, with an incidence from 2% to 10% and involving animals since weaning to 1 year of age. Multiple contributing factors are feed poor in fiber and rich in high-concentrate, plants rich in phytoestrogens, chronic cough, anatomical conformation in meat breeds, chronic diarrhea, extreme short tail docking, pregnancy and sex. In contrast, heritability has an uncertain implication.

In the present abstract, the authors describe cases of rectal prolapse in a flock of French meat sheep reared in Sicily (Italy), and discuss the potential causes.

Materials and methods:

The flock, of about 150 heads, was composed by a group of purchased adults (about 70 grazing ewes) and a group of young (about 80 finishing lambs and ewe lambs kept indoor with dusty and limited space, and fed *ad libitum* with a high-concentrate and poor fiber diets). Both groups were dewormed and vaccinated against clostridium. On newborn lambs, the owner practiced tail docking as close to the body as possible, in contrast of the adults that had a tail length of about 4-6 cm.

Results:

The owner reports that, annually, about 11% of the animals in the young group, mainly female, showed chronic lesions and premature culling. Five animals presented chronic rectal prolapse; they were disoresic and dehydrated, whilst another 3 showed intermittent signs especially during coughing or recumbency. Chronic cough in about 35% of the animals was observed. During the necropsy of 2 euthanized affected hoggets, the rectal mucosa appeared necrotic and covered with foreign bodies, whilst the rectum was filled with dry feces, ectasia of the urinary bladder and pneumonia were also observed. Samples of the lungs of the two animals and 6 nasal swabs from others with respiratory signs tested all positive for *Pasteurella multocida*. No diarrhea was observed in any animal.

Conclusions:

In countries with meat and/or wool ovine husbandry, the tail docking is performed to avoid the excessive soiling of the back with feces and to make breeding easier.

However, the excessive tail docking can itself predispose to myiasis and to rectal prolapse. This could occur because a radical amputation compromises the innervation of the anal sphincter. Moreover, feedlot lambs had a higher incidence than lambs on pasture. In this case, it is presumed that low motility of the animals, breed, poor fiber diet, and above all, chronic cough and extreme tail docking strongly implicated the development of the disease. Chronic rectal prolapse in sheep could not always be treated but it can be easily prevented, and the authors underline how good husbandry management plays an important role against several conditions that have a heavy impact on production and animal welfare.

ECSRHM Communications

P-14

STUDY ON THE EFFICACY OF SPECIFIC FOOT BATHS FOR FOOT-ROT MANAGEMENT IN SHEEP

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Objectives:

Foot-rot is an infectious disease caused by *Dichelobacter nodosus* that represents a worldwide economic and animal welfare issues. In the present study the authors assess the effectiveness of a protocol using specific foot baths, and evaluate the eradication of *D. nodosus* in a ewe flock.

Materials and methods:

A group of 59 symptomatic lactating ewes, belonged to a semi-intensively Sarda flock affected by foot-rot and reared in Cental Italy, were selected, segregated and used for the protocol. The flock tested positive for *D. nodosus* aprV2 strain. The trial was carried out on the original farm during the winter season.

The group was treated with specific foot bath (Intra Hoof-fit Bath Sheep® - Intracare BV) in a 5% solution (Dodecyl dipropylenetriamine, zinc chelate, isopropyl alcohol) twice a week for six weeks. The pathway lasted about 20 seconds in dedicated tanks (Intracare Stand-in Foot Bath®), followed by 30 minutes in a dried area. At T0, T1 (after 3 weeks), and T2 (after 6 weeks), sampling and eventual curettage were performed. Each animal was sampled with a single interdigital swabs of all four feet. Subsequently, the samples were processed in pools of 3-10 swabs each, according to the same SCS assigned (the SCS of the single animal was determined by the limb with the highest score, based on the BGK scoring - with a score of 1 to 5). A duplex q-PCR specifc for the detection of *D. nodosus* DNA was performed, allowing allelic discrimination between the virulent aprV2 strain and the benign aprB2 one. Before and during the study no antimicrobial treatment was administered to the animals, and after the trial they returned into the original flock.

Results:

At T0 swabs were pooled in 7 pools: 4 of them tested positive for the aprV2 strain, while the other were negative. At T1 swabs were divided in 7 groups: 5 of them yielded positive for the aprV2 strain, 1 was positive for the aprB2 strain, and 1 was negative. At T2 swabs were grouped in 8 pools: all of them resulted negative. In both T1 and T2, a significant reduction of clinical lameness was observed.

Conclusions:

The data provided in this study highliht that use of foot baths heavily reduce the presence of the virulent strain of *D. nodosus* and can facilitate the appearence of the benign strain. This selection of the benign strain could play a positive role in foot-rot management as it is related mainly to moderate lesions. This results encourage appropriate foot bath management rather than antimicrobial treatment.

Pooling for detection of *D. nodosus* represent a good compromromise between diagnostic skills and analysis costs, and this choise is essential for diagnostic purpose in a large folcks.

Further studies are needed, and a longer protocol (more than 6 weeks) may lead to more details.

ECSRHM Communications

P-15

CONSULTATION ON A RESOURCE FOR VETS, FARMERS AND VET STUDENTS ON THE PREVENTION OF ABORTION IN EWES AND REDUCING NEONATAL LAMB LOSSES

Kim Hamer.

University of Glasgow, Glasgow, United Kingdom.

Objectives:

To consult on the opinion of all attendees on a new online resource. Total lamb mortality is thought to be about 15% in UK flocks, but it has been shown to be anywhere between 1 and 43% depending on the farm and year. Of this, 30% are due to abortions, 49% is within the first 48hrs of being born, and an additional 11% is within the first 15 days of life. Also, the control of abortion in sheep was raised as a major area for which farmers required additional assistance and advice during the European SheepNet collaborative knowledge assimilation and exchange project. Therefore, the prevention of losses between scanning and weaning is important for health, welfare, productivity and viability of sheep flocks in the UK and across Europe.

This free resource brings together guidance from multiple sources and platforms to give veterinary surgeons, farmers and vet students a pertinent one-stop resource for guidance on avoiding preventable losses. These losses reduce animal welfare and production efficiency, therefore increasing the environmental impact of lamb production.

Materials and methods:

Attendees will be asked to access the resource on their mobile devices and provide online feedback and comments.

Results:

The resource being presented will be the result of collaborative work between the Universities of Edinburgh and Glasgow, and the European collaborative project SheepNet.

Conclusions:

The feedback received will be used to improve the resource and guide its application/promotion.

P-16

A COMPARISON OF HAEMOGLOBIN LEVELS IN THE BLOOD OF SUCKLED AND ARTIFICIALLY REARED, HOUSED AND OUTDOOR, LAMBS AND KIDS

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Objectives:

It is widely recognised that housed whole-milk fed calves are often iron-deficient, with subsequent anaemia, poorer growth rates and greater susceptibility to disease . Consequently, milk replacers contain higher iron levels than whole milk. The objective of this study was to compare the haemoglobin levels of artificially reared lambs and kids to suckled lambs and kids, to determine if the same trend observed in cattle is seen in small ruminants. In addition, a further comparison was made between indoor-reared suckled lambs and outdoor-reared suckled lambs.

Materials & Methods:

An early-lambing sheep flock was identified, where large numbers of lambs were artificially reared and suckled, and housed for their entire lives. This farm also had a smaller group of outdoor lambing ewes, so suckled, outdoor reared lambs were also available.

A large commercial dairy goat herd was the source of artificially reared, housed kids, while a small, Boer goat herd was the source of suckled, housed kids.

20 animals from each group were sampled by jugular venepuncture at 1 month of age, into EDTA sample pots, and were then submitted to a commercial veterinary laboratory (Axiom Veterinary Laboratories Ltd) for analysis for haemoglobin levels. Haemoglobin levels were then compared between the groups, using the statistical software package Minitab. Datasets within the species were compared by Student's t test.

Results:

The fraction of animals with haemoglobin levels below the normal range (8-14 g/dl) for each group was as follows:

Kids, indoor, suckled: 9/20.
Kids, indoor, artificially reared: 1/20.
Lambs, indoor, suckled: 16/20.
Lambs, indoor, artificially reared: 1/20.
Lambs, outdoor, suckled: 4/20.

