



# International Veterinary Vaccinology Network Annual Report 2019



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## Introduction

### **Welcome to the International Veterinary Vaccinology Network (IVVN) Annual Report 2019.**

The second year of the IVVN's existence has been as busy as the first – with no sign of the momentum that has developed around the Network slowing down. Building on the successes of the first year, we have hosted another excellent conference as well as a week-long vaccinology course, provided support for a number of workshops, funded 7 more exciting pump-priming projects, awarded more laboratory exchange awards and initiated the IVVN African Schools Outreach Programme. Much to our delight many of these activities have been undertaken with other organisations, including our sister Networks (UK Veterinary Vaccinology Network, the other GCRF-funded Vaccine Networks – BactiVac, HIC-Vac, VALIDATE and IMPRINT) and partners such as AfVANET and AWARD. We continue to engage with groups that have complementary areas of interest and there are several new areas of interaction with international partners in the pipeline that we hope to announce shortly.

As ever, we aim to be driven by the needs of our members and would welcome feedback on any aspect of the work that the IVVN is doing – things we are not yet doing that should be included in our activities, areas that we are doing well (or not so well) or any other relevant comments. In response to various comments, we are currently re-developing the member's area on the website and hope to make this an even more useful tool for identifying potential partners for new collaborations. We have also recently completed a survey of our members to find out how the IVVN can help them achieve their vaccine research aims and are discussing how these can be best met. Your feedback is always carefully considered and used to improve the opportunities provided by the IVVN.

As we enter the 3rd year of the Network, we are looking forward with excitement to the planned activities and hope that our members will continue to benefit from these. In addition to this, we are also beginning to look further ahead and at the need to secure further support to permit the Network to continue after the first phase of funding is concluded in 2021. As such, the third year of the Network promises to be as much fun but also as challenging as the first two years, and so I can conclude with the same sentence as at the end of last year's report – 'It is an exciting time to be involved with the IVVN and I look forward to the opportunities (and challenges) of the coming year'.

Kind regards,

Dr. Timothy Connelley, Director of the IVVN

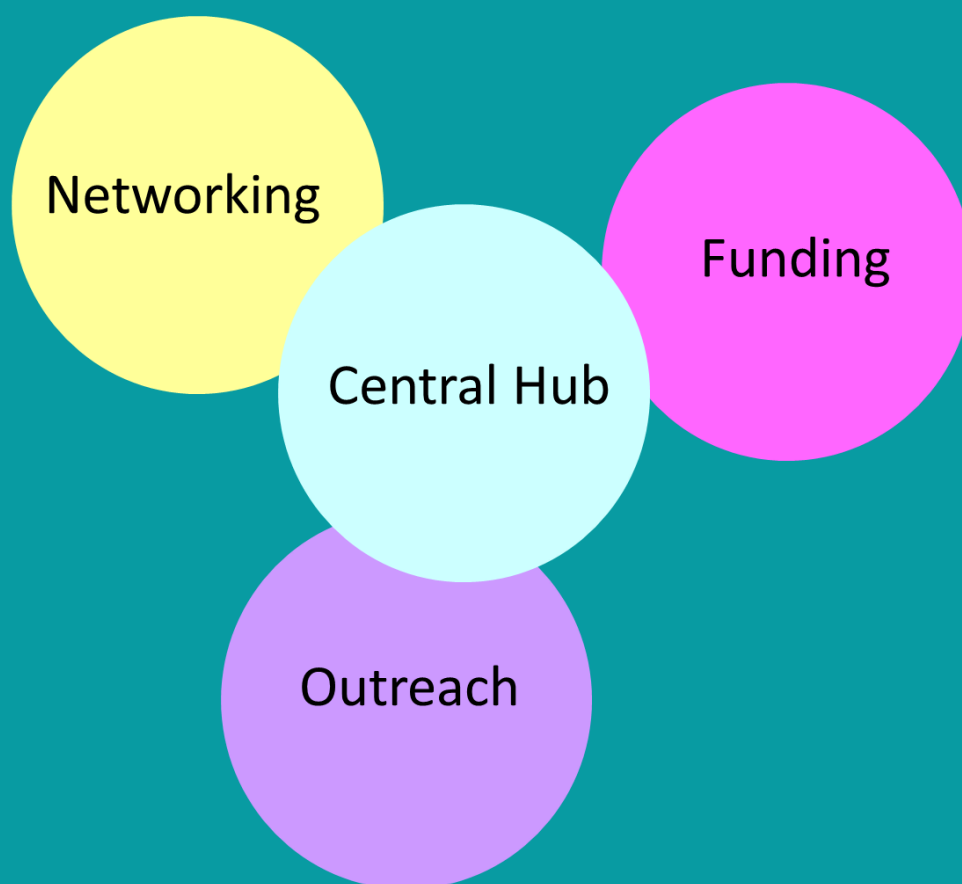
## Background

Animal diseases have significant impacts on societies in low-and-middle income countries (LMICs), through reduced animal health, impaired welfare, reduced livestock productivity and public health. Vaccines offer the most sustainable route to control and prevent many of the most devastating diseases of livestock. The IVVN provides the opportunity to establish multi-partnered, international collaborations that bring together the diverse skills that can accelerate the development of vaccines.

The IVVN offers a unique opportunity to establish a forum for specialists to focus on establishing new collaborations between partners with complementary expertise to address critical 'bottle-necks' in the development of veterinary vaccines for LMIC priority diseases. Many of these obstacles are relevant to human vaccinology and so much of the science conducted by the Network will have applications under the 'one-health' remit.

The IVVN launched in August 2017 after receiving £2.8M from the MRC and BBSRC through the GCRF. The activities of the Network will be achieved through:

- 1) Hosting Networking Events
- 2) Providing Catalyst Funding
- 3) Hosting Outreach Activities
- 4) Being a central 'hub' for information dissemination



## Organisational Structure

The IVVN is directed by Dr. Timothy Connelley (The Roslin Institute, UK) and Prof. Bryan Charleston (The Pirbright Institute, UK), and advised by a Network Management Board and External Advisory Group consisting of international experts from across the fields of human and veterinary vaccinology (Figure 1).

The IVVN is managed by Dr. Carly Hamilton (The Roslin Institute, UK) – please do not hesitate to contact Carly at [IVVN@roslin.ed.ac.uk](mailto:IVVN@roslin.ed.ac.uk) with any questions or comments.

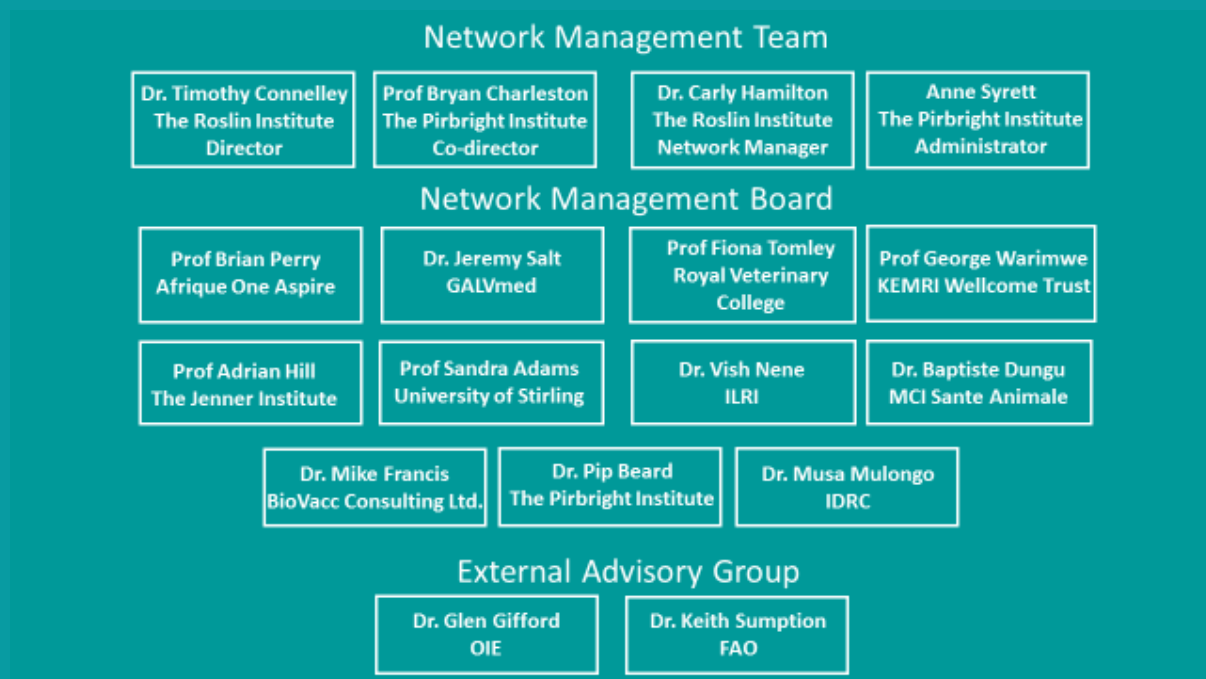


Figure 1: IVVN Organisational Structure

## Membership

The IVVN launched in August 2017 and excitingly, now consists of over 1,000 members from across 69 different countries.

Since the IVVN launched in August 2017, we have welcomed new members from across the globe, with 69 countries represented. Membership is continually expanding and we are delighted that recently we were able to welcome our 1,000<sup>th</sup> member.

