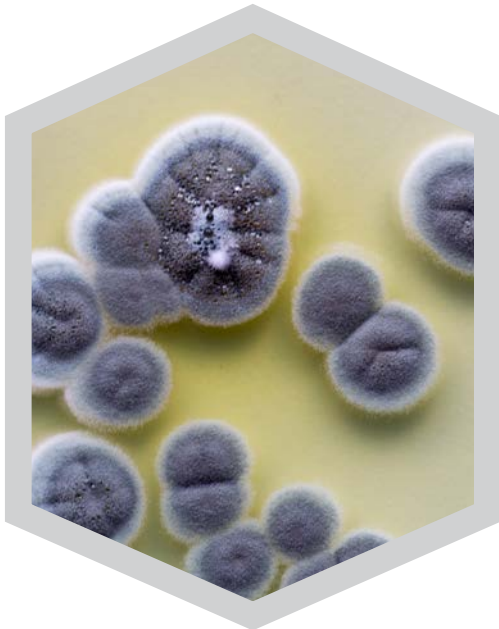


## OIE GLOBAL CONFERENCE ON ANTIMICROBIAL RESISTANCE

Putting Standards  
into Practice



**2nd OIE GLOBAL  
CONFERENCE  
ON ANTIMICROBIAL  
RESISTANCE  
AND PRUDENT USE  
OF ANTIMICROBIAL  
AGENTS IN ANIMALS**



Marrakesh, Morocco  
29-31 October 2018

## Under the high patronage of His Majesty, King Mohammed VI

With the support of 

Organised with the financial support of the Kingdom of Morocco, the People's Republic of China, the European Union, France, Germany, Italy, Japan, the Netherlands, Norad, the Pew Charitable Trusts, the United Kingdom Fleming Fund and the United States of America. The OIE would also like to thank the Kingdom of Morocco for its significant support in organising this conference.



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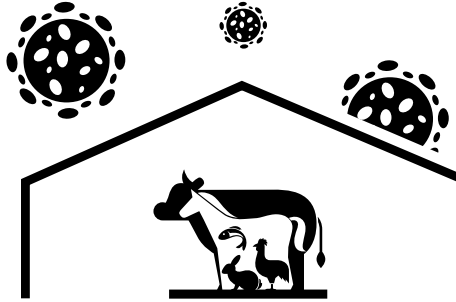
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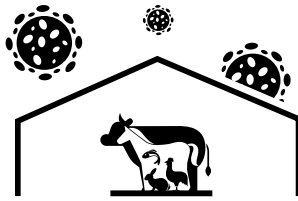
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## INTRODUCTION

There is a critical need to address the threat posed by antimicrobial resistance (AMR) to human, animal and environmental health. The significant scientific, economic and social challenges posed by AMR are now widely recognised by governments, the private sector, academia, organisations representing civil society, and increasingly consumers. Strong multisectoral collaboration at an intergovernmental level has been instrumental in elevating awareness and initiating coordinated action.

The Tripartite, a partnership between the OIE, the Food and Agriculture Organization of the United Nations (FAO), and the World Health Organization (WHO), has for many years worked together towards harmonised international standards, capacity building initiatives, and monitoring and evaluation to support responsible and prudent use of antimicrobials. In 2015, the Global Action Plan on Antimicrobial Resistance (AMR) was unanimously endorsed by the Membership of the three organisations, outlining the responsibilities of all stakeholders across sectors in combatting this global issue through a 'One Health' approach. The Tripartite also promotes a 'One Health' approach through the activities of the Interagency Coordination Group on Antimicrobial Resistance, formed by the United Nations in 2016.

Antimicrobial agents are essential tools for protecting animal health and welfare. They also contribute to satisfying the increasing world demand for safe and humanely produced food of animal origin. To ensure sustainability of livestock production and maintenance of animal welfare for terrestrial and aquatic animals, the efficacy of antimicrobial agents must be preserved through their responsible and prudent use. As the recognised global leader on animal health and welfare, the OIE engages in the fight against antimicrobial resistance through standard setting for and capacity building of Veterinary Services, livestock producers, and other stakeholders of the animal production industry. These activities are outlined in the four objectives of The OIE Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials, and reflect the principles of the Global Action Plan on AMR.

The objectives are:

- 1) Improve awareness and understanding;
- 2) Strengthen knowledge through surveillance and research;
- 3) Support good governance and capacity building;
- 4) Encourage implementation of international standards.

Following the first OIE Global Conference on the Responsible and Prudent Use of Antimicrobial Agents for Animals (13-15 March 2013), recommendations of this important meeting led directly to continued capacity building in Member Countries through the OIE PVS pathway, strengthened collaboration with WHO and FAO through the tripartite alliance, and the creation of the first global database on the use of antimicrobial agents in animals.

Since this time, OIE monitoring activities have demonstrated impressive progress in its Member Countries towards combatting AMR in animals. In 2012, an OIE questionnaire showed that 27% of the 152 responding Member Countries had an official system in place for collecting quantitative data on antimicrobial agents used in animals. By the second phase of the OIE data collection on antimicrobial agents intended for use in animals, concluded in May 2016, 73% (107 out of 146 countries that replied) were able to provide quantitative data on antimicrobial agents intended for use in animals.

The results of Technical Item 1 of the 85th OIE General Session in 2017, 'Global action to alleviate the threat of antimicrobial resistance: progress and opportunities for future activities under the 'One Health' initiative' also highlighted areas of development in Member Countries. The percentage of Member Countries declaring no significant awareness-raising activities on AMR fell from 46% (before 2015) to 22% (after 2015). The proportion of Member Countries reporting no data collection on antimicrobial use in animals fell from 31% to 19% after 2015. In the same period, the proportion of Member Countries without a regular national AMR surveillance

system or plan fell from 44% to 25%. Only 7% of reporting countries declared not having put in place any policy or legislation on the quality, efficacy and safety of medicinal products, and an increase was shown in use of OIE international standards and guidelines on antimicrobials across all OIE Regions.

These remarkable improvements demonstrate the significant impact a harmonised intergovernmental approach can achieve in tackling this global issue, while also highlighting areas where future growth is needed. Current work on antimicrobial resistance focuses primarily on antibiotics, while data shows that resistance to antiparasitics is of growing concern to animal health, welfare and productivity. Country reporting in monitoring and evaluation by the OIE and its Tripartite partners has also underscored the problem of substandard and falsified veterinary antimicrobials, which escape government regulation and surveillance aimed at reducing development of antimicrobial resistance, and with unknown contents, pose a risk to animal and human health.

To ensure a successful, harmonised and sustained response to antimicrobial resistance, international standards must be implemented at all levels, and in all areas regarding animal health and production. As Member Countries work to implement OIE standards nationally, engagement is essential from all stakeholders, such as the veterinary pharmaceutical industry, wholesale and retail distributors of veterinary antimicrobials, animal feed manufacturers, and veterinarians and food animal producers in the field. Achieving agreement and collaboration between these diverse and relevant stakeholders is the next step in capacity building on a national level.

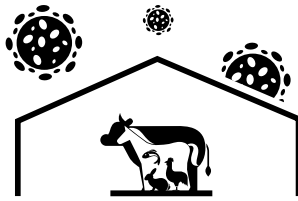
To achieve measurable results at the global, regional and at country levels, the OIE and Member Countries should ensure strong engagement and communication between, and training of, these different sectors of the animal health industry. Within the animal health sector

at a national level, a strong Veterinary Authority must ensure a comprehensive understanding and effective collaboration across the Veterinary Service, ensuring veterinarians, farmers, feed and pharmaceutical industries, are committed and engaged in the National Action Plan, each understanding their role, and are supported in developing the required competencies to achieve the shared goal of reducing development and spread of antimicrobial resistance. The Veterinary Service must build and sustain effective 'One Health' partnerships at a national level.

Additionally, on an intergovernmental level, enhanced integration of the surveillance and monitoring activities of the three organisations of the Tripartite would also support a better

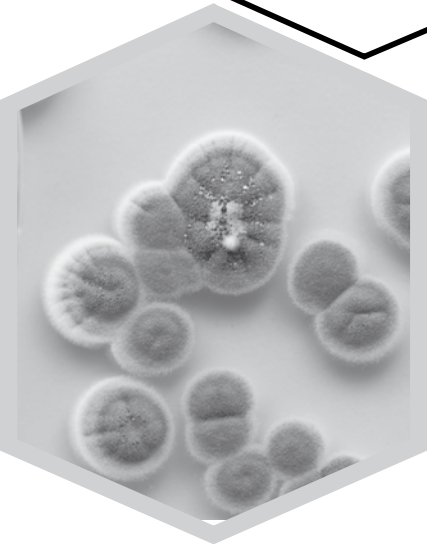
understanding of how antimicrobials are consumed, and how resistance circulates within and between humans, animals and plants, and through food, water and the environment. Such understanding is necessary to inform areas for beneficial intervention strategies in the future, and measurement of their impacts.





## OIE GLOBAL CONFERENCE ON ANTIMICROBIAL RESISTANCE

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# OBJECTIVES

## AIM OF THE CONFERENCE

The Second OIE Global Conference comes at a critical juncture in the fight against antimicrobial resistance. Member Countries have demonstrated an impressive commitment to development of national capacity in this effort in line with international standards. To build upon and further inform this momentum, the Second OIE Global Conference will bring together OIE Delegates and OIE National Focal Points for Veterinary Products, as well as experts, professionals, policy makers, international organisations and donors, with the aims to increase understanding of the current global situation on antimicrobial resistance in animals, and to develop recommendations for future sustained control of AMR while ensuring animal health, animal welfare, veterinary public health, and food security. Particularly, it will provide a forum to examine how to best support Member Countries in continued fulfilment of the objectives of the OIE Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials, and the Global Action Plan on Antimicrobial Resistance.



**The conference will in particular:**

- Inform on initiatives taken by the Tripartite and other international organisations involved in 'One Health' projects to control AMR in humans, animals, plants, and the environment at national, regional and international levels;
- Present an overview of the progress achieved since the first OIE Global Conference on the Responsible and Prudent Use of Antimicrobial Agents for Animals in 2013 on antimicrobial use in animals including the OIE global database on antimicrobial agents intended for use in animals;
- Promote implementation by all relevant stakeholders in OIE Member Countries of the OIE's international standards and guidelines on the use of antimicrobial agents and antimicrobial resistance in animals, including the updated OIE List of Antimicrobial Agents of Veterinary Importance;
- Support the ongoing development of comprehensive surveillance and monitoring systems for antimicrobial use and resistance appropriate to different national and regional contexts;
- Encourage responsible and prudent use of veterinary antimicrobials in the field, including development of species-specific clinical guidelines, and engagement strategies for veterinarians and livestock producers;
- Promote access to high quality veterinary products worldwide and strategies to reduce dissemination of falsified and substandard products;
- Consider communication tools and interventions to generate key behavioural changes towards reducing use of antimicrobials in the field;
- Inform on the research and possible implementation of alternatives to antimicrobial agents;
- Discuss the development of guidance on the responsible and prudent use of antiparasitics;
- Encourage international solidarity in supporting the OIE and its Member Countries to effectively implement the OIE Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials.



# ORGANISATION OF THE CONFERENCE

## STEERING COMMITTEE

- Dr Matthew Stone (World Organisation for Animal Health, OIE - Chair)
- Dr Alain Dehove (OIE)
- Dr Abderrahman El Abrak (Delegate of Morocco to the OIE - Office National de Sécurité Sanitaire des Produits Alimentaires - ONSSA)
- Dr Elisabeth Erlacher-Vindel (OIE)
- Dr Mara Gonzalez-Ortiz (OIE)
- Dr Eric Thévenard (European Commission)

## SCIENTIFIC COMMITTEE

- Dr Herbert Schneider (Scientific Committee Coordinator - Agrivet International Consultants, Namibia)
- Dr Carolee Carson (Public Health Agency of Canada)
- Dr Gérard Moulin (Agency for Food, Environmental and Occupational Health & Safety - ANMV/ANSES, France)
- Dr Donald Prater (U.S. Food and Drug Administration)
- Dr Masumi Sato (National Institute of Animal Health, Japan)
- Dr Chris Teale (Animal and Plant Health Agency, United Kingdom)
- Dr Jordi Torren Edo (European Medicines Agency - EMA)
- Prof. Jacques Acar (Senior Expert - OIE)
- Dr Elisabeth Erlacher-Vindel (OIE)
- Dr Delfy Góchez (OIE)
- Dr Awa Aidara-Kane (World Health Organization - WHO)
- Dr April Johnson (Food and Agriculture Organization of the United Nations - FAO)
- Dr Olivier Espeisse (HealthforAnimals)

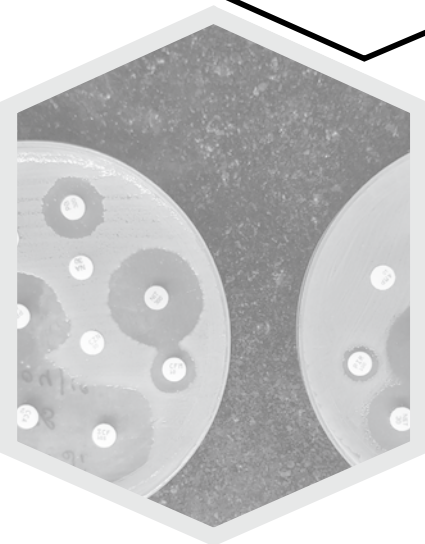
## ORGANISING COMMITTEE

- Dr Mara Gonzalez-Ortiz (Organising Committee Coordinator - OIE)
- Dr Khadija Id Sidi Yahia (Office national de sécurité sanitaire des produits alimentaires - ONSSA)
- Dr Rachid Bouguedour (OIE Sub-regional representation for North Africa, Tunis)
- Ms Nelly Dubarry (OIE)
- Dr Kimberly Calloway (OIE)
- Dr François Diaz (OIE)



## OIE GLOBAL CONFERENCE ON ANTIMICROBIAL RESISTANCE

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# GENERAL INFORMATION

## POSTERS

The selection of posters has been made following submission of an abstract.

The poster session offers an opportunity to present results-based activities from different countries and regions related to each of the conference sessions. The posters are available for viewing throughout the event.

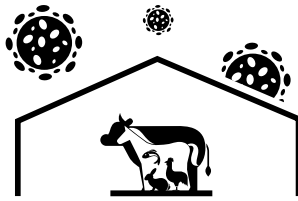
Note: The Poster Session is designed for educational and informational purposes only. It is not to be used for any commercial purposes.

## VENUE

Palais des Congrès de la Palmeraie  
Palmeraie Resorts  
Circuit de la Palmeraie  
BP 1488, 40000 Marrakesh, Morocco  
<http://www.palmeraieresorts.com/fr/meetings/>

## LANGUAGE

Speakers will give their presentations in one of the official OIE languages (English, French or Spanish with simultaneous interpretation into the other two).



## OIE GLOBAL CONFERENCE ON ANTIMICROBIAL RESISTANCE

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# PROGRAMME

**2nd OIE GLOBAL  
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AGENTS IN ANIMALS**

Marrakesh, Morocco  
29-31 October 2018

### DAY 1: MONDAY 29 OCTOBER 2018

9:00 - 10:30		OPENING ADDRESSES
	<b>Aziz Akhannouch</b> , Minister of Agriculture, Sea Fishing, Country development, Waters and Forests of Morocco	
	<b>Tedros Adhanom Ghebreyesus</b> (by video message), Director General, World Health Organization (WHO)	
	<b>José Graziano da Silva</b> , Director General, Food and Agricultural Organization of the United Nations (FAO) <i>Video Message</i> , introduced by <b>Berhe Tekola</b> , Director, Animal Production and Health Division FAO	
	<b>Monique Eloit</b> , Director General, World Organisation for Animal Health (OIE)	
	Photo	
10:30 - 11:00		Coffee
11:00 - 12:30		SESSION 1 SETTING THE SCENE
	Chair: <b>Abderrahman El Abrak</b> (OIE Delegate, National Office for Food Safety, Ministry of Agriculture, Sea Fishing, Country development, Waters and Forests of Morocco)	
11:00 - 11:30	The Tripartite antimicrobial resistance work programme under the Global Action Plan	<b>Matthew Stone</b> , Deputy Director General, World Organisation for Animal Health, OIE
11:30 - 12:00	The United Nations Interagency Coordination Group on Antimicrobial Resistance	<b>Sally Davies</b> , Co-convener, United Nations Interagency Coordination Group on AMR
12:00 - 12:30	The economic case for investment in antimicrobial resistance	<b>Juergen Voegele</b> , Senior Director of the Agriculture Global Practice, World Bank
12:30 - 14:00		Lunch
14:00 - 15:30		SESSION 2 POLITICAL PANEL: ANIMAL HEALTH SECTOR PARTICIPATION IN ANTIMICROBIAL RESISTANCE NATIONAL ACTION PLANS
	Chair: <b>Mark Schipp</b> (President, World Organisation for Animal Health, OIE)	
	<i>Minister's round table</i>	
15:30 - 16:00		Coffee

16:00 - 18:00	<b>SESSION 3</b> <i>BEHAVIOUR CHANGE AND COMMUNICATIONS STRATEGIES TOWARDS REDUCING ANTIMICROBIAL USE IN ANIMALS</i>	
	Chair: <b>Catherine Bertrand-Ferrandis</b> (World Organisation for Animal Health, OIE)	
16:00 - 16:30	New insights: applying behavioural science to the use of antimicrobial agents in livestock worldwide	<b>Elizabeth Long</b> , DTA Innovations
16:30 - 17:00	Global communication on antimicrobial resistance in animal health: OIE and Tripartite efforts	<b>Catherine Bertrand-Ferrandis</b> and <b>Taylor Gabourie</b> , World Organisation for Animal Health, OIE
17:00 - 17:20	Development of a communication strategy for animal health	<b>Joseph Othieno</b> , Kenya Tsetse and Trypanosomiasis Eradication Council
17:20 - 17:40	iAMResponsible: imparting a sense of accountability, ownership and responsibility among stakeholders in the fight against antimicrobial resistance	<b>Samuel Castro</b> , Department of Agriculture of the Philippines
17:40 - 18:00	Identification of behaviour change drivers in key stakeholders	<b>Christianne Brusckhe</b> , OIE Delegate, Nature and Food Quality, Ministry of Agriculture of the Netherlands

## DAY 2: TUESDAY 30 OCTOBER 2018

9:00 - 10:30	<b>SESSION 4</b> <i>RESPONSIBLE AND PRUDENT USE OF VETERINARY ANTIMICROBIALS: PRACTICAL TOOLS AND EXPERIENCES</i>	
	Chair: <b>Herbert Schneider</b> (Agrivet International Consultants)	
9:10 - 9:40	The OIE strategy on antimicrobial resistance and the prudent use of antimicrobials	<b>Elisabeth Erlacher-Vindel/David Sherman</b> , World Organisation for Animal Health, OIE
9:40 - 10:00	World Veterinary Association's experience and supportive tools to promote prudent use of antimicrobials worldwide	<b>Zeev Noga</b> , World Veterinary Association
10:00 - 10:20	Country level implementation: FAO experience including aquaculture	<b>Melba Reantaso</b> , Food and Agriculture Organization of the United Nations
10:20 - 10:30	<i>Discussion</i>	
10:30 - 11:00	Coffee	
11:00 - 13:00	<b>SESSION 5</b> <i>SURVEILLANCE AND MONITORING TOWARDS EFFECTIVE MANAGEMENT OF ANTIMICROBIAL RESISTANCE</i>	
	Chair: <b>Jordi Torren Edo</b> (European Medicines Agency)	
11:10 - 11:30	OIE Database on antimicrobial agents intended for use in animals: third phase results	<b>Delfy Góchez</b> , World Organisation for Animal Health, OIE
11:30 - 12:00	Global antimicrobial resistance surveillance initiatives: updates from the WHO GLASS and FAO ATLASS	<b>Carmem Pessoa</b> , World Health Organization/ <b>Beatrice Mouillé</b> , Food and Agriculture Organization of the United Nations
12:00 - 12:20	Integrated surveillance of antimicrobial resistance in the food chain: challenges	<b>Sarah Cahill</b> , Codex Alimentarius Commission