The summarised results are as follows:

	Mean (g/dl)	Upper 95% CI	Lower 95% CI
Kids, indoors, suckled	7.73	8.24	7.21
Kids, indoors, artificially reared	9.65	10.23	9.07
Lambs, indoors, suckled	6.80	7.46	6.14
Lambs, indoors, artificially reared	10.13	10.89	9.37
Lambs, outdoors, suckled	9.08	9.66	8.49

Conclusions:

Mean haemoglobin levels of suckled, indoor reared lambs and kids are below the normal range, while the mean haemoglobin levels of artificially reared lambs and kids, and outdoor reared lambs, are within the normal range. The mean haemoglobin levels of suckled lambs and kids are statistically significantly lower than those of artificially reared animals and outdoor reared animals.

There appears to be the same pattern seen in indoor-reared small ruminants as seen in calves, whereby iron-deficiency anaemia appears to be present in suckled, but not artificially-reared, animals. Whether or not there would be an impact of iron supplementation on lamb and kid growth rates, morbidity or mortality, requires further investigation.

This project received ethical approval from the CRERB of the Royal Veterinary College.

ECSRHM Communications

P-17

FIRST REPORTED CASE OF ANTHELMINTIC RESISTANCE IN GOAT POPULATION IN ROMANIA

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Objectives:

Parasitic infections, in particular, those caused by gastrointestinal nematodes, are one of the main factors responsible for economic losses in goat production worldwide. The emergence of drug resistance among gastro-intestinal nematodes over the last three decades is the main threat to goat breeding. The aim of the study was to evaluate the effectiveness of the anthelmintics by faecal egg count reduction test (FECRT), egg hatch test (EHT) and larval development test (LDT) in goat herd in Romania.

Materials and methods:

The study was carried out in 2021 in a dairy goat herd from the Transylvania region, Romania. Ten adult goats (>6 months) were selected for the faecal egg count reduction test (FECRT). FECRT was performed with eprinomectin (EPM) and faecal egg count reduction percentage (FECR) was calculated. Moreover, egg hatch test (EHT) and larval development test (LDT) for *in vitro* detection of anthelmintic resistance (AR) were performed. The larval culture was performed 14 days after deworming and after baermannization, a minimum of 100 third stage larvae (L3) from each pool were identified at the genus or species level.

Results:

FECR in the treated group at day 0 and day 14 after treatment was -88% CI: -248%, -1% for EPM. Results of FECRT indicated the occurrence of resistance to EPM of gastrointestinal nematodes in the herd. Hatching at the threshold value for thiabendazole (0.1 µg/ml) was 89%, which indicated resistance to benzimidazoles. L3 larvae development in LDT was observed in threshold concentrations of: thiabendazole - 0.08 µg/ml (L3 development: 88%), ivermectin aglycone - 21.7 ng/ml (L3 development: 87.5%) and levamisole - 2 µg/ml (L3 development: 0%). LDT revealed only the development of *H. contortus* L3 larvae at threshold concentrations of anthelmintics. *Hemonchus* spp, *Teladorsagia* spp., and *Oesophagostomum* spp. were identified in coproculture 14 days after treatment with EPM.

Conclusions:

Anthelmintic resistance to benzimidazoles and macrocyclic lactones (EPM) was confirmed for the first time in goats in Romania.

No formal ethics consent was required for this study, except for the informed consent of participants.

SEOC Communications

P-18

THE EFFECT OF FEED EFFICIENCY ON MEAT QUALITY OF FATTENING LAMBS

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Introduction:

Lambs under fattening production systems in Mediterranean countries show a wide range of variation as far as feed efficiency is concerned; in other words, animals need to consume different amounts of feed to produce the same amount of meat. In this regard, it is known that some factors causing these differences may be related to variations in the development of skeletal muscle and adipose tissue, which can also affect the quality of the final product.

Objectives:

For this reason, the objective of this work has been to study the effect of two groups of Assaf lambs with differences in feed efficiency according to residual feed intake (RFI) values (EFFI, efficient vs. NEFFI, non-efficient group; n=10 lambs per group) on the chemical composition, texture, water holding capacity and fatty acid content of meat.

Material & methods:

All the lambs (n=20) were fed a complete pelleted diet (CPD) ad libitum and slaughtered when they were 85-days old. All handling practices followed the recommendations of the Directive 2010/63/EU (EU, 2010) of the European Parliament and of the Council on the protection of animals used for scientific purposes. The experimental protocols were approved by the IGM-CSIC Animal Experimentation Committee (protocol number 2018-E04).

Results:

The results obtained reveal that the least efficient lambs according to RFI values (-45.4 vs. 50.4 g DM/animal day-1 for EFFI and NEFFI lambs, respectively; $P<0.001$) presented a trend towards increased tenderness of the meat (77 vs. 68 Newtons for EFFI and NEFFI lambs, respectively; $P=0.059$), probably caused by reduced cooking losses (26.1 vs. 23.9% for EFFI and NEFFI lambs, respectively; $P=0.043$). Other physicochemical traits such as chemical composition, fatty acid profile, pH or color changes of meat under refrigerated storage were not significantly affected by feed efficiency in the present study. Based on the results observed in this study, the Assaf breed lambs showing higher feed efficiency during the fattening period could present a tougher meat and, therefore, reduced organoleptic characteristics, being this effect unrelated to differences in the chemical composition or the fatty acid profile of the meat.

Conclusion:

All these results suggest the need for a deeper knowledge (including differential gene expression analyses and sensory characteristics) regarding the overall effects of feed efficiency on meat quality before implementing breeding programs for high efficient Assaf fattening lambs.

Keywords: feed efficiency, lamb, meat, texture.

POSTERS

SEOC Communications

P-19

ANTIBIOTIC SUSCEPTIBILITY IN DIGESTIVE AND RESPIRATORY DISEASES IN FEEDLOT LAMBS

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Objective:

The digestive and respiratory processes (especially those produced by the Ovine Respiratory Complex, CRO) acquire great importance in the pathology of fattening lambs and in their economic losses. The aim of this work was to analyze the susceptibility / resistance to antibiotics of pathogens isolated from samples from digestive and respiratory processes in feedlot lambs within Spain and Portugal.

Material and methods:

The information from 418 antibiograms has been used, corresponding to 307 cases referred by 114 lamb fattening farms. In the cases related to digestive problems (DIG, n = 79), the only microorganism considered was *Escherichia coli* (EC). In the cases of the Ovine Respiratory Complex (CRO), 339 analyzes were carried out, corresponding to 228 cases. The pathogens studied were: *Biberstenia threalosi* (BT, n = 25), *Mannheimia haemolitica* (MH, n = 168) and *Pasteurella multocida* (PN, n = 146). Concerning the type of samples, in the DIG cases, samples of: intestinal loop (n = 24), intestinal swab (n = 47) and rectal swab (n = 8) were analyzed. In the ORC processes, the samples analyzed were obtained from nasal swab (n = 15), nasotracheal lavage (n = 137) and lung (n = 187). The period of the study was from 2015 to 2020 and was grouped into two periods (DIG: period 1 = 27, period 2 = 52; CRO: period 1 = 83, period 2 = 256).

A study of susceptibility among regions were also carried out.

In the antibiograms, 21 antibiotics were used, of course, not all of them indicated for the two types of processes studied.

The results were analyzed by means of an independent ANOVA for the DIG cases and for the CRO cases, for the factors: region of origin, material sent, microorganisms considered and periods. The SPSS IBM Statistics version 26 statistical package was used.

Results and conclusion:

The proportion of cases related to CRO processes was three times higher than those related to digestive processes.

Concerning regions, statistically significant differences ($p < 0.05$) were only found between regions in the ENR antibiotic, in the case of digestive diseases. In the respiratory ones, more differences were found.

The amount of susceptible antibiotics was significantly lower in the nasal swab samples (6.80) than in the nasotracheal lavage and lung samples (14.51 and 13.22).