Membership is free and registration is available [here](#). Join us today!



Benefits of being an IVVN member include:

- Being part of an international community of researchers working to develop improved vaccines for major livestock and zoonotic diseases.
- Access to potential collaborators from across the fields of veterinary and human vaccinology via our [member's directory](#).
- Networking opportunities through attendance at our annual scientific meetings.
- Members are eligible to apply for scholarships to attend our annual scientific meetings.
- Members are eligible to apply for pump-priming grants of up to £100,000 and laboratory exchange awards of up to £10,000 to accelerate their vaccine research.
- Opportunities to host workshops on specific vaccine related topics.
- Notification of news, events, training, funding and publications of interest via our website, social media, and monthly newsletters.

## Networking Events

To facilitate the formation of international collaborations, the IVVN host annual scientific meetings, which focus on vaccine-related themes, and provide a platform for networking and knowledge exchange. Following on from the success of the **inaugural IVVN conference** in Nairobi in March 2018, the IVVN alongside the UK Veterinary Vaccinology Network, hosted the UK and International Veterinary Vaccinology Network Conference 2019 in The Tower Hotel, London, UK on 9th & 10th January 2019.

### UK and International Veterinary Vaccinology Network Conference 2019



*Delegates at the UK & International Veterinary Vaccinology Network Conference, The Tower Hotel, London, January 2019*

### Meeting Report

The UK & International Veterinary Vaccinology Network Conference took place on the 9<sup>th</sup> and 10<sup>th</sup> January 2019 in the stunning location of The Tower Hotel, overlooking London's Tower Bridge. Both the UK Veterinary Vaccinology Network (VVN) and the International Veterinary Vaccinology Network (IVVN) hosted the conference with 200 delegates from across 30 different countries in attendance. The aim of the conference was to bring together individuals from different career stages, disciplines and geographical locations with the hope of facilitating the formation of novel collaborations to improve vaccine design and development

for livestock and zoonotic diseases of importance in low-and-middle income countries (LMICs).

### Day 1: 9<sup>th</sup> January 2019

The conference began with VVN Director and IVVN Co-Director Prof Bryan Charleston (The Pirbright Institute, UK) welcoming delegates to London. VVN coordinator **Madeleine Clark** (The Pirbright Institute, UK) provided a summary of the fantastic achievements of the UK VVN over the past five years and a selection of the key initiatives that have been funded by the Network. The conference symbolised the joining of the UK and International networks and following Madeleine's presentation, IVVN Director **Dr. Timothy Connelley** (The Roslin Institute, UK), gave an overview of the activities of the IVVN since launching in July 2017, and the many opportunities available to IVVN members. Excitingly, an African Vaccinology Network (AfVANET) has also been established and AfVANET coordinator, **Prof Mustapha Oumouna** (University of Medea, Algeria) introduced delegates to the aims and objectives of the network.

'Vaccines for Ectoparasites' was the focus of the first session of the conference which was chaired by Professor Christine Maritz-Olivier (University of Pretoria, South Africa). **Prof Jose de la Fuente** (Instituto de Investigación en Recursos Cinegéticos, Spain) opened the session with a presentation on the use of systems biology to identify key molecules involved in tick-host-pathogen interactions in order to develop vaccines to control tick-borne diseases. The second talk of the session focused on mites, specifically *Dermanyssus gallinae* (poultry red mite), with **Dr. Alasdair Nisbet** (Moredun Research Institute, UK) presenting his work on the development of a reliable way to test prototype vaccines *in vivo*. Switching species from chickens to fish, **Prof Frank Nilson** (University of Bergen, Norway) described his sea lice vaccine research and illustrated the challenges in testing candidate vaccines. Presentations from **Prof Ala Tabor** (University of Queensland, Australia) and **Prof Isabel Santos** (University of Sao Paulo, Brazil) directed audience attention to anti-tick vaccines. Prof Ala Tabor illustrated her work on vaccines against *Rhipicephalus microplus* and *Rhipicephalus australis*. Prof Isabel Santos's talk provided an overview of a decavalent vaccine that decreases *Rhipicephalus microplus* infestations in cattle. Each session consisted of presentations from invited speakers and early career researchers. **Irene Kiio** (International Livestock Research Institute, Kenya) concluded the first session of the conference by presenting her PhD research on a dual mixture of recombinant tick antigens as a vaccine candidate against *Rhipicephalus appendiculatus*.

After a delicious lunch, the second session of the day on 'Vaccine Commercialisation' chaired by Dr. Jeremy Salt (GALVmed) was underway. Dr. Mahesh Kumar (Zoetis, USA) opened the session with a talk on the elements that influence the selection of candidate vaccines, the speed of vaccine development and the eventual success of a vaccine. Next, **Dr. Lois Muraguri** (GALVmed, UK) presented the East Africa Communities Mutual Recognition Procedure, an initiative to harmonise the registration and application procedure for veterinary medicines across all East African Community countries. The third presentation focused on business development aspects of vaccine commercialisation with **Dr. Peter Jeffries** (Business Development Advisor, UK) exploring the ways in which companies assess technology



opportunities. **Prof. Marshall Lightowlers** (University of Melbourne, Australia) then presented results of a Cysvax field trial undertaken in Nepal to eliminate *Taenia solium* transmission in pigs. The final talk of the session was from **Tabby Karanja-Lumumba**, a research award recipient from the International Development Research Centre (IDRC) in Kenya, who presented gender and youth-specific recommendations for adoption of Newcastle disease vaccine in East Africa.

Following a day of excellent presentations (and a quick trip outside for the group photo!), delegates networked and mingled during the drinks reception. 30 posters were presented and posters were assessed by an expert judging panel – all poster abstracts can be found **here**, and to find out who won the Early Career Researcher Poster Prizes, please click **here**. The first day of the conference concluded with a lovely three-course dinner and lots of discussion.

## **Day 2: 10<sup>th</sup> January 2019**

The second day of the conference began with a session on ‘Antigen Discovery’, chaired by Dr. Vish Nene (International Livestock Research Institute (ILRI), Kenya). African swine fever virus was the topic of the first presentation from **Dr. Axel Karger** (Friedrich-Loeffler-Institut, Germany) who presented data on the use of mass spectrometry to identify potential vaccine targets. The next talk was from **Dr. Volker Gerdts** (VIDO-InterVac, Canada) on developing a subunit vaccine for Contagious Bovine Pleuropneumonia (CBP) that is safe, effective and DIVA compatible. Following the morning coffee break, **Dr. Nicola Ternette** (University of Oxford, UK) gave a presentation on the identification of *Theileria parva* antigens to develop novel vaccines against East Coast Fever. **Dr. Omar Khan** (Tiba Biotech, USA) then presented a cross-species replicon RNA platform for the rapid design and manufacture of vaccines from Tiba Biotech. Next, **Dr. John Atack** (Griffith University, Australia) presented his research on the identification and study of phasevarions across several important bacterial veterinary pathogens. The session concluded with talks from two PhD students – **Andressa Fisch** (University of Sao Paulo, Brazil) described her research on the identification of cattle MHC II ligands for optimised CD4 epitope discovery, and Marc Faber (University of Aberdeen, UK) illustrated the use of Tb-MEG1 as a vaccine candidate and biomarker of proliferative kidney disease (PKD) in rainbow trout.

Following another delicious lunch and more networking, Prof. Peter Borriello (Veterinary Medicines Directorate, UK) chaired the final session of the conference on ‘Controlling AMR with Vaccination’. The first talk was from Prof Adam Cunningham (University of Birmingham, UK) who presented ways in which vaccines can help reduce AMR and introduced BactiVac, a sister network of the IVVN who are working to accelerate the development of bacterial vaccines. The second presentation was from **Dr. Vish Nene** (International Livestock Research Institute (ILRI), Kenya) who presented results of two OIE *ad hoc* meetings where the focus was to prioritise diseases for which vaccines could reduce antimicrobial use in animals. Next, **Dr. Shahida Syed** (Global AMR Innovation Fund (GAMRIF), UK Department of Health and Social Care (DHSC), UK) presented InnoVet-AMR, a partnership between the International Development Research Centre (IDRC) and UK Government’s GAMRIF, which will deliver funding to develop innovative solutions to fight AMR in livestock and aquaculture in LMICs.

The final talk of the session was from **Dr. BingLing Xu** from SEPPIC, France who illustrated the use of adjuvants in avian and swine bacterial autogenous vaccines.

**Dr. Nicoline de Haan** from the International Livestock Research Institute in Kenya delivered the keynote presentation on the factors affecting the livelihood of small holder farmers and the reasons why these factors are important for vaccine development. **Prof Gary Entrican** (Moredun Research Institute, UK) provided concluding comments and reflected on the past five years of the UK Veterinary Vaccinology Network and moving forward with the International Veterinary Vaccinology Network.

Thank you to the speakers, session chairs, poster presenters, sponsors and delegates for participating in the conference, and ensuring that it was a great success!