12:20 - 12:40	Experience on integrated surveillance at country level: AGISAR country pilot projects and the tricycle project	<b>Awa Aidara-Kane</b> , World Health Organization
12:40 - 13:00	<i>Discussion</i>	
13:00 - 14:30	Lunch	
14:30 - 15:40	<b>SESSION 6</b> <b>INDUSTRY PANEL: DRIVING PRIVATE SECTOR ENGAGEMENT IN THE GLOBAL RESPONSE TO ANTIMICROBIAL RESISTANCE</b>	
	Chair: <b>Carolee Carson</b> (Public Health Agency of Canada)	
14:40 - 15:40	<i>Round table:</i>	
	International Dairy Federation	<b>Caroline Emond</b>
	International Meat Secretariat	<b>Jacques Servière</b>
	International Egg Commission	<b>Olivier Espeisse</b>
	International Poultry Council	<b>Peter Bradnock</b>
	Network of Aquaculture Centres in Asia-Pacific	<b>Eduardo M. Leano</b>
15:40 - 16:10	Coffee	
16:10 - 18:00	<b>SESSION 7</b> <b>PROMOTING ACCESS TO HIGH QUALITY VETERINARY ANTIMICROBIALS</b>	
	Chair: <b>Jean-Pierre Orand</b> (French agency for veterinary medicinal products)	
16:20 - 16:40	Promoting access to high quality veterinary antimicrobials	<b>Norbert Mencke</b> , HealthforAnimals
16:40 - 17:00	Customs experience, challenges and findings	<b>Satoko Kagawa</b> , World Customs Organization
17:00 - 17:20	Antiparasitical resistance, a growing challenge	<b>Patrick Vudriko</b> , Uganda Makerere University
17:20 - 17:50	<i>Country experiences:</i>	
	Thailand	<b>Sasi Jaroenpoj</b> , Animal Feed and Veterinary Products Control Division Department of Livestock Development
	Morocco	<b>Khadija Id Sidi Yahia</b> , National Office of Food Safety
	Argentina	<b>Federico Alberto Luna</b> , National Agrifood Health and Quality Service
17:50 - 18:00	<i>Discussion</i>	

**DAY 3: WEDNESDAY 31 OCTOBER 2018**

8:30 - 10:30	<b>SESSION 8</b> <b>RESEARCH AND FUTURE DEVELOPMENTS IN COMBATting ANTIMICROBIAL RESISTANCE</b>	
	Chair: <b>Donald Prater</b> (Office of Foods and Veterinary Medicine, United States Food and Drug Administration)	
8:40 - 9:00	Moroccan innovations in the fight against antibiotic resistance	<b>Adnane Remmal</b> , Sidi Mohamed Ben Abdellah University, Fez

9:00 - 9:20	The road towards the research and development of alternatives to antibiotics	<b>Cyril Gay</b> , Agricultural Research Service, United States Department of Agriculture
9:20 - 9:40	Prioritisation of diseases for which vaccines could reduce antimicrobial use in animals	<b>G�rard Moulin</b> , French agency for veterinary medicinal products
9:40 - 10:00	The use of economics for selecting interventions and policies	<b>Jonathan Rushton</b> , University of Liverpool
10:00 - 10:20	The economic benefits and costs of antimicrobial use in food animal production: what lessons can be drawn?	<b>Michael Ryan</b> , Organisation for Economic Co-operation and Development
10:20 - 10:30	<i>Discussion</i>	
10:30 - 11:00	Coffee	
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	Chair: <b>Matthew Stone</b> (World Organisation for Animal Health, OIE)	
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11:20 - 12:00	<i>Round table:</i>	
	World Bank	<b>Franck Berthe</b>
	Fleming Fund	<b>Charles Penn</b>
	United Nations Environment Program	(tbd)
	European Commission	(tbd)
	World Health Organization	<b>Marc Sprenger</b>
	Food and Agriculture Organization of the United Nations	<b>Henk Jan Ormel</b>
12:00 - 13:00	<b>SESSION 10</b> <i>RECOMMENDATIONS AND CLOSING</i>	
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## S1.1

# THE TRIPARTITE AMR WORK PROGRAMME UNDER THE GLOBAL ACTION PLAN

**Matthew Stone**

World Organisation for Animal Health (OIE), Paris, France

Food and Agriculture Organization of the United Nations, World Organisation for Animal Health (OIE) and World Health Organization (WHO) identify antimicrobial resistance (AMR) as a global 'One Health' challenge requiring our leadership across human, animal and plant health, and food safety. AMR was prioritized in the Tripartite 'One Health' Concept Note in 2010. Our collective efforts created the Global Action Plan in 2015. AMR remains a high priority in the Tripartite 'One Health' Strategic Commitment, refreshed in 2017.

Each organisation manages its respective AMR work programme, developing standards, recommendations and guidelines as directed by our respective World Assemblies. We identify specific activities that require a collaborative approach.

Our members develop and implement National Action Plans (NAP) owned by the respective national government agencies and engaging all stakeholders. The Tripartite monitors progress through an annual survey. A Monitoring and Evaluation Plan has identified key indicators coherent from global to national plans that must now be implemented. The Tripartite is developing a Global Stewardship Framework that addresses development, access and prudent use of antimicrobials. The respective sectoral data collection systems for AMR and antimicrobial usage (AMU) will be brought together in a Tripartite Integrated Surveillance System for AMR (TISSA), now under design. Long-standing cooperation through the World Antibiotic Awareness Week has expanded to a collaboration on behavioural change and awareness, developing a modern platform to host the tools developed for Members and stakeholders.

Research to understand the drivers of AMR will support targeted and sustained action. The insights from such research are framed within the Tripartite principles that antimicrobials are a precious resource critically important to all sectors; that the natural processes of AMR have been accelerated by historically suboptimal practices in all sectors; and that all sectors must make the necessary changes to preserve antimicrobial efficacy for the future. We aspire to model for our Members and stakeholders the 'One Health' collaboration that is essential for the global response to AMR.

## S1.2

# THE UNITED NATIONS INTERAGENCY COORDINATION GROUP ON ANTIMICROBIAL RESISTANCE

**Sally Davies** <sup>(1, 2)</sup>

(1) Co-convenor, United Nations Interagency Coordination Group on AMR

(2) Chief Medical Officer for England

The United Nations Interagency Coordination Group (IACG) on Antimicrobial Resistance (AMR) was set up in response to the United Nations General Assembly (UNGA) declaration on AMR in September 2016 and was formally announced in March 2017. The group is composed of the tripartite (World Health Organization [WHO], Food and Agriculture Organization of the United Nations [FAO] and World Organisation for Animal Health [OIE]), who also make up the secretariat and the meetings are chaired by the UN Deputy Secretary General and the Director General of the WHO. Alongside members from UN agencies, there are 15 independent experts from all over the world including three co-convenors, of which Professor Dame Sally is one. The diversity of expertise and countries represented in this group reflects the 'One Health' and global nature of AMR and the multi-disciplinary approach that is required to tackle it.

The IACG is mandated:

- to review progress globally since September 2016, providing oversight and using its convening power to advocate for concrete action to address AMR;
- to provide practical guidance for approaches needed to ensure sustained effective global action to address AMR, grounded in an understanding of varied country situations;
- to recommend governance model(s), for future improved coordination and accountability, post IACG to ensure continued political momentum and sufficient action is taken.

This must be done in a report to the UN Secretary General (SG) by Summer 2019. The UN SG will then report to Member States by UNGA Sept 2019.

In this talk, Professor Dame Sally Davies will discuss the work of the IACG to date, the progress made on establishing recommendations and the outlook for UNGA 2019 and beyond.

## S1.3

# THE ECONOMIC CASE FOR INVESTMENT IN ANTIMICROBIAL RESISTANCE

### Juergen Voegele

Senior Director, Agriculture Global Practice, Sustainable Development, World Bank, Washington D.C., United States of America

Unless addressed swiftly, seriously and on a sustained basis, the growing global problem of antimicrobial resistance (AMR) will be disastrous for human and animal health, for food production and for global economies. Several recent reports on AMR, including the one by Lord Jim O'Neill's independent policy review, have called for an urgent focus on the issue and highlighted the enormous global economic losses it can cause, estimated about \$100 trillion in total by 2050. The main finding of the 2017 World Bank report is that AMR has the potential to cause a level of economic damage similar to - and likely worse than - that caused by the 2008 financial crisis. The analysis conducted by the Bank shows that a high-case scenario of AMR - where antibiotics and other antimicrobial drugs no longer treat infections the way they are supposed to - could cause low-income countries to lose more than 5% of their gross domestic product (GDP) and push up to 28 million people, mostly in developing countries, into poverty by 2050. Unlike the financial crisis of 2008, there would be no prospects for a cyclical recovery in the medium term, as the costly impact of AMR would persist.

The scale and nature of this economic threat could wipe out hard-fought development gains and put several Sustainable Development Goals of the 2030 Global Agenda out of reach. The cost of inaction is unaffordable, especially for the poorest countries. One of the best opportunities in the short-term to mitigate the threat of AMR is to strengthen investments in health systems and overall preparedness to tackle infectious diseases, and to improve public and veterinary health systems while building surveillance for AMR into them as an integral component.

The report strongly supports adequate financing and implementation of the Global Action Plan on AMR in countries.

## S3.1

# NEW INSIGHTS: APPLYING BEHAVIOURAL SCIENCE TO THE USE OF ANTIMICROBIAL AGENTS IN LIVESTOCK WORLDWIDE

**Elizabeth Long**

DTA Innovation, New York, United States of America

Behavioural economics, one part of behavioural science and behavioural design, is a relatively recent addition to the long-standing field of behaviour change. It is a new tool to help us better understand human decision-making and behaviour and therefore be able to design better programs and policies to promote behaviour change. Behavioural economics has shown that seemingly small factors – cues from the environment or even small hassles that a person has to overcome – can often have disproportionate effects on behaviour. A key premise of behavioural economics is that humans do not always act purely logically, that humans have what we call ‘cognitive and behavioural biases’ that affect our behaviour. These biases are not good or bad – they are a way for us to conserve mental energy and be as mentally efficient as possible when we take action – but sometimes our surroundings and situations leave room for biases to have unintended effects on our behaviours.

Behavioural design makes us reconsider the idea that someone is not doing something because they are ‘not motivated’ or they do ‘not understand’. Whether it is a farmer using low quality antibiotics to treat his flock or a supply chain agent providing antimicrobials without consulting a veterinarian about the best prescribing practice, the mental models that human behaviour can be perfect and gaps are due to a ‘lack of motivation’ or ‘lack of knowledge’ lead to systems blaming or even shaming individuals for not being perfect and to the creation of ineffective policies.

The presentation will introduce behavioural design and apply it to the behaviour and context of various people within the larger system of antimicrobial agents in livestock, using examples across the spectrum from low-income to high-income countries.

## S3.2

# GLOBAL COMMUNICATION ON ANTIMICROBIAL RESISTANCE IN ANIMAL HEALTH: OIE AND TRIPARTITE EFFORTS

**Catherine Bertrand-Ferrandis & Taylor Gabourie**

World Organisation for Animal Health (OIE), Paris, France

In support of the Global Action Plan on Antimicrobial Resistance adopted in 2015, the World Organisation for Animal Health (OIE), Food and Agriculture Organization of the United Nations, and World Health Organization have been operating collaboratively as a Tripartite to support surveillance and awareness on antimicrobial resistance (AMR). The Tripartite efforts have been specifically engaged in supporting the Global Action Plan's first objective *to improve awareness and understanding of antimicrobial resistance through effective communication, education and training*. The OIE annually celebrates World Antibiotics Awareness Week with the Tripartite to increase awareness about AMR. Each Tripartite member has developed aligned resources available to the public to harness resources to develop National Action Plans and behaviour change activities such as education materials, capacity building and communication strategies.

As a component of this work, the OIE's objective to improve awareness and understanding provides access to communication tools through the WE NEED YOU communication campaign targeting priority stakeholders to transfer knowledge about the OIE international Standards on responsible and prudent use of antimicrobials. The communication campaign targets Member Countries' national Veterinary Services as powerbrokers to develop National Action Plans, and provides a detailed leaflet with guidance. The OIE also provides targeted messaging for stakeholders such as veterinarians, farmers, policy makers, pharmaceutical industry, wholesalers/retails and feed producers. Resources such as leaflets, infographics, social media toolkits, and quizzes can all be accessed online through the OIE.

In order to strengthen capacities of Veterinary Services in terms of risk communication and behaviour change, the OIE conducted a series of regional seminars for communication focal points. Along with the capacity building, these seminars included a Behaviour Change exercise to identify barriers, interventions, timelines and outputs for desired behaviours of policy makers, farmers, veterinarians, industry/retailers and consumers. The exercise reveals a common barrier is adequate legislation and funding to protect antimicrobials, with strong support for interventions designed to create awareness about AMR amongst stakeholders. This exercise also highlights the importance of cross-sector communication and the involvement of all stakeholders. The OIE encourages application of its WE NEED YOU campaign to support National Action Plans to break down these barriers.



**S3.3****DEVELOPMENT OF A COMMUNICATION STRATEGY FOR ANIMAL HEALTH**

**Obadiah Njagi<sup>(1)</sup>, Allan Azegele<sup>(2)</sup> & Joseph O. Othieno<sup>(3)</sup>**

(1) Director of Veterinary Services (DVS), Kenya Veterinary Board, Nairobi, Kenya

(2) Team Leader AMR, Ministry of Livestock Development, Nairobi, Kenya

(3) Communication Focal Point, World Organisation for Animal Health (OIE), Nairobi, Kenya

Behaviour Change Communication (BCC) uses communication which is a basic and fundamental human activity to positively influence human behaviour. It is founded on the tenet that human actions are based on the kind of information they access and their cultural settings. BCC can be employed as one of the interventions in tackling antimicrobial resistance (AMR). A Knowledge Attitudes and Practices survey attributed human behaviour to AMR and proposed awareness creation to influence positive human behaviour.

The Kenyan Policy on prevention and containment of antimicrobial resistance outlines the need to create awareness on AMR through the development of a Communication Strategy. The DVS led a multi-sectoral team from Ministry of Health, State Departments of Agriculture, State Department of Fisheries, Professional Associations, Academia and non-governmental organization (NGO) in a 'One Health' approach to develop an AMR Communication Strategy in 2017.

The overall objective of the Communication Strategy was to improve awareness and understanding of AMR through effective communication, education and training. Specific objectives are to; Create awareness on AMR among the primary target audiences; improve understanding of AMR among secondary audience groups; establish a better policy framework for AMR through advocacy and sustained collaborations with other partners in AMR. The AMR Communication Strategy presents several tools that can be applied in audience segmentation, identification of information gaps and development of messages targeting various audience groups. The Strengths, Weaknesses, Opportunities and Threats (SWOT), Single Overarching Communication Outcome (SOCO) and Audience Analysis were among tools applied. The AMR Communication Strategy is currently being implemented. This presentation shares lessons learned during development and implementation of AMR Communication Strategy.

## S3.4

# IAMRESPONSIBLE: IMPARTING A SENSE OF ACCOUNTABILITY, OWNERSHIP AND RESPONSIBILITY AMONG STAKEHOLDERS IN THE FIGHT AGAINST ANTIMICROBIAL RESISTANCE

**Samuel Joseph M. Castro**<sup>(1)</sup> & **Reildrin G. Morales**<sup>(2)</sup>

(1) Bureau of Animal Industry, Department of Agriculture, Quezon City, Philippines

(2) Food and Agriculture Organization of the United Nations, Mandaluyong City, Philippines

Amidst a growing animal health and production industry, and a robust veterinary drug industry, there is a lack of knowledge and awareness on antimicrobial resistance (AMR) among concerned stakeholders in the food and agriculture sector in Philippines. The level of awareness is low even among government veterinary authorities, animal health professionals, farmers and producers.

The country's National Communication Strategy on AMR was developed through a communications-planning workshop co-organized and facilitated by the Bureau of Animal Industry (BAI) and the Food and Agriculture Organization of the United Nations (FAO). This, along with efforts on AMR surveillance, and policy formulation and review of the existing regulatory framework, is part of activities being supported by the FAO - BAI AMR Project.

The aim is to address awareness gaps on AMR including its implication and impact to sustainability of production in the food and agriculture sector, and ultimately, on food safety and public health. The communication strategy adapts the approaches of the FAO/OIE/WHO (World Health Organization) Tripartite Collaboration on AMR. The planning workshop developed and approved a communication campaign with key messages for the food and agriculture sector appropriate to the local setting. The said national strategy is based on the ASEAN (Association of Southeast Asian Nations) Regional Strategy on Antimicrobial Resistance Communication and Advocacy which has the objective of raising awareness on AMR and its consequences, and promote the prudent use of antimicrobials and good animal husbandry practices among stakeholders.

The strategy features a slogan: 'iAMResponsible' which targets government and private sector veterinarians and veterinary practitioners; Policy and decision makers; farmers and producers; veterinary drug manufacturers, distributors and retailers; and endeavours to impart a sense of accountability, ownership and responsibility among stakeholders. Along with the slogan, specific key messages have been developed to highlight the role that each stakeholder may take on to help limit the consequences of AMR on human, animal and environmental health.

## S3.5

# IDENTIFICATION OF BEHAVIOUR CHANGE DRIVERS IN KEY STAKEHOLDERS

**Christianne Bruschke, Bart van den Assum & Frouke de Groot**

Ministry of Agriculture, Nature and Food Quality, Den Haag, the Netherlands

In the period 2008-2011 the outline of the Dutch policy for a substantial reduction and a more responsible use of antibiotics in the livestock industry was drafted and sales of veterinary antimicrobials dropped by more than 64% between 2009 and 2016. Antimicrobial resistance levels decreased substantially as a result of the reduced use.

However the main reduction was achieved in the first years where after the reduction levelled off. To be able to develop a more sector specific approach, research was performed on the critical success and fail factors of a low usage of antibiotics in the different sectors.

Structural high and structural low user farms were incorporated in the study and the different characteristics of the farms in these groups were analysed e.g. farm type, farm size, farm management, construction of farm, health of the animals, education and knowledge of farmer etc. Statistical analyses were performed to show possible associations between certain factors and high/low usage of antibiotics.

For all sectors certain associations were found e.g. for the veal calf and pig sectors the small farms have a lower usage where the association is the other way around for poultry, large farms have a lower usage of antimicrobials. In all sectors clear leads were found to decrease the usage in the high user group.

In the poultry sector associations were found with the different market concepts, slower growing breeds use less antimicrobials. Management practices like thinning the flocks increase the usage.

In the veal sector management, ventilation and feeding but also nationality of the calves are points of attention. In the pig sector associations were found with management, vaccination and the number piglets. Not all results can be clarified and not all associations are causal relationships. Further in depth research is ongoing on certain aspects of the current results and moreover a similar project is executed for veterinarians investigating the differences between high and low prescribers.

The outcomes of these studies will be presented.