Related to the pathogen agent, significant differences ($p < 0.05$) were found in the antibiotics: AMP, P, N and SxT, with lower susceptibility values in BT and higher values in MH and PM. The differences between these two groups were significant. Besides, the amount of susceptible antibiotics was higher in PM and MH (14.40 and 13.19) than in BT (10.16).

Regarding the effect of the period, statistically significant differences ($p < 0.05$) were found between the two periods studied, with higher susceptibility in the first period than in the second one for some antibiotics. These results may be indicative of the generation of resistance, despite the limited period considered.

SEOC Communications

P-20

THE EFFECT OF LOCAL FLAX BY-PRODUCTS IN DAIRY SHEEP DIET: MILK PARAMETERS AND CURD TEXTURE

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Society is increasingly demanding functional foods. Under this context, EMALIN project's objective was to promote locally cultivated flax as an alternative raw material for livestock feeding and the production of milk derivatives with a differentiated quality.

Flax seed has high content of polyunsaturated fatty acids (PUFA), specifically linolenic acid (ALA). The modification of the composition of milk fat could modify its technological functionality as well as the organoleptic characteristics of the product.

Under this context, the main aim of this work was to determine the effect of different flax inclusions in dairy sheep diet on: the zootechnical parameters, the fatty acid profile of the milk and the texture of the curds.

An assay was carried out during 5 weeks with 5 homogeneous groups of ewes. Diets were composed by 5 different concentrates formulated with: flax cake (C-15: 15% flax cake; T-25: 25%), flax oil (O-5: 5% flax oil and O-7: 7%) and commercial as control (CTR). Daily milk yield (DMY) and the composition of milk in fat (FC) and protein (PC) as well as the fatty acid profile were determined: saturated (SFA), monounsaturated (MUFA), PUFA, ALA and atherogenic index (H'). Curds were made the last week of the assay and texture was determined by a texturometer.

Average DMY was 2.565±162g/d and the composition was 5.6%±0.80 FC and 4.1% ±0.20 PC. DMY was not significantly affected by the concentrate. Regarding milk composition, CTR group showed the highest ($p < 0.001$) content of FC; the lower levels of flax-fed milks have already been described (Isenberg et al., 2018) which is associated to the presence of unsaturated oils in the rumen that predisposes the inhibition of *de novo* synthesis in the mammary gland (Rego et al., 2009).

Regarding the fatty acid profile, cake diets showed higher SFA than oil diets which could be due to their lower flax-oil content. Moreover, all flax diets showed higher MUFA, PUFA and ALA contents than CTR and lower H', being more marked the difference in oil diets.

In the case of the texture of the curds, C-15 diet showed significantly greater firmness and higher resistance to breakage, followed by CTR group. The reduction of texture in the rest of the diets could be due to presenting a less SFA profile, which is associated with a decrease in the hardness of dairy derivatives (Oeffner et al., 2012).

As conclusion of the study, sheep fed with flax showed the same milk yield as the control group, but lower levels of milk fat. Moreover, this fat showed higher PUFA and ALA contents and lower H'. Finally, curds made with milk obtained from C-15 diet presented significantly higher firmness than the rest.

SEOC Communications

P-21

SELECTION OF VARIABLES THAT ALLOW TO DIFFERENTIATE BETWEEN CONSUMERS OF FRESH, SOFT AND HARD GOAT CHEESE IN MADRID REGION THROUGH DISCRIMINANT ANALYSIS

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Objectives:

The aim of this work was to identify variables that could allow differentiating between consumers of different types of goat cheese (fresh, soft and hard) in Madrid Region (MR).

Materials and methods:

A cross-sectional telephone survey was carried out to a representative sample of 1,111 consumers in MR. Seven questions were related to cheese consumption habits: such as a) the type of cheese consumed according to the origin of the milk (cow, sheep, goat or mixed), b) treatment of milk (raw or pasteurized), c) components related to health (fat and salt), d) cheese price, e) place of purchase and f) the region where the cheese is produced. Consumers were asked about the importance of these factors when buying cheese. Socio-demographic characteristics of the respondents were also included: sex, age, household size, level of education, occupation and size of the city.

To differentiate values and attitudes towards the agri-food sector, variables related to the perception of agriculture, food industry and distribution chains, the role of different organizations in the defense of consumers and the truthful information that different institutions provide in relation to the food sector were included. Consumers who do not buy cheese, as well as those who, when buying goat cheese, answered that they did not know or did not answer the type of cheese they were buying were excluded, so four hundred and fifty-nine consumers were included in this work. A stepwise discriminant analysis was carried out to select variables that allow differentiating between consumers of different types of goat cheese (fresh, soft and hard) in MR.

Results:

112 variables were studied, and for 11 a significant difference was obtained between the groups of consumers ($P \leq 0.05$), of which 4 were selected in the model: a) is the situation of agriculture currently better than it was 10 years ago?; b) what is the maximum price are you willing to pay for the cheese; c) have you participated in a boycott of a product for political or social reasons? and d) do you think that food safety is the main concern of traders?. Hard cheese consumers were the most optimistic about the situation in agriculture, as they were willing to pay a higher price for cheese, and they disagreed with the idea that food safety is the main concern of traders. Consumers of soft cheese participated to a greater extent than the rest in the boycott of a product for political or social reasons.

Conclusions:

Consumers of goat hard cheese valued more positively the evolution of agriculture in the last 10 years. They were willing to pay more for the cheese (20 euros/kg). They did not consider food safety to be the main concern of traders.

Consumers of goat soft cheese were more critical of the evolution of agriculture in the last 10 years. The maximum price they were willing to pay does not exceed 16 euros/kg. They participated to a greater extent than the rest of consumers in the rejection of a product for political or social reasons.

SEOC Communications

P-22

IMPORTANCE OF ECONOMIC, HEDONIC AND HEALTH FACTORS FOR THE PURCHASE DECISION OF THE DIFFERENT TYPES OF CONSUMERS OF GOAT CHEESE IN MADRID REGION

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Objectives:

The aim of the work was to study the importance of hedonic, economic and healthy factors for consumers of fresh, soft or hard goat cheese in Madrid Region (MR).

Materials and methods:

A cross-sectional telephone survey was conducted with a representative sample of 1,111 consumers over 15 years of age in MR. Consumers were asked about the importance when buying cheese of questions related to cheese consumption habits: a) components related to the health (fat and salt), b) economic (cheese price) and c) hedonic as the origin of the milk (cow, sheep, goat or mixed), treatment of milk (raw or pasteurized), region of origin of the cheese and Protected Designation of Origin (PDO) valued on a scale of four levels: not important, important, very important, or do not know or do not answer. Consumers who do not buy cheese were excluded (984 consumers were included). Bivariate analyses were conducted with the use of cross-tabulation analysis. Data were analysed by means of the statistical package IBM® SPSS® (version 22).

Results:

Goat cheese consumers can be classified into four groups according to the kind of goat cheese that they consume: fresh cheese (13%), soft (20%), hard (14%) or undecided (they do not know or do not answer) (53%).

There were differences between goat cheese consumer`s groups for the importance of cheese salt content (not for fat content), the region of origin of the cheese, the species from which the milk comes from or whether the product was protected by a PDO label. There were no differences in the price or the pre-treatment of the milk (pasteurization). Artisanal or industrial were factors not taken into account by consumers when deciding on the goat cheese purchase format in MR.

Consumers of fresh cheese responded in a greater proportion that salt content was very important and that the species from which the milk comes (sheep, goat or cow) was not important. Consumers of hard cheese were more influenced by the fact that the product was covered by PDO. Consumers who do not know or do not answer the type of cheese they buy affirmed to a greater extent that the salt content was not important. The region of origin of the cheese was an important characteristic to a greater extent for consumers of fresh and hard cheese.

Conclusions:

The percentage of salt in the cheese, the milk (sheep, goat, cow or mixture) used to make the cheese, the region of origin or the protection under a PDO Label were important factors for the decision of purchase. Price, treatment of the milk (pasteurization), fat content, or the fact that the cheese factory was artisan or industrial were not factors that were taken into account when deciding on the goat cheese purchase format in Madrid Region.

Thus, it can be stated that goat cheese consumers are inclined towards one type of ripening time when buying goat cheese depends on fundamentally healthy factors (for consumers of fresh cheese) or hedonic (consumers of hard cheese).