**Watch the conference highlights video [here](#).**



## Early Career Researcher Poster Competition



*L to R: Sarah Williams-Macdonald, Ruth Montero, Jennifer Wayland*

30 posters were presented during the UK & International Veterinary Vaccinology Network Conference 2019. An expert panel consisting of Prof Brian Perry (Jenner Institute and Afrique One Aspire), Dr. Sadhana Sharma (BBSRC, UK), Prof George Warimwe (KEMRI-Wellcome Trust, Kenya), Dr. Meritxell Donadeu (University of Melbourne, Australia) and Prof Cynthia Baldwin (University of Massachusetts, USA) judged the posters and awarded the following prizes:

**1st: Ruth Montero, Friedrich-Loeffler-Institute, Germany (poster 13)**

**'Outer Membrane Vesicles vaccine based: a model for oral vaccination against *Aeromonas salmonicida* in Rainbow trout and characterization of the immune response assembled'**

**2nd: Jennifer Wayland, University of Cape Town, South Africa (poster 23)**

**'Expression of West Nile Virus prM-E polyprotein in tobacco as a candidate vaccine'**

**3rd: Sarah Williams-Macdonald, Moredun Research Institute, UK (poster 24)**

**'Accelerated development of a safe and easily manufactured Q fever vaccine'**

Many congratulations to Ruth, Jennifer and Sarah!

To view all of the speaker and poster abstracts from the conference, please click [here](#).

## Scholarships

The IVVN awarded 18 scholarships for Masters Students, PhD Students, Post Docs, and Senior Researchers to attend the UK & International Veterinary Vaccinology Network Conference 2019. Reports from the scholars can be found [here](#).

## Scholars

*Andressa Fisch, University of Sao Paolo, Brazil*

*Arash Ghalyanchilangeroudi, University of Tehran, Iran*

*Hafza Zahira Manzoor, University of Veterinary and Animal Sciences, Pakistan*

*Hu Suk Lee, International Livestock Research Institute, Vietnam*

*Jennifer Wayland, University of Cape Town, South Africa*

*Kannaki Ramasay, Indian Council of Agriculture Research, India*

*Kiran Afshan, Quaid-i-Azam University, Pakistan*

*Luiz Gustavo Nogueira de Almeida, University of Sao Paolo, Brazil*

*Mahmoud Samir, Animal Health Research Institute, Egypt*

*Marc Faber, University of Aberdeen, UK*

*Mohamed Samy Mohamed Abousenna, Egypt*

*Mohammed A. Rohaim, Egypt*

*Rajan Kumar Pandey, Central University of Rajasthan, India*

*Reuben A Ocholi, National Veterinary Research Institute, Nigeria*

*Ruth Montero, Friedrich-Loeffler-Institute, Germany*

*Silvanus Anika, University of Nigeria, Nigeria*

*Silvina Wilkowsky, Instituto de Biotecnología, Argentina*

*Solomon Jauro, University of Pretoria, South Africa*

## Presentations

Links to recorded presentations from each session can be found below.

['UK Veterinary Vaccinology Network' Madeleine Clark \(The Pirbright Institute, UK\)](#)

['International Veterinary Vaccinology Network' Dr. Timothy Connelley \(The Roslin Institute, UK\)](#)

['African Vaccinology Network' Prof Mustapha Oumouna \(University of Medea, Algeria\)](#)

### **Theme 1: Vaccines for Ectoparasites**

['Targeting host-vector-pathogen interactions to reduce the global burden of tick-borne diseases' Professor Jose de la Fuente \(Instituto de Investigación en Recursos Cinegéticos, Spain\)](#)

['The potential for vaccination to control poultry red mite' Dr. Alasdair Nisbet \(Moredun Research Institute, UK\)](#)

['Sea lice vaccine development' Professor Frank Nilson \(University of Bergen, Norway\)](#)

['SophisTICKated anti-tick vaccines – cattle tick and Australian paralysis tick' Professor Ala Tabor \(University of Queensland, Australia\)](#)

['A decavalent vaccine based on recombinant tick salivary proteins decreases successive infestations with Rhipicephalus microplus in cattle' Professor Isabel Kinney Ferreira de Miranda Santos \(University of Sao Paulo, Brazil\)](#)

['A dual mixture of recombinant tick antigens decrease fecundity in Rhipicephalus appendiculatus under laboratory conditions' Irene Kiio \(International Livestock Research Institute, Kenya\)](#)

### **Theme 2: Vaccine Commercialisation**

['Towards sustainable supply of quality registered veterinary vaccines: the East Africa Community's Mutual Recognition Procedure' Dr Lois Muraguri \(GALVmed, UK\)](#)

['Technology Licensing: Art or Science?' Dr. Peter Jeffries \(Business Development Adviser, UK\)](#)

['Catalysing demand for livestock vaccines: Gender and youth-specific considerations in adoption of thermostable Newcastle disease vaccine in Eastern Kenya' Tabby Karanja-Lumumba, \(International Development Research Centre \(IDRC\), Kenya\)](#)

['Elimination of Taenia solium transmission by pigs in a field trial undertaken in Nepal using Cysvax, a commercially manufactured TSOL18 vaccine' Professor Marshall Lightowlers \(The University of Melbourne, Australia\)](#)

### **Theme 3: Antigen Discovery**

['Analyses of the intracellular Proteome of African swine fever virus' Dr. Axel Karger \(Friedrich-Loeffler-Institut, Germany\)](#)

'Development of a vaccine for contagious bovine pleuropneumonia' Dr. Volker Gerds (VIDO-InterVac, Canada)

'T cell antigen discovery for new vaccination approaches to East Coast Fever' Dr. Nicola Ternette (University of Oxford, UK)

'Programmable Animal Vaccines: The Modified Dendrimer-mRNA Platform' Dr. Omar Khan (Tiba Biotech, USA)

'Multiple bacterial veterinary pathogens contain phase-variable regulons; phasevarions' Dr. John Attack (Griffith University, Australia)

'Exploring the cattle MHCII ligands' Andressa Fisch (University of Sao Paulo, Brazil)

#### **Theme 4: Controlling AMR with Vaccination**

'Prioritization of animal diseases for which vaccines could reduce antimicrobial use' Dr. Vish Nene (International Livestock Research Institute, Kenya)

'Could and should vaccination be used to control antimicrobial use or antimicrobial resistance in animal populations?' Professor Ruth Zadoks (University of Glasgow, UK)

'InnoVet-AMR' Dr. Shahida Syed (Global AMR Innovation Fund (GAMRIF), UK Department of Health and Social Care (DHSC), UK)

'Dedicated adjuvants for bacterial autogenous vaccines' Dr. BingLing XU (SEPPIC, France)

#### **Keynote Presentation**

'The factors affecting the livelihood of small holder farmers in LMICs' Dr. Nicoline de Haan (International Livestock Research Institute, Kenya)

#### **Concluding Comments**

Professor Gary Entrican (Moredun Research Institute, UK)

**International Veterinary Vaccinology Network Conference 2020**

The Melia Hotel  
Hanoi, Vietnam

Vaccines for Poultry

Vaccines for Aquaculture

Vaccines for Ruminants

Vaccines for Swine

SAVE THE DATE

**MARCH 16-18**

International Veterinary Vaccinology Network

CIRAD

ROSLIN

MRC Medical Research Council

GCRF

BBSRC bioscience for the future

We are delighted to announce the International Veterinary Vaccinology Network Conference 2020, hosted in partnership with CIRAD and the National Institute of Veterinary Research, will be on the 16th – 18th March 2020 in **The Melia Hotel**, Hanoi, Vietnam.

The International Veterinary Vaccinology Network Conference 2020 will consist of four species-specific themes:

- Vaccines for Poultry: co-hosted by One Health Poultry Hub and chaired by Prof. Fiona Tomley (Royal Veterinary College, UK)
- Vaccines for Aquaculture: chaired by Prof. Sandra Adams (University of Stirling, UK) and Dr. Thao Ngo (Biotechnology Centre of Ho-chi Min City, Vietnam)
- Vaccines for Ruminants: chaired by Prof. Bryan Charleston (The Pirbright Institute, UK) and Dr. Yanmin Li (The Lanzhou Veterinary Research Institute, CAAS, Lanzhou, China)
- Vaccines for Swine: chaired by Dr. Simon Graham (The Pirbright Institute, UK) and Dr. Wantanee Kalpravidh (FAO Regional Office for Asia and the Pacific, Thailand)

Each session will be composed of presentations from invited speakers and selected talks from abstract submissions. There will also be a poster session, social afternoon and plenty of networking opportunities. As with previous IVVN conferences, the IVVN will provide scholarships for researchers from LMICs to attend and additionally, the UK Veterinary Vaccinology Network will provide funding for early career researchers (ECRs) to attend the event.

Conference registration, abstract submission and scholarship applications will open shortly.

We look forward to welcoming you to Hanoi!

## GCRF Networks Vaccinology Course



*Delegates at the GCRF Networks Vaccinology Course, Anantara Riverside Hotel, Bangkok, Thailand, December 2018*

The Global Challenges Research Fund (GCRF) Vaccine Networks (IVVN, BactiVac, HIC-Vac, IMPRINT and VALIDATE) hosted a veterinary and human vaccinology course in association with the United Nations Food and Agriculture Organisation (UN FAO), through the European Commission for the Control of Foot and Mouth Disease (EuFMD), on Monday 3rd to Friday 7th December 2018 at the Anantara Riverside Hotel, Bangkok, Thailand.

42 post-graduate students and early career researchers from the UK and LMICs attended the course which addressed aspects of human and animal vaccinology, the vaccine development process, biomanufacturing, regulatory and ethical issues. The course emulated the successful series of Jenner Institute training courses in Africa.