## S4.1

# THE OIE STRATEGY ON ANTIMICROBIAL RESISTANCE AND THE PRUDENT USE OF ANTIMICROBIALS

**Elisabeth Erlacher-Vindel & David Sherman**

World Organisation for Animal Health (OIE), Paris, France

As the international reference body for standards in animal health and welfare, the World Organisation for Animal Health (OIE) considers combating antimicrobial resistance among its priorities. In 2016, 'The OIE Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials' was published, describing the objectives of the organisation to support the responsible and prudent use of antimicrobials in animals in its 182 Member Countries, in cooperation with its Tripartite partners, the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO).

The OIE Strategy encompasses four objectives in line with the Global Action Plan on Antimicrobial Resistance:

1. improve awareness and understanding;
2. strengthen knowledge through surveillance and research;
3. support good governance and capacity building;
4. encourage implementation of international standards.

Essential to the enactment of the OIE Strategy is the continued updating of the OIE *Terrestrial Animal Health Code*, the *Aquatic Animal Health Code*, the *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* and the *Manual of Diagnostic Tests for Aquatic Animals*, which provide a global reference for the consistent regulation of antimicrobials, for the promotion of their responsible and prudent use, for associated surveillance, monitoring and risk analyses, and for collection of data on the use of antimicrobials in animals. Additionally, the OIE List of Antimicrobial Agents of Veterinary Importance includes recommendations on the use of the antimicrobial agents considered the most critical for animal and human health.

At the national level, the successful implementation of OIE standards relative to AMR depends on several factors – a solid legal basis for action, a well-functioning national Veterinary Services and well-educated professional staff. OIE has a number of tools and activities available to its Members designed to strengthen these areas including: the Veterinary Legislation Support Programme (VLSP) to assess the status of national veterinary legislation, the Performance of Veterinary Services (PVS) Pathway to assess the capacity of the national Veterinary Services; the development of recommended competencies and model core curriculum for the education of veterinarians and veterinary paraprofessionals; and a twinning programme for Veterinary Educational Establishments. The contribution of these various OIE initiatives to mitigating antimicrobial resistance will be discussed.

## S4.2

# WORLD VETERINARY ASSOCIATION'S EXPERIENCE AND SUPPORTIVE TOOLS TO PROMOTE PRUDENT USE OF ANTIMICROBIALS WORLDWIDE

**Zeev Noga**<sup>(1)</sup> & **Jan Vaarten**<sup>(2)</sup>

(1) Deputy Executive Director, World Veterinary Association, Brussels, Belgium

(2) Executive Director, World Veterinary Association, Brussels, Belgium

The Veterinary Profession, being responsible and accountable for the health and welfare of animals under their care, plays a crucial role in the global effort to tackle the development of antimicrobial resistance (AMR), using the 'One Health' approach.

Representing more than 500,000 veterinarians through 95 veterinary member associations, the World Veterinary Association (WVA) is concerned about antimicrobial resistance and works to tackle it across the global veterinary sector and in collaboration with other health professionals.

The aim of the presentation is to give an overview on the WVA's strategy, activities and collaborations plans to fight the development of AMR. It will include:

1. the development of a WVA policy on global basic principles of responsible antimicrobial use;
2. offering veterinary technical advice on global guidelines/discussions papers produced by International Health Agencies;
3. promoting global awareness on AMR through the World Veterinary Day;
4. organising with the World Medical Association global conferences on 'One Health' focusing on intersectoral collaborations to fight AMR;
5. organising with the World Health Organization/World Organisation for Animal Health/Food and Agriculture Organization of the United Nations tripartite global conferences on 'One Health' focusing on AMR;
6. and the development together with HealthforAnimals (representing the veterinary industry) of an online resource; *Animal Health Matters* that aims to educate and build greater awareness on pressing issues in animal and human health, including AMR.

Finally, the presentation will provide the delegates with key findings of a survey that was conducted recently among WVA members regarding the availability of guidelines of good practices and will suggest ideas on how veterinary associations can help to fight the development of AMR.

## S4.3

# COUNTRY LEVEL IMPLEMENTATION: FAO EXPERIENCE IN AQUACULTURE

**Melba G. Bondad-Reantaso**

Food and Agriculture Organization of the United Nations (FAO), Rome, Italy

In 2016, global aquaculture animal production amounted to 80.1 million tonnes, with an estimated value of USD 231.8 billion. While poised to contribute to an increasing share in the production of fish for human consumption, aquaculture is continuously confronted with biosecurity challenges posed by exotic, endemic and emerging diseases. Globally, the trend in aquaculture is that every few years a serious emerging transboundary aquatic animal disease appears that spreads rapidly and causes major production losses. There is often a long time lapse (usually years) from the time that a serious mortality event caused by an unknown and emerging pathogen is observed in the field to the time when cost-effective risk management measures are identified and implemented.

The situation in aquaculture is also complicated by the huge number of species being cultured (more than 500 species), and the diversity of the culture environment, the systems and types of management and scale of operation. Fish is also the most traded food commodity and this globalisation, in the absence of appropriate biosecurity, also simultaneously facilitated the spread of pathogens and diseases. Thus, we have seen increased reliance on veterinary medicines to ensure successful production through prevention and treatment of diseases, assuring healthy stocks and maximising production.

The presentation will cover the benefits of the use of antimicrobials in aquaculture and issues pertaining to their use in terms of:

1. threats posed by abuse, overuse and misuse;
2. human and animal health issues;
3. environmental and ecological issues;
4. antimicrobial residues;
5. antimicrobial resistance (AMR)].

This presentation will share initiatives in promoting the responsible and prudent use of veterinary antimicrobials through practical tools and experiences in aquaculture. To support sector sustainability, competent, knowledge-based governance and policy are becoming essential pillars - governance that equitably provides an enabling environment to both the private sector entrepreneurs and the small-scale producers that are involved in the aquaculture industry.

## S5.1

# OIE DATABASE ON ANTIMICROBIAL AGENTS INTENDED FOR USE IN ANIMALS: THIRD PHASE RESULTS

**Delfy Góchez & Margot Raicek**

World Organisation for Animal Health (OIE), Paris, France

For over two decades, the World Organisation for Animal Health (OIE) has engaged in combatting antimicrobial resistance through a 'One Health' approach. Following its Resolution No. 26: *Combating Antimicrobial Resistance and Promoting the Prudent Use of Antimicrobial Agents in Animals*, adopted by the OIE World Assembly during the 83rd General Session in May 2015, the OIE launched an annual collection of data on antimicrobial agents intended for use in animals. This activity is in line with the Global Action Plan on AMR, and with the *OIE Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials*.

The third phase of the data collection was launched in September 2017 and ended in May 2018. Increased participation was noted in submissions during the third phase. One hundred fifty-three (85%) of OIE Member Countries and two non-OIE Members submitted completed questionnaires. Of these, 118 countries (76%) reported quantities of antimicrobial agents intended for use in animals, where sales and imports were predominantly used as data sources.

In an addition analysis, animal biomass was calculated for 91 countries that provided quantitative data for the year 2015 in the first three phases of data collection. From the 91 countries included in the 2015 analysis, the estimated coverage of total animal biomass from four OIE Regions is 71%, higher than the 47% coverage for 2014. The third report will be published on the OIE website at the end of 2018.

## S5.2

# GLOBAL ANTIMICROBIAL RESISTANCE SURVEILLANCE INITIATIVES: UPDATES FROM THE WHO GLOBAL AMR SURVEILLANCE SYSTEM (WHO-GLASS) AND FAO ASSESSMENT TOOL FOR LABORATORIES AND ANTIMICROBIAL RESISTANCE SURVEILLANCE SYSTEMS (FAO-ATLASS)

Carmem Lúcia Pessoa-Silva<sup>(1)</sup>, Beatrice Mouille<sup>(2)</sup> & April Johnson<sup>(2)</sup>

(1) World Health Organization, Geneva, Switzerland

(2) Food and Agriculture Organization of the United Nations, Rome, Italy

Antimicrobial resistance (AMR) is a global threat to sustainable development. The United Nations General Assembly political declaration reaffirms the Global Action Plan on AMR as a blueprint for tackling AMR, and underscores surveillance to strengthen the knowledge and evidence base for policy and action.

WHO launched the Global Antimicrobial Resistance Surveillance System (GLASS) to assist decision-making, drive action and provide the evidence base for interventions. GLASS provides a standardised approach to the collection, analysis, and sharing of AMR data by countries, seeks to document the status national AMR surveillance systems and proposes a stepwise approach to achieve quality and representative data on selected human pathogens of public health relevance. The country enrolment started in March 2016. As of 5 September 2018, 68 countries are participating in GLASS.

At the same time, the Food and Agriculture Organization of the United Nations (FAO) developed the Assessment Tool for Laboratories and AMR Surveillance Systems (FAO-ATLASS) to support countries in assessing and improving their national AMR surveillance systems in the food and agriculture sectors.

FAO-ATLASS aims to collect harmonised descriptive data and provide a standardised score on the performance of national AMR surveillance-linked activities by:

1. mapping laboratory analytical capabilities and networks;
2. measuring activities on data collection and analysis, governance, communication, and sustainability.

The results help inform recommendations for improvement, and countries to prioritise actions. As of 5 September 2018, 15 countries have been assessed.

This presentation will update on the early implementation of GLASS and FAO-ATLASS, and explore possible approaches to enhance integrated AMR surveillance in the spirit of 'One Health'.



**S5.3****INTEGRATED SURVEILLANCE OF ANTIMICROBIAL RESISTANCE IN THE FOOD CHAIN: CHALLENGES**

**Sarah M. Cahill<sup>(1)</sup>, Suzanne Eckford<sup>(2)</sup>, Gracia Brisco<sup>(1)</sup>, Jeffrey LeJeune<sup>(2)</sup> & Renata Clarke<sup>(2)</sup>**

(1) Joint Food and Agriculture Organization of the United Nations/World Health Organization Food Standards Programme, Rome, Italy

(2) Food and Agriculture Organization of the United Nations, Rome, Italy

Knowledge on the development and transmission of antimicrobial resistance (AMR) in the food chain provides the basis for effective risk management of AMR. Yet globally the mechanisms by which we collect, analyse and ultimately use such data are far from optimised. Integrated surveillance of AMR, heralded as a critical foundation to risk management, remains beyond the reach of and even ambiguous for many countries.

This presentation will address:

- a) the overarching challenges of such an approach;
- b) international efforts in the area;
- c) implementation.

Food chain surveillance is challenging. With animal and plant (aquatic and terrestrial) production systems and multiple processing environments and techniques, each of which may impact the presence of AMR, to consider, determining the sampling and analytical approach, and in a manner that allows integration of different data sources, not just from the food chain but also from human surveillance is a significant challenge. But progress is being made through both global and local efforts. Discussions and guidance firstly by the World Health Organization (WHO) Advisory Group on Integrated Surveillance of Antimicrobial Resistance (AGISAR) and now the Codex Alimentarius through its ongoing work to develop international guidance for integrated surveillance of AMR, play a vital role in highlighting challenges and seeking solutions to overcome them. For example, the lack of data from and experience in surveillance of AMR from foods of plant origin, aquatic plants and animals and production environments and their relevance, has been considered in a recent Food and Agriculture Organization of the United Nations/World Health Organization expert meeting in collaboration with the World Organisation for Animal Health (OIE).

Finally, for many countries the challenge remains to implement any kind of surveillance system. Ongoing efforts to support countries and use international guidance as the basis for a step-wise approach will be highlighted. Promoting the establishment of the basic elements of a surveillance programme, will eventually, with knowledge, experience and resources, lead to the realisation of fit-for-purpose integrated surveillance.

## S5.4

# EXPERIENCE ON INTEGRATED SURVEILLANCE AT COUNTRY LEVEL: AGISAR COUNTRY PILOT PROJECTS AND THE TRICYCLE PROJECT

**Awa Aidara-Kane, Amina Benyahia, Yuki Minato & Jorge Matheu**

World Health Organization, Geneva, Switzerland

The World Health Organization (WHO) Advisory Group on Integrated Surveillance of Antimicrobial Resistance (AGISAR) supports WHO's efforts to minimise the public health impact of antimicrobial resistance (AMR) associated with the use of antimicrobials in food producing animals. AGISAR initiatives include review/update the WHO List of Critically Important Antimicrobials for Human Medicine and the development of guidance on integrated surveillance of antimicrobial resistance in foodborne pathogens using a 'One Health' approach. The WHO-AGISAR guidance developed in collaboration with Food and Agriculture Organization of the United Nations (FAO) and World Organisation for Animal Health (OIE) is disseminated through training workshops and through pilot projects to build sustainable capacity to implement/improve a National Integrated Surveillance System (NISS) on AMR. WHO biennially opens a call for proposals, to be considered for the selection process, the project should involve in addition to the human sector, the animal and/or food sector(s). Country projects are two year projects to establish or improve the NISS on AMR including antimicrobial usage in animals and humans. Since 2010, there are 41 pilot projects in the six WHO Regions. Some at the AGISAR have been critical in supporting the development and implementation of National Action Plan (NAP) on AMR taking a 'One Health' approach.

The WHO Integrated Global Survey on extended-spectrum beta lactamase (ESBL)-producing *Escherichia coli* using a 'One Health' approach, the Tricycle Project, is an AGISAR initiative to develop a standardised 'One Health' approach protocol on Integrated Surveillance on AMR including all relevant sectors, human, food chain and environment focused in a single indicator, ESBL producing *E. coli*, to facilitate the implementation and monitoring in all countries. The protocol is being developed; six countries are piloting the draft protocol, Ghana, Senegal, Madagascar, Pakistan, Indonesia and Malaysia.

## S7.1

# PROMOTING ACCESS TO HIGH QUALITY VETERINARY ANTIMICROBIALS

**Norbert Mencke**

HealthforAnimals (global animal medicines association), Brussels, Belgium

Antibiotics are key to treating infections in both humans and animals. There are no alternatives to treating life-threatening bacterial infections. Even where great efforts are made to prevent bacterial infections through good animal husbandry, bio-security and use of alternative measures, e.g. vaccines, there are occasions when animals are infected and diseased and thus require treatment with an antibiotic.

The world has recognised that antimicrobial resistance in humans is a challenge that costs lives. In veterinary medicine, antibiotics are important to maintaining animal health and welfare and, food safety and security, thus antimicrobial resistance is a challenge to be tackled under the holistic 'One Health' approach.

The vision of HealthforAnimals is a world where veterinary antibiotics are used responsibly, and where they maintain their value as a therapeutic tool. Antibiotics have a role to play in sustainable livestock production by reducing waste and inefficiencies caused by disease and help provide a safe supply of food from healthy animals. We need to maintain practices that allow the continued use of high quality registered antibiotic veterinary medicines when they are beneficial. Restrictions on antibiotic use must be science based and consider the 'One Health' consequences.

In line with World Organisation for Animal Health (OIE)/Food and Agriculture Organization of the United Nations (FAO)/World Health Organization (WHO) initiatives, HealthforAnimals works with its member companies and industry associations to actively fight antibiotic resistance by promoting responsible use to preserve antibiotics for future generations. Responsible or judicious use of antibiotics means: always according to label recommendation, under veterinary supervision and only when necessary. Enhanced surveillance of antibiotic resistance and monitoring of use of antibiotics are important. The animal health industry invests in development of antibiotics and the creation of alternatives. Its commitment can be found at: [www.healthforanimals.org/resources-and-events/antibiotics-commitment.html](http://www.healthforanimals.org/resources-and-events/antibiotics-commitment.html)

## S7.2

# CUSTOMS EXPERIENCE, CHALLENGES AND FINDINGS

**Satoko Kagawa**

World Customs Organization, Brussels, Belgium

The global trends on the illegal cross border transactions of counterfeit medical products seized by Customs will be introduced to indicate the potential situation for illegal transactions of veterinary medicines.

The results and findings of the World Customs Organization (WCO) operation Pangea, the collaborative approach to combat the illicit trade of counterfeit and illicit medical products worldwide will be presented to discuss the best practices and challenges of combatting the illicit trade of counterfeit medicines.

The importance and challenges of the strengthening the international cooperation to improve the Customs border control on counterfeit medical products cross border trade and the domestic cooperation between Customs and right holders will be discussed.

In the end of the presentation, the importance of the awareness raising to combat the illicit trade of counterfeit and illicit medical products would be briefly referred.

## S7.3

# ANTIPARASITICAL RESISTANCE, A GROWING CHALLENGE

**Patrick Vudriko**<sup>(1,2)</sup>

(1) Department of Veterinary Pharmacy, Clinics and Comparative Medicine, School of Veterinary Medicine and Animal Resources (SVAR), College of Veterinary Medicine, Animal Resources and Biosecurity (COVAB), Makerere University, Kampala, Uganda

(2) Research Center for Tropical Diseases and Vector Control (RTC), SVAR, COVAB, Makerere University, Kampala, Uganda

Parasitic diseases are among the leading constraints to the livestock productivity in Africa. Ectoparasites such as ticks vector tick borne diseases (i.e. theileriosis, babesiosis, anaplasmosis, cowdriosis), zoonotic bacterial and viral diseases. In an effort to prevent the above diseases, livestock farmers extensively use acaricides leading to emergence of tick acaricide resistance (TAR).

Within Africa, the highest burden of tick acaricide resistance has been reported in the Eastern and Southern regions. The most affected countries are South Africa, Zimbabwe and Uganda. In Uganda, TAR has reached unprecedented levels, with all the three major classes of acaricides, namely synthetic pyrethroids, organophosphates and amidines failing against both *Rhipicephalus (Boophilus) decoloratus* and *R. appendiculatus* at the same time. This extreme acaricide resistance has rendered farmers desperate hence opting for irrational habits of acaricide use such as application of higher concentrations, use of short acaricide application intervals (three days apart), mixing of multiple classes of acaricides, use of crop pesticides (concoctions) and prophylactic treatment of cattle with antibiotics to prevent tick-borne diseases. Ivermectin is one of the examples of an irrationally used anthelmintic to overcome TAR. The irrational acaricide application habits have been reported to cause both animal and human toxicity besides posing significant threat to food safety and environmental health. Furthermore, the irrational use of macrocyclic lactones and antibiotics in cattle farms experiencing TAR is postulated to be a potential hazard for **TAR-Anthelmintic-Antibiotic resistance complex**, which may cause a serious devastation to animal production and public health in Africa.

This calls for a 'One-Health' approach in the fight against TAR.

## S7.4

# PROMOTING ACCESS TO HIGH QUALITY VETERINARY ANTIMICROBIALS

**Sasi Jaroenpoj**

Division of Animal Feed and Veterinary Products Control, Department of Livestock Development, Bangkok, Thailand

Antimicrobials play an important role in human and animal health. Although the broad spectrum antimicrobials are used, it is impossible to kill all pathogens. On the contrary, the more selected resistant organisms have developed and survived. Therefore, it is necessary that the use of antimicrobials based on the risks benefit assessment for antimicrobial resistance (AMR). Apart from academic knowledge required, good regulation and law enforcement are needed to conduct in order to ensure the appropriate use of antimicrobials. Moreover, it also requires a control on the distribution channels of antimicrobials reach to animal farms.

To promote access to high quality of veterinary antimicrobial products, regulatory authority and international organisation should develop the system to control the sale of antimicrobial active pharmaceutical ingredients (APIs). APIs could be the source of both high quality or counterfeit drugs. Lack of good regulation and information technology to monitor APIs movements, the antimicrobials might leak from the distribution system to farm animals. Quality, strength and formulation of medicated premixes including the production control of medicated feed both at feed mills and farm mixers are also the vital part of good regulation to control and reduce the use of veterinary antimicrobials.