SEOC Communications

P-23

PERCEPTION OF FOOD SAFETY BY DIFFERENT TYPES OF GOAT CHEESE CONSUMERS IN MADRID REGION

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Objectives:

The aim of this work is to study if there are differences between the different types of goat cheese consumers regarding their perception of the safety of different foods in Madrid Region.

Materials and methods:

A cross-sectional telephone survey was conducted with a representative sample of 1,111 consumers over 15 years of age in Madrid Region. Consumers were asked about the type of goat cheese they consume (fresh, soft, hard or undecided when they do not know or do not answer). Consumers were asked also about the safety of different foods, with 4 alternative answers: very safe, fairly safe, not at all safe and don't know or no answer. Consumers who do not buy cheese were excluded. Bivariate analyses were conducted with the use of cross-tabulation analysis. Data were analysed by means of the statistical package IBM® SPSS® (version 22).

Results:

Different types of goat cheese consumers (fresh, soft, hard or undecided) had a different perception of the safety of different types of food: fruits and vegetables, canned tomatoes, veal and veal organic, sausages and food in restaurants. There were no significant differences in the perception of the safety of chicken, eggs, pork, fresh tomatoes, hamburgers or low-fat food (light products).

Consumers of fresh cheese thought to a lesser extent that fruits and vegetables are not safe. They also had confidence in the safety of organic beef, since fewer say they do not know or do not answer the question about the safety of this food and more people think it is very safe.

Consumers of soft cheese thought in greater proportion that fruits and vegetables are not safe. They also had confidence in the safety of organic beef, since fewer say they do not know or do not answer the question about the safety of this food and more people think it is very safe.

Consumers of hard cheese are the ones who most trust the safety of sausages.

Undecided consumers responded to a lesser extent that fruits and vegetables are very safe and to a greater extent that they are quite safe. There are also fewer hesitant consumers who thought canned tomatoes are very safe foods. They also answered to a lesser extent that organic veal is a very safe food and there are more who answer that they do not know or do not answer the question of the safety of this food. They were also the most pessimistic about the safety of sausages, with fewer who thought they are very safe and more who thought they were quite safe.

Conclusions:

Consumers of fresh goat cheese were those who perceive to a greater extent that the food is very safe. Fresh cheeses were perceived as foods with a higher microbiological risk than soft and hard cheeses, so consumers who buy them trust their safety. That type of consumer seems to trust food safety more than the rest. Undecided consumers perceived to a lesser extent that food is safe.

SEOC Communications

P-24

IMPORTANCE OF SOCIO-ECONOMIC FACTORS FOR THE PURCHASE DECISION OF THE DIFFERENT TYPES OF GOAT CHEESE CONSUMERS IN MADRID REGION

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Objectives:

The aim of this work was to find differences in the percentage of consumers who buy fresh, soft or hard goat cheese or undecided in Madrid Region (MR) as a function of different socio-economic variables. The socio-economic variables included were sex (S), size of the municipality of residence (MS), level of education (EL) and number of people living in the household (NP).

Materials and methods:

A cross-sectional telephone survey was conducted with a representative sample of 1,111 consumers over 15 years of age in MR. Consumers were asked about the type of goat cheese they consume (fresh, soft, hard or undecided, when they do not know or do not answer) and the frequency of purchase of each type of cheese was studied according to S, MS, EL and NP variates. Rural municipalities were considered when the number of inhabitants was less than 15,000. To carry out this work, consumers who do not buy cheese were excluded (984 consumers were included). Bivariate analyses were conducted with the use of cross-tabulation analysis. Data were analysed by means of the statistical package IBM® SPSS® (version 22).

Results:

Forty-six percent of the consumers surveyed were men. The age distribution was 13% under 30 years old, 38% (30-49), 23% (50-65) and 25% (over 65 years). Seven percent of the consumers lived in municipalities with less than 15,000 inhabitants.

No differences were detected between the different types of cheese consumers in relation to S or NP.

Considering the total population of MR 12.70% of consumers buy fresh cheese, 20.22% soft, 13.72% hard and 53.35% were undecided

In rural areas, more hard cheese and less fresh cheese (3,95%) are consumed than in cities. In rural areas 3,95% of the consumers buy fresh cheese (13,44% in cities), 19,77% buy soft cheese (20,26% in cities) and 26,32% buy hard cheese (12,67% in cities).

Consumers without studies consumed less hard cheese (2,44%) those with a basic education buy less soft (12,87%), consumers with secondary education level consumed less fresh cheese (6,25%) and consumers with university studies consumed more soft cheese (25,32%). Secondary education level of studies marked a limit in relation to the knowledge of the type of cheese that is consumed. Consumers with university studies responded to a lesser extent that they do not know or do not answer what type of goat cheese they consume (48,4%). Besides, consumers without studies, with a basic education level and with secondary studies responded in a higher proportion that they do not know or do not answer what type of goat they consume (68,29%, 60,52% and 57,14%, respectively).

Conclusions:

The size of the municipality, its rural or urban character, as well as the academic level achieved by consumers are important factors for goat cheese purchase decision. The traditional cheese culture is different in rural and urban areas, although located in nearby regions. The degree of education of consumers determines different consumption patterns of goat cheese, although a gradient can only be established up to a level of secondary education.

SEOC Communications

P-25

BODY WEIGHT AS A PREDICTOR OF SCROTAL CIRCUMFERENCE IN XISQUETA AND ARANESA BREED RAMS

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Introduction:

The importance of autochthonous breeds lies in their adaptability to the environment, their conservation being essential to contribute to the sustainability of the population and rural development. However, breeder selection in these breeds is often undervalued and underestimated by producers. The scrotal circumference (SC) is an essential measure for the reproductive strength evaluation in males, since it presents high positive correlations with testicular volume and therefore, with sperm production capacity. However, the determination of this reproductive parameter is not habitually registered by producers since this practice is time consuming and requires certain training. Furthermore, it is well known that the SC presents a high positive correlation with body weight (BW) in rams.

Objective:

To obtain a statistical model that allows predicting the SC from the BW measurements in rams of the endangered Catalonian autochthonous breeds Xisqueta and Aranesa.

Materials and methods:

The SC and BW measurements of 8 Xisqueta breed rams and 10 Aranesa breed rams between 6 and 36 months old were used to obtain the models that relate these parameters. In each animal, both SC and BW were measured monthly from 6 to 18 months old, and quarterly from 18 to 36 months old, obtaining a total of 339 measurements (19 by male, except for one Aranesa male in which only 16 measurements were recorded). Statistical analysis was performed using the simple regression method comparing 4 models (linear, quadratic, logarithmic and potential). The REG procedure of the SAS statistical software (V 9.4, 2015, SAS Institute Inc., Cary, NC, USA) was applied for the linear and quadratic models, and the NLIN procedure (from the same software) for the logarithmic and potential models. The best model was determined by the coefficient of determination (R^2).

Results:

On average, the Aranesa breed rams were heavier and with a higher SC measurement than the Xisqueta breed rams (79.91 kg ± 14.17 kg and 65.51 kg ± 11.26 kg for BW, and 34.02 cm ± 2.77 cm and 30.61 cm ± 2.61 cm for SC, respectively). All models were statistically significant ($P<0.001$). However, with the potential model the highest R^2 was obtained (99%) for the two breeds, while with the other models the R^2 was below 15% and 19% in the Xisqueta and Aranesa breeds, respectively. The predictive functions resulting from the potential model were: $SC = 15.33 \times BW^{0.17}$ in Xisqueta breed and $SC = 14.81 \times BW^{0.19}$ in Aranesa breed.

Conclusion:

The potential model was the best model to predict the SC from the BW measurements in Xisqueta and Aranesa breed rams between 6 and 36 months old, simplifying the selection of future breeders in these autochthonous breeds.