Thank you very much to everyone who contributed to the course and made it a great success, especially all of the speakers and delegates!



## Scholarships

The five GCRF networks supported 38 scholars from 14 countries to attend the GCRF Networks Vaccinology Course:

### BactiVac

- Luis Alberto Ontiveros-Padilla, Mexican Social Security Institute
- Daniel Tapia, University of Texas Medical Branch
- Justin Tirimba Nyasinga, Technical University of Kenya
- Alice Halliday, Imperial College/University of Bristol
- Elita Jauneikaite, Imperial College

### HIC-Vac

- Birendra Gupta, Tribhuvan University
- Achut Barakoti, Nepal Medical College Teaching Hospital
- Lam Ha, Eijkman-Oxford Clinical Research Unit (OCRU)
- Rupal Ojha, Central University of Rajasthan
- Rajan Kumar Pandey, Central University of Rajasthan

### IMPRINT

- Shona Moore, University of Liverpool
- Lok Bahadur Shrestha, B.P. Koirala Institute of Health Sciences
- Nasamon Wanlapakorn, University of Liverpool

### IVVN

- Natalia Bednarska, London School of Hygiene and Tropical Medicine/Imperial College
- Jossie Intan Cahyani, Gaja Mada University/Centre for Veterinary Biologics
- Panjaporn Chaichana, Mahidol Oxford Tropical Medicine Research Unit (MORU)
- Hai Hoang, Nong Lam University, Ho Chi Minh City
- Challika Kaewborisuth, National Center for Genetic Engineering and Biotechnology (BIOTEC)
- Rebecca McLean, Pirbright Institute
- Sean Monaghan, University of Stirling
- Mitzi Luisa Morales, Bureau of Animal Industry
- Teerawut Nedumpum, Faculty of Veterinary Science, Chulalongkorn University
- Hao Quang Pham, National Veterinary Joint Stock Company (Navetco)
- Thi-Nhan Phan, Nghe An, General Friendship Hospital
- Ronalie Rafael, Central Luzon State University
- Mohammed Jajere Saleh Fakulti Veterinar, Universiti Putra Malaysia
- Eleanor Senior, University of Liverpool

- Melbourne Talactac, Cavite State University
- Navapon Techakriengkrai, Faculty of Veterinary Science, Chulalongkorn University
- Siriwattana Thaisonthi, Green Innovative Biotechnology Company, Ltd.
- Xinyu Toh, Agri-Food and Veterinary Authority of Singapore
- Louise Vince, Royal Veterinary College
- Thi Thu Hang Vu, Korea University

#### VALIDATE

- Gobena Ameni, Addis Ababa Univeristy
- Raph Hamers, Eijkman-Oxford Clinical Research Unit (OCRU)
- Van Le, Eijkman-Oxford Clinical Research Unit (OCRU)
- Farah Isse, Mumin Red Sea University
- Erni Juwita, Nelwan Universitas Indonesia

## Presentations

### Day 1 – Principles of Vaccinology

[“Introduction to human and veterinary vaccinology”, Prof Adrian Hill, Jenner Institute, UK](#)

[“Human vaccine requirements in South East Asia”, Dr Anh Wartel, International Vaccine Institute, South Korea](#)

[“Veterinary Vaccine requirements in South East Asia”, Dr Ian Dacre, UN FAO-ECTAD-RAP, Thailand](#)

[“Vaccine immunology”, Dr Timothy Connelley, Roslin Institute, University of Edinburgh, UK](#)

[“The human vaccine development pathway – an industry perspective”, Dr Sit Thirapakpoomanunt, GPO-Mérieux, Thailand](#)

[“Technologies in vaccine development”, Prof Bryan Charleston, Pirbright Institute, UK](#)

[“Development of next-generation platforms for the production of biotherapeutics and animal vaccines in E. coli”, Prof Colin Robinson, University of Kent, UK](#)

[“Development of subunit vaccines to combat Porcine Circovirus infections, and role of a UK-Thai consortium funded by the GCRF programme”, Dr Peera Jaru-Ampornpan, Thai National Center for Genetic Engineering, Thailand](#)

### Day 2 – Vaccine Technologies and Development

[“The veterinary vaccine development pathway – an industry perspective”, Dr Gwenaelle Dauphin, Ceva Animal Health, France](#)

[“Vaccine delivery systems”, Prof Sarah Gilbert, Jenner Institute, UK](#)

[“Adjuvants”, Dr Anita Milicic, Jenner Institute, UK](#)

[“Immunogenicity and correlates of protection”, Prof Adrian Hill, Jenner Institute, UK](#)

[“Monitoring immune response: i\) B-cells”, Dr Danika Hill, Babraham Institute, UK](#)

[“Monitoring immune response: ii\) T-cells”, Dr Timothy Connelley, Roslin Institute, University of Edinburgh, UK](#)

[“Polio eradication”, Prof David Salisbury, Centre for Global Health Security, UK](#)

[“Malaria vaccines”, Prof Adrian Hill, Jenner Institute, UK](#)

### Day 3 – Major Vaccine Targets

[“Enteric bacterial diseases”, Prof Stephen Baker, Wellcome Trust Centre, Ho Chi Minh City, Vietnam](#)

[“Novel Foot-and mouth-disease vaccines”, Prof Bryan Charleston, Pirbright Institute, UK](#)

[“Tuberculosis”, Prof Helen Fletcher, LSHTM, UK](#)

[“Meloidosis Vaccines”, Prof Susanna Dunachie, Oxford University, UK](#)

[“Rabies vaccine requirements in South East Asia”, Dr Ian Dacre, UN FAO-ECTAD-RAP, Thailand](#)

[“Antimicrobial resistance in enteric pathogens”, Prof Stephen Baker, Wellcome Trust Centre, Ho Chi Minh City, Vietnam](#)

[“Regulatory and ethical issues”, Dr Anh Wartel, International Vaccine Institute, South Korea](#)

#### **Day 4 – Vaccine field trials and deployment in developing countries**

[“Phase 1 trials: first-in-man”, Prof Helen Fletcher, LSHTM, UK](#)

[“Epidemiology and vaccine trial design”, Dr Lorenz von Seidlein, Mahidol Oxford Tropical Medicine Research Unit \(MORU\), Thailand](#)

[“Good clinical practice and safety, QC and QA”, Dr Susan Tonks, Oxford Vaccine Group, UK](#)

[“Statistical analysis of vaccine trials”, Dr Mavuto Mukaka, MORU, Thailand](#)

[“Human vaccine trials in developing countries”, Dr Jacqueline Deen, University of the Philippines, Philippines](#)

[“Veterinary vaccine trials”, Dr Georgina Limon-Vega, Pirbright Institute, UK](#)

[“Vaccine security in ASEAN countries”, Dr Charung Muangchana, National Vaccine Institute, Thailand](#)

#### **Day 5 – Influenza as a case study of vaccine design and use**

[“Influenza vaccines and immunology”, Prof Sarah Gilbert, Jenner Institute, UK](#)

[“The role of the animal health sector in pandemic preparedness for influenza A”, Dr Filip Claes, UN FAO-ECTAD-RAP, Thailand](#)

## Workshops

The second form of networking activity hosted by the IVVN are workshops that aim to provide a platform for smaller groups to discuss specific topics of their choice. The IVVN provides workshop funding for IVVN members to host workshops on a particular topic. Find out more [here](#).

Report: Workshop on promoting the use of vaccines in tilapia Aquaculture



Dr Nguyễn Ngọc Phước, Hue University of Agriculture and Forestry, Vietnam and Dr Kim Thompson, Moredun Research Institute (MRI), UK, hosted a workshop at Hue University of Agriculture and Forestry on 29<sup>th</sup>-31<sup>st</sup> October 2018 entitled “Promoting the use of vaccines in tilapia Aquaculture”. This three day workshop was held as part of their IVVN pump-priming project “Development of immunological tools for monitoring the immune response of Nile tilapia” led by Dr Thompson. Other partners who attended included Dr Fred Fellouse, University of Toronto, Canada and Dr Nguyen Duc Hoang, Department of Microbiology, Vietnam National University, Ho Chi Minh City, Vietnam. Prof Sandra Adams, Institute of Aquaculture, University of Stirling, UK; Prof Ruth Zadoks, Institute of Biodiversity Animal Health and Comparative Medicine, University of Glasgow, UK; and Dr Alasdair Nisbet and Dr Janina Costa, MRI are also partners on the project.

Tilapia is an attractive species for aquaculture, reaching harvest size in 6-7 months; and it is now the second most predominant aquaculture species globally after carp. They are farmed in many low and middle-income countries (LMIC) and provide an important source of revenue for many low income families. Disease in tilapia culture is associated with intensification of the farming system, and both bacterial and viral diseases are severely impacting on the expansion of tilapia farming. There is increasing concern about the use of antibiotics to control disease outbreaks and attention is focusing on the use of vaccination for disease control. Vaccination exposes fish to a non-infectious dose of the pathogen, so when they come into contact with the pathogen at a later date, memory cells of their immune system stimulate a response to combat the disease. We need a better understanding of how immune cells respond to infection and vaccination to be able to develop and formulate effective vaccine products for tilapia. We have few reagents available for investigating the immune response of tilapia, however. Through the collaboration of scientists from Vietnam, Canada and the UK, we are developing a range of synthetic antibodies in our IVVN pump-priming project for studying the immune response of this important aquaculture species. Synthetic antibodies are made in the laboratory, unlike conventional antibodies, which are produced in animals, thus eliminating the need to use animals to make these reagents. The targets for antibody production include CD3 $\epsilon$ , CD4, CD8 (T-cells); CD172 (SIRP $\alpha$  – dendritic cells); CD45 (leukocytes) and CD163 (macrophages).