To combat antimicrobial resistance in veterinary practices, autogenous vaccine could be one of the major tools to reduce the use of antimicrobials in animals. Therefore, the international guideline or domestic regulation that facilitate the production and use of autogenous vaccine in line with standard are urgently needed to develop. The recommendation to the production and use of inactivated bacterial autogenous vaccine must be established and implemented.

In conclusion, establishing standards and putting into practice are required to control the production and use of medicated premix, medicated feed and autogenous vaccine. These are specific type of products that practice in animal health sector. These products should be prescribed by a veterinarian under acknowledged criteria. It supports the ultimate goal of safety and efficacy for veterinary antimicrobials in 'One Health' concept.

## S7.5

# EVOLUTION OF THE GOVERNANCE OF VETERINARY DRUGS IN MOROCCO

**Khadija Id Sidi Yahia**

Office National de Sécurité Sanitaire des Produits Alimentaires (ONSSA), Rabat, Morocco

One of the fundamental elements of global action to alleviate the threat of antimicrobial resistance (AMR) is to ensure access to high quality of veterinary medicinal products. This guarantee is closely linked to the good governance of veterinary medicines. In the 1980s, in connection with the development of the livestock sector and the increase in the need for therapeutic tools, Morocco set up a policy centered on the quality of the veterinary drug. A policy of strengthening the post-AMM control policy has been implemented since 2008 and concerned all the links in the manufacturing/import chain to use.

The legislation put in place provides for the quality, efficacy and safety of medicines, with most areas covered. Morocco is an observer member of the International Cooperation on Harmonisation of Technical Requirements for Registration of Veterinary Medicinal Products (VICH) and participates in the study of standards. With particular reference to the consideration of potential risks of resistance, during the evaluation of registration dossiers of antimicrobial agents, was implemented early 2018, after training of the instructors. Also, a process of prohibition of the use of antibiotics as growth promoters has been implemented gradually which became effective in July 2017.

Particular attention is paid to the provision of information tools on authorized products and their conditions of use, through the positive list of authorized veterinary products which is published and updated regularly; the Marketing Authorization (MA), the Summary of Product Characteristics (RCP) and/or the notices/labeling. An update of these documents for older products that do not have a precautionary message for proper use has started.

In the field of surveillance and quality control, the control system incorporates inspections of 'souks', veterinary cabinets and medicated feed manufacturers. Market surveillance is ensured through monitoring plans (drug quality, residues, antimicrobial resistance) and pharmacovigilance.

The level of quality management of veterinary drugs has increased. However, the link controls the use and the system of reporting drug-related problems by the users remains to be consolidated.

## S7.6

# PROMOTE ACCESS TO HIGH QUALITY VETERINARY ANTIMICROBIALS

### Federico Luna

World Organisation for Animal Health (OIE), National Focal Point of Veterinary Products, National Health and Agri-food Quality Service, Buenos Aires, Argentina

Quality is the set of attributes or qualities that constitute the way of being of a product. Basic attributes to define the quality of a pharmaceutical product.

It is for this reason that one of the key points in the development of national plans for the control of antimicrobial resistance is to guarantee the production and supply of quality veterinary products.

Good manufacturing practices are a tool that helps ensure that veterinary products are constantly produced and controlled by quality standards. They constitute the factor that ensures that the products are manufactured in a uniform and controlled manner, in accordance with the quality standards appropriate to the intended use of the products. They guarantee repeatability between batches.

Argentina has a veterinary industry of 600 companies and more than 8,000 registered veterinary products. Since 2002, good manufacturing practices have been in force.

The presentation tries to show the experience of Argentina in the implementation of good manufacturing practices, its traceability system of veterinary products and how it is possible to promote the supply of quality veterinary products through good manufacturing practices, verifying its compliance and using the traceability of veterinary products as a tool to achieve a formal market.



## S8.1

# MOROCCAN INNOVATIONS IN THE FIGHT AGAINST ANTIBIOTIC RESISTANCE

**Adnane Remmal**

Université Sidi Mohamed Ben Abdellah University, Fez, Morocco

Antibiotics are particularly valuable medicines for human medicine in hospitals, city medicine and veterinary medicine. The use of antibiotics exerts a selection pressure that favors resistant bacteria. The misuse of antibiotics in all areas exacerbates this resistance. Innovative products have been developed to diminish antibiotics used in agriculture and animal husbandry, by natural, more efficient and less expensive substances. This would foster the implementation of responsible and prudent use of antibiotics. An innovative drug combining antibiotics with natural substances boosts the action of antibiotics to make them effective against resistant bacteria. This drug has proven its effectiveness clinically and will soon be on the market in Morocco. These innovations are a contribution of Moroccan research in the fight against the phenomenon of antibiotic resistance that threatens human and veterinary medicine.

## S8.2

# THE ROAD TOWARDS THE RESEARCH AND DEVELOPMENT OF ALTERNATIVES TO ANTIBIOTICS

**Cyril G. Gay**

United States Department of Agriculture, Agricultural Research Service, Office of National Programs, Animal Production and Protection, Beltsville, Maryland, United States of America

Alternatives to antibiotics are broadly defined as any substance that can be substituted for therapeutic drugs that are increasingly becoming ineffective against pathogenic bacteria due to antimicrobial resistance. Antibiotics are an essential tool for treating animal diseases and the loss of these critical drugs to prevent and control animal diseases may be one of the most significant challenges facing veterinary medicine in the 21st century. The global impact of antimicrobial resistance and the restrictions on their use necessitates an urgent effort to research and develop new tools that can provide antibiotic alternatives. Although new tools to treat animal diseases is a priority, there is also a resurgent need for antibiotic alternatives to sustain intensive animal production systems. With these challenges in mind, the 2nd International Symposium on Alternatives to Antibiotics was held at the World Organisation for Animal Health (OIE) Headquarters in Paris, France, 12-15 December 2016, to discuss recent scientific advances in the research and development of alternatives to antibiotics for animal production.

More than 200 participants from academia, government research institutions, regulatory agencies, and animal industries from 25 different countries came together to discuss promising novel technologies that could provide alternatives to antibiotics for use in animals, assess challenges associated with their commercialization, and devise actionable strategies to facilitate their development.

The three-day meeting consisted of scientific sessions focused on five product categories:

- 1) vaccines;
- 2) microbial-derived products;
- 3) phytochemicals;
- 4) immune-related products;
- 5) innovative drugs, chemicals and enzymes.

Each session was followed by an expert panel discussion that included industry representatives and scientists that shared their experience and challenges associated with the research and development of antibiotic alternatives. One of the outcomes of the symposium was the publication of six review articles published in the journal *Veterinary Research*. Examples of new technologies from these review articles will be presented, providing new insights into the research and development of promising antibiotic alternatives to combat antimicrobial resistant bacteria in farm animals.

**S8.3****PRIORITISATION OF DISEASES FOR WHICH VACCINES COULD REDUCE ANTIMICROBIAL USE IN ANIMALS**

**G rard Moulin<sup>(1)</sup>, Cyril Gay<sup>(2)</sup>, Stefano Messori<sup>(3)</sup> & Elisabeth Erlacher-Vindel<sup>(3)</sup>**

(1) Agence nationale de s curit  sanitaire de l'alimentation, de l'environnement et du travail (ANSES), Agence Nationale du M dicament V t rinaire, Foug res, France

(2) United States Department of Agriculture, Agricultural Research Service, Animal Production and Protection, Beltsville, United States of America

(3) World Organisation for Animal Health (OIE), Paris, France

To address the threat of antimicrobial resistance (AMR), the World Health Organization (WHO), in collaboration with the World Organisation for Animal Health (OIE) and the Food and Agriculture Organization of the United Nations (FAO), developed a Global Action Plan on AMR, which was adopted in 2015. The use of vaccines to prevent diseases and to reduce the prevalence of infections was mentioned as one of the possible options to reduce the use of antimicrobial agents at the global level. In order to provide guidance on the prioritisation of diseases for which the use of improved and new vaccines could reduce antimicrobial use in animals, and to make recommendations for targeted research programmes, the OIE convened, in 2015, an *ad hoc* Group, focusing as a first step on pigs, poultry and fish. A second *ad hoc* Group was held in 2018 to complete the work, prioritising diseases for which vaccines could reduce antimicrobial use in cattle, sheep, and goats.

The *ad hoc* Groups identified, for the different species, the most prevalent and important bacterial infections being associated with high antibiotic use, as well as the most common non-bacterial infections showing clinical signs that trigger empirical antibiotic treatment (e.g. for diarrhoea) or which result frequently in bacterial co-infection. Diseases were ranked according to the associated level of antimicrobial use at the global level and to the availability and fitness for purpose of vaccines, in order to obtain prioritised lists for stimulating research into new or better adapted vaccines that would help reducing the use of antibiotics. Relevant gaps in vaccines were also assessed.

The Groups emphasised that there was a fundamental need for significant investment to use cutting-edge technologies to address the significant gaps in the available vaccines needed to reduce antimicrobial use in animals. Public-Private-Partnerships will be essential to transfer innovative technologies to vaccine manufacturers to advance the development of safe and effective vaccines.

## S8.4

# THE USE OF ECONOMICS FOR SELECTING INTERVENTIONS AND POLICIES

**Jonathan Rushton**<sup>(1)</sup>, **Lucy Coyne**<sup>(1)</sup>, **Ian Patrick**<sup>(2)</sup>, **Nicola Williams**<sup>(1)</sup>, **Juan Carrique-Mas**<sup>(3)</sup>, **Bao Truong Dinh**<sup>(4)</sup> & **Dominic Moran**<sup>(5)</sup>

(1) Department of Epidemiology and Population Health, Institute for Infection and Global Health, University of Liverpool, United Kingdom

(2) Agricultural and Resource Economic Consulting Services, Armidale, New South Wales, Australia

(3) Centre for Tropical Medicine and Global Health, Nuffield Department of Medicine, Oxford University, United Kingdom

(4) Faculty of Animal Science and Veterinary Medicine, Nong Lam University, Ho Chi Minh, Vietnam

(5) Global Academy on Agriculture and Food Security, University of Edinburgh, Edinburgh, United Kingdom

The consensus in the debate on what to do about antimicrobial resistance (AMR) is the need to reduce antimicrobial use (AMU). However, the interventions required to achieve these reductions are only now starting to emerge, and the resulting reductions in AMR are uncertain beyond a few examples in the European Union. There are also difficulties in linking impact on animal and human health with the changes.

As this field develops and strengthens there will be a need to capture high quality data on the costs of the interventions and their impacts on AMU/AMR that in turn affect human and animal health. Economics can play a role in shaping these data collection efforts through cost-effectiveness analyses that can then be used to build marginal abatement cost curves (MACC). When done with precision economics can provide evidence for policy making categorising the interventions in terms of being:

1. cost positive and requiring information and guidance;
2. cost neutral and requiring legislation and enforcement; and/or
3. cost negative and requiring financial support, information and legislation.

Using frameworks developed in projects in Southeast Asia, this paper will discuss the potential to use MACCs to improve the understanding of the economic impact of interventions devised to reduce AMU and AMR.

**S8.5****THE ECONOMIC BENEFITS AND COSTS OF ANTIMICROBIAL USE IN FOOD ANIMAL PRODUCTION: WHAT LESSONS CAN BE DRAWN?****Michael M. Ryan**

Organisation for Economic Co-operation and Development (OECD), Paris, France

For over five decades, food animal producers have used antimicrobials in production for a variety of purposes including the treatment of sick animals, the prevention of disease and, in some production systems, to promote growth. While it is well recognised that antimicrobials are important to ensure good animal health and animal welfare, there is growing concerns over the impacts of use and, in particular inappropriate use, on the rise in resistance and the transmission of resistance between different animal species and humans. To date, much of the research has focussed on finding the technical optimal level of antimicrobial use in animal production, and less attention has been given to identifying the optimal economic level of use in animal production.

This presentation outlines the ongoing work in the Organisation for Economic Co-operation and Development (OECD) on the economic costs and benefits of antimicrobial use in food producing animals. While a major challenge has been the lack of reliable data on the use of antibiotics on animal farms, nevertheless, good progress has been made in recent years on collecting and sharing information and data on the use of antibiotics in food animal production. Given the data limitations at the national level, this work takes a case study approach to assessing the economic benefits and costs of antimicrobials in the production system. While the case studies are specific to particular animal production systems, many of the lessons from these studies can be generalised to other systems and to other countries. The preliminary results would appear to indicate that the use of antibiotics in animal production tends to exceed the economic optimal level of use, and is closely related to the type of production system, level of management and biosecurity measures on the farm.

## S9.1

# HOW CAN STANDARDS BE TRANSLATED INTO PRACTICE

**Franck Berthe, Yoshini Naomi Rupasinghe, Alessia Thiebaud, Jonathan Wadsworth & Enis Baris**

World Bank, Washington D.C., United States of America

Since 2005, the World Organisation for Animal Health (OIE) has provided guidance to its members, and sets International Standards for responsible and prudent use of antimicrobials in animals. Similarly, the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) have long provided guidance throughout their respective constituencies; so, standards and technical guidelines on proper use of antimicrobials and on antimicrobial resistance (AMR) exist. In 2015, the WHO-FAO-OIE Tripartite outlined a Global Action Plan on AMR (2016-2020), stressing the importance of multi-dimensional responses to the issue, especially in countries with weak or inadequate monitoring systems. In 2016, 193 countries signed a Political Declaration of the United Nations High-level Meeting on Antimicrobial Resistance calling for coherent global action to address the issue and recognizing that failure to address AMR will jeopardize global capacity to deliver the Sustainable Development Goals. If unabated, AMR has the potential to wipe out decades of development progress and create an uncertain future for humanity.

To date, however, while many countries are developing, or have developed National Action Plans (NAPs), only few countries have fully implemented multi-sectoral NAPs. Technical solutions exist that can address AMR; however, they are often not implemented in the places where they are most needed. The gap between knowledge of what can be done to address AMR and the reality on the ground remains important. The World Bank is currently engaged in identifying and assessing these knowledge- and know-how- gaps with a view to providing policies and interventions that can be used to support countries, and in particular Low- and Middle- Income Countries (LMICs), in addressing AMR. The study will examine range of interventions and document knowledge and research gaps. It will also present case studies to provide illustrations and pathways of how action can be taken in resource-limited settings.



# POSTERS

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**P.01**

## **KNOWLEDGE AND ATTITUDES OF STAKEHOLDERS OF THE BRAZILIAN PIG PRODUCTION CHAIN REGARDING MICROBIAL RESISTANCE TO ANTIBIOTICS**

**Rita Albernaz-Gonçalves & Maria José Hötzel**

Laboratório de Etologia Aplicada e Bem-estar Animal, Universidade Federal de Santa Catarina, Florianópolis, Brazil

Microbial resistance to antibiotics (AMR) is a major global public health problem. The implementation of international standards on responsible and prudent use of antibiotics (ATB) in animal production is an essential step to alleviate the problem. The objective of this study was to identify the knowledge and attitudes of stakeholders of the pig production chain regarding these measures. In-depth interviews were done with 27 stakeholders from public and private bodies, with different types of involvement in the pig production chain. Added to a widespread use of ATB as growth promoters, the most cited prophylactic uses were: at birth and weaning, to prevent piglets' diarrhea; at surgical castration, to prevent infections; at the start of the reproductive cycle, to prevent sows' urinary infections. There was a consensus on the dependence of ATB use on pig farming, which interviewees related to the predominant production system and the levels of biosecurity of Brazilian farms.

The ease of access and reliance in ATB were viewed as main reasons for the indiscriminate use of ATB. Although all interviewees recognised AMR as a human and animal health problem, many argued that an association with the use of ATB in pig production is yet to be proved. The group was divided in the support of the prophylactic use of ATB. Many participants were unaware of any programs for prudent use of ATB presented by the interviewer; the cited limitations for their implementation were lack of awareness among producers and professionals, including veterinarians, about AMR; economic considerations; lack of political will; a perception of low priority compared to other problems of the chain; and conflicts of interests of pharmaceutical multinationals. This study highlighted several cultural, technical, and economic perceived barriers amongst stakeholders of the pig production chain, which need to be overcome in order to implement programs of prudent use of ATB.

## P.02

# COLLABORATIVE IMPLEMENTATION OF NATIONAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE IN JAPAN

**Manao Ozawa<sup>(1)</sup>, Masashi Totani<sup>(1)</sup>, Kumiko Igarashi<sup>(1)</sup>, Naofumi Nagashima<sup>(2)</sup> & Hiroyuki Noda<sup>(3)</sup>**

(1) Animal Products Safety Division, Food Safety and Consumer Affairs Bureau, Ministry of Agriculture Forestry and Fisheries

(2) Coordination Office of Measures on Emerging Infectious Diseases, Cabinet Secretariat

(3) Tuberculosis and Infectious Diseases Control Division Health Service Bureau, Ministry of Health, Labor and Welfare

**Objectives:** Following the World Health Organization's (WHO) adoption of its Global Action Plan on Antimicrobial Resistance (AMR), Japan developed its National Action Plan for 2016-2020. This, Japan's first comprehensive strategy against AMR, is structured around goals in six areas:

1. Public Awareness and Education;
2. Surveillance and Monitoring;
3. Infection Prevention and Control;
4. Appropriate Use of Antimicrobials;
5. Research and Development;
6. International Cooperation.

While multisectoral collaboration is indispensable in all these areas, concrete initiatives have already borne fruit, as described below.

**Methods and results:** Regarding Public Awareness and Education, under coordination by the Cabinet Secretariat, relevant Ministries work together towards the annual 'Antibiotic Awareness Month' in November. Activities include preparing awareness-promotion videos and educational materials for each sector. Also, Public Awareness Raising Meeting on Promoting Measures against Antimicrobial Resistance (AMR), headed by a famous astronaut, Dr Mamoru Mori, excellent awareness-raising activities carried out by groups or individuals were commended by relevant Ministers and also Japanese TV stars, Mr Joy and Ms Mariko Shinoda who have been appointed as 'Reduce AMR' Ambassadors, included the Japanese Association of Swine Veterinarians, for providing instruction on prudent use at the farm level, and the Japanese Society of Antimicrobials for Animals, for disseminating information on AMR among animals in Japan to stakeholders.

Regarding Surveillance and Monitoring, the Ministry of Health, Labour and Welfare takes the lead in organising the AMR 'One Health' Surveillance Committee, comprising multisectoral experts. It developed the Nippon AMR 'One Health' Report 2017, Japan's first comprehensive report covering the AMR situation for humans, animals (including aquatic and companion animals) and the environment.

**Conclusion:** Multisectoral collaboration is necessary for the fight against AMR. But that fight will not be successful without a clear and strong lead and a sense of ownership shared by all relevant sectors, including the public. The initiatives described above – still in the process of improvement and expansion – are promising examples of collaborative implementation of the National Action Plan.

**P.03**

## **ONE HEALTH APPROACH ON NATIONAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE (AMR) IN MALAYSIA**

**Rozanah A.A.Samad<sup>(1)</sup>, Norazlina M.Noh<sup>(1)</sup>, Siti Hafizah M.Salleh<sup>(1)</sup> & Quaza N.H.N.<sup>(2)</sup>**

(1) Zoonosis and Veterinary Public Health Section, Biosecurity Management and SPS Division, Department of Veterinary Services, Putrajaya, Malaysia

(2) Director General, Department of Veterinary Services, Putrajaya, Malaysia

Occurrence of antimicrobial resistance (AMR) in humans and animals has raised concerns at all levels of organisation worldwide. Malaysia too is looking at this issue seriously and has taken the next step by developing the National Action Plan on AMR under 'One Health' which involved multi-sectorial collaborations among government agencies, academia and industry players.