SEOC Communications

P-26

SEX AND SLAUGHTER WEIGHT EFFECT ON CARCASS CONFORMATION IN SUCKING LAMBS OF COLMENAREÑA OVINE AUTOCHTHONOUS BREED OF MADRID REGION

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Objectives:

The aim of the work has been to study meat quality of lambs of Colmenareña ovine breed, autochthonous of Madrid Region (MR) and the effect of sex and weight (light lambs or LL with a cold carcass weight less than 6 kg or heavy lambs or HL if it is greater than 6 kg) on suckling lamb carcass quality.

Materials and methods:

Thirty-seven sucking lambs (17 females and 20 males) of Colmenareña ovine breed were slaughtered at weaning (natural lactation) in a commercial slaughterhouse in accordance to the Spanish rules regarding transportation and slaughtering of meat animals. Lambs were supplied by breeders in Comenareña Ovine Breed Sheep Breeders Association.

Carcasses were weighed and hot carcass weight (HCW) and cold carcass weight (CCW) were obtained. CCW mean was 5.423 kg, and lambs were classified into two groups according to weight: light lambs (LL) and heavy lambs (HL). Objective and subjective measurements of carcass conformation were carried out according to the methodologies described by Colomer-Rocher (1988), the European Union (DOCE, 1992 and 1993), and Ruiz de Huidobro *et al*. (2004). The rest of carcass characteristics were determined following the methodology described by Colomer-Rocher *et al*. (1988) and Ruiz de Huidobro *et al*. (2005). Statistical analysis of the results was performed using the SPSS statistical package for Windows, version 21. To study the effect of the interaction between weight and sex on the quality variables of the carcass, an analysis was carried out using the model option general linear univariate of the statistical package. Carcass quality variables were selected as dependent variables and sex and carcass weight were included as fixed effects.

Results:

No interaction between weight and sex was observed for any variable studied, so both effects were studied independently. Weight had a greater effect than sex on degree of fatness and carcass conformation parameters. As carcass weight increased, carcass amount of subcutaneous fat increased accordingly ($p< 0,001$). LL lambs had lower fatness scores according to Colomer-Rocher *et al.* (1988) scale (1,07 vs 1,34), European Union official scale (1,37 vs 1,54), and Ruiz de Huidobro *et al*. (2005) scale (1,45 vs 2,22). LL lambs also had lower kidney knob and channel fat scores than HL, although no lesser thickness fat was measured. Measures taken on the carcass increased significantly as carcass weight grew. Lower values were obtained for buttock perimeter and buttock length, chest length, chest width, carcass internal length and hind limb length in LL.

Sex only had an effect on the subjective evaluation of carcass fatness according to the European Union scale (1,48 points for male carcasses and 1,33 for female, $p< 0,05$).

Conclusions:

Colmenareña ovine breed LL carcasses obtained lower scores for degree of fatness and conformation variables, both measured either subjectively or objectively.

No statistically significant variations were observed for most carcass quality variables (conformation and degree of fatness), due to sex.

SEOC Communications

P-28

SEX AND SLAUGHTER WEIGHT EFFECT ON MEAT QUALITY IN SUCKING LAMBS OF COLMENAREÑA OVINE AUTOCHTHONOUS BREED OF MADRID REGION

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Objectives:

The aim of the work has been to study the effect of sex and weight in light lambs (LL), with a cold carcass weight less than 6 kg, or heavy lambs (HL), if it is greater than 6 kg, on suckling lambs of Colmenareña ovine breed meat quality.

Materials and methods:

Thirty-seven lambs (17 females and 20 males) of Colmenareña ovine breed were slaughtered at weaning (natural lactation) in a commercial slaughterhouse in accordance with the rules of Spanish legislation regarding transportation and slaughter of meat animals. Lambs were supplied by breeders from the Comenareña Ovine Breed Sheep Breeders Association. *Longissimus thoracis et lumborum* muscle of the right half carcass was taken, from its inception to the fifth thoracic vertebra, to perform water holding capacity (WHC) and moisture, techniques that were performed on fresh meat, 24 hours after the slaughter of the animal. Chop were cut from the left half-carcass at level of the thirteenth thoracic vertebra and colour photographs were taken of them with a ruler as a reference. Chop's area and dimensions were calculated by image analysis.

The portion of muscle between sixth and twelfth thoracic vertebrae was used to carry out instrumental texture analysis, performed on raw meat samples. The muscle from the twelfth thoracic vertebra to the sixth lumbar vertebra of both half-carcass was used for sensory analysis (performed by a panel of 10 trained judges) and determination of intramuscular fat content. WHC, texturometry (Warner-Bratzler and Texture Profile Analysis (TPA)) and sensory analysis were performed according to Ruiz de Huidobro *et al.* (2003).

Results statistical analysis was carried out using the SPSS statistical package for Windows, release 21. The effect of the interaction between weight and sex on meat quality variables was carried out using the model option general linear univariate of the statistical package. Meat quality variables were selected as dependent variables, and sex and carcass weight were included as fixed effects.

Results:

No interaction between weight and sex was observed. LL lambs showed a lower value of WHC ($p < 0,001$) and had more moisture and a higher intramuscular fat content ($p < 0,05$). The proportion of intramuscular fat was less than 3%. Chop area and chop largest diameter were greater in HL. Instrumental texture analysis showed that females' meat was more tender ($p < 0,05$) and reached lower chewiness values ($p < 0,05$) than males'. It was showed that LL had a greater intensity of flavour ($p < 0,05$). There were no significant differences for the rest of the sensory attributes assessed between LL and HL groups of lambs and there was no sex effect on any of the sensory variables.

Conclusions:

There were practically no significant differences in instrumental and sensory characteristics depending on the sex. Weight had a more important effect than sex on Colmenareña ovine breed suckling lambs meat quality.

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EPIDEMIOLOGICAL SURVIELLANCE OF *MYCOBACTERIUM AVIUM* SUBSP. *PARATUBERCULOSIS* IN SMALL RUMINANTS IN SOUTHERN SPAIN

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Objectives:

Paratuberculosis is a worldwide chronic infectious disease caused by *Mycobacterium avium* subsp. *paratuberculosis* (MAP), which mainly affects domestic and wild ruminant species. This disease has an important economic impact on small ruminant production due to production losses and costs associated with the implementation of control measures. Although paratuberculosis is endemic in Spain, epidemiological information on this disease is still very limited in this country. Therefore, the aims of the present study were to assess the seroprevalence, spatial distribution and risk factors asssociated with MAP infection in sheep and goat in southern Spain.

Materials and methods:

A cross-sectional study was carried out to determine the seroprevalence, spatial distribution and risk factors associated with MAP exposure in sheep and goat in Andalusia (southern Spain). Serum samples from 4,134 small ruminants (2,266 sheep and 1,868 goats) from 153 flocks were tested for antibodies against MAP by an in-house ELISA.

Results:

Antibodies against MAP were detected in 8.1% (183/2,266; 95% CI: 7.0 - 9.2%) of sheep and 19.4% (363/1,868; 95% CI: 17.6 - 21.2%) of goats. At farm level, 118 of the 153 farms (77.1%; 95% CI: 70.5 - 83.8%) were seropositive to MAP. Seropositivity was detected in 66.3% (55/83; 95% CI: 56.1 - 76.4%) of the sheep flocks and 90% (63/70; 95% CI: 83.0 - 97.0%) of the goat flocks. Significantly higher seropositivity was observed in goats compared to sheep, both at individual ($p < 0.001$) and farm level ($p < 0.001$). The spatial analysis identified three statistically significant clusters ($p < 0.05$) associated to areas with higher seroprevalence of MAP at farm level. The main risk factors potentially associated with MAP exposure were: the species (goat), the absence of perimeter fence and the presence of wild ruminants. The results confirm a widespread circulation of MAP in small ruminants in southern Spain.

Conclusions:

The high farm prevalence and the significant spatial clusters identified, indicates the need to establish risk-based surveillance programs for developing most cost-effective control strategies for MAP in small ruminant farms in this region.

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P-30

EPIDEMIOLOGICAL STUDY OF PREVALENCE OF GASTROINTESTINAL PARASITES AND TYPE OF INFECTION IN SHEEP AND GOAT FLOCKS IN SOUTH-WESTERN SPAIN

Pablo Jose Rufino-Moya[1], Lilian De Paula Gonçalves Reis[1], Pablo González García[1], Isabel Acosta García[1], Álvaro Martínez-Moreno[1], Rafael Zafra Leva[1], Almudena Sánchez Gómez[2], Francisco García García[3], Diego E. Ruiz Di Genova[4], Javier Martínez Blasco[5], Francisco Javier Martínez-Moreno[1].