A total of 42 scientists attended the workshop, which was open to fish health scientists and fish immunologists in the region through additional funding awarded to Dr Nguyễn Ngọc Phước from IVVN's workshop fund and Belgian funding (VLIR-IUC program). As well as projects partners, 35 scientists were invited from Vietnam, and 7 scientists from around the region, including Bangladesh, Malaysia, Indonesia and Thailand (Figure 1). The purpose of the workshop was to promote the use of vaccines in tilapia Aquaculture, to inform delegates of the results of this IVVN project, and for scientists within the region to present updates on the disease status of tilapia aquaculture in their country. There was also discussion on how scientists could help validate the antibodies in their vaccination trials and if the consortium could find follow-on funding for this activity.

The workshop was open by the Director of Hue University of Agriculture and Forestry Prof Dr Le Van An. The speakers over the two days included:-

Dr Nguyễn Ngọc Phước – his research interests focus on improving aquatic animal health, especially on bacterial diseases of economically important farmed aquatic species in Vietnam. He is currently working on fish disease research, including experimental challenges, epidemiological and pathological studies of novel bacterial diseases in aquatic animal production in Vietnam. He gave an overview on “Aquaculture in Vietnam” and presented “a case study on developing and improving sustainable Aquaculture with emphasis on bottom-up solutions for environmental pollution in Thua Thien Hue province”

Dr Kim Thompson is a Principal Investigator within the Aquaculture Research Group at MRI. She has published more than 140 publications relating to fish immunity, focusing on vaccine development, effects of immunostimulants and feed additives on the immune system and

disease resistance of fish. She chaired the workshop and presented talks on “The immune response of tilapia” and “An overview on the application of vaccines in aquaculture”.

Dr. Frederic Fellouse generates antibodies using synthetic antibody technology and has generated of thousands of antibodies with high specificity and affinity against hundreds of targets, mostly related to human health. In the past 3 years, Dr Frederic Fellouse has applied this technology for veterinarian and infectious disease applications: serotype specific dengue fever diagnostic, epitope focused immunogen for dengue and east coast fever, recombinant antibody of bovine antibodies. He presented “An overview on the production of synthetic antibodies”

Prof. Md Sabri Bin Mohd Yusoff is a veterinarian working at Department of Veterinary Pathology & Microbiology, University of Putra, Malaysia (UPM). One of his research interests focuses on streptococcosis infections in tilapia and in his talk was entitled “Streptococcus vaccine in Malaysia” in which he discussed an oral vaccine he had developed with colleagues at UPM.

Dr. Channarong Rodkhum is a professor in the Department of Veterinary Microbiology at Chulalongkorn University, Thailand. His research focuses on infectious diseases of aquatic animals; pathogenesis and molecular biology of aquatic pathogens; current diagnostic methods, prevention and treatment of bacterial diseases of aquatic animals and antimicrobial resistance. His talks included “Integration of knowledge in molecular genetics and virulence of *Flavobacterium columnare* for development of vaccine against columnaris diseases in tilapia”, “Development of immersion formalin killed nano vaccine against *Flavobacterium columnare* in tilapia” and “Nanomedicine-based drug & vaccine delivery system for Aquatic animals”

Dr. Pattanapon Kayansamruaj is a professor in Veterinary Science, at Chulalongkorn University. His major research interest involves veterinary microbiology and he presented “Current epidemiological situation of infectious diseases threatening fresh-water farmed Asian sea bass (*Lates calcarifer*) in Thailand.

Prof. Md. Ali Reza Faruk, Bangladesh Agricultural University. Research Interests include aquatic animal health management, molecular mycology, development of immuno-diagnosis, and characterization of aquatic pathogens. He gave an “Overview of aquaculture and fish disease in Bangladesh”

Dr Duy Le has been a lecturer in Fish Diseases at the Faculty of Fisheries, Hue University of Agriculture and Forestry, Vietnam since 2008. His main areas of research are fish diseases diagnosis, microbiology and gut microbiome of fish. He presented “Live food and the use of probiotics in rabbit fish larviculture”.

Prof Nguyen Duc Hoang is an expert in bacterial genetics, protein expression and purification. His group works on the development of expression systems, engineering, production, and characterization of proteins. These include the development of bacterial expression vectors, generation of recombinant bacteria for production of recombinant proteins in *Bacillus*

*subtilis*. Some of the potential recombinant proteins are produced from infectious diseases for vaccine development. His talk was entitled “Novel technologies for vaccine development”

Some important points were discussed at the workshop with respect to administering vaccines to tilapia:

- A lot of farmers will not vaccinate by injection once the fish are in the farm, firstly because the culture period is so short for tilapia and secondly it is logistically difficult to vaccinate fish once they are in their grow-out site.
- The ideal solution is to vaccinate fish in the hatchery before they are moved for grow-out, around one-month post-hatch. Injection is difficult in small fish. Vaccinating the brood stock may potentially be an option.
- Alternative vaccine delivery methods are needed for tilapia, such as nanoparticle delivery which can be applied orally or by immersion.
- Vaccines for tilapia need to be cheap because it is such a low value species, otherwise the farmer will not be willing to pay for the vaccine.
- Concurrent infections are now the norm in tilapia culture. These complicate vaccine design, making vaccines more expensive and the co-infections can affect the fish’s ability to respond to the vaccine. Only healthy fish should be vaccinated for an optimal immune response to be induced by the vaccine.
- The major pathogens currently causing big problems in tilapia culture in Southeast Asia include *Streptococcus agalactiae* (especially serotypes Ia and III), *Streptococcus iniae*, *Aeromonas* (especially *Aeromonas veronii*), *Edwardsiella* spp, (*E. tarda* and *E. ictaluri*), *Mycobacterium marinum*, iridovirus and *Francisella noatunesis* subsp. *orientalis* (*Fno*). Farmers are seeing a big increase in *Flavobacterium columnare* outbreaks often in concurrent infections with *Fno*.

On the third day of the workshop, the delegates had the opportunity to visit aquaculture sites near Hue to observe the disease problems in tilapia farms first hand (Figure 2).

If you would like to know more about the IVVN project or are interested helping to evaluate the MAbs please contact Kim Thompson ([kim.thompson@moredun.ac.uk](mailto:kim.thompson@moredun.ac.uk)).



## Report: Field evaluation of novel livestock vaccines workshop



On 1 November 2018 thirty delegates assembled for the IVVN workshop on “Field evaluation of novel livestock vaccines” organised by Nick Lyons (EuFMD – FAO, Italy/Pirbright Institute, UK) and Eyal Klement (Associate Professor of Veterinary Epidemiology, Koret School of Veterinary Medicine, Hebrew University, Israel). The workshop followed the EuFMD Open Session on the subject of Global Vaccine Security.

The workshop explored the importance of field trials through twelve talks covering the principles of trial design, regulatory requirements and successes and challenges of specific case studies. The workshop comprised three sessions: Background and experience with vaccine evaluation in the field; Planning for field trials; and Vaccines under development. In the welcome and introductions, Eyal Klement stated the value of field trials as the best, most cost-efficient, effective and reliable way to test the efficacy and efficiency of vaccines. Nick Lyons and Eyal Klement also highlighted the lack of research funding for field trials, and the significant opportunity for academic, development and industry to expand field trial operations.

Paul Fine, Professor of Communicable Disease Epidemiology at the London School of Hygiene and Tropical Medicine (UK) opened the first session with a talk on “Principles of trial design for determining field efficacy of novel vaccines.” Paul outlined the purpose of field trials: “To evaluate the efficacy/effectiveness of a vaccine in preventing disease correctly and

convincingly”. He covered and defined terminology, development pipelines, study phases, and compared challenge studies and field trials.

Frida Hasslung Wikstrom, senior clinical assessor at the department of licensing for the Swedish Medical Products Agency (Sweden), presented her personal views on the “Regulatory requirements for animal vaccines”. She outlined the legal framework for immunological veterinary medicinal products in Europe, particularly Directive 2001/82 EC as amended, European Pharmacopoeia, scientific and regulatory guidance from the committees of EMA (European Medicines Agency), and the complexities of European and member state regulations and legislation. Frida spoke about the need for data, specifically field data and field efficacy and field safety data when developing drugs for market authorisation.

Claude Hamers, Technical Director of the Veterinary Public Health Center of Boehringer Ingelheim Animal Health, gave an industry perspective on field trials in “Field trials for novel animal vaccines – experience from industry”. Claude focussed on assessment of the safety of vaccines and assessment of the efficacy of vaccines. He discussed costs, challenges (such as herd selection, intercurrent diseases and data collection), and the realities of highly variable conditions in field trials. He underscored the talk with three examples of vaccine trials involving pregnant cows, swine and calves. Claude concluded, “Analyse results considering the effects of each variable, including some variables that you were not initially expecting” and highlighted the imperative of traceability.

Eyal Klement talked on “Testing the efficacy of lumpy skin disease vaccines in the field”. He gave an overview of lumpy skin disease (LSD) including clinical signs and global geographical distribution. Eyal then focussed on a LSD outbreak in Israel 2012-13, and discerning a good vaccine – one that is safe and efficacious – through the comparison of two LSD vaccines.