The objectives of this National Action plan are to:

1. inculcate responsible and prudent use of antimicrobial among all stakeholders and professionals;
2. to work in coordination as 'One Health' with multi-sectorial involvements and responsible;
3. to monitor and surveillance of antimicrobial usage (AMU) in relation to the occurrence of AMR;
4. to effectively and efficiently reduce and control the incident of AMR at its source.

Under this plan, all parties particularly the Health Sector and Animal Sector have come out with comprehensive educational, surveillance, control, preventive and monitoring programmes for antimicrobial usage and resistance at both human and animal levels in order to determine the occurrence and effective control and preventive measures.

Beside those programmes, national standards and guidelines are also in the process of establishing. The integrated awareness and programmes are being conducted simultaneously to the public, professionals, farmers, industry and relevant stakeholders on AMR.

**P.04****IMPLEMENTATION OF THE HONG KONG STRATEGY AND ACTION PLAN ON ANTIMICROBIAL RESISTANCE IN THE LIVESTOCK SECTOR****Thomas Sit**

Inspection and quarantine branch, Agriculture, Fisheries and Conservation Department (AFCD), Hong Kong Special Administrative Region

Hong Kong faces two key challenges in the fight against antimicrobial resistance (AMR) in the livestock industry despite its small size (43 pig farms and 29 chicken farms). First, there is limited control on antimicrobial import and sale. Therefore, no comprehensive information on antimicrobial use (AMU) is available. Second, limited veterinary services are available to farms, causing certain difficulties with disease management and supply of veterinary drugs and vaccines.

The Hong Kong Strategy and Action Plan on Antimicrobial Resistance (the Plan) was launched in July 2017. The Antimicrobial Resistance Surveillance Section (AMRSS) has been established under the Agriculture, Fisheries and Conservation Department (AFCD) to conduct tasks related to the local livestock farming industry. The current objectives of the tasks include establishing surveillance systems for AMR and AMU, enhancing Veterinary Services for farms and improving knowledge, attitude and practice (KAP) of farmers. These are being achieved through commissioning a consultancy study to devise the surveillance systems, conducting farm visits to collect relevant information, facilitating the development of farm veterinary services, organising educational seminars for farmers and various publicity activities and conducting surveys to identify gaps in farmers' KAP.

Over the first year of implementation of the Plan, preliminary surveillance systems involving laboratory testing of samples from animals, livestock feed, the environment (such as livestock waste collected from the waste bin) and Chinese medicinal products used for treatment or prevention of livestock diseases by farmers (such as Chinese herbs) have commenced. The development of comprehensive farm veterinary services and guidelines on AMU for farmers is also underway. Besides, gaps in farmers' KAP have been identified. Future educational activities and strategies will aim at rectifying these gaps.

Smooth implementation of the Plan in the livestock industry undoubtedly necessitates solid surveillance systems and cooperation from farmers. With the continued efforts of the AMRSS in executing the tasks, it is anticipated that the challenges in the fight against AMR in the industry will eventually be overcome and the AMR problem in the industry will be properly managed.

**P.05****HERD-SPECIFIC INTERVENTIONS TOWARDS  
A REDUCED ANTIMICROBIAL USAGE**

**Nele Caekebeke**<sup>(1)</sup>, **Angelique van den Hoogen**<sup>(2)</sup>, **Moniek Ringenier**<sup>(1)</sup>, **Arjan Stegeman**<sup>(2)</sup>  
& **Jeroen Dewulf**<sup>(1)</sup>

(1) Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

(2) Faculty of Veterinary Medicine, Utrecht University, Utrecht, the Netherlands

Since the establishment of goals to reduce antimicrobial usage (AMU) in the Netherlands and Belgium, already a considerable decline in the amount of antimicrobials used has been achieved sounds better. However, substantial reductions are still possible.

Previous studies already showed that coaching of farmers to a more reasonable AMU, has great potential. Within the i-4-1-Health project, the aim is to coach pig- and broiler farmers to a reduced infection pressure and improved antimicrobial stewardship.

A total of 30 pig and 30 broiler farms were selected in the Netherlands and Belgium. During the first visit, an inventarisation of farm management, biosecurity, health and AMU was carried out. After which a herd specific coaching path was set up. This included all measures already implemented since the first visit, together with specific points of action decided upon in a dialogue between farmer and coach. Two follow-up visits will follow, each with six months in between.

To coach the farmers, an adapted version of the ADKAR® (Awareness-Desire-Knowledge-Ability-Reinforcement) model was applied. This model identifies five different elements essential for the successful implementation of change. To assess the intrinsic change process of the farmer, an ADKAR profile per farmer was composed.

On all farms, a herd specific coaching path has been set up and depending on the score a farmer was given in the ADKAR® model, different implementations were advised. From all implementations suggested, the following were found most feasible in poultry production so far: presence of house specific and recognisable materials (60.0%); enhance the start of one-day-old chicks (53.3%). In pig farms, possible introduction of pathogens to the farm by transport vehicles was considered important and in need of more attention (46.7%). Also hygiene management of used materials could improve (60.0%).

At the moment, a first evaluation takes place to see whether measures found feasible are actually implemented.

**P.06****ENHANCED ASSESSMENT OF KNOWLEDGE, ATTITUDES AND PRACTICES (KAP+) ON ANTIMICROBIAL RESISTANCE AND ANTIMICROBIAL USE**

**Domingo Caro III, Frank Pumipuntu, Carolyn Benigno, Katinka deBalogh & Mary Joy Gordoncillo**  
Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific, Bangkok, Thailand

**Objective:** To pilot an enhanced assessment of knowledge, attitudes and practices (KAP+) toward antimicrobial resistance (AMR) and antimicrobial use (AMU) among key stakeholders in Southeast Asia.

**Methods:** First phase of the KAP+ was composed of cross-sectional studies conducted in Lao People's Democratic Republic (Lao PDR) and Viet Nam. It included groups of stakeholders in the animal health sector by stratified sampling in selected provinces in Lao PDR and Viet Nam between October 2017 and July 2018. 1,170 respondents were included in the study. Structured interviews and focus group discussions were used. Qualitative data were transcribed and analysed descriptively, while quantitative data were analysed using statistical software. Current literature on technical data (surveillance, documentation) were reviewed. The second phase consisted of planning and design of intervention with participation of stakeholders. Third phase was the implementation of interventions.

**Results:** Overall, the KAP survey reveal low level AMR knowledge and inappropriate AMU practices. Respondents' education level has a correlational relationship to their attitude towards the threat of AMR—the higher their educational level, the greater is their understanding of AMR threat. Results of the KAP survey and literature reviews were used as references for the objectives and design of KAP+. The planning workshop detailed interventions in public awareness and technical (surveillance, documentation, research, etc.) strategies to address AMR. A more informed campaign will be implemented.

**Discussions and Conclusions:** KAP+ is a novel approach linking research/investigation and implementation. Surveys of KAP usually just become written reports without action on recommendations. The proposed KAP+ approach consists of three phases: Assessment; Planning and Design; and Implementation. This project pursued a more meaningful KAP survey by integrating an implementation phase. The 'Plus' in the approach does not only focus on communication interventions but also technical ones such as surveillance, good practices and policy advocacy.

**P.07**

## **USE OF ANTIMICROBIALS IN SMALL ANIMAL PRACTICE IN ITALY: ONLINE SURVEY ON VETERINARIAN HABITS**

**Marialaura Corrente**<sup>(1)</sup>, **Mariarosaria Marinaro**<sup>(2)</sup>, **Margie Cirilli**<sup>(1)</sup>, **Alessandra Cavalli**<sup>(1)</sup>, **Alessio Sposato**<sup>(1)</sup>, **Elena Bozzetta**<sup>(3)</sup> & **Domenico Buonavoglia**<sup>(1)</sup>

(1) Department of Veterinary Medicine, University of Bari, Italy

(2) Istituto Superiore di Sanità, Rome, Italy

(3) Istituto Zooprofilattico Sperimentale Piemonte, Liguria e Valle d'Aosta, Italy

Gathering information on the use of antibiotics is important for improving strategies against antimicrobial resistance. An online questionnaire covering the following issues was administered to Italian veterinarians: prescribing patterns of antibiotics, routes of administration, request of laboratory testing, first-line treatment with new generation molecules, pet owner mistakes affecting compliance with the therapy. A total of 7,993 veterinarians completed the questionnaire (response rate 27%). The mean age was 40 years (median 38, range 25-63). Most of the veterinarians (93%) worked in small animal practice in small clinics rarely equipped with a microbiology laboratory (10%). Beta-lactams were the most prescribed drugs (80%), followed by quinolones (57%). Seventy-three percent of the veterinarians declared they prescribed third and fourth generation cephalosporins and fluoroquinolones as first-line therapy. Parenteral administration was the route preferentially employed during hospitalisation while the oral route was suggested for home therapy. Only 18% of the veterinarians periodically changed the drugs for prophylactic treatments and 3% of them requested a laboratory test before prescription. The veterinarians declared that several factors (such as the cost of the drug, ease of administration and pressures from the pet owner) influenced their final prescription. Early interruption of the therapy (71%) and missing one or several doses of antibiotics (52%) were frequent pet owner mistakes affecting compliance. Results of the survey indicate that Italian veterinarians are not completely aware on the prudent use of antibiotics and that improvement of communication with pet owners as well as antibiotic stewardship programs are needed.



**P.08****ECOANTIBIO: A SUCCESSFUL PUBLIC POLICY TO FIGHT AGAINST ANTIMICROBIAL RESISTANCE IN THE VETERINARY SECTOR IN FRANCE**

**Cécile Adam**<sup>(1)</sup>, **Jean-Pierre Orand**<sup>(2)</sup>, **Anne Chevance**<sup>(2)</sup>, **Delphine Méheust**<sup>(2)</sup>, **Gérard Moulin**<sup>(2)</sup> & **Jean-Yves Madec**<sup>(3)</sup>

(1) General Directorate for Food, Ministry for Agriculture and Food, Paris, France

(2) French agency for veterinary medicinal products/French agency for food, environmental and occupational health safety, Fougères, France

(3) French agency for food, environmental and occupational health safety, Lyon, France

The Ecoantibio plan is a public policy set up by the French Ministry of Agriculture and Food, aiming to reduce the contribution of antimicrobial use (AMU) in animals to antimicrobial resistance (AMR). It relates to all animal sectors (including pets) and covers all French territories.

The first Ecoantibio plan was published in November 2011, which set a quantitative objective (reduce animal exposure to antimicrobials by 25% in five years) and a qualitative objective (reduce animal exposure to critically important antimicrobials [CIA]).

This plan combined regulatory and incentive tools. Main regulatory tools are:

- a) the ban of antibiotics for preventive use;
- b) CIA can only be used to cure animals after diagnosis, bacterial identification and antibiotic susceptibility testing;
- c) ban on discounts for antimicrobial sales.

In order to encourage the main stakeholders to take actions, communication campaigns promoting careful AMUs and vaccinations were launched. Other pillars were also included, such as setting up guidelines on good practices and research funding to cover knowledge gaps.

Over the last five years (2012-2016), overall exposure has decreased by 36.6%. The decline in exposure to antimicrobials was observed for all species compared to 2011 (cattle: -24.3%, pigs: -41.5%, poultry: -42.8%, rabbits: -37.6%, cats and dogs: -19.4%). In 2016 exposure to newer-generation cephalosporins and fluoroquinolones decreased by 81.3% and 74.9% respectively, compared to 2013, all species combined. Initial quantitative and qualitative objectives have therefore been achieved and mostly exceeded. The decline in exposure to antimicrobials has been accompanied by a decline or stabilisation in resistance for the vast majority of antimicrobials tested.

Nevertheless, as these achievements needed to be consolidated in a 'One Health' perspective, a second Ecoantibio plan was published in April 2017 and is part of the interministerial roadmap for controlling AMR. This second plan focuses on training, research and communication.

In conclusion, Ecoantibio is an example of a successful public-private partnership, thanks to veterinarians and farmers' involvement.

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## ANTIMICROBIAL USE POLICY IN SMALLHOLDERS OF LMICS: MITIGATING ADVERSE HEALTH AND SOCIOECONOMIC IMPACTS

François Roger<sup>(1)</sup>, Flavie Goutard<sup>(1)</sup>, Eric Cardinale<sup>(1)</sup>, Marion Bordier<sup>(1)</sup>, Marisa Peyre<sup>(1)</sup> & Christian Ducrot<sup>(1, 2)</sup>

(1) Animal, santé, territoires, risques et écosystèmes (ASTRE), Centre de coopération internationale en recherche agronomique pour le développement (CIRAD), Montpellier, France

(2) Animal Health Department, Institut national de la recherche agronomique (INRA), Montpellier, France

**Introduction:** While there are numerous measures restricting the use of antimicrobials on livestock farms in industrialised countries, this is not the case in low- and middle-income countries (LMICs). On the contrary, their use has been boosted by the growing demand for animal protein and the boom in intensive livestock farming. One needs to decipher the complexity and impacts on small farmers of the phenomenon of antimicrobial resistance (AMR) and of the global strategies planned to fight it.

**Methods:** Surveys mainly based on participatory methods within field studies carried out in Southeast Asia and Indian Ocean.

**Results:** Only fragmented and sparse data are available. A common perception among farmers from LMICs is that without antimicrobials their animals will gain slowly. Many farmers even do not know that they are giving antimicrobials to their animals when using vitamins or some prepared feeds. However, in some areas, farmers have a positive attitude toward alternatives to antimicrobials and use medicinal plants (e.g. banana, guava). Many LMICs do not have the necessary veterinarian or para-veterinarian human resources to prescribe antimicrobials, and to control the drug importation where the volume of informal importations is already very high.

**Discussion:** The major challenge will be to implement adapted policies enabling the decrease and rationalisation of antimicrobial use (AMU), through a set of actions and associated regulatory measures. However, it should be noted that the effective application of these policies is dependent on one key factor: minimising adverse health and socio-economic impacts on the standard of living for farmers, especially in the most vulnerable regions.

**Conclusion:** We suggest lines of research by using participatory approaches in a 'One Health' framework and combining also studies on education, awareness and incentives. We also suggest to create networks including various stakeholders, that is under way within research platforms in Southeast Asia and Indian Ocean.

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**P.10****BRAZILIAN ALLIANCE ON RESPONSIBLE USE OF ANTIMICROBIALS****Sheila Guebara**

ABAG - Brazilian Agribusiness Association

SINDAN - National Association Animal Health Industry

ALANAC - National Association of Pharmaceutical Laboratories

SINDIRAÇÕES - Feed Industry Union

ABPA - Animal Protein Association

ABIEC - Beef Exporters Association

ASSOCON - National Association of Intensive Livestock

ABCS - Brazilian Swine Producers' Association

CNA - Confederation of Agriculture and Livestock

Viva Lácteos - Dairy Association

ABIQUIF - Pharmochemical Industry Association

Peixe BR - Fish Farming Association

G 100 - Smaller and Medium Cooperative and Companies Association

The Brazilian Alliance on Responsible Use of Antimicrobials (ALIANÇA), aim to guarantee aligned multistakeholder approach on regarding Antimicrobial Policy Development. The Alliance bring together representatives from different animal protein species (cattle, dairy, swine, poultry and fish). ALIANÇA understands that joint efforts are necessary to keep in force practices that minimise the emergence and transference of resistance and protect a public health effort while promoting the responsible and rational use of antimicrobials.

**Objectives:** protect animal health and well-being, produce safe food, and preserve antimicrobial efficacy and consumer confidence. We are committed to create a common and align voice to deliver guidelines and projects in partnership with government regulatory, which can address the following:

1. Surveillance Systems for the presence and prevalence of antimicrobial resistance (AMR) in food and animals  
*Outcome:* Integrated Surveillance Monitoring System (One Health);
2. Capacity building toward the judicious and responsible use of animal health antimicrobials seeking to minimise the risk of AMR  
*Outcome:* Policy education and improved awareness;
3. Global Mutual Recognition & Collaboration that recognises and respects national policies for judicious use of antibiotics where needed to protect animals and public health  
*Outcome:* Trade regulations and recognition consistent with the World Trade Organization, Codex, World Organisation for Animal Health and intergovernmental organisations;
4. Sustainable development and scientific dialogues  
*Outcome:* Policy framework that enables more sustainable practices and technologies.

## P.11

## ANTIMICROBIAL RESISTANCE GENE MARKERS (AMRS) AND CLASS 1 INTEGRON IN OPPORTUNISTIC PATHOGEN *CITROBACTER FREUNDII* STRAIN NR-12 FROM POULTRY

Munawar Sultana<sup>(1)</sup>, Shazid Hasan<sup>(2)</sup> & Anwar Hossain<sup>(3)</sup>

(1) Department of Microbiology, University of Dhaka, Dhaka, Bangladesh.

(2) Department of Microbiology, Jessore University of Science and Technology, Jessore, Bangladesh

(3) Vice-Chancellor, Jessore University of Science and Technology, Jessore, Bangladesh

Poor poultry hygiene, improper- and/or misuse of antibiotics in feed complicates the emergence of antibiotic resistant development in pathogens of zoonotic importance. *Citrobacter freundii* is an opportunistic nosocomial pathogen that can cause infection in blood stream and urinary tract, pneumonia and diarrhoea in compromised patients. The present study explores the antimicrobial resistant patterns and antimicrobial resistant gene markers (AMRs) of retrieved *Citrobacter* spp. of poultry origin in Bangladesh.

Twenty-three different poultry samples including swabs from cloacae, droppings, handlers, feed, and eggs were subjected to enrichment on selenite broth and subsequent isolation on Xylose Lysine Deoxycholate (XLD) agar medium. Among the isolated bacteria, five were phenotypically identified as *Citrobacter* spp. (isolate ID: NR- 12, NR-26, NR-27, NR-28, NR-46). All of them were analysed for Multidrug resistance (MDR) using 11 antimicrobial drugs belonging to eight antibiotic groups that are widely used in Bangladesh poultry farms. Complete genomes of selected isolates were sequenced using ion-torrent technology and bioinformatics analysis.

Colistin resistant *Citrobacter freundii* strain NR-12 was MDR, showing resistant to seven different antibiotics from five antimicrobial groups (polymyxin, sulfonamide, tetracycline, fluoroquinolone and macrolide). The minimum inhibitory concentration (MIC) of colistin for NR-12 was 16 µg/ml. Comprehensive genome analysis of *C. freundii* strain NR-12 (GenBank accession number MZZE00000000) revealed trimethoprim resistance gene *dfrA12*; sulfonamide resistance gene *sul1* and *sul2*; macrolide resistance gene *mph* (A); tetracycline resistance gene *tet* (A); fluoroquinolone resistance gene *qnrS1* and *qnrB13*; an extended spectrum β-lactamases *bla*<sub>TEM-176</sub>; class A β-lactamase and *bla*<sub>CMY-39</sub> as well as chromosomal colistin resistant genes *mgrB*, *phoP*, *phoQ*, *pmrA*, *pmrB*, *eptB* and *arnB*. Moreover, the strain harbored Class 1 integron gene cassette carrying four different antibiotic resistance genes (*dfrA12*, *aadA2*, *sul1*, *mph* (A)), which is one of the first reports worldwide.

*Citrobacter freundii* strain NR-12 is an opportunistic MDR pathogen with zoonotic potential and understanding of its resistant mechanism is necessary to implicate control strategy.