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Objectives:
The aim of this study was to evaluate the prevalence of the gastrointestinal parasite burden as well as the type of infection (simple, double, or multiple) in different types of management (veterinary advice, anthelminic rotation and frequency of anthelmintic treatment) in small ruminant (sheep and goat) farms according to the type of production (meat or dairy) and age (replacement or breeding).

Materials and methods:
For this study, a total of 198 farms (159 sheep farms and 39 goat farms) were consulted during the period of April to May 2021. Farmers were surveyed about the herd management. Faecal samples were individually obtained from the rectum and kept at 4°C until analysis. Two pools were made with faecal samples collected from three rearing animals and three breeding animals on each farm. These faecal pools were analysed using the McMaster method and the results were expressed as eggs/oocyst per gram faeces (EPG or OPG). Parasite's egg and oocyst were identified morphologically as *Eimeria spp.*, *Moniezia spp., Dicrocoelium dendriticum* and *Trichuris spp.* In the case of strongyles, only was able reach to suborder level (Strongylida). The data were analysed using descriptive statistics and prevalence was calculated. Fisher's exact test was applied to study the association between survey items and parasite burden.

Results:
Coprological analysis showed the same parasite species in sheep and goats, except for *Dicrocoelium dendriticum* (only in sheep with 2.01% of prevalence). Meat-producing sheep showed higher abundance of parasite species than dairy sheep. Most of goat herds presented simple type of infection (*Eimeria spp*), showing a prevalence of 98.11% and an average load of 18771.79 OPG. Sheep herds showed frequently double infection (*Eimeria spp.* and Strongylida), presenting a prevalence of 51.43% and an average load of 3371.46 of OPG and 144.79 EPG, respectively. Milk-producing sheep presented simple infection by *Eimeria spp*, with a 56.52 % of prevalence and 6754.35 OPG of average load. However, meat-producing sheep showed principally double infections (*Eimeria spp. and Strongylida*) with 52.0% of prevalence and an average of 3088.73 OPG and 148.73 EPG, respectively. The replacement animals and breeding animals showed principally double infections in sheep (48.95% and 53.54%) and simple infection in goat (94.87% and 69.23%).
The Fisher's exact test showed a significant association in general between the prevalences of *Eimeria spp.,* Strongylida and *Moniezia spp.* and the ruminant species (P<0.001). A significant association was also observed in meat-producing sheep with the presence of Strongylida (P=0.04) and *Moniezia spp.* (P=0.006). Replacement animals presented a significant increase of *Eimeria spp*. compared with breeding animals (17866.28 vs 1209.02 OPG; P<0.001).
Respect to the survey items, only the frequency of deworming influenced the prevalence of Strongylida. The lowest percentage of animals without parasites (18.53%) was associated with the animals deparasitized more than twice a year (P=0.038).

Conclusions:
Sheep and goats have similar gastrointestinal parasite species, although prevalence is influenced by ruminant specie, type of production and age. The most frequent infections are the single infection with *Eimeria spp.* (40.16%) and double infection with *Eimeria spp.* and Strongylida (43.62%).

POSTERS

SEOC Communications

P-31

EFFECT OF CLIMATE WINTER/SUMMER ON PREVALENCE OF GASTROINTESTINAL PARASITES IN ORGANIC SHEEP FARM IN IBERIAN PENINSULA: PRELIMINARY RESULTS

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Objectives:

The aim of this work was to study the effect of winter/summer on the prevalence of gastrointestinal parasites in organic sheep farms in the southwest of the Iberian Peninsula.

Materials and methods:

This study has been carried out on 6 sheep organic farms in the southwest of the Iberian Peninsula (Spain and Portugal), an area characterized by a *dehesa* landscape, where sheep were reared in an extensive system. Faeces samples were collected individually from 209 sheep. Each farm was sampled twice, once in winter and once in summer 2021. Three grams of each faecal sample was analysed based on the McMaster method. Results from the coprological study were expressed as eggs per gram faeces (EPG) or oocyst per gram faeces (OPG). Parasite's egg and oocyst were identified morphologically to genus (*Eimeria spp.*, *Moniezia spp.*, *Nematodirus spp.*, *Dicrocoelium dendriticum*, *Trichuris spp.* and *Dictyocaulus spp.*), or in the case of strongyles, to suborder level (Strongylida). The prevalence was expressed as the percentage of positive samples in relation with the total of samples analysed. Significant differences between samples (winter/summer) from the same farm were analysed with Fisher's exact Test. A P value < 0.05 was considered significant.

Results:

Eimeria spp. and Strongylida were present in all farms, while *Nematodirus spp.*, *Trichuris spp*., *Moniezia spp*., *Dicrocoelium dendriticum* and *Dictyocaulus spp*. were observed irregularly. The prevalence found in farms for *Eimeria spp.* and Strongilida ranged from 34.5-100 % and 5.5-92.1 %, respectively. The prevalence for *Nematodirus spp*., *Trichuris spp.*, *Moniezia spp*. and *Dicrocoelium dendriticum* ranged from 3.2-31.2 %, 2.6-10.5 %, 2.6-10 % and 2.6-43.8 %, respectively. *Dictyocaulus spp*. only occurred with a prevalence of 5.3 %. The highest prevalence values occurred mainly in the summer.

Two farms showed a significant effect of season on the prevalence of *Eimeria spp*., with one farm showing a higher prevalence in summer and the other in winter. All farms showed a significant seasonal effect for Strongylida prevalence. Five of them showed an increased prevalence in summer and one in winter. *Moniezia spp*. was found in both seasons, showing not seasonal effect. With regards to *Nematodirus spp*., *Trichuris spp*. and *Dicrocoelium dendriticum* presented a residual prevalence (only in some farms), they were observed in summer and were absent in winter. The opposite was observed with *Dyctiocaulus spp.*, which was present only during winter.

Conclusions:

Eimeria spp. and Strongylida were present on all farms and had the highest prevalence rates.

Summer is the season with higher prevalence of the different species on most farms.

These findings agree with the usual observation of these parasites. Nevertheless, a deeper prevalence study should be carried out in the temperate seasons (spring and autumn) in order to cover the whole year and determine the influence of the different seasons of the year on the prevalence of these gastro-intestinal parasites.

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P-32

STUDY OF THE PREVALENCE OF GASTROINTESTINAL PARASITES IN LAMBS RECENTLY ARRIVED AT THE FEEDLOT IN THE SOUTHWESTERN OF SPAIN

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Objectives:

The aim of the study was to know the prevalence of gastrointestinal parasites, the type of infection (single, double, or multiple) as well as the association between the presence of parasites with the appearance of clinical signs in lambs prior to entry to the feedlot in farms located in the southwestern of Spain.

Materials and methods:

Faecal samples from 195 farms were analysed. These sample were taken in duplicate from lambs prior to entering the feedlot. Thus, the faecal samples were classified according to the presence of clinical sings in two categories: “with clinical signs” and “without clinical signs”. Due to the high number of animals, the main sing evaluated was the presence of diarrhoea with perianal soiling, which was classified on a dag score from 0 to 5 (0: no faecal soiling; 1: very slight soiling; 2: slight soiling; 3: moderate soiling; 4: severe soiling; 5: very severe soiling with watering diarrhoea). A score from 3 onwards has been considered as “positive clinical sing” in this study.

Sampling was carried out between February and April 2021. Samples from lambs were obtained from the rectum and kept at 4°C until taken to the laboratory for coprological analysis. Three grams of each sample were examined according to the McMaster method. Parasites were identified based on oocyst/eggs morphology. According to this, were identified the genus *Eimeria spp.*, *Moniezia spp.*, *Nematodirus spp.* and *Trichuris spp.* For strongyles, the identification reaches the suborder level. The data were analysed using descriptive statistics, estimating the prevalence, expressed as the percentage of positive samples respect to the total number of samples examined. The relation between the presence of clinical signs and parasite burden was evaluate with Fisher’s exact test.

