Annual Scientific Conference and Annual General Meeting of the European College of Veterinary Public Health

"Fading of the HACCP after four decades: new trends in VPH for food safety"

Perugia, 17th – 19th October 2018

Proceedings of the Annual Scientific Conference and the Annual General Meeting of the European College of Veterinary Public Health, 17-19 October 2018 , University of Perugia, Italy

Editors: Beniamino Cenci Goga and Maria Francesca Iulietto

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Programme

Day-1 Wednesday 17th October

Where: *University of Perugia, Rettorato, Piazza Università 1, 06123 Perugia*

16,00 – 17,00 Erasmus welcome Day I University Choir and welcome address from the Chancellor (University auditorium)

16,00 – 19,00 ECVPH Council meeting (Room V)

17,30 – 19,00 Residents meeting (Room VII)

Where: *ADISU Bar Village, Via Francesco Innamorati 6, 06123 Perugia*

From 19,30 Welcome evening at the ***Bar Village*** of University of Perugia
Diplomates interaction with local Erasmus coordinators

Day-2 Thursday 18th October

Where: *Hotel Giò Jazz and Wine Area, via R. D'Andreotto 19, 06124 Perugia*

8,00 – 9,00 Conference registration and «registrazione ECM»

9,00 – 9,15 Welcome and opening addresses

Chair Ed Van Klink, University of Bristol, UK

9,15 – 10,00 Keynote lecture 1

• **Pavel Bystrický** - University of veterinary medicine and pharmacy, Košice, SK
HACCP, why we have it and what we use it for

10,00 – 10,45 Keynote lecture 2

• **Simone Siena**, Italian army
Food safety in military operation

10,45 – 11,15 Coffee break, poster viewing

Chair Lisa Boden, University of Edinburgh, UK
Open session - residents selected oral presentations

11.15 – 11.25 **Afrim Hamidi** – Antimicrobial resistance of *Staphylococcus aureus* strains isolated from some traditional milk and meat products in Kosovo – P15
11.25 – 11.35 **Anaïs Léger** - Economic assessment of policy options to reduce antibiotic prescribing in veal calf production in Switzerland – P23
11.35 – 11.45 **Dorien Eppink-** Association between within-herd seroprevalence and risk factors for *Toxoplasma gondii* in fattening pigs in the Netherlands – P11
11.45 – 11.55 **John Tulloch-** Utilising social media as an adjunct to traditional zoonotic surveillance systems. A case study: Lyme disease and dogs in the UK and Ireland - P34

Chair Len Lipman, Utrecht University, NL

12,00 – 12,45 Keynote lecture 3

• **Sofie Dhollander**, European food safety authority, Parma, IT
EFSA's risk assessment on vector borne diseases

12,45 – 13,30 Lunch

Chair Beniamino Cenci Goga, University of Perugia, IT

13,30 – 16,30 **Workshops** in three parallel interactive sessions

Workshop #1: **Laura Falzon,** University of Liverpool
The quantitative outcomes of a «one health» approach to study global health challenges: a joint residency project

Workshop #2: **Ed Van Klink,** University of Bristol, UK
Science and policy: some examples

Workshop #3: **Friederike Hilbert,** University of Veterinary Medicine, Vienna, AT
Big data analysis in veterinary public health: from sequence analysis to risk assessment

16,30 – 17,00 Coffee break, poster viewing

17,00 – 18,00 Annual General Meeting of the ECVPH

From 19,00 Departure from the conference venue by bus.
Conference dinner at *La dolce vita* restaurant

Day-3 Friday 19th October

Where: *Hotel Giò Jazz and Wine Area, via R. D'Andreotto 19, 06124 Perugia*

08,00 – 09,00 ECVPH Council Meeting

Chair Kurt Houf, Ghent University, BE

9,00 – 11,00 **Challenge session** - **The controversial topic of raw milk production and use**

• **Anna Catharina Berge,** Berge veterinary consulting, BE
Can raw milk be safe? Risk analysis and management plans for raw milk dairy farms

• **Agnes Wold,** University of Gothenburhg, S.
Allergy prevention by raw cow's milk - Epidemiological evidence and possible involved mechanisms

• **Giorgio Varisco,** Istituto zooprofilattico sperimentale della Lombardia e dell'Emilia Romagna, IT
Quantitative assessment of exposure to milk pathogens

11,00 – 11,30 Coffee break, poster viewing

Chair Gerty Vanantwerpen, DGZ, Ghent, BE
Open session - residents selected oral presentations

11,30 – 11,40 **Lisa Guardone** - *Anisakis* spp. larvae in marketed products made of herring (*Clupea harengus*) – P13
11.40 – 11,50 **Myrna de Rooij** - Livestock-related microbial air pollution at residential level: spatiotemporal variation of concentrations in ambient air and associated livestock-related characteristics – P9
11.50 – 12-00 **Riikka Laukkanen-Ninios** - Challenges in organizing practical meat inspection training of veterinary students in Finland – P21

Chair Ed Van Klink, University of Bristol, UK

12,00 – 13,00 Keynote lecture 4

• **Cheryl ME McCrindle** Faculty of health sciences, University of Pretoria, South Africa
Control of brucellosis: the lesson learnt after eradication campaigns in less developed countries

13,00 – 13,30 Poster prize - Presentation of the next year's venue - Closing session - «Test finale ECM»
13,30 – 14,30 Lunch and departure

Presidential foreword

Dear Diplomates, Residents, guests and colleagues,

It is with great pleasure that I welcome you to the annual conference of the European College of Veterinary Public Health in Perugia. One of the oldest universities of Europe, founded in the 14th century, is based in Perugia. The university has a strong veterinary school, and this year the school's food science group is our host for our annual conference. I am looking forward to meeting you and enjoy with you the scientific programme. Of course the Annual General Meeting (AGM) will also take place; your opportunity to discuss all affairs of the College. If you are a Diplomate, I would strongly like to recommend that you take part in the AGM.

There will also be ample opportunities to meet socially and informally. I look forward to seeing many of you and having the opportunity to speak with you. A particular word of welcome to our Residents, the future of our college. Grab the opportunity to forge or refresh connections both with fellow Residents and Diplomates. The seeds of future collaborations can often be planted at these conferences.

I would like to end with a plea and a recommendation in one. Our College is run by its members. There are many different roles in which people could contribute to the running of the College. We have committees like the Education Committee and the Credentials Committee, working very hard to manage the core duty of the College, the education of new Diplomates and the accreditation of new and existing Diplomates, but there are also several other positions within the College that require input from the membership. These include examination teams, assessment teams for the questions database and several other options. If you are interested to actively contribute to the College, please speak to one of the Council members. If anything, it will give you satisfaction as well as points for your reaccreditation!

Ed van Klink

President of the European College of Veterinary Public Health

Organisers foreword

Perugia was founded by the Umbrian and between the VI and the V century Before Christ was populated by the Etruscans, in expansion towards the Tyrrhenian Sea. It is transmitted that after the tragic defeat suffered by the Romans at Lake Trasimeno, they took refuge in Perugia and increased their population. After the fall of the Roman Empire Perugia, like many other cities in central Italy suffered the barbarian invasions. Later, Perugia accepted the protection of the Pontiffs, but not the lordship. Otherwise, they ruled Perugia until 1859, when inhabitants of Perugia expelled the papal legate and established a provisional Regency Committee. Pius IX troops resumed the Pope's control, but a year later, on September 14th 1860, the people from Perugia joined the rest of Italy.

Located north of Rome, in central Italy, Perugia offers all the advantages of a large city without sharing metropolitan problems: there is an airport that can be reached in less than 20 minutes, traffic is not intense and the search for parking is not spasmodic as in the metropolis, thanks also to a modern Minimetro. A mobile escalator system connects car parks to the city center. Characteristic is the path of the escalators inside the Rocca Paolina, a fortress built between 1540 and 1543 by the will of Pope Paul III and, until 1860, a symbol of papal power over the city. The various faculties are close to the city center, and also to the University of Perugia, founded in 1308 with the papal bull of Pope Clement V, followed in 1355 by the Diplomas of Emperor Charles IV: Perugia is a university campus in all respects. Perugia is also home to the oldest and most prestigious University for foreigners. On the outskirts, well served by public transport, is the area of Pian di Massiano where, in addition to the stadium and the sport palace, there are jogging tracks, skating rinks, slopes bicycles and basketball fields. For lovers of city life, Corso Vannucci is a meeting place and the city centre offers art places, such as the National Gallery of Umbria, established in the second half of the 16th century, and leisure like the Morlacchi theater, inaugurated in 1781.

The ECVPH Annual Scientific Conference and AGM 2018 therefore, will be part of a context that has always been a stage of the perfect blend of science and culture. The organizing committee hopes that event in this opportunity will enable the participation of qualified speakers, all of internationally renowned, to offer ideas and stimuli to the participants.

We like to salute you with a sentence by Barnabas Suebu, governor of the Indonesian province Papua until 2011 and "Hero of the Environment" for the Times magazine in 2007:

"Think big, start small, act now "

Beniamino Cenci Goga & Maria Francesca Iulietto
Local organizing committee

Scientific Committee

Ed van Klink, School of Veterinary Science, University of Bristol, United Kingdom
Jeroen Dewulf, Department of Reproduction Obstetrics and Herd Health, Ghent University, Belgium
Søren Saxmose Nielsen, Section of Animal Welfare and Disease Control, University of Copenhagen, Denmark
Kurt Houf, Department of Veterinary Public Health and Food Safety, Ghent University, Belgium
Eleni Iosifidou, Department of Hygiene and Technology of Food of Animal Origin, Aristotle University of Thessaloniki, Greece
Lisa Boden, EPIC- Centre of Expertise on Animal Disease Outbreaks, University of Glasgow, United Kingdom
Bojan Blagojevic, Department of Veterinary Medicine, University of Novi Sad, Serbia
Len Lipman, Institute for Risk Assessment Sciences, Utrecht, the Netherlands
Gerty Vanantwerpen, Dierengezondheidszorg Vlaanderen, Belgium
Andreas Wunsch, Veterinary Food Safety Expert, FS Training & Consultancy, Austria

Organising Committee

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Beniamino Cenci Goga, Department of Veterinary Medicine, University of Perugia, IT
Maria Francesca Iulietto, Department of Veterinary Medicine, University of Perugia, IT

Members
Anna Giovanna Fermani, ASL Latina, IT
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Fabrizio Santini, ASL Roma 4, IT
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Luca Grispoldi, Department of Veterinary Medicine, University of Perugia, IT
Ludovico Renda, Expert in farm animal nutrition, Perugia, IT
Margherita Ceccarelli, Department of Veterinary Medicine, University of Perugia, IT
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Perugia


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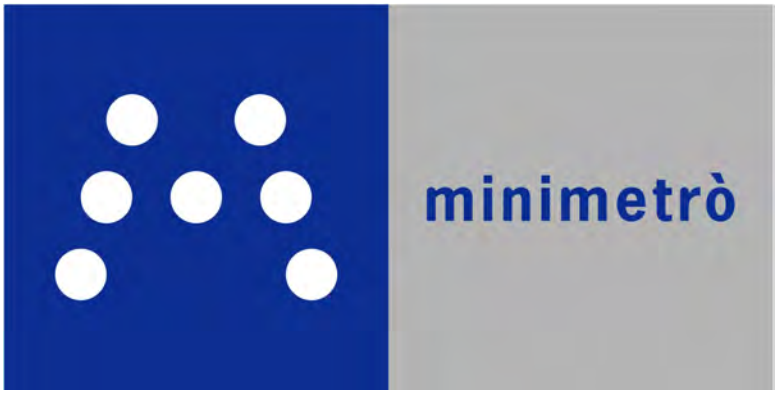
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CONFCOMMERCIO IMPRESE PER L'ITALIA UMBRIA

Abstracts

Keynote lectures

Keynote lecture 1 - HACCP, why we have it and what we use it for

Pavel Bystrický
University of veterinary medicine and pharmacy, Košice, SK

After many years since its legal enforcement, HACCP is to be considered as a natural part of organizing things at food production. It was designed to extend the GMPs and pro-actively control possible foodborne hazards so that they would not reach consumers. Practise had shown to be an effective tool to use. European legislators decided that "Food business operators shall put in place, implement and maintain a permanent procedure or procedures based on the HACCP principles" or use „guides to good practice for hygiene" to both increase food safety and relieve financial load necessary for control of the hygiene control. At that time only a small number of experts really understood the system and many, especially middle and low throughput producers were short of knowledge and experience. Expertise level at the controlling authorities side was similar. Despite all the odds, HACCP was implemented and the implementation checked as complete. The answer for the question "why we have it" is therefore "because the government decided so".

However, enforcement of the HACCP did not end there. The legislators decided to regulate also the HACCP evolution and issued specific CCPs to be duly established (e.g. Reg. 853/2004) and lots of limits to be followed (e.g. microbiological, chemical). Both the compulsory CCPs and the limits have impact on the (HACCP) system: FBOs had been limited in imagination with possible slowing effect in technology development and the controlling authorities enjoy some Pou Stous that make it easier to conclude whether the law is followed. After clarifying some matters both FBOs and the controlling authorise settled the relations and the statistics showed noticeable improvement in public health. The answer for the question "what we use it for" should therefore be "to improve the public health".

It is not that straightforward, however. After establishing the HACCP, there are some evolution traits to be observed. Firstly, due to formal revisions (frequently because of economical pressure) or convenient "not noticing possible hazards" it loses its preventive effect and shifts into the position of retroactive GMP at many places. As the onset of foodborne problems is not immediate, this shift stays often either not noted or ignored by the controlling authorities and major failure may be predicted (and observed, e.g. as leaks of uncontrolled meat into food). The second trait is possible negative effect of long-term protection of consumers from food-borne hazards. E.g. need to comply with the microbiological criteria often leads to devitalization of what we call natural microflora and thus flow of information to the immune system and consequent errors in immunological responses. Consumers may have health problems when they eat "safe" food in distant regions (e.g. holidays) or enter different population group (e.g. enrol school) as their immune system does not have proper information and react by readying forgotten defences. In long term, the immune system without anything to fight starts to be engaged with what is available, i.e. own body. We see it as increase of autoimmune diseases within the population.

It may be concluded that the HACCP system is obviously functional in respect of protecting consumers from food-borne hazards. The world around is not static, however, and the system

must observe it. What is possibly the most slowing its response is the “hazard communication” as part of the hazard analysis principle. All the parties (producers, controlling authorities, consumers) are involved and should provide their relevant data on the fly, not as yearly statistical reports or even conceal them on the basis that it is “not good for business”. Also, the system would benefit if the legislative response to already recognised problem is faster.

Keynote lecture 2 - Food safety in military operation

Simone Siena
Italian army

Military operations are conducted in different environments and situations in which, often, hygiene conditions are critical in comparison with national level of safety.
Force health protection is a priority in order to guarantee the maximum operational capability of personnel.
Food safety is one of the most important measures within force health protection.
The presentation gives some examples about NATO standardized procedures, particularly oriented to ensure the quality of food processors and food suppliers during all field operations, to provide a template for audit reports for both food suppliers and food producers and to establish minimum requirements for food production facilities in terms of safety, sanitation and food quality.

Keynote lecture 3 - The European Food Safety Authority's risk assessment of vector-borne diseases. An example focusing on the risk of mosquito-borne viruses.