**P.12****RANDOMNESS OF ANTIMICROBIAL USAGE REGARDING CHOICE OF ANTIMICROBIAL CLASS AND DOSAGE ON PIG, POULTRY, TURKEY AND VEAL CALF FARMS**

**Philip Joosten**<sup>(1)</sup>, **Steven Sarrazin**<sup>(1)</sup>, **Liese van Gompel**<sup>(2)</sup>, **Roosmarijn Luiken**<sup>(2)</sup>, **[EFFORT group]**<sup>(4)</sup>, **Jaap Wagenaar**<sup>(3)</sup>, **Dick Heederik**<sup>(2)</sup> & **Jeroen Dewulf**<sup>(1)</sup>

(1) Veterinary Epidemiology Unit, Department of Obstetrics, Reproduction and Herd Health, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

(2) Institute for Risk Assessment Sciences, Utrecht University, Utrecht, the Netherlands

(3) Department of Infectious Diseases and Immunology, Faculty of Veterinary Medicine, Utrecht University, Utrecht, the Netherlands

(4) Ecology from Farm to Fork Of microbial drug Resistance and Transmission, <http://www.effort-against-amr.eu/>

Antimicrobial resistance (AMR), which is driven by antimicrobial usage (AMU), is posing a major threat to public health worldwide. To stop AMR, we do not only need to reduce AMU, we also need to promote a more responsible usage. Therefore, AMU characteristics in food animal production were explored to identify how usage of these drugs could be improved.

Within the Ecology from Farm to Fork Of microbial drug Resistance and Transmission (EFFORT) project, a European project investigating the epidemiology and ecology of antimicrobial resistance, details on AMU were registered on 181 broiler farms, 180 pig farms, 60 turkey farms and 61 veal calf farms. An in depth description of the set up and methodology can be found in previous EFFORT studies.

When comparing the choice of antimicrobial class to treat a similar indication, totally different classes were used between countries, a pattern that was observed within each species. Also dosage of antimicrobials varied a lot between farms. For example, dosage of all 12 colistin treatments, administered through drinking water on the sampled broiler farms, ranged from 3.6 mg to 50.4 mg colistin per kg animal per day. This type of variation was also observed for other products and in other species.

These findings show a randomness of usage when it comes to choice of antimicrobial class and dosing of antimicrobial treatments. Differences in product availability and prices on regional level might explain this. Nevertheless, such randomness in AMU is no longer justifiable and should be addressed if we want to strive for a more responsible AMU.

**P.13****QUANTITIES OF VETERINARY ANTIMICROBIAL USE IN NIGERIA BETWEEN 2014 AND 2016**

**Dooshima Kwange**<sup>(1)</sup>, **Gideon Mbursa Mshelbwala**<sup>(1)</sup>, **Mwapu Dika Ndahi**<sup>(1)</sup>, **Bukar Ali Usman**<sup>(2)</sup> & **Yunus Idowu Sadiq**<sup>(2)</sup>

(1) Department of Veterinary and Pest Control Services, Federal Ministry of Agriculture and Rural Development, Abuja, Nigeria

(2) National Agency for Food and Drugs Administration and Control (NAFDAC), Lagos, Nigeria

Antimicrobial (AM) agents are essential for protection of animal health and welfare. However, the non-prudent use of AMs, exposure to sub optimal doses as feed additives, growth promotion or lack of observance of withdrawal period leads to resistance. Antimicrobial resistance (AMR) has become a global public health concern, cutting across human and animal health and environment. As a result, the World Organisation for Animal Health (OIE) has established a global data base on AM use in animals to which all OIE member countries are expected to contribute. The OIE member countries are expected to report on quantities of AM use in animals using various options. Nigeria has contributed to the OIE data base for the years 2014-2016 using option 1. Data on AM use in animals was from import data from the National Food and Drug Administration and Control (NAFDAC). The quantities of active ingredients in various classes of AM agents imported were calculated and converted into kilograms, using formulas described in the OIE *Manual of Diagnostic Test and Vaccines for Terrestrial Animals*. The classes of Antimicrobials for each year were determined and the cumulative amounts in kilogram were 207,000 kg for 2014, 515,892 kg for 2015 and 331,074 kg for 2016. Tetracyclines had the highest amount while glycopeptides were the least for the three years. The data used in this study is not comprehensive since it was import data obtained only from NAFDAC. Other probable sources of data include that from informal purchases across the border, personal purchases and local manufacturers. As part of the implementation of National Action Plan for Antimicrobial Resistance, survey for AM use in animals will be at market and farm levels and will enable Nigeria to report using option 2 and thus have data that is closer to actual AM use in animals.

**P.14****GLOBAL RESPONSIBLE USE OF FLUOROQUINOLONES IN VETERINARY MEDICINE**

**Sonja Tennagels, Carolin Ludwig-Erdmann, Guido Schiffer, Bernd Stephan, Jörg Willenborg, Juan Raul Vazquez & Norbert Mencke**

Bayer Animal Health GmbH, Leverkusen, Germany

The availability of effective antimicrobial drugs in veterinary medicine such as fluoroquinolones, safeguard animal health and well-being, and subsequently provide healthy animal products for human nutrition. Reducing the availability of therapeutic medicines to the veterinarian will have a significant detrimental impact on animal health and well-being. To minimise the risk of resistance selection during veterinary therapeutic use and to safeguard the future utility of fluoroquinolones in veterinary medicine, 'Principles for the Responsible Use of Fluoroquinolones in Veterinary Medicine', were published in 1998 (revised 2014). According to these principles, administration on prescription-only and under veterinary supervision, and we are committed to susceptibility monitoring. Only authorised fluoroquinolones should be used. The application as performance enhancer/growth promoter, in aquaculture, as in-feed medication, for viral or trivial bacterial infections or for routine prophylaxis is not permitted. Bayer Animal Health is part of various extensive monitoring programs performed across Europe started in 1992, for major target animal pathogens and zoonotic bacteria. Since then, more than 28.000 bacterial isolates sampled from food producing animals covering major indications been analyzed and stored.

Between 2007 and 2018, 1,449 porcine and 224 bovine pathogens were collected from animals with respiratory disease and Minimum Inhibitory Concentrations (MICs) of enrofloxacin were determined by worldwide-accepted standards. The most common species isolated from pigs were *Pasteurella multocida* (n=386), *Streptococcus suis* (n=376), *Bordetella bronchiseptica* (n=261), *Actinobacillus pleuropneumoniae* (n=179) and *Haemophilus parasuis* (n=113), from cattle mainly *P. multocida* (n=100) and *Mannheimia haemolytica* (n=59) were isolated. Enrofloxacin resistance was absent for *M. haemolytica*, *P. multocida* as well as *A. pleuropneumoniae* and very low for the other main species (<2.0%) isolated from pigs.

This survey demonstrates a very high susceptibility of respiratory pathogens obtained from pigs and cattle to enrofloxacin. The data are published regularly and are consistent with the results of national authority programmes.

P.15

## ANTIMICROBIAL USAGE AND RESISTANCE IN COMPANION ANIMALS A CROSS-SECTIONAL STUDY IN THREE EUROPEAN COUNTRIES

Evelien Odent<sup>(1)</sup>, Steven Sarrazin<sup>(1)</sup>, Daniela Ceccarelli<sup>(2)</sup>, [EFFORT group]<sup>(4)</sup>, Dik Mevius<sup>(2,3)</sup> & Jeroen Dewulf<sup>(1)</sup>

(1) Veterinary Epidemiology Unit, Department of Reproduction, Obstetrics and Herd health, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

(2) Department of Bacteriology and Epidemiology, Wageningen Bioveterinary Research, Lelystad, the Netherlands

(3) Department of Infectious Diseases and Immunology, Faculty of Veterinary Medicine, Utrecht University, Utrecht, the Netherlands

(4) Ecology from Farm to Fork Of microbial drug Resistance and Transmission, <http://www.effort-against-amr.eu/>

Antimicrobial resistance (AMR) is a complex issue with many contributing factors. Companion animals have been described as potential reservoirs of AMR, however data remain scarce. High usage of broad-spectrum antimicrobials in these species is demonstrated in different studies, which can select for resistance. Objectives of this cross-sectional study were to describe antimicrobial use in dogs and cats in three different European countries and to investigate phenotypic AMR in *Escherichia coli* isolates.

This study was set up within the framework of the European research project Ecology from Farm to Fork Of microbial drug Resistance and Transmission (EFFORT, <http://www.effort-against-amr.eu/>). Over one year sampling, a questionnaire filled in by the owner, and one faecal sample per animal (n=303) were collected. Antimicrobial use of one year was registered and quantified based on the mean dosage per active compound since no European Surveillance Veterinary Antimicrobial Consumption defined daily dose for animals (DDDvet) values are available. Phenotypic resistance profiles of 282 *E. coli* isolated from faecal samples were determined for 14 different antimicrobials.

In one year, 19% of the animals received at least one antimicrobial treatment. Overall, the most frequently prescribed compounds were amoxicillin-clavulanate (27%), amoxicillin (8%), cefovecin (8%) and enrofloxacin (8%). The average treatment incidence of treated animals is 4%, which means that four animals per 100 receive a daily dose of antimicrobials. Resistance to at least one antimicrobial agent was found in 27% of the isolates; of these 66% showed resistance to two or more unrelated antimicrobial agents. Most common resistance in *E. coli* was to ampicillin (18%). Two isolates were colistin resistant, a last-resort antimicrobial in human medicine.

These results show high use of broad-spectrum and critically important antimicrobials and a substantial resistance prevalence. Taking into account that owners and pets often have close contact, companion animals should be considered as a potential transmission route of AMR. This emphasizes the importance of studying AMR in companion animals and the possible risks of transmission to owners.



## P.16

## TRANSBOUNDARY PUBLIC HEALTH IMPLICATIONS OF UNETHICAL INJECTABLE ANTIMICROBIAL-DRUGS-ADMINISTRATION UNDER BOVINE LIVESTOCK-FARMING AND COMMERCIAL CONDITIONS

**Adenike A.O. Ogunshe**<sup>(1)</sup>, **Abiodun A. Adeola**<sup>(2)</sup>, **Rahamon A.M. Adedokun**<sup>(3)</sup>  
& **Afusat T. Jagun-Jubril**<sup>(4)</sup>

(1) Applied Microbiology & Infectious Diseases, Department of Microbiology, Faculty of Science, University of Ibadan, Nigeria

(2) Food and Nutrition Research Programme, Institute of Food Security, Environmental Resources and Agricultural Research, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria

(3) Department of Veterinary Medicine, Faculty of Veterinary Medicine, University of Ibadan, Nigeria

(4) Department of Veterinary Pathology, Faculty of Veterinary Medicine, University of Ibadan, Nigeria

**Background:** Cattle-rearing in Nigeria can be inferred to have livestock-wildlife interface; whereas, animal trade plays an important role in the spread of infectious diseases and antimicrobial resistance in livestock and human populations.

**Objectives:** To investigate and highlight the trans-boundary-public-health implications of drug-injection malpractices during livestock-farming and livestock-trading in Nigeria on the communal, national and trans-boundary 'One Health'.

**Study-populations and methods:** Study was limited to the Southwest Nigeria, where the indigenous (nomadic) cattle-farmers could be interviewed under non-hostile and safer conditions. However, two of the nomads had travelled up to about 26 out of the 37 states of the country. Obtained verbal informed-consents were obtained from six cattle-farmers and twelve cattle-traders, at six major cattle-farm-settlements and six cattle-markets, and eight veterinary doctors/three animal husbandmen, followed by informal oral interviews, questionnaire-administration and telephone-conversations. Relevant information were transcribed and analysed as textual data.

**Results:** Cattle-farmers and traders mostly dosed presumably healthy-cattle with vitamins and iron drugs, while ill-cattle were injected with iron-dextran, oxytetracycline, penstrep, ofloxacin, chloramphenicol, tylosin, ivermectin, diminazene aceturate, izonid, colistin, etc. Clinical implications and associated adverse public health significance of expiry dates and improper storage of medications; non-combination of different medications in the same containers or syringes; microbial contamination of administered medications by previously used needle and syringe or left-over medications; administration of adulterated or expired injection-drugs under veterinary conditions; as well as, zoonotic-infections, antimicrobial resistance and antimicrobial residues, were not comprehended by the cattle-farmers and cattle-traders. Cattle-farmers and cattle-traders in Nigeria unethically inject their cattle with prescription veterinary-medications, especially antibiotics and antiparasitics because of shortage to animal health professionals, due to nomadic-cattle-farming, lack of subsidy and non-compensation by governments, in cases of cattle morbidity and mortality, and cattle-farmers' occasional refusal to pay for rendered Veterinary Services.

**Conclusion:** Unprofessional antimicrobial-injections-in-livestock-health must be addressed by appropriate implementable policies, due to eco-health/cross-border health implications.

**P.17****PUTTING 'ACTION' BACK INTO NATIONAL ACTION PLANS - MAKING RESPONSIBLE ANTIMICROBIAL USAGE A REALITY IN BANGLADESH**

**Mohammad Habibur Rahman**<sup>(1)</sup>, **Syeda Papia Sultana**<sup>(2)</sup>, **Ingrid Smith**<sup>(3)</sup>, **Jeffrey T. LeJeune**<sup>(4)</sup>, **Sally Crafter**<sup>(4)</sup>, **Md. Sayedur Rahman**<sup>(5)</sup>, **Nitish C Debnath**<sup>(1)</sup> & **Eric Brum**<sup>(1)</sup>

(1) Emergency Center for Transboundary Animal Diseases, Food and Agriculture Organization of the United Nations, Dhaka, Bangladesh

(2) Ashiyan Medical College, Dhaka, Bangladesh

(3) Department of Essential Medicines and Health Products, World Health Organization, Geneva, Switzerland

(4) Food Safety and Quality Unit, Food and Agriculture Organization of the United Nations, Rome, Italy

(5) Department of Pharmacology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

Bangladesh has the highest density of humans and livestock in the world. The poultry industry has been growing at an exceptional pace to meet continually increasing demand for animal protein. To support high production levels on low biosecurity farms, large quantities of a wide variety of antibiotics, including World Organisation for Animal Health (OIE) and World Health Organization (WHO) critically important antibiotics such as ciprofloxacin and colistin are regularly used, thereby contributing significantly to emergence of antimicrobial resistance (AMR) in Bangladesh. The National Action Plan on AMR containment identified a 'One Health' approach to be the most effective means to address AMR. A group of leading animal and human health professionals came together to form the Bangladesh AMR Response Alliance (BARA), a community of practice dedicated to prescribing antimicrobials responsibly. BARA subsequently developed 'One Health' antimicrobial usage (AMU) guidelines covering AMU in poultry and human medicine via collaborative workshops supported and facilitated by Food and Agriculture Organization of the United Nations (FAO) and the WHO.

Continuing Professional Development Trainings for both practitioners were organised for BARA leaders to train fellow practitioners how to utilise the AMU guidelines. Furthermore, a smartphone application to access the guidelines was developed and an online social media group was initiated; 128 BARA members have been trained. BARA has become an active 'One Health' functional forum advocating for responsible AMU in human and veterinary medicine independent of respective employers/sectors/affiliations. Thirteen standard participatory training modules and tools were developed, pretested, revised and finalised incorporating the feedback from users. The BARA social media group hosts discussions and also shares AMR-related research articles, tripartite (FAO/OIE/WHO) publications, newsletters, promotional materials. Empowered by concrete, evidence-based guidelines for responsible AMU, BARA members are serving as role models within their professional communities.

**P.18****APPLIED MANAGEMENT OF BOVINE MASTITIS  
MINIMISING THE USE OF ANTIBIOTICS**

**Samir K. Rana, Anakara V. Hari Kumar, Pankaj Dutta, Kota S.N. Leela Surendra, Vijay S. Bahekar, Gonuguntla Hariprasad, Sagar Shroff & Girish K. Sharma**

National Dairy Development Board (NDDB), Anand, India

Alternative approaches were applied for bovine mastitis management minimising the use of antibiotics. Milk samples (n=2,25,276) at dairy cooperative society (DCS) level were screened by California Mastitis Test (CMT) for sub-clinical mastitis (SCM) and positive animals were given tri-sodium citrate (TSC) regimen which resulted in reduction of 38% in the incidence of SCM in a span of three years. Management of clinical mastitis (CM) through Ethno-veterinary medicine (EVM) was undertaken by application of herbal paste comprising *Aloe vera*, turmeric and lime on the affected udder and around 82% of total CM cases (n=18514) could be clinically cured in the last two years. This mastitis control programme is implemented by the National Dairy Development Board (NDDB) in 27 milk unions covering nearly 1,500 DCS targeting more than 200,000 lactating animals. Characterisation of bacterial agents involved in mastitis was also undertaken in this project.

*Staphylococcus* spp., *Streptococcus* spp. and *Escherichia coli* were the leading bacterial agents identified from mastitis cases using traditional, molecular and BD Phoenix system. Antimicrobial resistant (AMR) profile of these pathogens were studied by phoenix antibiotics panel, detection of AMR genes by PCR and whole genome sequencing. Molecular studies reveal that some of *E. coli* isolates harbour blaTEM-1B, QnrS1, sul2, tet(A), blaCTX genes. Presence of aac(6')-aph(2''), mecA, blaTEM, Tet(K) and dfrG genes were recorded in some of the *Staphylococcal* isolates. Antibiotic sensitivity results by BD Phoenix indicate only some isolates have resistance against commonly used antibiotics of beta-lactam, cephalosporin and tetracycline groups.

The present study reveals that application of TSC and EVM can be used for management of bovine mastitis rationalising the use of antibiotics thus minimising the likelihood of development of AMR as well as antibiotic residues in milk.

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## TIME TO REDUCE, REPLACE AND RE-THINK THE USE OF ANTIMICROBIALS IN ANIMALS IN THE EUROPEAN UNION - A SCIENTIFIC OPINION BY EMA AND EFSA

**Pietro Stella**<sup>(1)</sup>, **Zoltan Kunsagi**<sup>(2)</sup>, **Jordi Torren**<sup>(2)</sup>, **Rosella Brozzi**<sup>(1)</sup>, **Denise Candiani**<sup>(1)</sup>, **Marian Bos**<sup>(2)</sup>, **Beatriz Guerra**<sup>(1)</sup> & **Ernesto Liebana**<sup>(1)</sup>

(1) European Food Safety Authority (EFSA), Parma, Italy

(2) European Medicines Agency (EMA), London, United Kingdom

The European Medicines Agency (EMA) and the European Food Safety Authority (EFSA) jointly reviewed measures taken in the European Union (EU) to reduce the need for and use of antimicrobials in food-producing animals, and the resultant impacts on antimicrobial resistance (AMR) (EMA and EFSA, 2017). Information on reduction strategies implemented in EU Member States gathered from competent authorities, stakeholders and through literature searches was reviewed and discussed, with the aim of providing recommendations on reduction strategies, their advantages and disadvantages. Due to the multiplicity of factors contributing to AMR, the impact of any single measure is difficult to quantify, although there is evidence of an association between reduction in antimicrobial use and reduced AMR. To minimise antimicrobial use, a multifaceted integrated approach should be implemented, adapted to local circumstances.

Recommended options (non-prioritised) include: developing national strategies; harmonised systems for monitoring antimicrobial use and AMR development; establishing national targets for antimicrobial use reduction; using on-farm health plans; increasing the responsibility of veterinarians for antimicrobial prescribing; training, education and raising public awareness; increasing the availability of rapid and reliable diagnostics; improving husbandry and management procedures for disease prevention and control; rethinking livestock production systems to reduce inherent disease risk. A limited number of studies provide robust evidence of alternatives to antimicrobials that positively influence health parameters. Possible alternatives include probiotics and prebiotics, competitive exclusion, bacteriophages, immunomodulators, organic acids and teat sealants. Developing a legislative framework that permits the use of specific products as alternatives should be considered. Further research to evaluate the potential of alternative farming systems on reducing AMR is recommended. Animals suffering from bacterial infections should only be treated with antimicrobials based on veterinary diagnosis and prescription. Options should be reviewed to phase out most preventive use of antimicrobials and to reduce and refine metaphylaxis by applying recognised alternative measures.