Results:

In the animals studied, the most prevalent parasites were coccidia (*Eimeria spp.* 99%), followed by strongyles (52%) and to a lesser extent *Moniezia spp*. (10%) and *Trichuris spp*. (4%). The presence of *Nematodirus spp*. was residual (1%). These parasitosis were observed with single (45%), double (43%) or multiple (11%) frequency. Statistical analysis using Fisher’s exact test revealed that there was no association between the presence of clinical signs (diarrhoea with perianal soiling with a score greater than and equal to 3) and high coccidial burden or the presence of helminths. The percentage of animals without clinical signs was 73% of the total number of animals evaluated.

Conclusions:

The results from this study concludes that in lambs prior to arrive at the feedlot the most frequent infections were *Eimeria spp*. followed by strongilids, in a single infection or double infection (composed by *Eimeria spp* + strongilids). Statistical study showed that the presence of clinical signs was not related to parasite infections. It should be noted that this is the first study carried out in Andalusia on the prevalence of the most frequent parasites in lambs prior to fattening.

SEOC Communications

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ULTRASOUND EVALUATION OF TESTICLES IN PREPUBERTAL, PUBERAL AND ADULT MALE SHEEP

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Objetives:

The objective was to evaluate characteristics of testicles, epididymis and pampiniform plexus with ultrasound.

Materials and methods:

All the methods used, as well as the handling of the sheep and the young that made up this study are strictly adhered to the accepted guidelines for the ethical use, care and welfare of the animals used in International Research, according to the Federation of Societies. of Animal Sciences (FASS, 2010). The work was carried out in a production unit located in the municipality of Nicolas Romero, State of Mexico. An ultrasound (Mindray) and a convex probe were used, working at 3.5 MHz, analyzing 168 images obtained from 12 (4+4+4) animals divided into three groups, 4 prepubertal lambs (6 months old), 4 puberal (10-12 months old) and 4 adults (3 years or more), all clinically healthy and without apparent injuries to palpation. The images were obtained from both testicles, boyh tail of the epididymis and both pampiniform plexus, for each of the testicles 5 images were made, one longitudinal cranial, one longitudinal flow, and 3 transverse, proximal, medial and distal, similary were obtained 1 longitudinal image of to each tail of the epididymis and two transverse of the pampiniform plexus, left and right, thus obtaining a total of 14 images per individual. The images were analyzed with the free software Program Image J® 1,480. From each image, 4 fields of 28x28 pixels were taken to measure echogenicity based on grayscale. For the analysis, the means for the parenchyma of each tissue (testis, epididymis and pampiniform plexus) were compared between groups using an ANOVA and Tukey's tests (SPSS IBM ®).

Results:

Differences ($p \leq 0.05$) were found in the echogenicity of the parenchyma among groups. The puberal showed a higher echogenicity in both testicles ($p \leq 0.05$) 64.67±3.7 (right and left testicle) vs prepuberals and adult; in the epididymis the prepuberals showed a higher echogenicity ($p \leq 0.05$) compared to puberals and adults; finally, in the pampiniform plexus, the puberals and prepuberals showed greater echogenicity ($p \leq 0.05$) compared to the adults.

Conclusions:

This work shows important aspects, first, that through ultrasound no lesions were identified in testicular parenchyma, epididymis or in the pampiniform plexus, the second that there are differences in echogenicity among prepuberals, puberals and adult males, which may serve as a basis for future comparisons in healthy individuals or in those showing subclinical lesions and sperm abnormalities.

P-34

ESTIMATION OF THE ENERGY VALUE FOR RUMINANTS OF THE ALMOND HULLS

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Objectives:

Assess the energetic value of the almond hulls for ruminants, using the *in vitro* total gas production technique (24h). Assess methane gas production *in vitro* (98h). In both cases, dehydrated alfalfa is reference.

Material and Methods:

Total gas production-(TGP) (cc/g fermented material) of 8 samples of almond hulls and 8 samples of dehydrated alfalfa were measured using glass syringes. Plunger displacemente is carried out to 0, 2, 4, 6, 8, 10, 12, 24, 48, 72 y 96h. Sheep faeces were used as inoculum.

Chemical composition of the samples (Moisture, Ash, CP, CF, CF, NDF, ADF) was analysed. TGP in 24h is proportional to rumen degradability and energetic content.

Final methane production (cc/g fermented material) was determined using a closed gas circuit and an industrial methanometer (GMI-PS200).

Statistical analysis was performed using a Kruskal-Wallis test for non-parametric data (SPSS V26).

Results:

Chemical composition.

Table 1.- Chemical composition (%) of almond hulls and dehydrated alfalfa (Dry matter basis).

	D.M.	O.M.	E.E.	C.P.	C.F.	N.D.F.	A.D.F	NFE*
Almond hulls	32.16±1.21	71.64±0.20	1.80±0.31	4.56±0.22	17.65±0.82	45.25±0.42	33.62±1.40	47.56
Dehydrated	92.2±1.40	10.86±0.54	1.87±0.35	16.96±1.96	28.78±3.12	49.32±8.81	35.34±5.23	38.67

*calculated value.

The dry matter obtained (32%) in the raw product is much lower than that indicated by other authors (range 62-92%), it may be due to the time of harvesting of the by-product and only affects the product's preservation. Organic matter shows a lower value than usual and the rest of the parameters are normal.

Total gas production.

From 6h to the end of fermentation (96h), TGP is systematically higher in almond hulls than in dehydrated alfalfa ($p < 0.05$). Therefore, considering the energy value of dehydrated alfalfa (0.7-0.75 UFL/kg ms), almond hulls, at least, equals this value.

Table 2.- TGP of almond hulls and dehydrated alfalfa (cc/g fermented material).

Hours	Dehyd. Alfalfa	Almond hulls
4 (n.s.)	20.46±6.65	23.14±7.58
6 (p<0.001)	32.26±6.72	53.78±5.46
8 (p<0.001)	46.55±7.15	79.46±6.24
10 (p<0.001)	61.02±5.34	102.31±8.75
12 (p<0.001)	71.27±12.21	126.95±8.61
24 (p<0.001)	138.24±10.32	206.31±6.08
48 (p<0.001)	176.00±12.34	238.94±11.24
72 (p<0.001)	196.48±16.55	262.09±16.67
96 (p<0.001)	207.94±21.03	268.52±19.45

The approximation of the nutritional value (TGP 24h) (Table 3), underestimates the real value of dehydrated alfalfa, but indicates that the TGP of the almond hulls would have a 23% higher ME value than dehydrated alfalfa, which would imply a real value of UFL/kg dm higher than 0.8 UFL/kg dm.

Table 3.- Estimation of organic matter digestibility and nutritive energy value from TGP in 24 hours.

	% DMO	Kcal EM	UFL	UFC
Peladura	51.46	1780	0.62	0.58
Alfalfa	38.08	1450	0.42	0.33

Methane production

For almond hulls, methane production is proportionally greater than TGP, which would indicate the presence of some factor that enhances methane production.

Table 4.- Methane production (cc/g fermented matter) after 96 hours of incubation.

Material	Mean (p<0.001)	S.D.
Alfalfa	28.99	4.51
Peladura	58.89	6.76

Conclusions:

Energy value for ruminants of the almond hulls is, at least, similar to alfalfa. Methane production in almond hulls is proportionally greater than the total gas produced.

P-35

EFFECT OF REARING SYSTEM ON CASTELLANA LAMBS CARCASS CHARACTERISTICS

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The objective of this study was to assess the carcass characteristics of Castellana breed lambs reared under different management systems.

To achieve this, 28 lambs from the same farm and lambing season were reared with their dams until they were 6 weeks old, when they were weaned. After weaning, lambs were assigned to two different rearing systems. Thus, 14 lambs were reared indoors with free access to commercial concentrate and barley straw (group indoors) whereas another 14 lambs were reared outdoors on spring rye and barley grass with no concentrate supplementation (group outdoors). Outdoor lambs were managed under a system qualified as “organic”. Slaughtering took place when animals reached 4.5 months old on four different days, between 3 and 4 animals from each group being slaughtered on each day.