Dhollander Sofie, Beltran-Beck Beatriz, Bicout Dominique, Czwienczek Ewelina, De Koeijer Aline, De Vos Clazien, Gogin Andrey, Miranda Miguel Angel, Thulke Hans-Hermann and Stegeman Jan Arend.
European food safety authority, Parma, IT

Globalisation, extreme weather events attributable to climate change, social and political instability, changes in landscape use or management are all potential drivers for the introduction of pathogens in previously free regions. Vector-borne diseases, with their complex epidemiology being the result of a delicate interaction between vectors, hosts and pathogens, are amongst the most complex diseases to prevent and control. Their potential impact on plant, animal and/or public health, trade or environment justify efforts to predict their risk and improve preparedness. The European Food Safety Authority has an important role in supporting risk managers to effectively increase preparedness for emerging diseases. In this study, a previously developed Method for INTegrated RISK assessment (MINTRISK) developed was used to assess and compare the possible rate of introduction of 14 exotic mosquito-borne diseases (MBDs) into the European Union. A detailed methodology was developed to integrate existing databases in the assessment, thus making the assessment data-driven and quantitative where possible. However, where only expert opinion was available, guidelines were used to make qualitative assessments repeatable. The assessment resulted in a characterisation of 14 MBDs containing an assessment of their global occurrence, the rate of entry, probability of transmission and establishment. These steps resulted in a first assessment of the overall rate of introduction of the MBDs that is comparable and updatable and pointed out diseases with an annual rate of introduction such as Bunyamwera virus, Vesicular stomatitis virus and Eastern equine encephalitis virus, which was more than low and could merit a more in-depth analysis.

Keynote lecture 4 - Control of brucellosis: the lesson learnt after eradication campaigns in less developed countries

Cheryl ME McCrindle
Faculty of health sciences, University of Pretoria, South Africa

Bovine brucellosis is an important occupational zoonosis for dairy and beef producers as well as veterinarians and abattoir workers, causing fever, joint pains, urogenital symptoms and severe chronic disability. Research into bovine brucellosis in African farming systems has shown that it remains endemic in both humans and livestock, despite OIE regulations and the best efforts of veterinary services and farmers. In Africa, cattle farming systems include large and small scale commercial dairy, dual purpose and beef production; sedentary small-scale, communal and subsistence; as well as transhumant dual purpose. Most animals in these systems are eventually slaughtered for food. Although brucellosis is most often transmitted to consumers through unpasteurised dairy products; both formal and informal beef and dual purpose production systems present a very high risk of zoonotic transmission to veterinarians and farmers, as well as abattoir workers. In South Africa, abattoir legislation has always been based more on auditing and hygiene assessment systems than HACCP, although all registered abattoirs must be HACCP compliant. Informal slaughter for cultural purposes and home consumption is legal. Recent research has enabled comparative risk assessment of both formal and informal beef and dairy production systems. It appears that HACCP may be a better way to estimate and reduce the risk of occupational exposure and zoonotic transmission of bovine brucellosis, during both informal and formal slaughter. The research has also raised questions about environmental transmission to both humans and livestock via effluents and fomites from infected cattle, before and during slaughter.

Key references:

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Workshops

Workshop 1 - The quantitative outcomes of a «one health» approach to study global health challenges: a joint residency project

Laura Falzon, University of Liverpool, UK and **Isabel Lechner**, SAFOSO, CH

Objectives:
- to describe the previous joint resident project - how it came about, study findings, and opportunities it created;
- to discuss ideas and topics for future resident projects and to share tips on the residency experience overall;

Description of the workshop topic and themes
The target audience for this workshop are current residents, though anyone is welcome to attend. We will briefly describe the joint residency project we worked on (i.e. a scoping review on the quantitative outcomes of a One Health approach), describing how the project was conceived and developed, project findings, and the benefits and opportunities created through such a collaborative work. We shall then open the floor to all participants to discuss ongoing collaborative projects, and brainstorm ideas for future resident projects.

Workshop 2: Science and policy: some examples

Ed Van Klink, University of Bristol, UK; **Lisa Boden**, University of Glasgow, UK;
Dominic Mellor, University of Glasgow, UK and **Simon More,** University College Dublin, IE.

Objectives

Much research in animal health is done in the field of notifiable animal disease or in subjects that are highly politically sensitive. There often is not a good match between what policy expects, and what science can provide. As was discussed in a challenge session last year, policy often for example wants quick answers. It is important for scientists to know where and how their work meets the requirements of the policy makers, as governments are often a major funder for research in our field.

Description of the workshop topic and themes

A few examples of policy-related research projects will be used to illustrate where difficulties might arise related to research being conducted on behalf of policy makers. The participants in the workshop will be asked to provide solutions to solve the disconnect between scientists on the one side and policy makers on the other. Several examples of research subjects will be considered and the participants will be asked to assess the subjects presented from both the scientist angle and the policy maker angle.

The workshop will provide the participants with a better understanding of the intricacies of the policy role. Understanding the policy maker as a client is helpful in improving allignment between waht the client wants and what the scientist can deliver, ultimately improving science – policy cooperation.

Workshop 3 - Big data analysis in veterinary public health: from sequence analysis to risk assessment

Friederike Hilbert, University of Veterinary Medicine, Vienna, AT
Roswitha Merle, Institute for Veterinary epidemiology and statistics, Freie Universität Berlin, DE

"Big data" has become a trendy word in the last years but a common definition is still missing. Nevertheless, especially in Veterinary Public Health new technologies allow the collection of huge amounts of data, to be extremely useful when analysed properly and here we are, discussing "Big Data" and specific technology for analysis.
Well known examples like data from whole genome sequencing of pathogens and the usefulness for rapid foodborne outbreak investigations or pandemic disease control, data for qualitative risk assessment for visual-only post mortem meat inspection, data from the total food chain, traceable food production and transport or multiscale individual health data for electronic health records for animals and humans can be named.
Hard- and software requirements and education to develop and apply these properly are challenges to cope with as an individual and within the society. Interdisciplinary connections between biologists, veterinarians, bioinformatics, mathematicians, sociologists and many more are required to optimise benefits and to prevent misuse.
Two examples will be provided:
Analysis of whole genome sequencing data of foodborne pathogens using a novel developed (during an EFSA funded research project named INNUENDO) freely available tool.
A second example will look inside the prediction of protein structures based on their amino acid sequence only, using Tet(O), a ribosomal binding protein and a new variant of it, recently detected in Campylobacter.

Challenge session

The controversial topic of raw milk production and use

1. Can raw milk be safe? Risk analysis and management plans for raw milk dairy farms

Anna Catharina Berge
Berge veterinary consulting, BE.

There is a world-wide increasing interest in the consumption of raw milk and milk products partly due to health reasons such as reduction in allergies and asthma, but also for taste, freshness, closeness to the producer and to support local food production. The pasteurization requirements for raw milk arose in the 1930's when the hygienic quality and safety of raw milk could not be assured through methods and systems that we have available today. Raw milk producers in numerous countries have demonstrated that raw milk can be extremely safe and hygienic, adopting HACCP principles and professional risk reduction and management plans. Proper risk assessment and management of dedicated raw milk production systems are needed to allow consumers to choose food with desirable qualities.

2. Allergy prevention by raw cow's milk - Epidemiological evidence and possible involved mechanisms

Agnes Wold
University of Gothenburg and Sahlgrenska, S.

Allergy is the most common chronic disease among adolescents and young adults in affluent countries. The prevalence of allergy has risen continuously during the 20th century, in parallel with economic development, higher living standards and increased sanitation. Atopic allergy comprises a number of diseases, including atopic dermatitis (atopic eczema), hay fever (allergic rhinitis) and asthma. They are all caused by an overly aggressive immune system that reacts to innocuous compounds present in the food and air, so called "allergens". Normally, food and inhalant proteins should elicit physiological immune tolerance, so called oral tolerance. There is currently no effective method to prevent allergy development.
The risk of becoming allergic is to a large extent determined by the milieu surrounding the infant and young child. A traditional life-style with large families and frequent contacts with animals is associated with low risk of allergy development, while the modern Western lifestyle characterized by small families and lack of animal is associated with high risk. Children growing up on small dairy farms have particularly low risk of becoming allergic and part of this protective effect is linked to consumption of raw milk. Furthermore, consumption of raw milk by children who do not themselves live on a farm, has been shown to exert protection against allergy development. Notably, raw milk not only confers protection against allergy to cow's milk proteins, but also to a broad range of airborne allergens, such as pollens. The mechanisms behind the protective effect are currently unknown, but may relate to a number of components present in cow's milk, such as viable bacteria, viable immune cells and fat droplets. If a microbially safe raw milk could be produced, we might be able to develop an effective preventive treatment against allergy, our most common chronic disease.

3. Quantitative assessment of exposure to milk pathogens

Giorgio Varisco[1], Guido Finazzi[1], Paolo Daminelli[1], Giuseppe Bolzoni[1],Marina Nadia Losio[1].
Istituto zooprofilattico sperimentale della Lombardia e dell'Emilia Romagna, IT

Direct raw milk selling has been allowed in Italy since 2004. The presence of pathogenic bacteria in raw milk has been well documented both in Europe and in USA, and the isolation rate varies considerably from study to study.
The main objective of this study was to estimate the risk of different pathogens, such as *Salmonella, Listeria monocytogenes, Campylobacter jejuni, E. coli* VTEC due to consumption of raw cow's milk purchased from vending machines located in different Italian regions.
The development and implementation of different quantitative risk assessment (QRA) models is one means to ensure food safety control. The QRA considered the presence of these pathogens in dairy farms, the field handling conditions of raw milk during distribution and delivery to the consumer, consumer habits and the behaviour of pathogens throughout the food chain. Data were collected from a previous survey that gathered together microbiological records of official controls monitoring raw milk samples from self service vending machine in different regions of Italy performed by the regional veterinary authorities from 2008 to 2011
One hundred seventy-eight of 60,907 samples were positive for one of the four foodborne pathogens investigated: 18 samples were positive for *Salmonella*, 83 for *L. monocytogenes*, 24 for *E. coli* O157:H7, and 53 for *C. jejuni* in the seven regions investigated. No significant differences in prevalence were found among regions, but a significant increase in C. jejuni prevalence was observed over the years of the study.
Data on consumer habits revealed that some behaviors may enhance the risk of infection linked to raw milk consumption: 37% of consumers did not boil milk before consumption, 93% never used an insulated bag to transport raw milk home, and raw milk was consumed by children younger than 5 years of age
The RA models predicted no human listeriosis cases per year either in the best or worst storage conditions and with or without boiling raw milk, whereas the annual estimated cases of salmonellosis depend on the dose-response relationships used in the model, the milk storage conditions, and consumer behavior in relation to boiling raw milk or not. Considering from 10,000 up to 20,000 consumers each year, the models predicted for the best and worst storage conditions (4°C and 12° C), respectively, 2.12 and 1.14 campylobacteriosis cases and 0.02 and 0.09 HUS cases in the 0- to 5-year age group and 0.1 and 0.5 HUS cases in the over 5-year age group
Quantitative risk assessment related to raw milk consumption is necessary from a public health perspective and the proposed RA model represents a useful and flexible tool to perform future RAs based on local consumer habits to support decision-making on safety policies.
Further educational programmes for raw milk consumers or potential raw milk consumers are required to encourage consumers to boil milk to reduce the associated risk of illness.

Poster abstracts

P1: Evaluation of the effects of cattle hide treatment with aqueous shellac solutions on microbial status of beef meat

Dragan Antic[1], Eleni Michalopoulou[1], Christian James[2], Graham Purnell[2], Manfred Penning[3], Martin Rose[4]

[1]University of Liverpool, United Kingdom, [2]Grimsby Institute, United Kingdom, [3]PennConsult, Germany, [4]Jorvik Food and Environmental Chemical Safety, United Kingdom.

Background
Cattle hides are very significant source of microbial contamination of beef carcasses during dehiding. The microbial immobilisation on cattle hides has been proposed to reduce microbial transmission from hides onto beef carcasses.

Objective
This study evaluated the effectiveness of aqueous shellac solutions (ASL) applied to hides in reducing the transferability of microbiota from hide to meat under laboratory and commercial abattoir conditions.

Materials and Methods
Various ASL efficacy in preventing transfer onto beef meat of aerobic bacteria (ACC), *Enterobacteriaceae* (EBC) naturally occurring on cattle hides and inoculated *E. coli* O157, was investigated using direct hide-to-meat contact laboratory model. Hide treatment with ASL was also evaluated in beef abattoir where twenty clean and dry cattle were spray treated (after bleeding, before dehiding), over hide area where skin-opening cuts are made. The effects of hide coating with shellac was evaluated by swab-sampling four carcass meat sites after dehiding and examining for ACC and EBC.

Results
The reduction effects for ASL in preventing transfer of bacteria from hides onto meat in lab trials were up to 3 logs of ACC and 2.4 logs of EBC, with average reduction of 2 logs. The reduction effect on microbial transfer from cattle hides onto resulting carcass meat in abattoir comparing to untreated animals was on different carcass sites from 0.3-1.1 log for ACC and from 0-0.7 log for EBC.

Discussion and Conclusion
The best properties (efficacy and practicality for use) were observed with ASL with propylene glycol, with a reduction in transfer of 2 log of ACC and 1.7 log of EBC. The efficacy of ASL in abattoir was comparable and better than reported in some other hide decontamination studies.

Perspectives

The results provided a scientific basis for further optimisation of cattle hide treatment with aqueous shellac solutions for use in a commercial abattoir setting.

P2: Comparative epidemiology of *E. coli* resistance to third-generation cephalosporins in diseased food-producing animals

Clémence Boireau[1,2,3], Claire Chauvin[4], Éric Jouy[5], Géraldine Cazeau[2], Nathalie Jarrige[2], Agnès Leblond[3], Émilie Gay[2]

[1]École Nationale des Services Vétérinaires, ENSV, VetagroSup, Marcy l'Étoile, France; [2]Université de Lyon, ANSES, Laboratoire de Lyon, Unité EAS, 31 avenue Tony Garnier, 69007 Lyon, France; [3]EPIA, UMR 0346, Epidémiologie des maladies Animales et zoonotiques, INRA, VetagroSup, University of Lyon, F-69280, Marcy L'Etoile, France; [4]ANSES, Laboratoire de Ploufragan-Plouzané, Unité Epidémiologie et Bien-être du porc, Université Bretagne Loire, Technopôle Saint-Brieuc Armor, 22440 Ploufragan, France; [5]ANSES, Laboratoire de Ploufragan-Plouzané, Unité Mycoplasmologie, Bactériologie et Antibiorésistance, Université Bretagne Loire, Technopôle Saint-Brieuc Armor, 22440 Ploufragan, France.

Background
Categorized by WHO as critically important antibiotics, third-generation cephalosporins (3GCs) are one of the latest therapeutic alternatives to fight severe infectious diseases in humans. Some antibiotics belonging to this class are prescribed to treat food-producing animals in specific pathological contexts.

Objective
Preserving the effectiveness of 3GCs requires characterization and careful monitoring of 3GCs resistance and the identification and implementation of measures that can limit this antimicrobial resistance (AMR). Here, we characterized the 3GCs resistance in Escherichia coli isolated from diseased animals.

Materials and Methods
Using data collected from broilers, hens, calves, piglets, sows, turkeys and ducks between 2006 and 2016 by the French surveillance network of AMR in pathogenic bacteria of animal origin (called RESAPATH), we investigated the dynamics of resistance to 3GCs and confronted resistance trends with practices changes.

Results
Our non-linear analysis applied to time series showed that the evolution of E. coli resistance to 3GCs is specific to each animal category. From 2006 to 2010, resistance to 3GCs increased for most animal categories. We observed peaks of high-level of resistance for hens (21.5% in 2010) and broilers (26.7% in 2011), whereas trends stayed below 10% for the other animal categories throughout the study period. Resistance later decreased and, since 2014, 3GCs resistance has dropped below 10% for all animal categories. Our findings demonstrate that inversion of resistance trends can rapidly occur.