**P.20****INVESTIGATIONS INTO THE LINKAGE BETWEEN THE HERD HEALTH STATUS OF FOOD ANIMALS AND THE PRESENCE OF ANTIMICROBIAL RESISTANCE**

**Katharina Wadepohl**<sup>(1)</sup>, **Thomas Blaha**<sup>(1)</sup> & **Diana Meemken**<sup>(2)</sup>

(1) University of Veterinary Medicine Hannover, Foundation, Field Station for Epidemiology, Bakum, Germany

(2) Freie Universität Berlin, Department of Veterinary Medicine, Institute of Food Safety and Food Hygiene, Section Meat Hygiene, Berlin, Germany

**Background:** The occurrence of antimicrobial resistance (AMR) in livestock is an increasing challenge and represents an issue of growing concern, in particular as a risk for human health (EFSA, 2015). The animal health status of food-producing animal herds can indirectly, as one of the determinants of bacterial spread and of antibiotic use in a herd, modulate the herd level of resistance of animal population. The health and welfare status of food-producing animals can be semi-quantitatively assessed e.g. by an on-farm scoring system to evaluate the herd health and welfare status, which helps to indirectly estimate the level of resistant bacteria.

**Objective:** Part of the German contribution to the European FP7 research project Ecology from Farm to Fork Of microbial drug Resistance and Transmission (EFFORT) is the assessment of the health and welfare quality status of pig herds to indirectly assess the potential level of resistant bacteria. The aim was to develop an easy to use scoring system based on existing scores, such as the indicator system developed within the Welfare Quality project, to build a rough, but broadly usable index.

**Materials and methods:** The Herd Health and Welfare Index (HHWI) developed by the authors was used to assess the health and welfare status of 180 pig herds in nine European countries. The HHWI results were compared to the level of antimicrobial use (AMU) and the phenotypical AMR, which was determined based on the sentinel organism *E. coli*.

**Results:** The results indicate a very weak association between AMU and HHWI. Psychological determinants effecting AMU might explain this. However, quite a considerable association between AMU and AMR is noticeable and therefore the number of treatments (AMU) has to be further decreased to slow down the transmission of AMR.

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**P.21****TRANSFORMING CAPACITIES ON AMR SURVEILLANCE IN FOOD AND AGRICULTURE IN ASIA: A PROGRAMMATIC APPROACH**

**Mary Joy Gordoncillo**<sup>(1)</sup>, **Carolyn Benigno**<sup>(1)</sup>, **Katinka de Balogh**<sup>(1)</sup>, **Wantanee Kalpravidh**<sup>(1)</sup> & **Rungtip Chuanchuen**<sup>(2)</sup>

(1) Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific, Bangkok, Thailand

(2) Faculty of Veterinary Science, Chulalongkorn University, Pathumwan, Bangkok, Thailand

**Objective:** To develop surveillance capacities on antimicrobial resistance (AMR) in food and agriculture in Asia, taking into account existing international standards and other particular considerations unique to the region.

**Methods:** The Food and Agriculture Organization Regional Office for Asia and the Pacific (FAO RAP), with support from the United States Agency for International Development (USAID) and the Fleming Fund from the United Kingdom, has set up a regional AMR surveillance coordination to help progress AMR surveillance in food and agriculture in Asia. Regional directions and priority areas of work were identified and pursued to strategically stimulate, initiate, and strengthen AMR surveillance in the region.

**Results:** A series of regionally harmonised AMR surveillance guidelines were conceptualised and developed to prepare countries in carrying out initiatives and generating a cohesive body of regional information for future evidence-based actions. FAO Assessment Tool for Laboratory and AMR Surveillance System (ATLASS) was rolled out to systematically assess capacities of AMR laboratories, and post-ATLASS mission was also developed to strategically advance current states. A pool of ATLASS assessors to expand this service to the region was built. The regional AMR Technical Advisory Group was initiated and the FAO Regional Reference Center for AMR was also established. Regional laboratory trainings on harmonised and standard methods on antimicrobial susceptibility testing were conducted and implementation of AMR surveillance initiatives were also piloted in select countries.

**Discussion and conclusion:** AMR surveillance in bacteria from animals is a critical element in providing evidence to inform actions towards AMR mitigation. While it is clear that much remains to be done, these initiatives have catalysed and created the needed momentum for this area of work in the region. Continued support needs to be advocated to further build on this initial success and ensure that AMR surveillance in Asia is sustained and expanded.

**P.22****STRENGTHEN JAPANESE VETERINARY ANTIMICROBIAL RESISTANCE MONITORING SYSTEM (JVARM) AND INTERNATIONAL COOPERATION ACCORDING TO NATIONAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE**

**Michiko Kawanishi, Mari Matsuda, Rie Narushima, Takahiro Shirakawa & Mayumi Kijima**

National Veterinary Assay Laboratory, Ministry of Agriculture, Forestry and Fisheries, Tokyo, Japan

In 2016, Japanese National Action Plan on Antimicrobial Resistance (AMR) (2016-2020) was developed by the Ministerial Meeting and presents priorities to be implemented over the next five years to promote antimicrobial resistance measures. This Action Plan is structured around goals in the six areas:

1. Public Awareness and Education;
2. Surveillance and Monitoring;
3. Infection Prevention and Control;
4. Appropriate Use of Antimicrobials;
5. Research and Development;
6. International Cooperation.

For the surveillance and monitoring, Japanese Veterinary Antimicrobial Resistance Monitoring System (JVARM) was established in 1999 and has continuously conducted nation-wide monitoring. Under JVARM, three types of monitoring are conducted:

1. monitoring of the volumes of sales of antimicrobials;
2. monitoring of antimicrobial resistance among indicator and foodborne bacteria derived from healthy animals;
3. monitoring of antimicrobial resistance among pathogenic bacteria derived from diseased animals.

The results of the monitoring provide the basis for understanding the trends of antimicrobial-resistant bacteria, and developing and implementing risk assessment and risk management measures.

According to Japanese National Action Plan on AMR, several steps have been taken since 2017, which include:

1. implementing monitoring for companion animals;
2. performing analysis on antimicrobial-resistant genes, including whole genome analysis using next-generation sequencers;
3. collaborating with human sector for making an integrated report 'Nippon AMR 'One Health' Report 2017';
4. strengthen the aquaculture monitoring by expanding the fish species.

Since 2016, in collaboration with the World Organisation for Animal Health (OIE), National Veterinary Assay Laboratory (NVAL) has organised the training and seminar on AMR with 18 participants from 12 Asian countries/regions. In 2017, Japan has promoted international cooperation by holding international seminars concerning surveillance and monitoring. In the seminar, participants showed their country situations and made a group discussion how to develop comprehensive surveillance and monitoring systems in each country.

In our poster, we are going to introduce those current activities in JVARM.

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## FAO ASSESSMENT TOOL FOR LABORATORIES AND ANTIMICROBIAL RESISTANCE SURVEILLANCE SYSTEMS IN FOOD AND AGRICULTURE SECTORS

Francesca Latronico<sup>(1)</sup>, Nicolas Keck<sup>(1,2)</sup>, Michael Treilles<sup>(1,3)</sup>, Emmanuel Kabali<sup>(4)</sup>, Carolyn Benigno<sup>(5)</sup>, Mary Joy Gordoncillo<sup>(5)</sup> & Beatrice Mouille<sup>(1)</sup>

(1) Food and Agriculture Organization of the United Nations, Rome, Italy

(2) Laboratoire Départemental Vétérinaire, Montpellier, France

(3) QUALYSE Laboratory, Champdeniers, France

(4) Food and Agriculture Organization of the United Nations, Southern Africa Subregional Office, Harare, Zimbabwe

(5) Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific, Bangkok, Thailand

**Background:** In 2016, the Food and Agriculture Organization of the United Nations (FAO) published the FAO Action Plan on Antimicrobial Resistance (AMR) that identifies the need to develop capacity for AMR surveillance and monitoring in food and agriculture sectors as one of four focus areas. In order to support countries in assessing and improving their AMR surveillance system in the food and agriculture sectors, FAO has developed, supported by Fleming Fund, the 'Assessment Tool for Laboratories and AMR Surveillance Systems' (FAO-ATLASS).

**Materials and methods:** FAO-ATLASS includes two modules, ATLASS-Surveillance and ATLASS-Laboratory. Each module includes two questionnaires that collect descriptive data and score the performance of AMR-linked activities based on five major pillars (laboratories, epidemiology unit, governance, communication, and sustainability). In-country assessment missions, conducted by trained assessors, include meetings with all relevant stakeholders and visits to selected laboratories involved in AMR surveillance. Based on the questionnaires' answers, a Progressive Improvement Pathway (PIP) stage, ranging from '1-no capacity' to '5-sustainable capacity', is assigned for each laboratory, each pillar, and the national AMR surveillance system as a whole.

**Results:** As of June 2018, FAO-ATLASS has assessed national AMR surveillance systems in 14 countries (Africa, 6; Asia, 8) for a total of 16 missions. Fourteen missions provided baseline data to monitor the progress towards reliable and sustainable AMR surveillance systems, and recommendations to prioritise actions for improvement. Two follow-up missions were requested and conducted to measure the improvements after the implementation of recommendations.

**Conclusions:** FAO-ATLASS allows national authorities to identify a stepwise approach to improve AMR surveillance systems via PIP, and can provide an evidence base for action and advocacy. Implementation of FAO-ATLASS can contribute to harmonised and better coordinated surveillance strategies at the regional and global levels aiming to an integrated AMR surveillance system as for a 'One Health' approach.



**P.24****ACTIVITIES OF THE RUSSIAN FEDERATION ON AMR MONITORING AND CONTROL IN VETERINARY FIELD**

**Alexander Komarov, Dmitry Makarov, Olga Ivanova, Sergey Karabanov, Ekaterina Davydova, Ekaterina Krylova, Alexander Kulikovskiy & Sergey Lenev**

Russian State Center for Quality and Standardization of Veterinary Drugs and Feed, Moscow, Russian Federation

The Russian Federation develops measures of antimicrobial resistance (AMR) control following internationally recognised approaches. 'National Strategy on Prevention of Antimicrobial Resistance Spread in the Russian Federation for 2017-2030' was approved by the Government in 2017. National Action Plan is now being developed by the Ministry of Health, Ministry of Agriculture, Ministry of Economic Development and other organisations. Among key points of this Plan for the veterinary field:

- collection of data on volumes of antimicrobials used in animal husbandry by tracing all stages of antimicrobial circulation and application using special electronic information systems;
- harmonisation of antimicrobial susceptibility testing (AST) methods, development and implementation of the National Programme of AMR Monitoring in veterinary field;
- restriction of antimicrobial use in animal husbandry through: ban of antimicrobials application except as treatment option; medical feed manufacturing control; approval of list of prescription only antimicrobials, special rules applied for antimicrobials of medical importance, etc.

The Russian State Center for Quality and Standardization of Veterinary Drugs and Feed (VGNKI) is currently doing a research project on AMR in zoonotic bacteria which may serve as a basis for National programme. AST is performed using internationally harmonised broth microdilution method. Bacteria and number of isolates were chosen according to World Organisation for Animal Health (OIE) recommendations. Isolates are taken from poultry, cattle, swine, reindeer and different food and feed. More than 30 antimicrobials from 12 classes were included in the programme based on data on medical, veterinary importance and sales volumes in Russia. Minimum inhibitory concentrations (MIC) are interpreted using European Committee on Antimicrobial Susceptibility Testing (EUCAST), Clinical & Laboratory Standards Institute (CLSI) and Russian epidemiological and clinical breakpoints. Data will be provided to international organisations including OIE. Preliminary results showed multiresistant properties for the part of *Salmonella*, *Enterococcus*, *Escherichia coli* and *Campylobacter* isolates, including bacteria taken from reindeers. Genes of resistance for some isolates are investigated by whole-genome sequencing. Several large plasmids were discovered conferring simultaneous *Salmonella* resistance to penicillins, cephalosporins, aminoglycosides, sulfonamides and tetracyclines, similar to plasmids isolated in the United States of America and Italy.

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## UTILISING EXISTING SURVEILLANCE PLATFORMS TO ESTABLISH A SUSTAINABLE AMR NATIONAL SURVEILLANCE AND MONITORING SYSTEM IN BANGLADESH

Tanzinah Nasrin<sup>(1)</sup>, Shamima Akter<sup>(2)</sup>, Pran Krishna Howlader<sup>(2)</sup>, A.H.M. Saiful Islam Khan<sup>(2)</sup>, Jeffrey LeJeune<sup>(3)</sup>, Mohammad Aminul Islam<sup>(4)</sup>, Mohammad Habibur Rahman<sup>(1)</sup>, Shovon Chakma<sup>(1)</sup>, Holy Akwar<sup>(1)</sup> & Eric Brum<sup>(1)</sup>

(1) Emergency Centre for Transboundary Diseases, Food and Agriculture Organization of the United Nations, Dhaka, Bangladesh

(2) Central Disease Investigation Laboratory, Department of Livestock Services, Dhaka, Bangladesh

(3) Food Safety and Quality Unit, Food and Agriculture Organization of the United Nations, Rome, Italy

(4) International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka, Bangladesh

Although the usage of significant amounts of World Organisation for Animal Health (OIE) and World Health Organization (WHO) critically important antibiotics in livestock production is well recognised, the impact of antimicrobial usage (AMU) on antimicrobial resistance (AMR) in Bangladesh is still poorly characterised. Furthermore, no standard surveillance system is in place to monitor AMR over time. As a result, impact of changes in AMR policy and AMU practices cannot be assessed. Within the poultry sector specifically, there is limited data to assess the magnitude of AMR burden in poultry and to increase awareness amongst frontline veterinarians on the public health impacts of inappropriate AMU. To address these gaps, an active poultry AMR surveillance programme was initiated by the Department of Livestock Services (DLS) with technical support from the Food and Agriculture Organization of the United Nations (FAO). Standard sampling methods, laboratory protocols, and participatory training modules were developed, pretested, and finalised. Extended spectrum  $\beta$ -lactamase (ESBL)-resistant *Escherichia coli* identified through the disk diffusion antimicrobial sensitivity testing (AST) method were selected as the indicator bacteria for AMR in the first phase of surveillance. Additional bacteria and resistance markers will be added as laboratory proficiency increases. To reduce cost and human resource needs, Market Environment Surveillance Officers within the Government of Bangladesh who were already collecting samples for the national avian influenza surveillance programme were cross-trained by FAO in the sampling method for AMR surveillance. Each month 44 poultry caecal samples from 22 live bird markets (LBMs) in Dhaka are collected and sent to DLS Central Disease Investigation Laboratory for culture and AST. Twenty-four isolates of *E. coli* have been successfully isolated thus far and 13 (54%) are ESBL-resistant. Surveillance findings are reported by DLS to stakeholders on a regular basis to assess impact of AMU interventions as well as to inform policy and practice.

**P.26****MRSA SURVEILLANCE IN JAPAN'S PIG POPULATION**

**Yukitake Okamura**<sup>(1)</sup>, **Minako Furuno**<sup>(2)</sup>, **Takashi Kubo**<sup>(2)</sup>, **Hisae Fukuhara**<sup>(2)</sup>, **Shigeru Morino**<sup>(2)</sup>, **Kazuo Ito**<sup>(2)</sup> & **Mayumi Kijima**<sup>(3)</sup>

(1) Animal Products Safety Division, Food Safety and Consumer Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries, Tokyo, Japan

(2) Animal Quarantine Service, Ministry of Agriculture, Forestry and Fisheries, Kanagawa, Japan

(3) National Veterinary Assay Laboratory, Ministry of Agriculture, Forestry and Fisheries, Tokyo, Japan

**Background and objective:** Livestock associated Methicillin-resistant *Staphylococcus aureus* (LA- MRSA) is a growing concern, especially in Europe where a certain type of LA- MRSA has been reported in high prevalence. To grasp the baseline information of MRSA in Japan's swine population, we conducted MRSA surveillance in domestic and imported pigs.

**Methods:** For the surveillance of MRSA in domestic swine holdings, dust swabs of pig pens were taken from 344 farms throughout Japan in 2017. For the imported pigs, nasal swabs from 125 gilts, belonging to 15 lots (unit of import) from five countries were taken in quarantine facilities and tested for MRSA from July 2016 to February 2017. Multilocus sequence typing (MLST) was performed by previously described method. MICs were determined by broth dilution method in accordance with Clinical and Laboratory Standards Institute (CLSI) guidelines.

**Results:** From the domestic swine holdings, two MRSA isolates were detected and one was typed as ST398 and the other was ST8. Of which, ST398 isolate was tetracycline-resistant. Regarding the imported pigs, MRSA isolates were obtained from six lots from two countries. All the isolates tested for MLST were classified as ST398 and were ampicillin- and tetracycline-resistant.

**Discussion and conclusions:** Our data shows that, while the prevalence rate of MRSA ST398 in domestic swine holdings is still low, MRSA could be introduced into Japan by imported pigs. Monitoring of resistant bacteria in imported animals is important to properly understand the introduction route of resistant bacteria and resistance determinants and such concern of transboundary move of resistant bacteria should be discussed at an international arena. Finally, more attention needs to be paid to direct transmission of resistant bacteria from animal to human.

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## **ANTIBIOTIC STEWARDSHIP PROGRAMME FOR FOOD BUSINESSES**

**Inês Ajuda**

Food Business Programme, Compassion in World Farming, Godalming, United Kingdom

The industry engagement and initiative has been a driver for the development of different areas in animal production. We believe that food businesses can also be part of the movement for a more responsible use of antibiotics in animal production, including changes in management and living conditions of the farms under their supply chain. By engaging with them and arming them with informative resources we enable a speedier movement towards a global responsible use of antibiotics.

The majority of the queries received by us from companies regarding antibiotic use are related to implementation of a plan and 'how to tackle' the issue. In order to help food businesses our team at Compassion in World Farming has developed a roadmap to help companies establish an Antibiotic Stewardship Programme in their supply chain.

The roadmap is based on eight steps such as assessing motivations, defining priorities, measuring progress, educating and training as well as communicating. In each step specific examples are given and links provided, so companies can select the best solution for their specific case. There are also specific guidelines for companies that have control over the farms that supply them (for example manufacturers) and for companies that only supply from intermediary companies (for example food services). A pivotal part of this resource are the clear examples of how a good management on farm as well as higher animal welfare (such as lower stocking densities, avoidance of mutilations and adopting robust breeds) can help to reduce the use of antibiotics, helping to build the case for an improved animal health and welfare. It also includes two case studies.

With this tool we hope to motivate food companies to initiate the process of a more responsible use of antibiotics in their supply chain, helping to create an impact on 'the bigger picture'.

**P.28****SUPPORTING VETERINARIANS IN THEIR IMPLEMENTATION OF ANTIMICROBIAL STEWARDSHIP THROUGH CORE PRINCIPLES, EDUCATION AND RESOURCES****Michael Costin**

American Veterinary Medical Association, Schaumburg, IL, United States of America

**Objective:** To develop a consensus definition of antimicrobial stewardship and core principles of implementation, and provide education, assessment, and resources so as to ensure that veterinarians across the United States are knowledgeable and have practical tools that support them in successfully implementing stewardship programs within their practices.