All the lambs were weighted, transported to a commercial abattoir (1 h transport), stunned, slaughtered by exsanguination from the jugular vein, eviscerated, and skinned to obtain the carcass (chilled at 4 °C for 24 h). Afterwards, carcasses were transported to the ITACyL facilities in an isolated van. Carcasses were weighted, jointed and measured. Live weight was 1.5 times higher in indoors that in outdoors animals ($P<0.001$), this fact conditioning the rest of carcass measurements (carcass weight, length, buttocks width and perimeter, thorax perimeter, conformation and fatness) but leg length, which resulted unaffected by rearing system.

Outdoors lambs showed thinner subcutaneous fat thickness and muscle longissimus depth (both at thoracic and lumbar levels) than indoor ones ($P<0.001$). Carcass and leg compactness indices were greater in indoor than in outdoor lambs ($P<0.001$).

Regarding carcass jointing, ourdoor lambs rendered less weight in the three commercial categories (first, second and third), albeit the proportion of first category did not differ between both groups, whereas indoor lambs showed a greater proportion of third category and lower proportion of second category joints than outdoor lambs.

Rearing lambs outdoors is an alternative to produce organic or pasture based meat, but important decreases in animal performance (in terms of meat production) must be expected and considered.

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REARING SYSTEM AFFECTS CASTELLANA LAMBS CARCASS MICROBIOLOGY AND MEAT CHEMICAL COMPOSITION

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The objective of this study was to assess the carcass microbiology and meat chemical composition of Castellana breed lambs reared under different management systems.

To achieve this, 28 lambs from the same farm and lambing season were reared with their dams until they were 6 weeks old, when they were weaned. After weaning, lambs were assigned to two different rearing systems. Thus, 14 lambs were reared indoors with free access to commercial concentrate and barley straw (group indoors) whereas another 14 lambs were reared outdoors on spring rye and barley grass with no concentrate supplementation (group outdoors).

Outdoor lambs were managed under a system qualified as “organic”. Slaughtering took place when animals reached 4.5 months old on four different days, between 3 and 4 animals from each group being slaughtered on each day. All the lambs were weighted, transported to a commercial abattoir (1 h transport), stunned, slaughtered by exsanguination from the jugular vein, eviscerated, and skinned to obtain the carcass.

Continuedly, swabs samples were taken from carcasses just before chilling: samples were collected from hind leg, neck and loin to a total of 400 cm2, pooled, moistened in 0.1 % peptone water and processed as one. Afterwards, carcasses were chilled at 4 ºC for 24 h and transported to the ITACyL facilities in an isolated van. Carcasses were carcasses were split and the Longissimus thoracis et lumborum muscles removed. Carcass swabs were analysed for aerobic mesophilic, E. coli, Salmonella, Listeria monocytogenes and E. coli O157:H7, whereas muscles were assayed for proximate and fatty acid composition. Indoor lambs were heavier, thus showing greater intramuscular fat content and lower meat moisture than outdoor lambs ($P<0.001$). As a consequence of feeding and rearing regime, outdoor lambs showed greater saturated and polyunsaturated fatty acid content, whereas indoor lambs had higher monounsaturated fatty acid content ($P<0.001$). N-6 fatty acids content was not different between groups ($P>0.10$), but n-3 fatty acids were higher in outdoors lambs thus leading to a lower n-6/n-3 ratio ($P<0.001$).

Regarding microbiological analyses, E. coli counts were not different between groups, but indoor lambs had higher counts of aerobic mesophilic ($P<0.05$). It must be highlighted that Salmonella, Listeria monocytogenes and E. coli O157:H7 were not detected in any sample.

Rearing lambs outdoors is an alternative to produce organic or pasture based meat, that can result in leaner meat enriched in polyunsaturated fatty acids, while maintaining high standards of meat safety (low microbiological counts).

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AFLATOXIN M1 IN DAIRY SHEEP FARMS FROM CASTILLA Y LEÓN

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The objective of this study was to assess the occurrence of aflatoxin M1 (AFM1) in sheep milk from Castilla y León. In order to achieve this, bulk tank milk samples were collected every three months from 51 dairy sheep farms from Castilla and León (Spain) from autumn 2019 to summer 2020. Milk samples were assayed for AFM1 by using a rapid test (lateral flow immunoassay LFI) with a limit of detection (LOD) of 8 ng/L (samples below LOD can be considered as negative).

For the purposes of this communication, values below LOD were computed as 8 to allow logarithmic data transformation. Raw (untransformed) data did not follow a normal distribution (Shapiro test) even when logarithmic values were calculated. Variances were homogeneous (Levene test) only after logarithmic transformation. Average (standard deviation) values of AFM1 in sheep milk were 10.8 (11.70), 19.7 (6.69) 9.9 (3.12) and 10.8 (2.91) ng/L for autumn, winter, spring and summer seasons, respectively. Likewise, median values for autumn, winter, spring and summer were 8.0, 19.2, 8.0, 10.7 ng/L, respectively. Logarithmic transformed values were subjected to a Kruskal-Wallis test.

Results showed that AFM1 values were higher ($P<0.001$) in winter compared to the rest of seasons. It must be highlighted that there was only one single sample (taken in autumn) whose value was above the maximum permitted level (50 ng AFM1/L milk). In this particular case, corrective actions were immediately taken by the veterinarian and the farmer: withdrawal and sampling of any suspected feedstocks and inclusion of mycotoxin adsorbents in the mixed ration for animals. A batch of corn grain was found to be contaminated with moulds, identified as the potential cause for the problem and, therefore, removed from animal feeding.

Subsequent milk samples were far below the limit of 50 ng/L. It should be highlighted, therefore, that the vast majority (more than 99 %) of the analysed samples were below this limit. It can be concluded that even though AFM1 could be found at very low levels in some sheep milk samples, the probability of finding samples in Castilla y León above the maximum permitted level is extremely low.

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PREVALENCE OF ANAPLASMA AND PIROPLASM IN SMALL RUMINANTS FROM ALTO ALENTEJO REGION, PORTUGAL

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Objectives:

The present study was conducted to investigate prevalence of tick-borne pathogens,namely, bacteria belonging to genus *Anaplasma* and protists of the *Piroplasmida* order and to describe the presence of animal co-infection by both pathogens in blood samples collected from small ruminants, from five different municipalities in the Alto Alentejo region, in different production units and animal breeds. Furthermore, we will carry out specie identification and characterization at specie level through a molecular diagnosis and phylogenetic analysis of obtained sequences to reach a consensus. We also plan to assess the correlation between the presence of these pathogens and different factos.

Materials and Methods:

A total of 290 blood samples were analysed, from a total of 180 sheep and 110 goats. Samples were tested with different primer sets for conventional PCR. Anaplasma identification and characterization was analysed using 16SrRNA and RpoB genes, and Piroplasmida identification was tested using 18SrRNA gene. Statistical analysis was performed using the Statistical Package for the Social Sciences version 28.0 (SPSS). The differences were considered statistically significant when *P*-value is < 0.05.

Results:

The results showed a prevalence of 35.4% (102/290) of animals infected with *Anaplasma spp.* and 25.5% (74/290) with *Theileria spp.* There was no infection caused by *Babesia spp*. Coinfection were present in 11.7% (34/290) of animals. The species detected in the samples showing co-infection were *A. ovis* and *Candidatus A. corsicanum*, and *T. ovis* and *T. capreoli*. An increase infection with *Anaplasma spp*. or *Theileria spp.* was detected in sheep, adults and females. A predominance of infection was found in sheep (*P*< 0.001) and adult animals (P< 0.001).

Conclusions:

Findings indicate the presence of these zoonotic pathogens in the domestic host sampled, including new genetic variants, in this basis, suitable surveillance and further analyses of other hosts and areas are required. As studies of anaplasmosis and piroplasmosis in small ruminants in Portugal are practically nonexistent, results obtained in this study the importance of developing and applying more and specific techniques that clearly identify parasites and detect asymptomatic carriers. Such investigations are essential, not only, to evaluate disease incidence in the country but also to evidence the need of establishing adequate control measures.

AUTHORS' INDEX

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