Discussion and Conclusion
These extensive data provide a basis for evaluating control strategies. The parallel between trends and measures to limit AMR over the period shed lights on the impact of practices changes, public

policies (EcoAntibio Plan) and sector-led initiatives (moratorium in swine sector). Our results provide a guide for future AMR control strategies from a risk analysis perspective.

Perspectives

Finally, they highlight the usefulness and importance of AMR surveillance networks in animal health.

P3: Experimental inoculation of calves with EHEC O157:H7 MC2 strain isolated from cattle

Delphine Bibbal[1], Thomas Secher[1], Monique Kérourédan[1], Audrey Segura[2], Hervé Cassard[3], Eric Oswald[1,4], Yolande Bertin[2], Evelyne Forano[2], Hubert Brugère[1]

[1]IRSD, Université de Toulouse, INSERM, INRA, ENVT, UPS, Toulouse, France; [2]UMR-MEDIS, Université Clermont Auvergne, INRA, Clermont-Ferrand, France; [3]UMR 1225, INRA, ENVT, Toulouse, France ; [4]CHU de Toulouse, Hôpital Purpan, Toulouse, France.

Background
MC2 strain is an EHEC O157:H7 isolated from a cattle farm where a persistent shedding had been identified.

Objectives
The objectives were to better characterize (i) the shedding of EHEC O157:H7 MC2, (ii) the colonization of cattle by this strain and (iii) the host response.

Materials and Methods
MC2 strain was inoculated to a group of five 3 month-old calves at the dose of 10^{10} CFU. Calves were re-inoculated 3 weeks after the first inoculation, and were necropsied 4 days after the second inoculation. A NaCl solution was administered to a control group of five calves. This project, referenced under the number APAFIS#4704-2016032517325815 V4, was estimated on the ethical plan by the French ethics committee in animal experiment N°115. It was authorized having received a favorable opinion.

Results and Discussion
During the first 7 days post inoculation (dpi), fecal excretion of MC2 was high, and then has gradually declined. At necropsy, all digestive lymph nodes were negative for MC2. High concentrations of MC2 were detected in contents of ileum, cecum, spiral colon and descending colon. As regards digestive tissues, the recto-anal junction was the predilection site of colonization; but other tissues could be colonized at high concentrations, notably tissues of the ileon, the ileocecal valve and the colon. Finally, MC2 strain was systematically detected from hides and ears of inoculated cattle. MC2 inoculation did not affect the clinical status, the biochemical parameters, or the numeration blood formulation of cattle. At a systemic level, MC2 inoculation did not lead to the production of pro-inflammatory cytokines. On the contrary, MC2 inoculation led to a local inflammation with a higher production of INFγ and IL1b in the recto-anal junction of inoculated cattle compared to control calves. Histological studies also revealed differences between inoculated and control calves: effaced microvilli, detached squamous epithelial cells, hyperemia and local infiltration by eosinophils.

Perspectives
The model of experimental inoculation developed in this study might be used to evaluate the efficacy of preharvest food safety practices.

P4: Outer Membrane Vesicles of enterohemorrhagic *Escherichia coli* O80:H2 alter the autophagy flux and create an inflammatory state in human host cells

Laure David[1], Frédéric Taieb[1], Patricia Martin[1], Marie Penary[1], Frédérick Barreau[1], Priscilla Branchu[1], Hubert Brugere[1], Eric Oswald[1,2]

[1]IRSD, Université de Toulouse, INSERM, INRA, ENVT, UPS, Toulouse, France; [2]CHU de Toulouse, Hôpital Purpan, Toulouse, France.

Background

The enterohemorrhagic *Escherichia coli* (EHEC) of serotype O80:H2 has emerged in France and represents a new threat in terms of public health. Indeed, this strain has a high virulence potential, it can provoke an hemolytic and uremic syndrome (HUS) and extra-intestinal manifestations. Moreover, it was the 3nd leading cause of pediatric HUS in France in 2015 and 2016. In addition to EHEC virulence factors, EHEC O80:H2 gained a virulence plasmid that is characteristic of extra-intestinal *E.coli* and is absent in other EHEC strains. It codes for the hemolysin F (HlyF) protein. Interestingly, it has been shown that HlyF stimulates the production of outer membrane vesicles (OMVs) with the capacity to modulate the autophagic process in host cells. As autophagy is involved in inflammation regulation, an alteration of this process by OMVs could promote an inflammation exacerbation in intoxicated cells.

Objective

The aim of this project is to decipher how HlyF and OMVs could contribute to the virulence of EHEC O80:H2.

Materials and Methods

EHEC must be manipulated in a biosafety level 3 laboratory. Due to the technical difficulty, we managed pilot experiments on laboratory strains over-expressing or not *hlyF* as preliminary models. We prepared, purified and evaluated the biological effects of OMVs on epithelial and monocytic cells. We measured autophagy by detection of the autophagy-associated protein LC3 and inflammation by dosage of proinflammatory cytokines in the supernatant of culture.

Results

Pilot results show that OMVs produced by *hlyF+* strains induce a massive autophagy blockade due to a defect in the fusion autophagosomes – lysosomes step in host cells, associated to the activation of pro-inflammatory host response.

Discussion and Conclusion

Our experiments show that OMVs produced by *hlyF+* strains induce a massive autophagy blockade due to a defect in the fusion autophagosomes – lysosomes step in host cells, associated to the activation of pro-inflammatory host response. Altogether, these results highlight the pro-inflammatory role of HlyF-stimulated OMVs.

Perspectives

Ultimately, this project will investigate the mechanism of action of these crucial virulence factors to decipher if they participate in the pathogenicity of EHEC O80:H2.

P5: Prevalence of carriage of EHEC serotypes O26:H11, O45:H2, O103:H2, O111:H8, O121:H19, O145:H28 and O157:H7, among slaughtered veal calves in France

F. Auvray[1], M.M. Um[1], C. Bièche-Terrier[2], L. Allais[3], M. Drouet[2], E. Oswald[1-4], D. Bibbal[1], H. Brugère[1]

[1]IRSD, Université de Toulouse, INSERM, INRA, ENVT, UPS, Toulouse, France; [2]Institut de l'Elevage, Service Qualité des Viandes, Villers-Bocage, France; [3]Institut de l'Elevage, Laboratoire Analyse et Technologie des Produits, Villers-Bocage, France; [4]CHU de Toulouse, Hôpital Purpan, Toulouse, France.

Background
The main enterohemorrhagic *Escherichia coli* (EHEC) belong to serotypes O26:H11, O45:H2, O103:H2, O111:H8, O121:H19, O145:H28 and O157:H7. Data on the occurrence of EHEC in calves are limited compared to adult cattle.

Objective
The objective of this study was to evaluate the prevalence of the "top seven" EHEC in veal calves slaughtered in France.

Materials and Methods
A total of 500 veal calf fecal samples originating from 103 veal calf fattening units representative of French production were collected from five abattoirs from January to December 2017. They were analyzed using an approach similar to ISO/TS 13136, that included real-time PCR screening of *stx*, *eae* variants and O-group DNA markers from the top seven EHEC. EHEC were isolated and enumerated using immuno-magnetic separation and the most probable number (MPN) method, respectively. Characterization of isolates showed that EPEC strains (*stx*-) might also be recovered.

Results
Out of the 500 individuals tested, a total of 69 *E. coli* isolates from the top seven serogroups were recovered that included 30 EHEC and 39 EPEC. EHEC belonged to O103:H2 (13 strains), O26:H11 (9 strains), O145:H28 (5 strains) and O157:H7 (3 strains) serotypes. EPEC belonged to O145:H28 (24 strains), O26:H11 (13 strains), O103:H2 (1 strain) and O157:H7 (1 strain) serotypes. The prevalence of the top seven EHEC was 5.6%. Seasonal variation was observed. Simultaneous carriage of two EHEC serotypes was detected in two animals. EHEC enumeration ranged from less than 0.5 to 2.5 10^4 MPN per gram of feces.

Conclusions
Consistent with previous studies that evaluated the influence of animal age on EHEC fecal shedding, the prevalence of carriage in veal calves was higher than that determined in adult cattle (1.8%). Only two super-shedders were identified.

Perspectives
Future work will be performed to determine the source of contamination of veal calves by EHEC.

P6: Antimicrobial resistance determinants in *Salmonella* isolates from swine

Héctor Argüello[1,2], Beatriz Guerra[3,4], Pedro J. de Nova[2], Rubén Miranda[2], Pedro Rubio[2], Ana Carvajal[2]

[1]University of Córdoba, Spain, [2]University of León, Spain, [3]European Food Safety Authority, Parma, Italy, [4]Department Biological Safety, German Federal Institute for Risk Assessment, Berlin, Germany.

Background

Antimicrobial resistance (AMR) and *Salmonella* are a primary concerns in public health. Furthermore, *Salmonella* isolates from husbandry animals usually exhibit resistance to several antimicrobials. Molecular characterisation of the AMR and their location is of paramount interest to understand the mechanisms of AMR and potential risk of horizontal transference.

Objective

The present study characterises the AMR determinants of 62 multi-drug resistant (MDR) *Salmonella spp.* isolates from swine.

Materials and Methods

Sixty-two multi-resistant *Salmonella* isolates recovered from finishing pigs in two cross-sectional studies conducted in Spain were included. In all of them, the antimicrobial resistant determinants were investigated by PCR, checking the presence of class 1, class 2 integrons and 29 genes responsible for resistance aminoglycosides, beta-lactams, amphenicols, tetracyclines, sulphonamides and quinolones.

Results

Genes *sul1*, $bla_{\text{TEM1-like}}$, *aadA2*, *tetA* and *dfrA12* were more prevalent ($p<0.05$) than the other determinants checked in their respective AMR families. Co-existence of different genes conferring resistance to the same antimicrobial was common. No differences in AMR determinants prevalence were observed between *S.* Typhimurium, the main serotype included, and other serovars from the study. Class 1 integrons were present in 48 of 62 isolates, again with no differences linked to any serovar. Nine different variable regions were observed, 1000 bp/*aadA2*-1200 bp/bla_{PSE1} (13 isolates) and $bla_{\text{OXA-like}}$/*aadA1 (*8 isolates) were the most common. Four isolates *S.* Typhimurium (2), *S.* Bredeney (1) and *S.* Kapemba (1), harboured a class 2 integron 2300bp estX-*sat2*-*aadA1*.

Discussion and Conclusion

Results from the study highlight the importance of class 1 integrons and certain genes in MDR swine *Salmonella* isolates.

Perspectives

The information is of relevance for monitoring in the forthcoming scope of reduction of antibiotic usage in swine production as well as from a public health perspective.

P7: Biosecurity and antimicrobial usage in swine farms in Spain

Oscar Mencía[1], Sonia Martínez[1], Héctor Puente[1], Juan I. Méndez[1], Manuel Gómez[1], Pedro Rubio[1], Elías F. Rodríguez-Ferri[1], César B. Gutiérrez[1], Ana Carvajal[1]

[1]*University of León, Spain.*

Background

Antimicrobial resistance is a major public health problem and accordingly, the reduction of antimicrobial usage in intensive swine production is an urgent need.

Objective

The aim of the present research is to describe biosecurity and antibiotic usage in Spanish swine farms suffering from respiratory and digestive disorders and to investigate the relationships between these parameters and several farm characteristics.

Materials and Methods

A total of 33 swine farms that submitted samples for diagnostic of respiratory or enteric disorders to the Animal Health Department of the University of León and agreed to participate in the study fulfilled questionnaires regarding biosecurity (Biocheck-UGent™), antibiotic usage in the previous three months and several farm characteristics (number of pigs, years of experience, number of workers and age of buildings).

Results

Total biosecurity score ranged between 40 and 81, with an average of 65.45 (SD 10.49). External biosecurity was in general higher (mean 76.82, SD 8.41) than internal biosecurity (mean 53.61, SD 15.28). Antibiotic usage was very variable with a median of 431.68 mg/PCU. No correlation between antibiotic usage and biosecurity scores was found using Spearman correlation coefficient test. However, a tendency of higher antibiotic usage in larger farms was evident by ANOVA ($F=3.0$; $p=0.093$).

Discussion and Conclusion

Our results allow us to conclude that there is room for improvement of biosecurity in Spanish swine farms, particularly with regard to internal biosecurity. Moreover, antibiotic usage in the sampled farms was high and very variable with tetracyclins and penicilin derivatives as the most used substances. The lack of interconnection between the antibiotics consumption and biosecurity scores could be related to a very common prophylactic or metaphylactic use of these molecules in swine farms.

Perspectives

The results obtained are important to promote interventions for the necessary reduction of antibiotic consumption in Spanish swine production.

P8: Study on the growth and enterotoxin production by *Staphylococcus aureus* spiked in canned meat

B. T. Cenci-Goga[1,2], P. A. Popescu[3], M. Karama[2], V. Gullo[1], G. Poerio[1], E. Borgogni[1], P. Torlai[1], G. Chianese[1], P. Sechi[1], M.F. Iulietto[1], L. Grispoldi[1]

[1]Medicina Veterinaria, Laboratorio di Ispezione degli Alimenti di Origine Animale, Università degli Studi di Perugia, 06126 Perugia, Italy; [2]University of Pretoria, Faculty of Veterinary Science, Department of Paraclinical Sciences, Onderstepoort, South Africa; [3]University of Agronomical Science and Veterinary Medicine, Faculty of Biotechnology Bucharest, Romania.

Background
Possible contamination by *Staphylococcus aureus* of the production environment and of the meat of a canned meat producing factory was analysed.

Objective
To determine how much time can elapse between the seaming of the can and the sterilization in autoclave without any risk of enterotoxin production by *S. aureus* and consequently risk of food poisoning for the consumer, the growth and enterotoxin production of an enterotoxin A and E producing strain of *S. aureus* in canned meat before sterilization was investigated.

Materials and Methods
Two types of meat where used, one with sodium nitrate and one without. Meat was spiked with an enterotoxin A and E producing strain of *S. aureus* and incubated at three different temperatures (37, 20 and 10 °C).

Results
In the canned products the spiked bacteria spread throughout the meat and attained high numbers. Enterotoxin production was demonstrated starting from 12 hours of incubation with a bacterial load approximately between 8 and 9 log cfu g^{-1} of meat. The statistical analysis of the data showed that the difference between the two different types of meat was not significant (*p* value>0.05).

Discussion and Conclusion
Since it is well known that after heat treatment staphylococcal enterotoxins can be undetectable (loss of serological recognition) but still active (in in vivo assays), depending on food matrix and pH, it is quite difficult to foresee the impact of heat treatment on enterotoxin activity. Thus, although the bacteria are eliminated, the toxins may remain and cause food poisoning. The significance of the results of this study to the implementation of good manufacturing practices and hazard analysis critical control point in a canned meat factory are discussed with reference to the management of pre-retorting steps after seaming.

P9: Livestock-related microbial air pollution at residential level: spatiotemporal variation of concentrations in ambient air and associated livestock-related characteristics

Myrna M.T. de Rooij[1], Dick J.J. Heederik[1], Heike Schmitt[1,2], Gerard Hoek[1], Ingmar Janse[2], Arno Swart[2], Inge M. Wouters[1]

[1]*Utrecht University, Institute for Risk Assessment Sciences, Environmental Epidemiology - Veterinary Public Health;*
[2]*National Institute for Public Health and the Environment (RIVM), Centre for Infectious Disease Control.*

Background
Microbial air pollution from livestock industry has raised concerns about potential public health and environmental impact. Elevated concentrations of airborne bacteria have been reported at close proximity to farms. Knowledge on concentrations at further distances is limited, while this is important regarding public health relevance. Availability of molecular techniques opens up the possibility to study microbial air pollution at residential level.