Annie Cook, a veterinary epidemiologist at ILRI in Kenya, gave a presentation via skype on “A vaccine trial in Kenya demonstrated protection against wildebeest-associated malignant catarrhal fever in cattle”. Annie laid out the background of MCF, MCF vaccines and the study site, before discussing the field trial. She concluded by raising the importance of market scoping, safety and risk mapping.

Michael van Straten, head of the Department of Herd Health and Epidemiology at Hachaklait Veterinary Services (Israel), provided a presentation entitled “*Brucella abortus* S19 vaccine protects dairy cattle against natural infection with *Brucella melitensis*”. Michael began by discussing some of the challenges of field trials, such as ethics, expense, and lack of facilities. He moved on to compare randomized, controlled (blinded) trials vs. real life, and the effect of bias. Michael’s talk focussed on an outbreak of *Brucella melitensis* in Israel in October 2015 following the end of compulsory vaccination with *Brucella abortus* S19 vaccine, “possibly the only evidence for cross protection *B. melitensis* with *B. abortus* strain in dairy cattle”. He highlighted the monitoring, baselining and coordination of regulations and policies in Israel that created conditions for a natural experiment on vaccine effectiveness. He concluded that the “Findings have influenced decisions regarding use of S19 in dairy farms.”

Madeleine Clark, PhD student at Pirbright Institute (UK) opened the second session with a talk on “A field trial assessing the immunogenicity of a novel Rift Valley Fever vaccine in multiple

species in Kenya: planning, challenges and collaborations – learning on the ground”. Madeleine described her work on a novel RVF vaccine using a Chimpanzee Adenovirus Vector, and a non-inferiority immunogenicity field trial at ILRI.

Georgina Limon-Vega, a veterinary epidemiologist at Pirbright Institute (UK), gave a talk on an “Efficacy study for a novel vaccine against Crimean-Congo haemorrhagic fever (CCHF) in Bulgaria”. The purpose of the project was to assess the efficacy of vaccine in sheep and the objective of the trial was to “assess whether the vaccine prevents infection in sheep (to limit exposure of humans) after natural challenge in a field study in an endemic area, during periods of high levels of transmission in the tick season.” Georgina talked about the importance of working with local communities and farmers as partners in field trials, in particular that it is “very helpful to discuss unexpected results with field vets”.

The third session opened with a presentation over skype by Shintouou Cabirou Mouchili, PhD student at the University of Buea (Cameroon). Shintouo talked about “Design of a multi-antigenic, multi-stage and multi-epitope vaccine candidate against onchocerciasis and related filarial diseases”. He talked about the social and economic burdens of onchocerciasis – approximately 15.5 million worldwide are infected – and the mitigation strategies. He outlined his work on a novel vaccine Ov-DKR, and concluded it “demonstrates superior antigenicity to the current individual lead vaccine candidates”, and that “Ov-DKR could act as a therapeutic and prophylactic vaccine.”

Chukwunonso Ezeasor, PhD Student at the University of Nigeria, gave a presentation by skype on “Comparative evaluation of the mucoadhesive strengths of *Abelmoschus esculentus* and *Irvingia gabonensis* gums for possible applications in veterinary mucoadhesive vaccine delivery systems.” He began with “Studies have shown that mucosal vaccination can successfully induce both systemic and mucosal immune responses, thus preventing the invasion and colonization of pathogens on the mucosal surfaces.” Chukwunonso concluded, “*I. gabonensis* (bush mango) gum is more suitable for use in mucoadhesive delivery in ruminants more than *A. esculentus* (okra) gum...The findings of this work have also shown that the methods of polymer extraction, plays a very important role in the mucoadhesiveness.”

Moez Mhadhbi, Assistant Professor in Veterinary Parasitology at the Veterinary School of Sifi Thabet (Tunisia), talked on the subject of “Development of a new live attenuated vaccine system for tropical theileriosis [TT] – The way forward for improving the control of tropical theileriosis in Tunisia”. He outlined the symptoms of TT and the *Theileria annulata* life cycle. He highlighted the scale of the problem – “400 million cattle are threatened throughout a large geographic area, possible extension to other regions with Climate Change.” – and the economic cost. Moez discussed many considerations in vaccine development and design, including the demographic and seasonal aspects of TT in Tunisia, farm typology and cattle population dynamics. He also raised the important issue of the size of the final product and thermostability, “vaccine bottles volume to be adapted to the average size of farms to avoid waste of vaccine particularly if frozen”.

Adeyinka Adedeji, Principal Veterinary Research Officer in the Viral Division of the National Veterinary Research Institute (Nigeria) gave the final talk on “Development of live attenuated goat pox vaccine in Nigeria”. Adeyinka outlined goat pox and sheep pox, and the costs and implications of goat pox – “GTP causes considerable economic losses due to morbidity, mortality, depreciation of wool and skin quality and international trade restrictions...outbreaks are frequently reported with mortality up to 49%-64.4%”. He concluded that the GTP vaccine developed at NVRI “has the potential to protect against both SPP and GTP although no field trial has been carried out.”

After the final talk, delegates engaged in a spirited discussion of the presentations, challenges and opportunities related to field trials, regulatory frameworks, licensing, commercialisation, distribution and implementation of vaccination programmes, and funding. The workshop concluded with a reiteration of the value of field trials as the best, most cost-efficient, effective and reliable way to test the efficacy and efficiency of vaccines. The other primary conclusion was the lack of funding for field trials, and the significant opportunity for academic, development and industry to expand field trial operations.

Thank you very much to all the excellent speakers for thought-provoking presentations. Thank you to the delegates for attending the workshop and engaging in discussions and forging new collaborations. Thank you to the EuFMD team for organising the workshop.

All presentations from the workshop are available: <https://www.eufmd.info/workshops>.

For more information please contact Nick Lyons ([nicholas.lyons@fao.org](mailto:nicholas.lyons@fao.org); [nicholas.lyons@pirbright.ac.uk](mailto:nicholas.lyons@pirbright.ac.uk)) or Eyal Klement ([eyal.klement@gmail.com](mailto:eyal.klement@gmail.com)).



*Delegates at the inaugural AfVANET scientific workshop, 19<sup>th</sup> & 20<sup>th</sup> March 2019, Nairobi*

The African Vaccinology Network (AFVANET) hosted its first scientific workshop at the International Livestock Research Institute (ILRI) Nairobi, Kenya on March 19th and 20th, 2019. AfVANET was established with the goal of bringing together African and non-African partners interested in vaccinology, and to better involve African scientists in finding and designing solutions for infectious diseases of humans and animals that negatively impact the health and economy of Africa.

30 delegates from 13 countries attended the workshop, including early career researchers, scientists, researchers and officials from Africa, Australia, South Korea and Europe. The workshop was supported by a grant from the International Veterinary Vaccinology Network (IVVN), a close partner of AfVANET that have supported this network since its establishment. The workshop permitted fruitful exchanges among participants and favoured contacts for future collaborations.

The inaugural talk was given by **Prof Mustapha Oumouna**, University of Medea, Algeria and AFVANET General Coordinator. He presented the different steps leading to the establishment of AFVANET and the purpose and goals of the network. The inaugural speech was followed by six sessions spread across two days.

#### **Day 1 – March 19th, 2019**

The first session entitled “Animal and human vaccines in Africa: need, availability and opportunities for innovation” was chaired by **Prof. Christine Maritz-Olivier**, University of

Pretoria, South Africa. It was dedicated to surveys of the most important human and animal infectious diseases in the five regions of Africa presented by AFVANET members **Dr Yakhya Dieye** (Northern region), **Dr Kwabena Duedu** (Western region), **Dr Gzahegne Mamo** (Eastern region), **Dr Jerome Nyhalah Dinga** (Central region) and **Dr David Lazarus** (Southern region).

The second session of the workshop was chaired by Dr Lucilla Steinaa (ILRI) and focused on the importance of networking in vaccine research and R&D in Africa. Dr Tim Connelley (The Roslin Institute), director of the IVVN, presented the range of activities of this organization aiming to bring together partners and stakeholders from UK, LMICs and other countries to promote vaccine development for livestock diseases. Dr Kristin Stuke from GALVmed, then described the current activities of this not-for-profit organization that aim to overcome the challenges preventing animal health to be available to people by connecting relevant partners and promoting products and market development. The final talk of the session was from Dr Tabby Karanja, International Development Research Centre (IDRC), who presented a study on the impact of gender in vaccine adoption using thermostable Newcastle disease vaccine among users in Kenya.