**Methods:** Through its Committee on Antimicrobials, which includes representatives with technical and species-specific expertise from across the US veterinary profession, the American Veterinary Medical Association (AVMA) developed a unifying description of veterinary antimicrobial stewardship. In January 2018, the *Definition of Antimicrobial Stewardship* and identified *Core Principles of Antimicrobial Stewardship in Veterinary Practice* were adopted as policy by the AVMA House of Delegates. Because the members of the House of Delegates also represent geographical and species diversity across the profession, for the first time, the US veterinary profession had unified behind a definition and core tenets of antimicrobial stewardship.

Since its approval, the AVMA has actively worked to incorporate these documents into the matrix of veterinary education, supporting faculty integration into degree education and assessment, providing continuing education opportunities, and working with the US Department of Agriculture (USDA) to incorporate it in accreditation requirements for national Veterinary Services. The AVMA has also promoted its approach to the Presidential Advisory Council on Combatting Antimicrobial Resistant Bacteria (PACCARB), which is responsible for advising the Secretary of Health and Human Services on the US National Action Plan. In addition, the AVMA is collaborating with species-specific veterinary associations to develop resources that will assist veterinarians in more aggressively implementing stewardship in their practices.

**Conclusions:** Incorporating principles of antimicrobial stewardship into veterinary degree education, continuing education, and USDA accreditation that supports the provision of national Veterinary Services will assure US veterinarians are educated on the key tenets of successful veterinary antimicrobial stewardship and are well-positioned to integrate them successfully into their practices.

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## **INITIATING ACTIVITIES IN VETERINARY SECTOR TO COMBAT ANTIMICROBIAL RESISTANCE IN NEPAL**

**Suraj Subedi, Kiran Pandey, Bimal Kumar Nirmal, Samjhana Kumari Kafle, Mukul Upadhyaya & Pragya Koirala**

Department of Livestock Services, Harihar Bhawan, Lalitpur, Nepal

Antimicrobial resistance (AMR) has emerged as one of the major challenges for public and animal health. The national Veterinary Service of Nepal has initiated various activities to combat antimicrobial resistance. Department of Livestock Services (DLS) has approved National microbial standards and maximum residue limits (MRL) of different drugs to regulate the drug residues of different antimicrobials and minimise the public health issues. Several antibiotics like tetracycline, macrolide, aminoglycoside, sulfonamide, penicillin etc. were found in milk and meat samples of different geographical areas of the country tested in the fiscal year 2017/18. Veterinary Public Health Office (VPHO) found 12% milk samples positive and Veterinary Standards and Drug Administration Office (VSDAO) found 14%, 2.5% and 13% residue of beta-lactam, aminoglycosides and tetracyclines respectively in the milk samples collected non-systematically from different areas. Similarly, meat samples (mainly poultry meat) contained antibiotic residues using commercial diagnostic kits. Random studies also found 16% and 33.5% of meat samples contain tetracyclines and quinolones respectively at VSDAO and several antibiotics in meat samples at VPHO. Likewise, the central veterinary laboratory and regional laboratories use disc diffusion methods to study antibiotic resistance in various milk and meat samples. Similarly, DLS is discouraging the use of antibiotics as growth promoters in livestock use and also conducting various public awareness activities for prudent use of antimicrobials. A 'One Health' strategic framework of Nepal government is yet to be endorsed, yet still DLS has been collaborating with the National Public Health Laboratory for AMR surveillance since 2011. In the current federal structuring of the country, the Veterinary Services of Nepal is reviewing the legal frameworks of different acts and revision and endorsement of new and existing laws in the Veterinary Services of the country and addressing AMR in the legal framework in 'One Health' approach.

**P.30****USE OF ANTIMICROBIALS IN POULTRY SECTOR IN BANGLADESH****Ainul Haque<sup>(1)</sup> & Abu Sufian<sup>(2)</sup>**

(1) Director General and Chief Veterinary Officer, Department of Livestock Services, Dhaka, Bangladesh

(2) Assistant Director and Focal Points for Veterinary Products, Department of Livestock Services, Dhaka, Bangladesh

Commercial poultry production has been growing rapidly in Bangladesh since early 1990 and has contributed to income generation, creating employment opportunity and reduction of nutritional deficiencies. Poultry are the most popular source of animal protein for humans and intensification of poultry production along with production enhancement has created potential food safety risks also. More than 500 million pieces of broiler are produced annually with the fastest growth rate in Bangladesh. Poultry production is facing a lack of recording of production practices, traceability, processing, a mostly traditional marketing system and lack of good hygienic practice (GHP). Features of intensive production such as high poultry densities and turnover, poor farm biosecurity, and high use of antimicrobials leads to antimicrobial resistance. There is a bright prospect to enter the international market and it is not very easy as most of the importing partners follow strict sanitary and phytosanitary standards. It is important to prevent the hazards and to provide a safe and wholesome poultry meat for human consumption. To do so, the Department of Livestock Services investigated development of a standard biosecurity method to produce safe broiler meat for human consumption. We have selected and conducted 2 days of training on farm biosecurity of 500 lead farmers from 25 Upazilas (sub districts). We have conducted a base line survey and analysed data of 500 poultry farms. We have developed a farm record book and disseminated it among the farmers for records of farm practices. Twenty Five (25) android mobile phones were distributed among 25 Upazila Livestock Officials and they were trained on ODK (Open Data Kit) based software on farm practices monitoring. They were sent the data through ODK based software to the central server. Data was analysed accordingly. We found that GHP significantly decreased antimicrobial use and reduced the medicinal cost and feed conversion ratio also. We also found that the poultry mortality rate was reduced after improving biosecurity practices. It is concluded that GHP improvement is the key tool for production of safe broiler meat for human consumption and reduced the antimicrobials resistance in Bangladesh.

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## UNDERLYING RESISTANCE MECHANISMS IN MULTI-DRUG RESISTANT *ESCHERICHIA COLI* ISOLATED FROM POULTRY ENVIRONMENT

**Abhilasha Dadhich**<sup>(1)</sup>, **Ram Hari Meena**<sup>(2)</sup>, **Manish Agarwal**<sup>(3)</sup>, **Manisha Mathur**<sup>(4)</sup>  
& **Sunil Maherchandani**<sup>(5)</sup>

(1) Master's Student, Rajasthan University of Veterinary and Animal Sciences. Bikaner, India

(2) Teaching Associate, Rajasthan University of Veterinary and Animal Sciences. Bikaner, India

(3) Assistant Professor, Post Graduate Institute Veterinary Education & Research, Jaipur, India

(4) Associate Professor, Rajasthan University of Veterinary and Animal Sciences. Bikaner, India

(5) Professor, Rajasthan University of Veterinary and Animal Sciences. Bikaner, India

Antimicrobial drugs have played an indispensable role in decreasing illness and death associated with infectious diseases. Despite their enormous advantages, selective pressure exerted by antimicrobial drug use has led to emergence of drug-resistance traits in bacteria. Antibiotic use selects for resistance not only in pathogenic bacteria but also in the endogenous flora of exposed individuals or populations further leading to complications.

To evaluate the underlying mechanisms contributing to resistant phenotypes, a total of 40 multidrug resistant (MDR) *Escherichia coli* from healthy poultry birds were selected. Of these 40 isolates 62.5% isolates belonged to phylogroup A and 37.5% isolates belonged to phylogroup B1. All the isolates had a multiple drug resistance (MDR) index of more than 0.2, when tested against 30 different antibiotics representing all the major categories of antibiotics indicating high drug resistance. In, 15 (37%) isolates blaCTX-M- group 1 gene was detected. None of the isolates had genes coding for ESBLs (extended spectrum  $\beta$ -lactamases), metallo-carbapenemases (MBLs), and OXA-type non metallo-carbapenemases. These isolates could effectively exclude 0.5 mg/l of Ethidium bromide (Et-Br) in Et-Br dye exclusion test. There were ten isolates that could exclude as high as 2.5 mg/l of Ethidium bromide (Et-Br). Nearly, 50% reduction in colony forming units (cfu) was observed for all the isolates in presence of carbonyl cyanide m-chlorophenylhydrazone (CCCP). An efflux pump inhibitor with four antibiotics i.e. Ceftazidime, Tetracycline, Chloramphenicol and Streptomycin indicating significant contribution of efflux activity in MDR phenotypes.



**P.32****ANTIBIOTIC RESISTANCE OF *ESCHERICHIA COLI* ISOLATED FROM BROILER CHICKEN WITH COLIBACILLOSIS IN THE CENTER OF ALGERIA**

**Zehor Halfaoui<sup>(1)</sup>, Nabil Mohamed Menoueri<sup>(1)</sup> & Lyes Mohamed Bendali<sup>(2)</sup>**

(1) Veterinary Institute, University of Blida, Blida, Algeria

(2) Medical Analysis Laboratory, Miliana, Algeria

Colibacillosis is considered as one of the major bacterial infections in avian pathology. The excessive use of antibiotics reduced their effectiveness which eventually led to the risk of emergence of antibiotic resistance. The aim of this study was to isolate, identify the pathogenic *Escherichia coli* strains and to determine their antibiotic susceptibility.

A total of 180 samples from different organs of broilers with colibacillosis lesions were collected (liver, spleen, lung and heart) in the center of Algeria. The isolation was carried out on Hecktoen agar and the strains were identified using the API20 E system kit. These strains were tested over 13 antibiotics; antimicrobial susceptibility testing was carried out for all isolates by the disk diffusion method on Mueller-Hinton agar, according to Clinical and Laboratory Standards Institute standards.

A total of 156 strains of *E. coli* were isolated. The antimicrobial susceptibility test, presented high level of resistance to tetracyclins (94.12%), flumequin (91.5%), sulfamethoxazole-trimethoprim (88.89%), enrofloxacin (86.27%), nalidixic acid (85.62%), ampicillin (83.01%) and doxycyclin (75.81%), medium level resistance to chloramphenicol (39.22%) and amoxicillin-clavulanic acid (43.13%). All the strains were susceptible to cefotaxim, excepting three, which presented an extended spectrum  $\beta$ -lactamase. In addition, the results of multi-resistance showed that 98.7% of strains were resistant at the minimum to three antibiotics and 66.66% of strains were resistant to at least seven antibiotics.

In conclusion, the antibiotic resistance continues to rise at an alarming rate and the emergence of extended spectrum  $\beta$ -lactamase is considered as a threat for public health.

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## DETECTION OF EXTENDED-SPECTRUM $\beta$ -LACTAMASE (ESBL) PRODUCING *ESCHERICHIA COLI* STRAINS IN BROILER CHICKENS IN TUNISIA

Amira Chaouechi<sup>(1)</sup>, Mariem Saidani<sup>(1)</sup>, Monia Daaloul<sup>(1)</sup>, Chahid Chakroun<sup>(2)</sup>, Omar Abbas<sup>(3)</sup>,  
Alya Soudani<sup>(1)</sup> & Lilia Messadi<sup>(1)</sup>

(1) Department of microbiology and immunology, National school of veterinary medicine of Sidi Thabet, University of Manouba, Tunisia

(2) Interprofessional Group of Poultry and Cunicultural Products, Tunis, Tunisia

(3) DICK Poulina Group Holding, Boumhel Bassatine, Tunisia

**Introduction:** The development of bacterial resistance to antibiotics is a major worldwide concern for human and animal health, especially in broilers, submitted to overuse of antibiotics. This antimicrobial resistance (AMR) allows spread of multidrug resistant bacteria, which express resistance to almost all antibiotics and particularly to critical antibiotics like fluoroquinolones, cephalosporins of 3rd and 4th generation and colistin.

**Objectives:** This study aims to evaluate AMR of *Escherichia coli* isolated from fecal microflora of chickens in some regions of Tunisia and to detect extended-spectrum beta lactamase (ESBL) producing strains.

**Methods:** The fecal carriage of *Escherichia coli* was investigated in six broiler farms from the greater Tunis and Nabeul. The isolation of *E. coli* strains from cloacal swabs on McConkey agar with and without cefotaxime was followed by the study of their sensitivity to 18 antibiotics and the detection of ESBLs by the double disc synergy test. The detection of the plasmid-mediated colistin resistance gene *mcr-1* was made by PCR.

**Results:** Among the 279 isolates, the highest resistance rates were observed with nalidixic acid (77.4%), amoxicillin (76.3%), tetracycline (75.7%), chloramphenicol (75.6%), florfenicol (71.3%), trimethoprim-sulfamethoxazole (67%) and ciprofloxacin (55.2%). Forty-one ESBL producing *E. coli* ESBL (14.4%) were detected, with a high level of multidrug resistance (65.9%). Three strains producing ESBL expressed the gene *mcr-1*. The AMR rates were correlated to some risk factors.

**Conclusion:** The high level of AMR of these avian strains is worrying and it is essential to monitor bacteria isolated in poultry farming and to demand compliance with good practices for the use of antibiotic therapy.

**P.34****IDENTIFICATION AND MOLECULAR CHARACTERIZATION OF ANTIMICROBIAL RESISTANCE OF *KLEBSIELLA PNEUMONIAE* FROM MASTITIC DAIRY CATTLE OF BATANGAS, PHILIPPINES**

**Flor Marie Immanuelle R. Pilapil<sup>(1)</sup>, Loinda R. Baldrias<sup>(2)</sup>, Antonio A. Rayos<sup>(3)</sup> & Billy P. Divina<sup>(2)</sup>**

(1) Department of Veterinary Clinical Sciences, College of Veterinary Medicine, University of the Philippines Los Baños, Laguna, Philippines

(2) Department of Veterinary Paraclinical Sciences, College of Veterinary Medicine, University of the Philippines Los Baños, Laguna, Philippines

(3) Institute of Animal Science, College of Agriculture and Food Science, University of the Philippines Los Baños, Laguna, Philippines

*Klebsiella pneumoniae* mastitis is exacerbated by poor antimicrobial response, rapid progress to toxic shock and death. Organisms resistant to antimicrobials can be acquired through the consumption of untreated or inadequately medicated milk. Antimicrobial resistance (AMR) and genetic characterisation of *Klebsiella pneumoniae* isolates from bovine milk were obtained in this study. Individual quarter milk samples of CMT score 3 (n=230) were collected aseptically. After colony morphology, biochemical testing and molecular detection, six isolates remained with a 2.6% (6/230) prevalence rate. Broth microdilution was employed for antibiotic sensitivity testing (AST).

Isolates were screened for the integrase gene *int1* (254 bp) using PCR and gene cassettes (1,000 bp) were screened on isolates with *int1* gene. Extended-spectrum  $\beta$ -lactamase genes like *bla*<sub>CTX-M</sub> (variable size), *bla*<sub>TEM</sub> (799bp) and *bla*<sub>SHV</sub> (862bp) and resistance genes for streptomycin (*aadA1* - 631 bp and *aadA2* - 500 bp), sulfamethoxazole (*sul1* - 331 bp), tetracycline (*tetA* - 210bp and *tetB* - 659bp) and trimethoprim (*dfrA6* - 419 bp and *dfrA12* - 395bp) were investigated. There were 9% (20/230) subclinical and 19% (43/230) clinical mastitis rates. AMR was seen with trimethoprim (100%), streptomycin (83%), cefoperazone (67%), colistin (33%) and doxycycline (17%) but not with sulfamethazine (0%). All were multi-drug resistant. One isolate exhibited class 1 integron and gene cassette. *bla*<sub>SHV</sub>, *aadA2*, *sul1* and *tetA* genes were present in one, five, one and two isolate/s respectively. It appears that locally isolated *Klebsiella pneumoniae* have already acquired antibiotic resistance genes, with capacity to transfer gene systems through site-specific recombination mechanisms like the integron gene cassettes (Bennett, 2008). The data collected provide more evidence suggesting that food from animals could pose as a means to transfer antimicrobial resistance.

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## EVALUATION OF ANIMAL FEEDS FOR PRESENCE OF THREE IMPORTANT ANTIMICROBIALS IN BHUTAN

**Ganga Maya Rizal<sup>(1)</sup>, Jambay Gyeltshen<sup>(2)</sup> & Kuenga Namgay<sup>(1)</sup>**

(1) Animal Nutrition Division, Department of Livestock, Ministry of Agriculture and Forests, Thimphu, Bhutan

(2) National Research and Development Centre for Animal Nutrition, Department of Livestock, Ministry of Agriculture and Forests, Bumthang, Bhutan

The alarming rate of emergence of antimicrobial resistance globally has urged Bhutan to steward and rationalise antibiotics use. There are no prior studies conducted to assess use of antibiotics in feeds in Bhutan. This paper aims to investigate the status of use of three important antibiotics in animal feeds in Bhutan.

A total of 13 feed samples were selected randomly from the pool of feed samples submitted by bidders of Annual Animal Feed Tender (fiscal year 2015-16) of the Department of Livestock, Bhutan. These samples were tested for nitrofurans and its metabolites (1), tetracyclines and sulphonamides (2) in an Indian Laboratory (TUV Pvt. Ltd, Pune).

Two samples, bid by Indian Feed Agents, tested positive for oxytetracycline at a level of 0.072 and 0.037 mg/kg, respectively. When compared to the FAC<sup>1</sup> recommended dose (10-50 g/ton) of oxytetracycline for poultry, the levels in the two samples were much lower. Bids of positive samples were rejected as use of medicated feed is banned in Bhutan. It is assumed that feed manufactured in Bhutan is antibiotic-free.

However, some farmers might be feeding medicated feed unknowingly although often the winning bidder of tender is the major feed supplier in the country.

Therefore, more screening and investigation must be conducted to confirm further and prevent antibiotics abuse in animal feed in Bhutan<sup>2</sup>. Further, in-country laboratory facilities must be established to test for antibiotics in feed and the laboratory could be brought under 'One Health' Programme strengthening the testing activity.

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**P.36****BHUTAN AT THE FOREFRONT OF ANTIMICROBIAL RESISTANCE PREVENTION ACTIVITIES**

**Nirmal K. Thapa**<sup>(1)</sup>, **Puspa M. Sharma**<sup>(1)</sup>, **Tenzin Tenzin**<sup>(1)</sup>, **Kinzang Dukpa**<sup>(1)</sup> & **Tashi Samdup**<sup>(2)</sup>

(1) National Centre for Animal Health Serbithang, Thimphu, Bhutan

(2) Department of Livestock, Thimphu, Bhutan

The global concern of antimicrobial resistance (AMR) is addressed by the World Organisation for Animal Health, World Health Organization and the Food and Agriculture Organization of the United Nations. In line with the global strategy of AMR progressive management pathway, the Department of Livestock under the Ministry of Agriculture & Forests (MoAF) in Bhutan has initiated AMR prevention and containment activities in the country. We conducted a review to understand the current status on AMR containment activities in Bhutan with an aim to align the activities with Bhutan's National Action Plan (NAP) for AMR.

We have identified multi drug resistant (MDR) *Salmonella* as one of the most important pathogens in both imported (1) and home produced chicken (2). The *Salmonella* isolates were found to be resistant to antibiotics like Gentamicin, Streptomycin, Ampicillin, Trimethoprim Nalidixic acid & Amoxicillin. In another study involving government pig breeding farms, a MDR extended spectrum beta-lactamase (ESBL) producing *Escherichia coli* was isolated from the pigs (3) which are of public health significance.

Realising the need for a multi-sectorial (One Health) approach for prevention and containment of AMR, the NAP was developed jointly by the Ministry of Health and MoAF. Public awareness are created by observing antibiotic awareness week and through mass media. The antibiotic uses in both human and animal is being regulated by the Drug Regulatory Authority of Bhutan. Use of antibiotics as growth promoters/additives in animal feeds are also restricted in the country.

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