Objective
Our aim was to measure airborne livestock-related bacterial markers at residential level. Objectives were to gain insight in the level of concentrations, to assess spatiotemporal variation, and to explore associations with livestock-related characteristics of the surroundings.

Materials and Methods
Measurements were performed in the Netherlands from May 2014-December 2015. Ambient fine dust was collected repeatedly at 61 residential sites representing a variety of nearby livestock-related characteristics. Quantitative-PCR was used to assess DNA of bacteria (commensals: *Escherichia coli*, *Staphylococcus spp;* pathogen: *Campylobacter jejuni*) and antimicrobial resistance (AMR) genes (tetW, mecA). Concentrations were log-transformed, except for *C.jejuni* which was analyzed binary. Multivariable mixed models were used to explore associations with livestock-related characteristics.

Results
Variation in airborne DNA concentrations was large for *E.coli, Staphylococcus spp, tetW* and *mecA* (95th percentile of: 2.5E+02, 3.7E+04, 1.8E+04, 1.8E+02; respectively), 42% of samples was positive for *C.jejuni.* Clear variation over time and between sites was observed (concentration differences of factors of tens-hundreds). Farm densities were significantly associated to airborne DNA concentrations/levels, associations were strongest with poultry- and pig farms.

Discussion and Conclusion
Residential exposure to airborne livestock-related bacteria and AMR genes was identified, exposure concentrations varied considerably. Identified associations suggest contribution of livestock industry to microbial air pollution in general, and attribution differences between farm-types.

Perspectives

Health implications will have to be established. Associations of zoonotic diseases with residential proximity to farms have been observed, but transmission routes are unknown. More insight will be gained by implementing airborne exposures in future health effect studies.

P10: Defining the Evolutionary Space and Mode of Foot-and-Mouth Disease Virus Lineages Emergence

Antonello Di Nardo[1], Luca Ferretti[1], Jemma Wadsworth[1], Donald P King[1], Nick J Knowles[1]

[1]*The Pirbright Institute, Pirbright, Woking, Surrey, United Kingdom.*

Background
Studying the genomics of FMDV improves our understanding of the principles and processes that drives the evolutionary fitness and geographical structure of FMDV lineages in endemic systems, as well as the virus adaptation and virulence evolution in response to resistance variability among host populations.

Objectives
We seek to map the fitness landscape of FMDV in endemic systems by reconstructing: (i) the transmission events in space-time; (ii) the geographical structure of phylogenetic clusters; and (iii) the dynamics of viral populations.

Materials and Methods
A dataset comprising n=2495 FMDV VP1 coding sequences belonging to contemporary O/ME-SA/PanAsia2 (n=1321), A/ASIA/Iran-05 (n=843), and Asia-1/ASIA/Sindh-08 (n=331) lineages was analysed using Bayesian phylogeographic methods and metapopulation phylodynamic models.

Results
Evolutionary trajectories of FMDV lineages revealed a cyclical dynamic of virus transmissions by alternating serotypes, with single lineages predominating at time intervals. Emergence of new lineages were sustained at geographical level by virus transmissions periodically originated from countries of the Southern Asia region. Different lineages were reported to diffuse at the very same geographical scale, with transitions being reconstructed in a westerly direction from the Southern Asia region to Western Asia and North Africa. Pakistan, Afghanistan and Iran act both as primary conveyor of infections and for generating virus diversity.

Discussion and Conclusion
The circulation of multiple FMDV serotypes at the endemic level is a complex evolutionary dynamics process involving competition between geographically co-existing lineages, co-evolving within the same host population structure. In this context, the Southern Asia region represents the 'mixing vessel' ecosystem for moving viruses along with livestock trade pathways both westwards to West Eurasia and into North Africa, and eastwards into Southeast and East Asia.

Perspectives
Insights on the space and mode of FMDV evolutionary dynamics can be translated into effective intervention and prevention strategies, in order to support the progression towards FMD control in line with global efforts.

P11: Association between within-herd seroprevalence and risk factors for *Toxoplasma gondii* in fattening pigs in the Netherlands

D.M. Eppink[1], M. Bouwknegt[1], D. Oorburg[1], H.A.P. Urlings[1], M.A.P.M. Van Asseldonk[2], C.P.A. Van Wagenberg[2], I. Krijger[3], J.W.P. Van der Giessen[4], M. Swanenburg[4], H.J. Wisselink[5]

[1]Vion, Boxtel, The Netherlands; [2]Wageningen Economic Research, Wageningen, The Netherlands; [3] Wageningen Livestock Research, Wageningen, The Netherlands; [4]National Institute for Public Health and the Environment, Bilthoven, The Netherlands; [5]Wageningen Bioveterinary Research, Lelystad, The Netherlands.

Background
Toxoplasma gondii is a relevant foodborne pathogen ranking 3rd for its disease burden in Europe. In the Netherlands, the contribution of pork to meatborne *T. gondii* infections is estimated to be 11%. EFSA advised to perform serological testing of pigs and on farm audits on risk factors.

Objective
To determine the association between within-herd seroprevalence and risk factors for *T. gondii* on fattening pig farms in the Netherlands.

Materials and Methods
From 2015 to 2018, 75 audits with a HACCP based questionnaire were performed on 50 case farms and 25 control farms to assess potential risk factors. Case farms had a minimum of one positive monster in the year before the audit and control farms had no positive monsters as measured by PrioCHECK™ Toxoplasma Antibody ELISA on 6263 serum samples from a private food safety monitoring programme. Data were analysed using logistic regression, with the within-herd seroprevalence as dependent variable and potential risk factors as independent variables. Variables showing a univariable *P*-value <0.25 were included in a multi-variate model by means of backward elimination until all remaining variables had *P*-values <0.05.

Results
Final analyses are currently being conducted. Preliminary results show that there is a significant association between seroprevalence and risk factors as cats present on farms, use of unheated feed products and feeding wet feed.

Discussion and Conclusion
Serological screening of Dutch intensive pig farms for *T. gondii* lead to the identification of pig farms where typical risk factors are present (cats, unheated feed products, and wet feed). Previous studies also identified these risk factors on organic pig farms and in other countries.

Perspectives
The use of serological testing is valuable to guide and monitor the control of T. *gondii* in pork production. Changing farm management will likely contribute to reduction of the human disease burden and is presently studied.

P12: Characterization of *E. coli* strains isolated during HACCP procedure in meat plants

L. Grispoldi[1], P. Sechi[1], M. F. Iulietto[1], M. Ceccarelli[1], M. Revoltella[1], G. Ventura[1], C. Crotti[1], B. T. Cenci-Goga[1]

[1]*Medicina Veterinaria, Laboratorio di Ispezione degli Alimenti di Origine Animale, Università degli Studi di Perugia, 06126 Perugia, Italy.*

Background
A potential source of pathogenic bacteria in ground beef is the lymphatic system, specifically the lymph nodes.

Objective
The objective of the current study was to determine the prevalence of *Escherichia coli* in bovine lymph nodes.

Materials and Methods
Bovine lymph nodes were collected from 597 carcasses at a commercial slaughterhouse located in central Italy between May 2012 and September 2017. 492 (82.41%) lymph nodes samples were obtained from regular slaughter, and the remainder 105 (17.58%) were obtained from emergency slaughter. Subiliaci lymph nodes were collected for this study. The isolates were analysed by PCR for the presence of the *stx-1*, *stx-2*, *hly* and *eae* genes and by the Kirby Bauer test for susceptibility to the most commonly used antimicrobials.

Results
204 *E. coli* strains were isolated, 157 from regular slaughter and 47 from emergency slaughter, with an overall prevalence of 34.17%. The prevalence of *E. coli* in limph nodes from regular slaughter was 31.91% while it was 44.76% in limph nodes from emergency slaughter. Thirty-four (16.6%) strains were positive for the *hly* gene, 41 (20.09%) for *stx-1*, 23 (11.27%) for *stx-2*, 11 (5.39%) for *eaeA* and 4 (1.96%) for both *stx-1* and *stx-2*. The prevalence of the genes in the strains isolated from regular slaughter was: 20.38% *hly*, 11.46% *stx-1*, 13.37% *stx-2* and 5.73% *eaeA*. The prevalence of the genes in the strains isolated from emergency slaughter was: 4.25% *hly*, 48.93% *stx-1*, 4.25% *stx-2* and 4.25% *eaeA*.

Discussion and Conclusion
The prevalence of *E. coli* was higher in lymph nodes isolated from emergency slaughter and the difference was statistically significant ($p<0.05$). The prevalence of *stx* positive strains was also higher in lymph nodes isolated from emergency slaughter and the difference was statistically significant ($p<0.01$). Our results indicate that the presence of E. coli in the lymph nodes that remain in the carcass after grooming may represent an important source of contamination of the meat, especially if these are used for the production of minced meat.

P13: *Anisakis* spp. larvae in marketed products made of herring (*Clupea harengus*)

Lisa Guardone[1], Marco Bordino[1], Nicoletta Rosellini[1], Daniele Nucera[2], Alessandra Guidi[1], Andrea Armani[1]

[1]*University of Pisa, Italy;* [2]*University of Turin, Italy.*

Background
Atlantic herrings (*Clupea harengus*) are the third most commercialized species in the European Union and common hosts of *Anisakis* spp. larvae.

Objective
To assess the occurrence and viability of *Anisakis* spp. larvae in herring products sold in Italy.

Materials and Methods
120 products (50 smoked whole and 70 filleted herrings) were visually inspected and digested using Trichineasy® (CTSV srl, Brescia). For whole herrings, viscera and muscle were separately digested. Collected nematodes were checked for viability, identified, counted and stored until molecular analysis. The positivity rate and the larval density per gram, at muscle and visceral level, when possible, were calculated; differences were investigated by Chi-square, Kruskal-Wallis and Mann-Whitney tests.

Results
At least one *Anisakis* spp. larva was found in 56 products (46.7%) and 1715 dead larvae were collected. Most of them (1559, 91%) were found in the viscera of 49 of the 50 whole herrings (98%). A highly significant difference ($p<0.0001$) was observed between the positivity rate and larval density of the remaining 156 larvae at muscle level: 149 larvae were found in the muscle of 31 whole herrings (positivity rate 62%, 0.022 larval density/g) while only 7 in the 70 filleted products (positivity rate 10.7%, 0.001 larval density/g). All larvae were molecularly identified as *A. simplex*.

Discussion and Conclusion
Although no live larvae were found, dead visible larvae represent a defect making the product unfit for human consumption, especially in the case of heavy infections. In addition, the allergenic potential of dead larvae is debated. The significant difference between muscle tissue of whole and filleted herrings, results in different level of risk exposure depending on consumers' preferences.

Perspectives
Differences in the production processes of whole and filleted herrings should be further investigated and quality control procedures should be implemented by producers.

P14: Determination of Ochratoxin A in European seabass and Gilthead seabream farmed in Italy

Lisa Guardone[1], Lara Tinacci[1], Giacomo Luci[1], Valentina Meucci[1], Luigi Intorre[1], Andrea Armani[1]

[1]*University of Pisa, Italy.*

Background
The incresing use of alternative raw materials for aquafeeds, including oils and proteins of plants origin, can introduce contaminants previously not associated with fish farming, such as mycotoxins. In particular, Ochratoxin A (OTA), a mycotoxin produced by *Aspergillus* and *Penicillium* species with nephrotoxic, carcinogenic and teratogenic potential, has been found in several food commodities, including cereals, and can be present in food of animal origin due to carryover. Therefore, utilization of fish feeds contaminated with OTA can result in bioaccumulation and bioconcentration in fish tissues.

Objective
To determine OTA concentrations in Gilthead seabreams and European seabass farmed in Italy.

Materials and Methods
Analysis were performed on muscle, liver and kidney of 10 seabreams and 10 seabass by using an enzymatic digestion (ED) method coupled to high-performance liquid chromatography with a fluorescence detector (HPLC-FLD). The method was validated for: specificity, recovery, trueness, selectivity, linearity, limit of detection (LOD) and limit of quntification (LOQ), repeatability and reproducibility.

Results
Recoveries were higher than 85% for all tissues. Intra- and inter-day repeatability expressed as relative standard deviation were <9%. LOD and LOQ for liver and muscles samples were 0.001 and 0.002 µg/kg, respectively. LOD and LOQ for kidney samples were 0.01 and 0.02 µg/kg, respectively. OTA highest concentrations were found in the kidney (range <LOD-0.91 µg/kg, mean 0.32 ± 0.30 µg/kg). Liver concentrations ranged between <LOD-0.74 µg/kg, (mean 0.53 ± 0.22 µg/kg), while the lowest concentrations were found in muscle (<LOD-0.28 µg/kg, mean 0.12 ± 0.11 µg/kg). No differences were observed between the two species.

Discussion and Conclusion
The present results are in agreement with a previous study suggesting that an high OTA amount could be present in feed administerd to fish sampled in this study.

Perspectives
Further analysis should be conducted on a larger number of samples and on fish feed.

P15: Antimicrobial resistance of *Staphylococcus aureus* strains isolated from some traditional milk and meat products in Kosovo

Afrim Hamidi[1], Driton Sylejmani[1], Artiola Xhaka[1], Era Jusufi[1], Diellza Shala[1], Flakëresa Nikçi[1], Erënesa Gorçaj[1], Mensorina Mustafa[1], Adhuron Samadraxha[1], Fatjona Alushaj[1], Dorentina Humolli[1], Diana Neziri[1], Armenda Berisha[1], Erza Osmani[1], David Baumler[2], Karsten Giffey[3]

[1]Faculty of Agriculture and Veterinary, University of Prishtina "Hasan Prishtina", Kosovo; [2]College of Food and Agricultural and Nutritional Sciences, University of Minnesota, USA; [3]European College of Veterinary Public Health, Brussels.

Background

Based on the report from the WHO, Kosovo's population is among the countries with highest use of antibiotics. High resistance levels of *S. aureus* strains isolated from dairy farms have been registered, especially for penicillin, streptomycin and chloramphenicol but there are no data about AMR of *S. aureus* from food products.

Objective

The objective of this study was to determine the level of AMR of coagulase positive *S. aureus* isolates, isolated from traditional dairy and meat products for antibiotics mostly used in Veterinary and Human Medicine.

Materials and Methods

In this study 77 *S. aureus* strains isolated from traditional dairy and meat products were spread onto Mueller Hinton agar, and 10 different antibiotic disks (Vancomycin, Gentamycin, Chloramphenicol, Erythromycin, Kanamycin, Neomycin, Novobiocin, Penicillin G, Streptomycin, Tetracycline) were placed to test for resistance.

Results

The AMR of *S. aureus* ranged from 16.1 % for Vancomycin to 80.6 % for Streptomycin from isolates from soft cheese samples; from 11.1 % for Erythromycin and Tetracycline to 88.9 % for Penicillin from isolates from paprika in crème and ricotta; from 0 % for Gentamycin and Neomycin to 80 % for Penicillin from isolates from homemade sausage samples; and from 4.5 % for Vancomycin to 77.2 % for Penicillin from isolates from salçiçe samples. 4 isolates showed resistance to all antibiotics tested.

Discussion and Conclusion

In general, high AMR results were registered in *S. aureus* strains for Penicillin, Streptomycin, Novobiocin and Kanamycin. Although in low rate, all the food tested, contained *S. aureus* strains resistant to Vancomycin. The results indicate that AMR of *S. aureus* is emerging, considering the presence of multidrug strains. Data about resistance of *S. aureus* from other products and humans have to be acquired and compared.

Perspectives

The one health initiative needs to be instituted for better surveillance of AMR in human and veterinary medicine, stricter policy on antibiotic registration, control of use both in humans and animals.