The third session entitled “The role of African and international institutions in the fight against infectious diseases” was chaired by **Dr Tim Connelley** and contained seven presentations. Firstly, **Dr Lucilla Steinaa** presented the ILVAC vaccine platform and the development of vaccine against African Swine Fever, East Cost Fever and Contagious Bovine/Caprine Pleuro Pneumonia (CBPP) at ILRI. Secondly, **Prof. Christine Maritz-Olivier**, University of Pretoria spoke about a molecular immunology study analyzing the regulation of T and B lymphocytes in response to infestation by *Rhipicephalus microplus*. She additionally mentioned a partnership approach involving researchers, farmers and industry in the fight against tick and tick-borne diseases in South Africa. **Prof Denise Doolan**, James Cook University, Cairns, Australia, then described a combined systems approaches to identify *Plasmodium falciparum* antigens for clinical development and the identification relevant biomarkers. In the next talk, **Stefano Massori**, STAR-IDAZ IRC discussed the priority diseases established by the OIE and STAR-IDAZ efforts to coordinate research to develop new strategies and tools for animal disease control. **Dr Jennifer Mabuka** from the African Academy of Sciences (AAS) then presented the AAS strategies to build capacity in clinical trials and establish sites in Africa. Next, **Dr David Shamaki**, National Veterinary Research Institute (NVRI), Vom, Nigeria gave a lecture on the production of bacterial and viral vaccines for animals at the NVRI. The last speech of the session was made by **Dr Philip Bejon**, Kenya Medical Research Institute (KEMRI) who presented activities at KEMRI including clinical trials for several human and animal vaccines in Africa, bio-banking, and identification of biomarkers to distinguish different infections.



*AfVANET founding members*

## **Day 2 – March 20th, 2019**

The second day of the workshop began with a session entitled “AfVANET Women in R&D against infectious diseases” chaired by **Prof. Denise Doolan**. **Dr Afolayan Funmilayo**, University of Ibadan, Nigeria and member of the AfVANET coordination committee presented her work on anti-parasitic and immunomodulatory properties of compounds from plants used in traditional medicine. Next, **Dr Nontobeko Thema**, University of Pretoria, South Africa presented a study screening peptides for the design of multi-epitope vaccines against *Ehrlichia ruminantum*, a bacterial pathogen transmitted by ticks. **Dr Maroua Bettaieb**, National School of Veterinary Medicine, Tunisia then concluded the session with a talk on strategies for implementing efficient vaccination in avian species.

The fifth session entitled “Young African Voices” was dedicated to early career researchers. **Dr Akinbobola Jones**, University of Abuja, Nigeria, member of AFVANET coordination committee began the session by discussing the importance of targeting food animal reservoirs for prevention of *Trypanosoma brucei gambiense* in Africa. **Dr Abraham Ali Mohamed**, Ethiopian Public Health Institute, then presented a cross-sectional sero-analysis aiming to find whether Middle East Respiratory Syndrome Coronavirus (MERS-CoV) could be transmitted from camels to humans in Ethiopia. Next, **Moussa Dia**, Institut Pasteur de Dakar, Senegal spoke about the development of a live attenuated vaccine strain of West Nile virus. Lastly, **Dr Tshifhiwa Nefefe**, University of Pretoria, South Africa presented a systems biology approach in a sheep model to find innate immune actors that can improve vaccines against *Ehrlichia ruminantum*.

The next session was dedicated to infectious diseases in Africa and began with a talk from **Prof. Ignacio Moriyon** from Spain who highlighted the importance of the vaccines in the fight against brucellosis in Africa. **Prof. Denise Doolan** then gave an overview of vaccine trial efforts

in Africa in order to eradicate major infectious diseases, and this was followed by the talk of **Dr Arijit Sil** from International Vaccine Institute (South Korea)

**Prof. Mustapha Oumouna** closed the two day workshop by thanking IVVN for the financial support of the workshop, as well as the participants and their efforts in making the workshop a success. Furthermore, special thanks were presented to **Dr Vish Nene** (ILRI) for his endless support and advice. **Prof. Mustapha Oumouna** concluded the meeting by mentioning the tremendous work done by AfVANET founding members and AfVANET hopes that other activities will be programmed in the near future.

#### Support for LMIC researchers to attend external workshops

The IVVN has provided funding for researchers from LMICs to attend:

- 1) 20th Fish Immunology Workshop, Wageningen University & Research, April 28<sup>th</sup> - May 2<sup>nd</sup> 2019.
- 2) Vaccinology in Africa Course, The Gambia, April 29<sup>th</sup> – May 3<sup>rd</sup> 2019.
- 3) 12<sup>th</sup> International Veterinary Immunology Symposium, Seattle, 13<sup>th</sup> – 16<sup>th</sup> August 2019.



## Catalyst Funding

### Pump-priming grants

Grants of up to £100,000 are available for collaborative teams of IVVN members to address key bottlenecks preventing the development of a particular vaccine. The IVVN will announce pump-priming grant calls intermittently and members will receive a notification via email.

### Awarded pump-priming grants (Round 2)

#### **1) Rethinking ‘impossible’: creating a platform for developing novel vaccines against animal trypanosomiasis in Brazil**

Professor Andrew Jackson (University of Liverpool, UK), Professor Marta M.G. Teixeira (University of Sao Paulo, Brazil), Dr. Gavin J. Wright (Wellcome Trust Sanger Institute, UK) and Professor Rosangela Zacharias (São Paulo State University, UK).

Animal African Trypanosomiasis (AAT) is a livestock disease caused by a blood parasite called *Trypanosoma vivax*. In South America, biting flies transmit *T. vivax* resulting in frequent AAT epidemics, substantial animal mortality and economic loss. This pilot project will create the capacity to develop novel vaccines for AAT. A vaccine has enormous commercial potential in Brazil, which is the world’s largest beef exporter and where meat exports are around 7% of GDP. AAT infection reduces profit per animal by 11%, so a sustainable solution to AAT will have direct economic benefits to livestock production in Brazil and across South America. However, research on human trypanosomes has shown that they change their surface proteins to prevent the immune system from identifying and destroying them. Due to this process of antigenic variation, vaccination against AAT has generally been considered impossible. However, our research on *T. vivax* has suggested that we can target invariant features and so remove this major bottleneck in progress. We identified a suite of *T. vivax*-specific cell surface proteins that do not display antigenic variation, but do elicit strong immune responses in natural infections, and we have developed a system for producing *T. vivax* proteins for vaccination. We will vaccinate cattle with one novel *T. vivax* antigen and test whether this protects them against *T. vivax* infection, and, if so, what kind of immune response is necessary. This will establish proof-of-principle that we can express and evaluate antigens, leading to a full-scale project testing our entire panel of *T. vivax*-specific proteins using different vaccination methods. This project will translate our insights into parasite biology into the first experimental vaccine, a combination of protective antigens that can be used in a clinical trial; this is an essential step in removing the burden of AAT on animal health and economic prosperity.

#### **2) Towards edible vaccines for chickens**

Dr. Kate Sutton (The Roslin Institute, UK), Professor Lonneke Verdelde (The Roslin Institute, UK), Dr. Roger New (Proxima Concepts Ltd, UK) and Professor Damer Blake (Royal Veterinary College, UK).

The burden of infectious disease in livestock continues to be a major constraint to sustained agricultural development, food security and economic benefits in developing countries.

*Eimeria spp.* have been recognised as important parasites of poultry for more than 100 years. Risks associated with uncontrolled coccidial infection include failure of chickens to thrive, increased susceptibility to diseases, such as necrotic enteritis, compromised feed conversion and, for some species of parasite, high levels of mortality. Prophylactic anti-coccidial drugs are routinely used to control *Eimeria*, and live parasite vaccines are popular in some sectors of the industry although they are unsuitable for the dominant broiler sector, small holders and backyard chickens. Drug resistance and the need for *in vivo* propagation of live vaccines have prompted development of next generation recombinant anti-coccidial vaccines. The most important issues to tackle are (i) development of an efficacious formulation, (ii) demonstrate ease of administration with relevance to routine vaccination of chickens, independent of a cold chain and propagation in live animals, and (iii) a broad spectrum that will protect against multiple strains of *Eimeria*.

In this project we will test a novel vaccine caplet that can be mixed into feed making it suitable for routine administration to broilers and backyard poultry with particular relevance in low and middle income countries where poultry production is expanding rapidly. The vaccine format is highly stable in the environment and can easily be stored without a cold chain. Two promising *Eimeria* antigens are being taken forward in this proposal due to their ability to reduce parasite burden in infected animals when administered via injection. We will utilize an established innovative oral vaccine-delivery technology in humans and test its ability in chickens with the aim to develop a prototype vaccine against *Eimeria*.

### **3) Efficacy testing of novel immersion and oral vaccines for *Aeromonas hydrophila* in Tilapia and Vietnamese catfish**

Dr. Thao Ngo (Biotechnology Center of Ho Chi Minh City, Vietnam), Professor Dang Thi Hoang Oanh (Can Tho University, Vietnam), Professor Alaa Eldin Eissa (Cairo University, Egypt), Professor Alexandra Adams (University of Stirling, UK), Dr. Kerry Bartie (Stirling University), Dr. Andrew Desbois (University of Stirling, UK), Professor Dirk Werling (Royal Veterinary College, UK), Dr. Callum Scott (Benchmark Animal Health Ltd.)