P16: Relative risk assessment of *Listeria monocytogenes* in a ready-to-eat chicken salad using a challenge test after cold stress

Joana Santos Ferreira[1], António Salvador Barreto[1], Telmo Nunes[1], Ana Rita Henriques[1]

Centro de Investigação Interdisciplinar em Sanidade Animal (CIISA), Faculty of Veterinary Medicine, University of Lisbon, Portugal.

Background

Listeria monocytogenes is the causal agent of human listeriosis, an infection almost exclusively transmitted by food consumption. *L. monocytogenes* may thrive in refrigerated foods reaching unsafe limits during shelf-life. Food challenge testing is useful to provide information on the behaviour of potential pathogens during food storage.

Objective

A challenge test was conducted to establish the maximum concentration of *L. monocytogenes* that may be present at the production stage to comply with the mandatory limit of 100 cfu/g at the end of shelf-life. Using an exponential dose-response model (EDRM), the relative risk of different scenarios at packaging and at the end of shelf-life were calculated.

Materials and Methods

L. monocytogenes serotype 1/2a strain was kept at 5°C/12 days, to recreate an adaptation to the industrial refrigerated environment, and its viability was regularly monitored. Ready-to-eat chicken salad (RTECS) were inoculated and kept at 5°C/7 days. *L. monocytogenes* detection (ISO11290-1:1996) and enumeration (ISO11290-2:1998) were performed together with samples' pH and a_w determination. Three replicates were considered. ComBase Predictor and R software were used as a predictive model and for statistical analyses, respectively. To determine the risk of acquiring listeriosis from exposure to contaminated RTECS, FAO/WHO EDRM was used.

Results

From day 4 to day 7, *L. monocytogenes* ranged from 6.1±0.6 to 6.4±0.8 log cfu/g, while pH varied from 6.1±0.6 to 6.4±0.3 and a_w from 0.95±0.03 to 0.98±0.01. *L. monocytogenes* average growth was 1.22 log cfu/g.

Discussion and Conclusion

RTECS was confirmed as able to support the growth of *L. monocytogenes,* although its observed growth was lower than the one estimated by the predictive model using day 0 parameters. The EDRM revealed an extremely low risk of acquiring listeriosis during RTECS shelf-life.

Perspectives

Using the EDRM, a portion of RTECS contaminated with less than 100 cfu/g, represents an extremely low risk of listeriosis, even for risk groups.

P17: Antibiotic resistance genes in honey bees (*Apis mellifera ligustica*) from Umbria - Italy

Paola Sechi[1], Maria Francesca Iulietto[1], Rosa Ciavarella[1], Luca Grispoldi[1], Maria Vittoria Pipistrelli[1], Enzo Goretti[1], Beniamino T. Cenci Goga[1]

[1]*University of Perugia, Department of Veterinary Medicine, Italy.*

Background

The honey bees can serve as bioindicators of the state of pollution of the environment in which they live. Furthermore, they can act as collector and disseminator of antibiotic resistance genes; the use of antibiotics for therapeutic purposes in humans and animals over time can be associated with the presence of antimicrobial residues in the environment and, in some cases, accumulated by honey bees. The use of antibiotics has exerted selective pressure in recent years to determine the onset and spread of antibiotic resistance genes, some of which are responsible for the therapeutic failure of infectious diseases in humans and animals.

Objective

This study aimed to assess the occurrence of antibiotic resistance genes in honey bees. To this end, the prevalence of 4 selected genes [*tet*(M), *aac(6')-aph(2")*, *bla*Z and s*ul1*] coding for resistance to tetracycline, aminoglycosides, beta-lactams and sulfonamide was determined.

Materials and Methods

36 samples of 10 bees each were collected in 35 Umbrian apiculture sites (Italy). After DNA extraction, the PCR was performed for the following target genes: *tet*(M), *aac(6')-aph(2")*, *blaZ* and *sul1*.

Results

Of the samples being tested, three were positive for *tet*(M) gene (8,33%), two were positive for *aac(6')-aph(2")* gene (5,56%), six for *blaZ* gene (16,67%), ten for *sul1* (27,78%) and eight samples showed multiple drug resistances.

Discussion and Conclusions

This study contributes to the monitoring of the presence of antibiotic resistance genes in insects which are not directly treated with antibiotics but which can be exposed though the environment. The honey bee represents in fact, an environmental bioindicator and a sentinel of the presence of antibiotic resistance genes in the ecosystem, suggesting a prudent use of antimicrobial compounds.

P18: Current practices in pig meat inspection: effects on the detection of diseases of low public health impact

Rolando Piccioni[1], Maria Francesca Iulietto[2], Marianna Ciancaglini[3], Monica Castagna[4], Rosalba Lembo[5]

[1]ASL n. 4 Teramo, Italy; [2]Department of Veterinary Medicine, University of Perugia, Italy; [3]Master in Veterinary Public Health and Food Hygiene, University of Perugia, Italy; [4]ASL Pescara, Italy; [5]San Raffaele Hospital Institute for Hospitalization and Scientific Care, Milano, Italy.

Background

Meat inspection is aimed to ensure that the meat is fit for human consumption and to review and identify notifiable animal diseases. From the 1st June 2014, pig meat inspection practices were modified: only visual inspection without compulsory palpation or incision (to avoid cross-contamination). The low sensitivity of this method hasn't any impact on zoonosis such as tuberculosis and brucellosis because of the ongoing preventive programs on farm. However, diseases considered of lower importance in terms of impact on public health – i.e. non-zoonotic ones or non-foodborne – might be detected with a lesser efficiency.

Objective

An analysis «before/after» was applied to estimate the effect of the current practices of pig meat inspection on the detection of lower public health impacts pig diseases.

Materials and Methods

Evidences from 7764 pig meat inspections conducted from 2011 to 2017 at a medium scale abattoir located in Teramo (IT) were analyzed to compare the prevalence of hepatic and respiratory diseases before and after the 1st June 2014 with the introduction of the simplified practices.

Results

The results shows a statistically significant reduction (p-value <0,0001) in detection and diagnosis of hepatic and respiratory diseases in pig during the post mortem inspection; evidences of disease conditions of the liver were reduced of the 59% while evidences of disease conditions of the lungs were reduced of the 38,5%.

Discussion and Conclusions

The applied model provided quantitative evidence supporting the hypothesis of causal association between the modification of the technique and the reduction of diagnostic capacity. These deficiencies should be checked to improve and ensure high performances of the system of official controls during pig *post mortem* inspection.

P19: House cricket small-scale farming: on site monitoring of microbial levels

Maria Francesca Iulietto[1], Paola Sechi[1], Luca Grispoldi[1], Giuliana Mezzio[1], Beniamino T. Cenci Goga[1]

Department of Veterinary Medicine, University of Perugia, Italy.

Background

Insect farming in western countries is approaching and the requirements should be the same as for other animals. Rearing *house crickets* (*Acheta domesticus*) can be a low-tech activity requiring limited capital investment; insects in fact are kept in a closed environment where high level of biosecurity can be ensured.

Objective

Considered that little is known on the microbiology of *house cricket* farming, this research aims at monitoring the microbial levels on farm during a three months adult raising period in a small-scale farm in central Italy.

Materials and Methods

The present research analysed a total of thirty-six superficial swab samples during three months of production. Each week, an area of 400 cm^2 for each cage was swabbed to evaluate the level of total aerobic mesophilic bacteria, *Pseudomonas* spp., *Enterobacteriaceae*, coliforms, *Staphylococcus* spp., *Enterococcus* spp., lactic acid bacteria, yeasts and moulds through viable count plating.

Results

The mean values of total aerobic mesophilic bacteria were 4.29 log cfu/400 cm^2 (sd 1.21) *Pseudomonas* spp. 2.31 log cfu/400 cm^2 (sd 1.67), *Enterobacteriaceae* 2.50 log cfu/400 cm^2 (sd 1.52), coliforms 2.33 log cfu/400 cm^2 (sd 1.49), *Staphylococcus* spp. 2.88 log cfu/400 cm^2 (sd 1.48), *Enterococcus* spp. 3.88 log cfu/400 cm^2 (sd 1.56), lactic acid bacteria 3.48 log cfu/400 cm^2 (sd 2.00), yeasts and moulds 1.59 log cfu/400 cm^2 (sd 0.52). *Salmonella* spp. was never detected while *Citrobacter youngae* was frequently isolated. Furthermore, from the microbiological analysis of dead crickets, *Serratia marcescens* and *Proteus mirabilis* were isolated growing symbiotically.

Discussion

Low insect density and high frequency in sanitization of the cages is required to maintain the microbial value constant throughout the life cycle. These results give valuable and update information for stakeholders: farms can be a reservoir of foodborne pathogens and prevalence of microbiological hazards has been studied in livestock farms while more data are requested by the European Food Safety Authority for risk assessment in insect farming.

P20: Food business operators' opinions on disclosed food safety inspections

Jenni Kaskela[1], Annukka Vainio[2], Sari Ollila[1], Janne Lundén[1]

[1]University of Helsinki, Finland; [2]Natural Resources Institute Finland, Finland.

Background
Disclosing food safety inspection results aims to increase efficacy, consistency and transparency of the official food control. Food safety inspection disclosure system "Oiva" was implemented in Finland 2013 in food retail and service, and 2015 in food industry. Inspected items are assessed based on publicly available instructions and graded by using a four-step scale. When the Oiva system was introduced, disagreements on grading between inspectors and food business operators (FBOs) were anticipated. Disagreements can have a negative effect on the correction of non-compliances and consequently on the efficacy of food control.

Objective
The aim of the study was to investigate FBOs' opinions on the efficacy of the Oiva system and disagreements about grading.

Materials and Methods
A questionnaire study was conducted among FBOs in industry, service and retail in 2016.

Results
In total 1277 answers were received (total response rate 12.8%). Most of the FBOs in all food sectors (77.6%) considered that disclosure of the Oiva inspection results promotes the correction of non-compliances and 80.3% of FBOs considered that the public assessment instructions clarify legal requirements. Still 80.2% of all FBOs did not consider the grading regionally consistent in Finland. Furthermore, over half of all respondents (54.9%) had experienced disagreements with the inspector on the grading. Most often disagreements concerned the assessments of premises maintenance, the record-keeping of own-check plan and the adequacy and suitability of premises for operations. FBOs in food service had disagreed more often with the inspector about assessments than FBOs in industry or retail.

Discussion and Conclusion
Oiva system has increased the efficacy of inspections, but inconsistency and disagreements about assessments of inspected items are still challenging according to the FBOs.

Perspectives
Further studies will be carried out to elucidate factors affecting the occurrence of disagreements such as risk perception of FBOs.

P21: Challenges in organizing practical meat inspection training of veterinary students in Finland

Riikka Laukkanen-Ninios[1], Maria Frederiksson Ahomaa[1]

[1]*University of Helsinki, Finland.*

Background

The practical training in meat inspection and slaughterhouse control required by European System of Evaluation of Veterinary Training and Regulation (EC) No 854/2004 is organized in Finland as an external training supervised by the official veterinarians in the slaughterhouses. However, the number of slaughterhouses has been decreasing and the number of students increasing since the 2000s and we have found it increasingly difficult to organize the training for all the students.

Objective

To get an objective view on the situation, we reviewed the organization of practical training in meat inspection and slaughterhouse control since 2000s in the University of Helsinki, the sole provider of training program in veterinary medicine in Finland.

Materials and Methods

We collected from the Faculty of Veterinary Medicine the annual student admission numbers and changes in the organization of the practical training in 2001–2018. The number of active slaughterhouses each year was obtained from Finnish Food Safety Authority Evira responsible for meat inspection in Finland.

Results and Discussion

The number of students training yearly in slaughterhouses increased by 42% from 48 to 68 between 2001 and 2018 and the number of slaughterhouses eligible for training decreased by 44% from 27 to 15. The number of training weeks per slaughterhouse increased from 7.1 in 2001 to 13.6 in 2018. The highest ratio of training weeks per slaughterhouse was in 2012 with 16 training weeks/slaughterhouse, after which the training period was reduced from four to three weeks resulting in 10.7 training weeks/slaughterhouse. Since then, the training week/slaughterhouse ratio has been steadily increasing to the 13.6 training weeks/slaughterhouse in 2018. In addition to shortening training period, we have tried to find alternative training places and arrangements and increased supervision fee for official veterinarians. However, the ever-increasing training weeks/slaughterhouse ratio requires radical rethinking of the training.

P22: Inter-sectorial ranking of antimicrobial resistance transmission pathways relevant to consumers

Isabel Lechner[1], Claudia Freivogel[2], Vivianne Visschers[2], Katharina D.C. Stärk[1]

[1]SAFOSO, Switzerland; [2]School of Applied Psychology FHNW, Switzerland.

Background
Bacteria occur in diverse environments and can become resistant to antimicrobials (AM) by mechanisms of resistance transfer. The resulting system of exposure pathways relevant to humans is therefore highly complex. Linkages between different compartments within which antimicrobial resistant (AMR) bacteria can be observed are currently not well understood. Understanding of AMR exposure pathways is essential to develop effective interventions to reduce the risks of resistance exposure for humans. The focus is on exposure of consumers.

Objective
This investigation aims to map existing AMR pathways between animals and humans, and subsequently rank these pathways according to their relative importance for Swiss consumers.

Materials and Methods
A literature review was conducted to identify potential AMR transmission pathways from animals to humans and provide scientific evidence for their relative significance. A preliminary ranking of identified pathways was performed by the investigator, and validated in an expert workshop with AMR experts from the fields of small and large animal practice, food safety, environmental sciences and hospital hygiene.

Results
Existing AMR transmission pathways were identified and mapped. Results of the ranking of the pathways according to their significance in terms of the probability of exposure and intensity of transfer will be presented. At the time of the meeting, also the outcome validated in a workshop of Swiss AMR experts from different sectors will be available.

Discussion and Conclusion
Discussion and conclusion will be based on the final results (not yet available).

Perspectives
Mapping of exposure pathways for AMR in combination with the ranking will help set priorities for risk management to mitigate AMR exposure in the human population and to provide recommendations for risk management and intervention strategies to praxis stakeholders. It also may inform policy decisions in regard to targeted intervention programs, for example, how exposure pathways should be prioritized in Switzerland.

P23: Economic assessment of policy options to reduce antibiotic prescribing in veal calf production in Switzerland

Anaïs Léger[1], Julie Pont[2], Isabel Lechner[1], Maren Feldmann[2], Martin Kaske[2], Katharina D.C. Stärk[1]

[1]SAFOSO AG, Switzerland; [2] Vetsuisse-Faculty Zurich, Switzerland.

Background

The economic sustainability of veal calf production in many European countries, including Switzerland, is is at least partially reliant on the use of antibiotics. The Swiss national strategy for antimicrobial reduction (StAR) lists actions to decrease AM usage. However, veterinarians, who are selling antibiotics with a profit, may at least partially depend on this income. Without alternative buiness models, a change of practice may be difficult to achieve.

Objective

The objective of this study was to assess the extent of income realised from AM sales by vets and to explore alternative policy options.

Materials and Methods

First, a workshop was organised with selected European experts to create an inventory of alternative policies that could be adopted to reduce prescription intensity. Second, AM sales data were collected over a 12-months-period from 30 practices for 90 veal calf clients in Switzerland. Finally, a selected list of alternative services was economically assessed at veterinary practice level using partial budgetting.

Results

In our model, loss of revenues could not always be compensated by, for instance, rewards for low AM prescription or increase of consultation price. It is anticipated that only a fundamental change in activities and services offered by clinics can help balancing the income of veterinarians after a substancial decrease of revenue from AM sales (i.e. decrease of prescription, ban of sales possibilities).

Discussion and Conclusion

The results will be discussed among veterinarians, industry partners and policy makers to consolidate views. If economically attractive alternatives can be identified, this could be explored in a larger study.

Perspectives

To reduce the use of AM in the veal calves value chain, options targeting other actors might be necessary such as transparency among the chain, reducing the number of actors or agreeing acceptable approaches for sharing the costs of externalities.

P24: Full Moon, or any other lunar phase, is not associated with a higher birth rate in cattle

Ludovic Martinelle[1], E. Moyse[2], S. Graff[3], J.-L. Deville[4], L. Delooz[5,6]

[1]*Fundamental and Applied Research for Animals & Health (FARAH), Experimental Station CARE-FEPEX, University of Liege, Liege, Belgium;* [2]*Fundamental and Applied Research for Animals & Health (FARAH), Department of Biostatistics and Bioinformatics applied to Veterinary Sciences, University of Liege, Liege, Belgium;* [3]*Pneumology Department, CHU Liege, Liege, Belgium;* [4]CHR Verviers East Belgium, Verviers, Belgium; [5]*Fundamental and Applied Research for Animals & Health (FARAH), Epidemiology and Risk Analysis Applied to Veterinary Sciences, University of Liege, Liege, Belgium*; [6]*ARSIA asbl, Ciney, Belgium.*

Background
There has been a persistent belief regarding the putative influence of the lunar cycle on birth rate in human as well as in cattle. Any parameter allowing to better anticipate and control the calving is of great interest to improve herd management.

Objective
In this retrospective study we examined a total of 476043 calving occurring in 2015 in the Walloon region of Belgium to evaluate the influence of the lunar cycle on the distribution of deliveries among Belgian cattle population.

Materials and Methods
Analyses were done using a mixed model with the day of the week and the month as fixed effects and the date as a random effect. The gender of the calves and the type of breed were considered (dairy n=144005, beef n=280972 or mixed n=51066). The effect of the lunar phases on birth rate was tested on a four and eight phases base.

Results
Further analysis using linear regression on residual values data showed that the month and the day of the week can explain 86 % of the births. A clear “Tuesday effect” regarding an increased birth rate for dairy and mixed cattle was reported. This is most likely caused by calf fattening management in Belgium: male calves are mostly grouped by livestock dealers starting on Tuesdays. Indeed, regulations forbid the selling of calves before the age of two weeks. Therefore there is a bias in birth declarations in order to sell calves sooner. When further testing according to a 4 or 8 phases lunar cycle there were no effect of any particular phase on birth frequency (P=0.13 and P=0.60, respectively).

Discussion and Conclusion
The results of the current study do not support the hypothesis of a relationship between lunar cycle and the frequency of calving in the Walloon Region of Belgium. Lunar phases are of no help to predict calving.

P25: Is Sono Steam the solution in the fight against *Campylobacter*?

Madeleine Moazzami[1], Emma Bergenkvist[1], Ingrid Hansson[1]

[1]*Swedish University of Agricultural Sciences.*

Background

Campylobacter causes the most commonly reported foodborne disease in humans in many European countries. Poultry and poultry products are known as the most important sources of human infections.
The slaughter process of poultry is highly automated and a higher slaughter rate increases the risk of contamination of the chicken. The number of human campylobacteriosis cases has increased the last years in Sweden.

Objective

Is it possible to reduce the number of *Campylobacter* on broiler carcasses by SonoSteam treatment at abattoir?

Materials and Methods

A combination of steam with ultrasounds (Sonosteam®) was investigated on naturally contaminated broilers in a Swedish abattoir. The aim of the study was to evaluate if Sonosteam® could reduce the number of bacteria of the carcasses. Neck skins from broiler carcasses were sampled before and after the SonoSteam treatment. The samples were analysed for *Campylobacter* (ISO10272-2*),* thermotolerant *E.coli* (NMKL 125), *Enterobactereaceae* (NMKL 144), and total aerobic bacteria (NMKL 86). MaldiTof was used for the confirmation of *Campylobacter* spp. and thermotolerant *E.coli*.

Results

The preliminary results indicate a small reduction of the amount of bacteria on the carcasses after treatment of SonoSteam. The mean number of *Campylobacter* was 2,83 log cfu/g before the treatment and 2,23 logs after. The reduction of the amount of *Enterobacteriaceae* varied in the study. At the first sampling occasion the level was 2,92 logs before and 2,35 logs after treatment. At the second sampling occasion the mean level of *Enterobacteriaceae* was 4,19 logs before and 2,89 logs after and at the third sampling it was 3,31 logs before and 2,57 logs after.

Discussion and Conclusion

The first results of the study do not indicate an important reduction of bacteria on contaminated broiler carcasses after the SonoSteam® treatment.

Perspectives

This is an ongoing project and more analyses have to be performed before further conclusions can be drawn.

P26: Population structure and virulence gene profiles of *Streptococcus agalactiae* collected from different hosts worldwide

Marina Morach[1], Roger Stephan[1], Sarah Schmitt[1], Christa Ewers[2], Michael Zschöck[3], Julian Reyes-Velez[4,5], Urs Gilli[6], María del Pilar Crespo-Ortiz[7,8], Margaret Crumlish[9], Revathi Gunturu[10], Claudia A. Daubenberger[11,12], Margaret Ip[13], Walter Regli[14], Sophia Johler[1]

[1]University of Zurich, Switzerland; [2]Justus-Liebig University, Germany; [3]Hessian State Laboratory, Germany; [4]University of Prince Edward Island, Canada; [5]CES University, Colombia; [6]IDEXX Diavet Laboratories, Switzerland; [7]University of Valle, Colombia; [8]Santiago de Cali University, Colombia; [9]University of Stirling, UK; [10]Aga Khan University Hospital, Kenya; [11]Swiss Tropical and Public Health Institute, Switzerland; [12]University of Basel, Switzerland; [13]Chinese University of Hong Kong, China; [14]labor-zentral.ch, Switzerland.

Background

Streptococcus agalactiae is a leading cause of morbidity and mortality among neonates and causes severe infections in pregnant women and nonpregnant predisposed adults, in addition to various animal species worldwide. Still, information on the population structure of *S. agalactiae* and the geographical distribution of different clones is limited. Further data are urgently needed to identify particularly successful clones and obtain insights into possible routes of transmission within one host species and across species borders.

Objective

We aimed to determine the population structure and virulence gene profiles of *S. agalactiae* strains from a diverse set of sources and geographical origins.

Materials and Methods

To this end, 373 *S. agalactiae* isolates obtained from humans and animals from five different continents were typed by DNA microarray profiling.

Results

A total of 242 different *S. agalactiae* strains were identified and further analyzed. Particularly successful clonal lineages, hybridization patterns, and strains were identified that were spread across different continents and/or were present in more than one host species. In particular, several strains were detected in both humans and cattle, and several canine strains were also detected in samples from human, bovine, and porcine hosts.

Discussion and Conclusion

The findings of our study suggest that although *S. agalactiae* is well adapted to various hosts including humans, cattle, dogs, rodents, and fish, interspecies transmission is possible and occurs between humans and cows, dogs, and rabbits.

Perspectives

The virulence and resistance gene profiles presented enable new insights into interspecies transmission and make a crucial contribution to the identification of suitable targets for therapeutic agents and vaccines.

P27: Aujeszky´s Disease Virus circulating in wild boar populations of the Iberian Peninsula

Natacha Melo[2, 4], Alexandra Müller[1], Jose Ruiz-Fons[3], Nuno Alegria[2, 4], Madalena Vieira-Pinto[2, 4]

[1]Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto, Portugal, [2]University of Trás-Os-Montes e Alto Douro (UTAD), Portugal, [3]University of University of Castilla-La Mancha, Spain; [4] Veterinary and Animal Science Research Center (CECAV) - UTAD.

Background
Aujeszky´s Disease (AD has already been eradicated from domestic pigs in Spain, whereas a national eradication programme is ongoing in Portugal. In both countries, large herds of domestic pigs are reared outdoors. The presence of Aujeszky´s Disease virus (ADV) in wild boar could represent a source of reintroduction of the virus in domestic pigs, interfering with the eradication programmes.

Objective
To investigate if ADV is circulating in wild boar in hunting areas in Portugal (one area: IN) and Spain (three areas: ED, EF, QM).

Materials and Methods
Samples were taken in the hunting season 2014-2015. A total of 236 wild boar sera were tested for ADV antibodies by ELISA (Idexx HerdCheck), and ADV excretion was determined by PCR in 98 oro-nasal and genital swabs of the same hunted wild boar.

Results
In Portugal, seroprevalence was 12.7% (95%CI 5.3 – 24.5%) and the ADV detection rate in swabs was 10.9% (95%CI 3.6 – 23.6%). In Spain, seroprevalence ranged between 35.7% in ED and 57.7% in RF, and ADV detection rate in swabs between 5.9% (95%CI 0.2-28.7%) in QM and 55.6% (95%CI 30.8 – 78.5%) in RF.

Discussion and Conclusion
Our findings further support that AD is endemic in wild boar populations in the Iberian Peninsula. Evidence of ADV exposure and excretion in wild boar in Portugal was shown for the first time. Previous findings in Spain are strengthened. Prevalence of antibodies and DNA in swabs differed between the study areas. Factors such as wild boar density, age of the hunted animals and month of sampling may influence this variability. We conclude that ADV circulation in wild boar may pose a risk of ADV reintroduction in domestic pigs, potentially compromising ongoing eradication programmes.

Perspectives
Outdoor pig farms in areas sympatric with wild boar should be subject to heightened surveillance and biosecurity measures.

P28: Low health literacy about dirofilariasis in a community from an endemic region from Portugal

Francisco Cortez Nunes[1,2], Ana Inês Pena[3], Rui Leandro Maia[4], Teresa Letra Mateus[1,2,3]

[1]Departamento de Medicina Veterinária, Escola Universitária Vasco da Gama, Coimbra, Portugal; [2]ISPUP-EPIUnit, Universidade do Porto, Porto, Portugal; [3]Escola Superior Agrária, Instituto Politécnico de Viana do Castelo, Ponte de Lima, Portugal; [4]UFP Energy, Environment and Health Research Unit (FP-ENAS), Universidade Fernando Pessoa, Praça 9 de Abril, 349, 4249-004 Porto, Portugal.

Background

Dirofilaria immitis is one of the most frequently detected mosquito-borne zoonotic nematode in mammals in Europe and is considered as an emerging zoonosis. In Portugal, dirofilariasis has been identified in several different animals. Previous studies revealed the existence of dirofilariasis across the country in dogs with an overall prevalence ranging from 2.1% to 24.8%.

Objective

The main objectives were to: assess the population awareness of, and attitudes towards parasitic zoonosis and dirofilariasis; determine the prevalence of known risk factors related to animal health and to assess the best ways to transmit information.

Materials and Methods

A questionnaire was constructed, tested and administered to the costumers of the veterinary hospitals and clinics and to people from a community in an endemic area. Statistical analysis was done using IBM® SPSS® Statistics vs.24.0.

Results

A total of 316 people were surveyed, 49% of them with ages between 31-50 years and 81% owning a pet. Most of them live in a high risk exposure area (53%) and affirmed to use flee, tick, mosquito, sand fly preventative and dewormer (88%). The majority (58%) choose the tick and only 27% considered the mosquito, the most dangerous vector. Only 34% recognize the term dirofilariasis, but 61% recognize the term heartworm. Only 13% recognized the disease as a zoonosis. Half of the respondents would like to receive more information about dirofilariasis, mainly via email or by their veterinarian.

Discussion and Conclusion

Beside the need to inform about dirofilariasis, it seems that there is also the need to communicate as even those who seem to have knowledge, adopt risk behaviours. The veterinarians may have an important role in public health education.

Perspectives

It is necessary to raise awareness amongst the community but also for veterinarians to promote public health education.

P29: High prevalence of potentially zoonotic *Toxocara cati* in cats from the north and centre of Portugal

Francisco Cortez Nunes[1,2], Carla Barbosa[3], Ricardo Cabeças[1], Teresa Letra Mateus[1,2,3]

[1]Departamento de Medicina Veterinária, Escola Universitária Vasco da Gama, Coimbra, Portugal; [2]ISPUP-EPIUnit, Universidade do Porto, Porto, Portugal; [3]Escola Superior Agrária, Instituto Politécnico de Viana do Castelo, Ponte de Lima, Portugal.

Background

The cat is nowadays a very fashionable pet, playing a very important role in the society, because besides providing companionship to the owners, they promote the psychological well being of many people. On the other hand, these animals can also represent a health risks through zoonotic parasitic diseases that can be transmitted to humans.

Objective

The objective of this study was to evaluate the prevalence and diversity of zoonotic gastrointestinal parasites in domestic cats from the north and centre of Portugal.

Materials and Methods

Cats' fecal samples had been collected at households, veterinary hospitals or clinics and at state shelters. The samples were analysed using qualitative and quantitative methods (Willis and McMaster, respectively).

Results

Of the 411 collected samples, with the results of the qualitative analysis, it was possible to identify that 29.7% of them (122/411) had parasitic forms. The most prevalent parasite was *Toxocara cati* (20.2%, 83/411), followed by *Cystoisospora felis* (6.6%, 27/411) and *Cystoisospora rivolta* (4.4 %, 18/411), hookworms (4.9%, 20/411) and *Capillaria* spp. (0.5%, 2/411). The burden of *Toxocara cati* reached 162400 eggs per gram of feces in some samples, especially from kittens.

Discussion and Conclusion

The burden of parasites found was not negligible. There is an environmental contamination with potentially zoonotic parasites - *Toxocara cati* and hookworms - so it is essential that the population is alert and aware of these diseases so that they can also be prevented through proper deworming of the animals, as well as appropriate prophylactic measures.

Perspectives

These results suggest that there is a public health risk for cats' owners and the need to promote health education concerning parasitic zoonosis, in a one health perspective.

P30: Update on VPH-focussed veterinary school in Hong Kong

Michael P Reichel[1], Ioannis Magouras[1], Dirk U Pfeiffer[1]

[1]*City University of Hong Kong, SAR China.*

Background
City University (CityU) of Hong Kong established the first veterinary school in Hong Kong in 2014. It has engaged with the Australasian Veterinary Boards Council (AVBC) and the Royal College of Veterinary Surgeons (RCVS) to seek international accreditation.

Objective
The now College of Veterinary Medicine and Life Sciences (CVMLS), aims to address four key areas in its undergraduate, Bachelor of Veterinary Medicine (BVM) offering, a six-year degree designed in conjunction with Cornell University's College of Veterinary medicine (CVM) in Ithaca, NY.

Materials and Methods
A six-year BVM addresses locally pertinent issues, such as Food Safety, Emerging Infectious diseases, Animal Welfare and Aquaculture and addresses those particularly in the early years of the students' experience.

Results
The first class of 12 internationally recruited students commenced their studies at CVMLS in the autumn of 2017. After completion of their first year of academic training they participated in an Extramural training exercise in Animal Husbandry at Cornell's CVM. Recruitment of the next cohort for the 2018 intake is well underway with the College aiming for 20 students. Facilities are being completed to world standard and added to facilitate teaching and research. A state-of-the-art veterinary diagnostic laboratory is operational, and a retail centre is being turned into a 3-floors veterinary specialist teaching clinic, occupying ~3,500 sqm.

Discussion and Conclusion
The roll—out of the first internationally accredited veterinary degree in Asia is proceeding well with the programme being "provisionally accredited" by the AVBC.

Perspectives
The accreditation pathway through the AVBC/RCVS provides ongoing quality assurance until 2023 (and beyond), when the first cohort of students will graduate from CityU. Full accreditation will then be conferred and graduates becoming eligible to practice in Hong Kong, Australia and New Zealand, as well as the UK, South Africa, and a number of jurisdictions in Asia (incl. China).

P31: Man-imal: An experimental One Health degree program

Nathalie Ruvoen[1], Jean-Michel Cappelier[1], Matthieu Éveillard[2], Didier Lepelletier[3], Sébastien Couvreur[4] Michel Krempf[2,] Catherine Magras[1], Sara Malherbe[1]

[1]Oniris, the Nantes-Atlantic National College of Veterinary Medicine, Food Science and Engineering France; [2]The Faculty of Health of the University of Angers; [3]The Faculty of Medicine of the University of Nantes France; [4]The Higher Education Institute of Agriculture of Angers France.

Background

In 2011, the French government began a vast experiment on pedagogical innovation by funding 37 projects experimenting creative, collective and cross-disciplinary approaches to teaching (http://www.enseignementsup-recherche.gouv.fr/cid59599/37-projets-de-formation-labellises-idefi.html, http://www.man-imal.fr/en/home/introduction).

Objective

One of these projects, the Man-imal program, is the first France-based international higher education degree program exclusively founded on the "One World, One Health" initiative.

Materials and Methods

Man-imal experiments the 1) use of ICTE (Information and Communication Technology in Education) but most importantly 2) a multidisciplinary approach by its study content conceived by Teacher-Researchers from the Medical sciences, Veterinary sciences and the Agricultural engineering as well as

3) by the composition of its students coming from diverse backgrounds (medical and veterinary studies, agricultural engineering, biological and pharmacy studies).

Results

The created training courses are introduced starting from the first years of studies as Bachelor-level modules. The Man-imal teachings include also an international One Health post-graduate degree taught entirely in English, the latter experimenting also a multicultural approach. The professors participating in the Man-imal experiment have at their disposal a full-time support staff of 10 persons for 7 years, including pedagogical engineers, graphic designers, an audiovisual manager, education and studies assistants as well as a program coordinator.

Discussion and Conclusion

Today, almost 6 years after the beginning of the program, we are able to present results from multiple aspects of the project. Firstly, on the successful multi-disciplinary cooperation between teacher-researchers from different scientific fields, secondly on the particularities of coordinating a cross-disciplinary and multicultural class of students, thirdly on the good practices in the management of a pedagogical project and finally on the importance of the close cooperation between the support staff and Teacher-Researchers.

Perspectives

In order to contribute to other similar Higher Education projects, Man-imal has hired two persons researching the results of our program (pedagogical impact of our resources, the use of ICTE, introducing innovation…).

P32: Development of a local risk map for African Swine Fever in Germany

Christiane Breidenstein[1], Ronald Schröder[1], Christoph Staubach[1], Carola Sauter-Louis[1], Klaus Depner[1], Klaas Dietze[1], Timo Homeier-Bachmann[1], Franz J. Conraths[1]

[1]*Friedrich-Loeffler-Institut, Germany.*

Background
With the spread of African swine fever in Eastern Europe, risk assessments on disease introduction, exposure and spread are of major importance for risk managers. For them, to subsequently deduct effective mitigation measures at local level, high resolution in risk maps are needed.

Objective
We develop a local risk map for veterinary authorities to estimate the risk of entry of ASF virus and the risk of exposure of domestic pigs and wild boar, taking into account local peculiarities.

Materials and Methods
Available data is first used to establish geographic layers for potential risk factors. This includes information on vegetation, season, temperature and the number of wild boar reported in the hunting bag. In addition, anthropogenic factors like settlements, pig holdings, roads, rest areas along motorways and traffic data are included. Veterinary authorities may add local knowledge like information on the presence of seasonal workers from ASF-endemic areas or on hunting tourism to areas where ASF has occurred, hot spots for illegal waste disposal or areas of outstanding wild boar abundance.

Results
We developed a risk map for Lower Saxony, Germany, using a grid of 3 km x 3 km. Each geographical layer presents the data in a categorized manner (presence of motorways in binary form, vegetation classes, etc.). The final risk for each grid cell is calculated in an additive fashion from the risks of the individual geographical layers. This will be complemented by weighing each layer individually.

Discussion and Conclusion
The tool will provide risk managers with information on critical areas to increase the chance of early detection of ASF and to use resources effectively for both prevention and control if ASF is introduced.

Perspectives
This tool can be extended to other wildlife diseases like avian influenza, classical swine fever, Hantavirus infections.

P33: *Bla Bla* black sheep, have you any AMR?

Sue C Tongue[1], Julie Stirling[1], Jude Evans[1], Steven Murray[2], Catriona Webster[1], Roger Humphry[1], the CARS-NHS-FSS team[3], George J Gunn[1], Geoffrey Foster[1,3]

[1]ERU, SRUC (Scotland's Rural College), Inverness, Scotland; [2]SAC Consulting Veterinary Services, Inverness, Scotland; [3]CARS-NHS-FSS team, Health Protection Scotland, Glasgow, Ninewells Hospital, Dundee & Food Standards Scotland, Aberdeen Scotland.

Background

Antimicrobial resistance (AMR) is a global challenge with national, regional and local implications. Collection of antimicrobial sensitivity (AMS) data from all levels of the food chain is required to help inform the issue of antimicrobial resistance (AMR), its development and transmission.

Objective

To provide an indication of the frequency of occurrence of AMR in a/ lambs intended for slaughter from Scottish flocks b/ sheep slaughtered at Scottish abattoirs and c/ to explore the utility of sheep movement data as a means to improve the design and interpretation of such monitoring & surveillance activities.

Materials and Methods

One *E. coli* isolate - from each of approx. 390 enteric samples from sheep presented to one Scottish abattoir in 2017/18 - was tested for AMS by disc diffusion against 12 antibiotics. The same isolates were tested by PCR against a panel of AMR genes. Convenience samples from 11 Scottish sheep flocks were also tested. Movement data were used to define the abattoir throughput and catchment area, as well as their relationship to the Scottish slaughtered and slaughter sheep populations.

Results

The levels of resistance found were very low to negligible depending on the target antibiotic or gene. Given the sampling strategy, low numbers sampled and farm-level clustering, the results from the field flocks were not inconsistent with the findings from the abattoir samples. Sampling from the one high throughput abattoir, although good, does not provide a completely representative sample of the Scottish slaughtered and slaughter sheep populations.

Discussion, Conclusion(s) and Perspectives

The levels of AMR detected in Scottish sheep are extremely low. It will be difficult to measure any change or trends in frequencies in this sector without significant investment of resources. Sheep movement data can be used to inform the design and interpretation of such monitoring & surveillance activities.

P34: Utilising social media as an adjunct to traditional zoonotic surveillance systems. A case study: Lyme disease and dogs in the UK and Ireland

John Tulloch[1,2], Roberto Vivancos[1,2], Rob Christley[1,3], Jenny Warner[4,5], Alan Radford[1,3]

[1]NIHR Health Protection Research Unit in Emerging and Zoonotic Infections, University of Liverpool, United Kingdom; [2]Public Health England, Liverpool, United Kingdom; [3]Institute of Infection and Global Health, University of Liverpool, Liverpool, United Kingdom; [4]NIHR Health Protection Research Unit in Emerging and Zoonotic Infections, Public Health England, Porton Down, United Kingdom; [5]Rare and Imported Pathogens Laboratory, Public Health England, Porton Down, United Kingdom.

Background

Social media (e.g. twitter) has revolutionised communication, but it's potential for surveillance of veterinary diseases remains unexplored. Lyme disease is a zoonotic tick-borne disease, and it's incidence in humans is rising across Europe. However, little is known about the incidence and public perception of canine Lyme disease.

Objective

1) To compare human and canine twitter datasets to known epidemiological data.
2) Identify themes raised about canine Lyme disease.

Materials and Methods

Tweets from the UK and Ireland (July 2017 - June 2018) were searched for the word 'Lyme'. Dog and human subsets were generated. Trends in seasonality and geography were compared to published figures. Data was explored for word frequency, association, sentiment analysis, and impact.

Results

5,212 users tweeted 13,757 tweets containing 'Lyme', peaking in summer. Clustering of users occurred in the South-West of England and Highlands of Scotland**,** reflecting the known epidemiology of Lyme disease in humans. 165 users tweeted 205 tweets containing 'Lyme' and 'dog'. The data suggested some seasonality, but data was skewed by one tweet. No geographical conclusions could be drawn. The most frequent words were 'worms', 'tape' and 'fleas', suggesting poor knowledge about disease transmission. The largest sentiment scored was 'anger'. The most impactful tweet warned people about ticks, originating from a pet charity.

Discussion and Conclusion

Twitter may be useful as an epidemiological tool to assist in Lyme disease surveillance. It can be analysed in real-time and identify potential disease hotspots; however there is a substantial risk of false positives. The canine-specific dataset was too small to provide useful epidemiological data. Such data can guide veterinary public health practitioners in the education of the public about the relative risk that Lyme poses to pets and its mode of transmission.

Perspectives

Social media can be utilised to understand the public's knowledge base and emotions about a disease; and therefore shape education and policy.

P35: *Fasciola gigantica* in slaughtered cattle in Cape Verde: Fluke genetic identification and coprological analysis

Sara Levy[1], Manuela Calado[2], Teresa Mateus[3,4,5], Madalena Vieira-Pinto[1,6]

[1]Departamento de Ciências Veterinárias, Universidade de Trás-os-Montes e Alto Douro, UTAD; [2]Global Health and Tropical Medicine, GHTM, Instituto de Higiene e Medicina Tropical, IHMT, Universidade Nova de Lisboa, UNL; [3]Departamento de Medicina Veterinária, Escola Universitária Vasco da Gama, Coimbra, Portugal; [4]Escola Superior Agrária, Instituto Politécnico de Viana do Castelo, Ponte de Lima, Portugal; [5]EpiUnit, Instituto de Saúde Pública da Universidade do Porto, Porto, Portugal; [6]CECAV, Centro de Ciência Animal e Veterinária, Universidade de Trás-os-Montes e Alto Douro.

Background
Several cases of Human Fasciolosis by *Fasciola gigantica* have already been documented in Cape Verde. However, information on this disease in cattle is scarce, which limits the knowledge of its role in the epidemiology of this disease.

Objective
The aims for this study were, mainly, to evaluate the presence and to genetically identify *Fasciola gigantica* in slaughtered cattle in Cape Verde.

Material and methods
During 2 months, meat inspection of cattle was carried out at Praia's Abattoir, Cape Verde. Liver lesions compatible with Fasciolosis were identified and flukes were collected. Also, faeces from positive animals were sampled. At the laboratory, flukes were subjected to PCR-RFLP (Restriction Fragment Length Polymorphism) in order to identify the specie. Faeces were analysed through sedimentation technique for egg identification.

Results
From the 131 slaughtered bovines inspected, 12 (9.2%) presented liver lesions compatible with *Fasciolosis*. From those, 19 flukes were collected. Genetic analysis through PCR-RFLP confirmed to be *Fasciola gigantica*. No hybrids were found. The presence of *Fasciola* spp. eggs were detected in 7 of 11 faecal samples.

Discussion and Conclusion
According to the authors' knowledge this result constitutes the first report of *Fasciola gigantica* genetically confirmed in cattle in Cape Verde, being crucial to distinguish between *F. hepatica* and *F. gigantica* that have different epidemiological characteristics.
The eggs present in the faeces confirmed that animals (during life) were active shedders of eggs into the environment, promoting the dissemination of this disease (both to animals and humans).

Perspectives

The new data obtained could create awareness and encourage the implementation of effective strategies for disease control and mitigation, thus reducing the level of animal and human infection.

P36: Gastrointestinal parasites and *Trichinella* spp. in wild carnivores from Portugal

Ana Isabel Martins[1], Hélder Cortes[2,3], Madalena Vieira-Pinto[4,5], Nuno Carolino[1,6,7], Ricardo Brandão[8], Teresa Letra Mateus[1,9,10]

[1]Departamento de Medicina Veterinária, Escola Universitária Vasco da Gama, Coimbra, Portugal; [2]Laboratório de Parasitologia Victor Caeiro, Universidade de Évora, Portugal; [3]ICAAM - Instituto de Ciências Agrárias e Ambientais Mediterrânicas, Portugal; [4]Departamento de Ciências Veterinárias, Universidade de Trás-os-Montes e Alto Douro, UTAD, Portugal; [5]Centro de Estudos em Ciência Animal e Veterinária, UTAD, Portugal; [6]Instituto Nacional de Investigação Agrária e Veterinária, I.P., Estação Zootécnica Nacional, Fonte Boa, Vale de Santarém, Portugal; [7]CIISA – Faculdade de Medicina Veterinária, Universidade de Lisboa, Lisboa, Portugal; [8]CERVAS - Centro de Ecologia, Recuperação e Vigilância de Animais Selvagens, Gouveia, Portugal; [9]Escola Superior Agrária, Instituto Politécnico de Viana do Castelo, Ponte de Lima, Portugal; [10]EpiUnit, Instituto de Saúde Pública da Universidade do Porto, Porto, Portugal.

Background

Ecological changes, mainly due to anthropogenic factors, are leading to a greater proximity of the wildlife to urban areas, increasing the contact between domestic animals, wild animals and humans. At the same time, the occurrence of zoonotic diseases, having wild animals as hosts are a major public health problem, affecting the whole world.

Objective

The aim of the present study was to assess the prevalence and the burden of gastrointestinal helminth fauna and the presence of *Trichinella* spp. in wild carnivores from Portugal.

Materials and Methods

Faecal samples of foxes and faecal and muscular samples of eurasian badgers, genets, stone martens were collected in a wildlife rescue centre. The faecal samples were analysed using Mini-FLOTAC method and the muscles were processed by artificial digestion method.

Results

In 40 out of 70 faecal samples (57.1%) gastrointestinal parasites were found. The most frequent parasites were those of the family Ancylostomatidae (24.2%), followed by *Capillaria* spp. (22.8%) and *Toxocara* spp. (22.8%). Parasites of the families Spiruridae, Oxyuridae and Taeniidae and the species *Toxascaris leonina* and *Alaria alata* were also present. *Capillaria* spp. and badgers reached the higher burden. *Trichinella* spp. was not identified in any pool sample.

Discussion and Conclusion

It was found that neither the species, nor the age, nor the gender of the animals influenced the burden. The study showed that, in Portugal as in other European countries, hookworms and *Toxocara* spp. are the main danger to animal and public health, since their prevalence is very high in synanthropic animals, like foxes.

Perspectives

More representative parasitological studies should be carried out in order to draw more conclusions about the current situation, especially with respect to *Trichinella* spp.

P37: Challenges to the diagnosis of ruminants' hydatidosis during meat inspection and its importance for disease control

Teresa Letra Mateus[1,2,3] António Castro[4], João Niza Ribeiro[3,5], Madalena Vieira-Pinto[6,7]

[1]Departamento de Medicina Veterinária, Escola Universitária Vasco da Gama, Coimbra, Portugal; [2] Escola Superior Agrária, Instituto Politécnico de Viana do Castelo, Ponte de Lima, Portugal; [3]EpiUnit, Instituto de Saúde Pública da Universidade do Porto, Porto, Portugal; [4]ICETA/CECA, University of Porto, Public Health Centre Dr. Gonçalves Ferreira, National Institute of Health, Porto, Portugal; [5] Institute of Biomedical Sciences Abel Salazar, University of Porto, Porto, Portugal; [6]Departamento de Ciências Veterinárias, Universidade de Trás-os-Montes e Alto Douro, UTAD, Portugal; [7]Centro de Estudos em Ciência Animal e Veterinária, UTAD, Portugal.

Background

Hydatidosis, monitored under Directive 2003/99/EC, is one of the five zoonotic disease most frequently diagnosed in the Mediterranean. Nevertheless it remains a neglected zoonosis. Meat inspection is an important part of hydatidosis monitoring programmes in slaughtered intermediate hosts (livestock), which can be a major challenge for the official veterinarian due to the existence of several differential diagnoses.

Objective

The aim of this study was to evaluate the reliability of meat inspection procedures to identify lesions of hydatid cysts in ruminants.

Materials and Methods

Hydatid cysts' compatible lesions (HCCL) identified during meat inspection of domestic ruminants were collected in 8 slaughterhouses from Portugal. These lesions were further analysed through additional macroscopic analysis after incision and through the use of PCR reactions for the amplification of an *Echinococcus granulosus* repeated sequence.

Results

HCCL from cattle (n=44) and sheep (n=72) were identified and analysed from lung (n=50), liver (n=52) and lung+liver (n=14). At laboratory, a more detailed macroscopic analysis after incision detected only 43 (37.1%) samples as compatible lesions (presence of hydatid liquid, sand or germinative membranes) in which molecular analysis also confirmed the presence of *E. granulosus*, resulting in 38.6% (17/44, cattle) and 77.8% (56/72, sheep) of false positive. In these cases, the main differential diagnosis found in sheep was cysticercosis and in cattle non specific granuloma.

Discussion and Conclusion

The reliability of meat inspection in sheep was lowest comparing to cattle. From the total of HCCL identified during meat inspection, only 37.1% were hydatid cysts, requiring a more detailed evaluation of lesions, including incisions (avoiding agents spread) that seems to constitute an important additional procedure to prevent misdiagnosis.

Perspectives

Monitoring hydatidosis in intermediate hosts should remain during *post mortem* inspection, but procedures (like incisions) should be improved in order to increase reliability of meat inspection.

P38: Potential use of alpha-1-acid glycoprotein as a biomarker of febrile associated dark carcasses in slaughtered poultry

Sofia Balga[1], Emily O'Reilly[2], Fernando Moreira[3], David Eckersall[2], Madalena Vieira-Pinto[1,4]

[1]Department of Veterinary Sciences, University of Trás-os-Montes and Alto Douro (UTAD), Vila Real, Portugal; [2]University of Glasgow, Institute of Biodiversity, Animal Health and Comparative Medicine, Glasgow, G61 1QH, UK; [3]Department of Veterinary Sciences, Instituto de Ciências Biomédicas de Abel Salazar (ICBAS), University of Porto (UP), Portugal. Centro de Estudos de Ciência Animal (CECA), Instituto de Ciências, Tecnologias e Agroambiente from University of Porto (ICETA), Portugal; [4]Veterinary and Animal Science Research Center (CECAV) - UTAD.

Background

Dark-colored carcasses are one the major causes of poultry condemnation at slaughter. Dark carcasses can be related to a febrile state associated with an inflammatory or infectious process, prior to slaughter or with non-febrile factors, such as DFD or inefficient bleeding. It is important to be able to differentiate the cause so as to allow responsibility attribution of the economic losses. Acute phase proteins (APPs), measurable in serum and plasma, are widely used as infectious/inflammatory process biomarkers in veterinary medicine, but their presence and measurement in poultry meat juice has not been previously established.

Objective

To identify and measure alpha-1-acid glycoprotein (AGP), a widely measured APP in poultry, in paired serum and meat juice samples of febrile and healthy animals from poultry farms, with the aim of identifying febrile-associated dark carcasses using meat juice as an alternative and easily accessible matrix at the slaughterhouse level.

Materials and Methods

Paired serum and meat juice was collected from 40 healthy (40-41.5˚C) and 40 febrile (>42˚C) broilers aged 30-46 days. Following a validation stage, AGP was determined using ELISA *kit* (Chicken alpha-1-acid glycoprotein ELISA, AGP-5, Life Diagnostics™), according to the manufacturer's instructions.

Results

AGP concentration in serum and meat juice were significantly higher in samples of febrile animals ($p<0.0001$) as well as the correlation between the results from the samples of serum and meat juice ($r = 0.7540$).

Discussion and Conclusion

These results demonstrate that AGP is a suitable biomarker for the identification of febrile animals at farm level with potential to be tested at slaughterhouse using meat juice as a matrix to identify febrile-associated dark carcasses.

Perspectives

Further studies to test the applicability at slaughterhouse are required, helping to more accurately classified dark carcasses related to febrile processes, being an important tool for Official Veterinarians and Food Business Operators.

List of participants (updated on October 10th 2018)

First Name	Surname	Country	Email
Jens Frederik	**Agger**	Denmark	jfa@sund.ku.dk
Lis	**Alban**	Denmark	lia@lf.dk
Carvajal	**Ana**	Spain	ana.carvajal@unileon.es
Dragan	**Antic**	United Kingdom	dragan.Antic@liverpool.ac.uk
Simon	**Archer**	United Kingdom	simon.archer67@gmail.com
Alessio	**Benvenuti**	Italy	benveale@hotmail.it
Anna Catharina	**Berge**	Sweden	cat@bergevetconsulting.com
Maria Elisabetta	**Bigliazzi**	Italy	elisabetta.bigliazzi@gmail.com
Bojan	**Blagojevic**	Serbia	blagojevic.bojan@yahoo.com
Lisa	**Boden**	United Kingdom	Lisa.Boden@ed.ac.uk
Frank	**Boelaert**	Italy	frank.boelaert@efsa.europa.eu
Clémence	**Boireau**	France	clemence.boireau@anses.fr
Lisa	**Bradford**	Ireland	lisa.bradford@ucdconnect.ie
Mark	**Bronsvoort**	United Kingdom	mark.bronsvoort@ed.ac.uk
Hubert	**Brugere**	France	h.brugere@envt.fr
Anja	**Buschulte**	Germany	anja.buschulte@bfr.bund.de
Pavel	**Bystrický**	Slovakia	bystricky@uvlf.sk
Jean-Michel	**Cappelier**	France	patricia.maillot@oniris-nantes.fr
Maria	**Caramelli**	Italy	direzione.segreteria@izsto.it
Emanuele	**Carminati**	Italy	ecarminati7@gmail.com
Luis Pedro	**Carmo**	Switzerland	luis.gomesdocarmo@vetsuisse.unibe.ch
Claudio	**Caruso**	Italy	claudiocaruso1986@libero.it
Margherita	**Ceccarelli**	Italy	margherita.ceccarelli@gmail.com

First Name	Surname	Country	Email
Beniamino T.	**Cenci Goga**	Italy	beniamino.cencigoga@unipg.it
Annie	**Cook**	Kenya	annievet1@gmail.com
Francisco	**Cortez Nunes**	Portugal	franciscojvcnunes@gmail.com
Georges	**Daube**	Belgium	Georges.Daube@uliege.be
Yvette	**de Geus**	Netherlands	yvettedegeus@gmail.com
Daniele	**De Meneghi**	Italy	daniele.demeneghi@unito.it
Marco	**De Nardi**	Italy	marco.denardi@safoso.ch
Myrna	**de Rooij**	Netherlands	m.m.t.derooij@uu.nl
Francesco	**Debenedetti**	United Kingdom	frankdebe@gmail.com
Sofie	**Dhollander**	Italy	sofie.dhollander@efsa.europa.eu
Antonello	**Di Nardo**	United Kingdom	antonello.di-nardo@pirbright.ac.uk
Marcus	**Doherr**	Germany	marcus.doherr@fu-berlin.de
Dorien	**Eppink**	Netherlands	dorien.eppink@vionfood.com
Anna	**Fahrion**	Switzerland	anna.fahrion@safoso.ch
Laura	**Falzon**	United Kingdom	laura.falzon@liverpool.ac.uk
Ezio	**Ferroglio**	Italy	ezio.ferroglio@unito.it
Juan	**García-Díez**	Portugal	juangarciadiez@gmail.com
Marios	**Georgiadis**	Italy	mariosg@vet.auth.gr
Karsten	**Giffey**	Germany	kgiffey@yahoo.de
Riccardo	**Giglietti**	Italy	gigliettiriccardo@gmail.com
Pia	**Gjertsen Prestmo**	Norway	Piagprestmo@gmail.com
Luca	**Grispoldi**	Italy	grisluca@outlook.it
Lisa	**Guardone**	Italy	lisa.guardone@for.unipi.it
Chrystalleni	**Hadjicharalambous**	Greece	chad@materials.uoc.gr
Afrim	**Hamidi**	Macedonia	afrimhamidi@gmail.com
Michael	**Hässig**	Switzerland	mhaessig@vetclinics.uzh.ch

First Name	Surname	Country	Email
Ana Rita	**Henriques**	Portugal	anaritah@fmv.ulisboa.pt
Friederike	**Hilbert**	Austria	friederike.hilbert@vetmeduni.ac.at
Kurt	**Houf**	Belgium	kurt.houf@UGent.be
Giovanni	**Iaquinta**	Italy	giovanni.iaquinta7@virgilio.it
Eleni	**Iosifidou**	Greece	ehygfood@vet.auth.gr
Maria Francesca	**Iulietto**	Italy	mf.iulietto@gmail.com
Peter	**Jakob**	Switzerland	peter.jakob@blv.admin.ch
Sophia	**Johler**	Switzerland	sophia.johler@uzh.ch
Annemarie	**Kaesbohrer**	Austria	annemarie.kaesbohrer@vetmeduni.ac.at
Jenni	**Kaskela**	Finland	jenni.kaskela@helsinki.fi
Pieter-Jan	**Kerkhof**	Belgium	PieterJan.Kerkhof@UGent.be
Tineke	**Kramer**	Netherlands	tinekekramer@gmail.com
Manja	**Krizman**	Slovenia	manja.krizman@vf.uni-lj.si
Riikka	**Laukkanen-Ninios**	Finland	riikka.laukkanen-ninios@helsinki.fi
Thomai	**Lazou**	Greece	thomilazou@yahoo.gr
Isabel	**Lechner**	Switzerland	isabel.lechner@safoso.ch
Anaïs	**Léger**	Switzerland	anais.leger@safoso.ch
Len	**Lipman**	Netherlands	L.J.A.Lipman@uu.nl
Anna Rita	**Loschi**	Italy	annarita.loschi@unicam.it
Raul Carlos	**Mainar-Jaime**	Spain	rcmainar@unizar.es
Alessandro	**Mannelli**	Italy	alessandro.mannelli@unito.it
Maria Luisa	**Marenzoni**	Italy	marialuisa.marenzoni@unipg.it
Hans	**Marx**	Germany	johann.marx@lra-m.bayern.de
Filipe Miguel	**Maximiano Alves de Sousa**	Switzerland	filipe.maximiano@vetsuisse.unibe.ch
Anne	**Mayer-Scholl**	Germany	anne.mayer-scholl@bfr.bund.de

First Name	Surname	Country	Email
Stella	**Mazeri**	United Kingdom	stellamazeri@gmail.com
Catherine	**McCarthy**	United Kingdom	hlcmccar@liv.ac.uk
Cheryl	**McCrindle**	South Africa	cheryl.mccrindle@gmail.com
Roswitha	**Merle**	Germany	roswitha.merle@fu-berlin.de
Davide	**Messina**	United Kingdom	davide.messina.medvet@gmail.com
Natascha	**Meunier**	United Kingdom	natascha.meunier@ed.ac.uk
Madeleine	**Moazzami**	Sweden	madeleine.moazzami@slu.se
Marina	**Morach**	Switzerland	marinameret.morach@uzh.ch
Simon	**More**	Ireland	simon.more@ucd.ie
Paolo	**Motta**	Italy	motta.paolo@outlook.com
Alexandra	**Muller**	Portugal	ammuller@icbas.up.pt
Micheál	**O'Mahony**	Ireland	micheal.omahony@sfpa.ie
Ilias	**Papapanagiotou**	Greece	ipapapan@vet.auth.gr
Thomas	**Paratscha**	Italy	thomas.paratscha@sabes.it
Andy	**Paterson**	United Kingdom	andy.paterson@apha.gsi.gov.uk
Peter	**Paulsen**	Austria	friederike.hilbert@vetmeduni.ac.at
Ornella	**Peppi**	Italy	o.peppi@sanita.it
Maria Francesca	**Peruzy**	Belgium	mariafrancesca.peruzy@gmail.com
Dirk	**Pfeiffer**	United Kingdom	dirkpfeiffer@hotmail.com
Rohtraud	**Pichner**	Germany	rohtraud.pichner@oe.hs-fulda.de
Gina	**Pinchbeck**	United Kingdom	ginap@liv.ac.uk
Paul	**Popescu**	Romania	paul.alex.popescu@gmail.com
Laura	**Quercetti**	Italy	lauraquercetti@yahoo.it
Apostolos	**Rantsios**	Greece	ebteatr@hol.gr
Stefano	**Rea**	Italy	stefano.rea@unicam.it

First Name	Surname	Country	Email
Michael	**Reichel**	Hong Kong	michael.reichel@cityu.edu.hk
Katharina	**Riehn**	Germany	katharina.riehn@haw-hamburg.de
Nathalie	**Ruvoen**	France	patricia.maillot@oniris-nantes.fr
Morgane	**Salines**	France	morgane.salines@anses.fr
Cristina	**Saraiva**	Portugal	crisarai@utad.pt
Eleonora	**Sarno**	Italy	eleonorasarno@libero.it
Carola	**Sauter-Louis**	Germany	carola.sauter-louis@fli.de
Erik	**Schmid**	Austria	erik.schmid@vorarlberg.at
Gertraud	**Schüpbach-Regula**	Switzerland	Gertraud.Schuepbach@vetsuisse.unibe.ch
Paola	**Sechi**	Italy	paola_sechi@outlook.it
Simone	**Siena**	Italy	simonesiena@teletu.it
Eystein	**Skjerve**	Norway	eystein.skjerve@nmbu.no
Cristina	**Soare**	United Kingdom	Cristina.Soare@ed.ac.uk
Ricardo	**Soares Magalhaes**	Australia	r.magalhaes@uq.edu.au
Karin	**Söderqvist**	Sweden	karin.soderqvist@slu.se
Nikolaos	**Soultos**	Greece	soultos@vet.auth.gr
Cameron	**Stewart**	United Kingdom	cameron.stewart@apha.gsi.gov.uk
Marco	**Tamba**	Italy	marco.tamba@izsler.it
Etienne	**Thiry**	Belgium	etienne.thiry@uliege.be
Sue	**Tongue**	United Kingdom	jane.brennan@sruc.ac.uk
John	**Tulloch**	United Kingdom	elaine.mooney@phe.gov.uk
Matthias	**Upmann**	Germany	matthias.upmann@hs-owl.de
Ivar	**Vagsholm**	Sweden	ivar.vagsholm@slu.se
Ed	**van Klink**	United Kingdom	ed.vanklink@bristol.ac.uk
Gerty	**Vanantwerpen**	Belgium	gerty.vanantwerpen@dgz.be

First Name	Surname	Country	Email
Giorgio	**Varisco**	Italy	giorgio.varisco@izsler.it
Madalena	**Vieira-Pinto**	Portugal	mmvpinto@utad.pt
Katharina	**Wadepohl**	Germany	katharina.wadepohl@tiho-hannover.de
Patrick	**Wall**	Ireland	patrick.wall@ucd.ie
Agnes	**Wold**	Sweden	agnes.wold@microbio.gu.se
Francesco	**Zanchini**	Italy	zanchini.francesco@gmail.com
Urs	**Zimmerli**	Switzerland	urs.zimmerli@blv.admin.ch