In 2014 the contribution of aquaculture to supply food for human consumption overtook that of wild-caught fish for the first time. Aquaculture currently contributes approximately 73.8 million tonnes of aquatic animals with a value of US\$ 130 billion. This has increased by 10-12% from 59 million tonnes in 2011, representing the fastest growing animal production sector. Over 30 species are currently farmed, including tilapia and Pangasius (Vietnamese catfish also known as Tra catfish). These fish species are farmed in low and middle-income countries (LMICs) and provide an important source of revenue for many low income families supplying both the domestic and export market. Tilapia production is rapidly increasing with Egypt the third largest global producer. Tilapia and Vietnamese catfish are both produced in Vietnam. Although Vietnamese catfish production increased dramatically between 2004 and 2008, the export market has since levelled off due to public concern over disease and over use of antibiotics. Currently, disease outbreaks caused by *Aeromonas hydrophila* are having a major economic impact on aquaculture in both countries. No vaccine is currently available in Egypt and despite a vaccine being available for use in Vietnamese catfish, antibiotics remain the treatment of choice due to doubts over vaccine effectiveness (*A. hydrophila* strains are

highly diverse) and the high cost of the vaccine (administered by injecting individual sedated fish). The widespread use of antibiotics within farms can encourage antimicrobial resistance, reducing the treatment options for both fish and human infection. Through a collaboration of scientists from Vietnam, Egypt and the UK we plan to test the efficacy of novel vaccines that can be easily administered (i.e. immersion and oral vaccines), without the need for highly trained personnel and specialist equipment. Such vaccines are urgently needed to help prevent *A. hydrophila* disease outbreaks and reduce antibiotic use in both tilapia and Vietnamese catfish aquaculture.

#### **4) New antigen identification in the African swine fever virus genome through a plasmid DNA library**

Dr. Anna Lacasta (International Livestock Research Institute, Kenya), Professor Susan Rosser (University of Edinburgh, UK) and Dr. Fernando Rodriguez (IRTA-CReSA, Spain)

African swine fever (ASF) is a haemorrhagic devastating pig disease with mortality rates up to 100% caused by African swine fever virus (ASFV). The disease is endemic in Africa but now it is also present in the Russian Federation and other Eastern European countries, becoming a global threat. Currently, there is no vaccine nor treatment and the only countermeasures against ASF are the rapid diagnosis and culling of infected animals. However, in recent years several new approaches in the field of vaccinology have been developed against ASFV. The generation of recombinant attenuated ASFV isolates is a very promising approach, but a subunit vaccine would be a much safer and cheaper approach to vaccination and would pose less constraints for licensing in both scenarios, the European and the African. Previous studies have demonstrated the key role that humoral and cellular response can play in protection and several antigens targeting CD8+ T-cell and antibody response were identified. Unfortunately, none of them or combinations of them were able to protect a 100% of the pigs after ASFV challenge. The tested antigens eliciting an antibody response were immunodominant in the domestic pig sera, and very little is known about other possible subdominant antigens. On the other hand, an exhaustive screening of bushpig and warthog (resistant to ASF) sera was never done before. In this project we propose a comprehensive approach where we will compare the pattern of antibody recognition of domestic pig and wild pig sera using a DNA library encoding the complete ASFV Kenya 1033 genome individually and test their neutralizing capacity. The identified antigens will be susceptible to be included in a future vaccine against ASFV.

## Laboratory Exchange Awards

Laboratory exchange awards of up to £10,000 are available to facilitate transfer of expertise between laboratories in the Network. Calls for laboratory exchange award proposals will be announced intermittently and members will receive a notification via email.

### Awarded Laboratory Exchange Awards (Round 1)

**1) Investigation of novel AB5 toxin from the fish pathogen *Yersenia ruckeri*, a potential mucosal vaccine adjuvant**

Dr. Travis Beddoe (La Trobe University, Australia) and Prof Chris Secombes (University of Aberdeen, UK)

**2) Genomic analysis of antigenic diversity in Brazilian *Trypanosoma vivax* strains**

Dr. Guilherme da Costa Martins (University of Sao Paulo, Brazil) and Dr. Andrew Jackson (University of Liverpool, UK)

**3) Isolation and molecular characterisation of mycobacterium strains responsible for endemic bovine tuberculosis in Medea, Algeria**

Dr. Mammam Khames (University of Medea, Algeria) and Dr. Sharon Kendall (Royal Veterinary College, UK)

**4) Understanding the role of humoral immunity in vaccine development for *Streptococcus agalactiae* infection in tilapia**

Dr. Mugimba Kahoza Kizito (Makerere University, Uganda) and Prof Kim Thompson (Moredun Research Institute, UK)

**5) Advancing the analysis of bovine class II MHC restricted T cell responses to vaccination**

Dr. Isaac Kombe Silwamba (University of Zambia, Zambia) and Dr. Bill Golde (Moredun Research Institute, UK)

## Outreach Activities

### IVVN African Schools Outreach Programme

The IVVN African Schools Outreach Programme, which **launched on International Women's Day 2019**, is a collaborative initiative between the IVVN, University of Edinburgh, International Livestock Research Institute (ILRI), University of Ibadan, University of Zambia, African Women in Agricultural Research and Development (AWARD), and the African Vaccinology Network (AfVANET). The aim of the programme is to provide women scientists working in veterinary vaccinology across Africa with the training and resources to host schools outreach workshops in their own countries, with the overall goal of inspiring the next generation of scientists. Following a successful planning meeting in January at the **UK & International Veterinary Vaccinology Network Conference 2019**, the IVVN African Schools Outreach Programme project team met at ILRI headquarters in Nairobi, Kenya between 22nd and 25th March 2019. The aim of this second meeting was to train the scientists who will be delivering the programme and to pilot the outreach activity in a secondary school in Nairobi.

### Training Session at ILRI, Nairobi



The 'laboratory in a suitcase' contains all of the components required to deliver schools outreach workshops.

Dr. Nicola Stock and Jayne Quoiani, public engagement professionals from the University of Edinburgh's **Easter Bush Science Outreach Centre (EBSOC)**, delivered the two-day training session, which began with an introduction to the IVVN African Schools Outreach Programme. The group discussed various aspects of public engagement, including the importance of engaging through hands-on science and the benefits for both school students and researchers of getting involved in public engagement projects, and their personal motivations for being involved in the IVVN African Schools Outreach Programme:

*“This project aligns with our passion and vision in life – to reach out to young people to inspire them because they have what it takes to be scientists.”*

*“Having benefited greatly from mentorship before in personal growth and life skills, I am very keen to extend this mentorship to high school students.”*

The group of scientists were introduced to the mobile ‘laboratory in a suitcase’, which contains all of the equipment and reagents required to deliver the outreach workshops. The scientists learned practical tips for teaching groups of students in a classroom including capturing and maintaining students’ attention, positive reinforcement and different presentation styles. The training session concluded with the scientists practising delivery of the schools outreach activity and preparing for its delivery the following week.

### **Pilot Activity at Precious Blood Riruta Girls High School, Nairobi**

After a successful training session, the IVVN African Schools Outreach Programme project team (and laboratory in a suitcase!) visited Precious Blood Riruta Girls High School in Nairobi to deliver the programme for the first time to 40 excited students aged between 15 and 17 years old. The workshop began with students writing down three qualities they associated with being a scientist and, in order to establish the students’ existing scientific knowledge, students were asked two questions: 1) What is a vaccine? and 2) What infectious diseases have you heard of?

Students then put on lab coats, gloves and safety goggles and were introduced to the concept of the experiment and taught how to use a micropipette. The students worked together in groups of four to pipette different volumes of liquid using micropipette instruction cards. After learning how to pipette, the concepts of negative and positive controls were introduced to the students before they performed a “diagnostic test” on mock serum samples from 40 dogs to determine the percentage of dogs in the sample set that had been vaccinated against Rabies. The students successfully identified those dogs that had received a Rabies vaccine and learned the importance of vaccinating animals to protect both human and animal health.

Following the practical work it was time for ‘Meet the Scientist’, which gave the students an opportunity to interact with the scientists delivering the workshop in order to learn more about their career paths and to ask the scientists questions.

Following the experimental session, a partner of the IVVN African Schools Outreach Programme, **AWARD**, hosted a mentorship event led by its Kenyan chapter, KeWARD. Dr. Michelè Mbo’o-Tchouawou, AWARD’s deputy director, began the session by introducing the students to the organisation which has programmes across many African countries. Nora Ndege, Chairperson, KeAWARD, provided an overview of KeWARD. The day concluded with inspirational and motivational talks from Dr. Esther Kaduma, Dr. Beatrice Tuei and Dr. Margaret Lukuyu, three AWARD fellows working in the field of animals sciences and veterinary vaccinology, who highlighted how the students can follow similar career paths and become excellent scientists.

## **Future Direction**

Thank you to everyone who made the first phase of the IVVN African Schools Outreach Programme such a success. Special thanks go to Dr. Nicola Stock and Jayne Quoiani for designing the activity and running the training, ILRI for hosting the training session, the students and teachers at Precious Blood Riruta Girls High School, AWARD for hosting the mentoring session and, most importantly, the inspirational scientists who delivered the programme.

Following on from the success of the pilot project, the IVVN African Schools Outreach Programme will now be implemented in other schools in Kenya and in Nigeria and Zambia – watch this space!

Follow the progress of the project on Twitter [@IntVetVaccNet](https://twitter.com/IntVetVaccNet) and using the hashtag [#InspiringFutureScientists](https://twitter.com/IntVetVaccNet).

Funding for the IVVN African Schools Outreach Programme was provided through the University of Edinburgh's GCRF-Scottish Funding Council allocation for 2018-2019.

**Watch the training and pilot activity highlights video [here](#).**

## Information Dissemination

The IVVN is a central area for dissemination of relevant information to the veterinary vaccinology community via the website, twitter, blog and monthly newsletters.

### Website

This year we launched a new IVVN website, designed by Manta Ray Media, which includes a searchable member's directory and interactive Google map to facilitate the formation of new collaborations. Check it out! [www.intvetvaccnet.co.uk](http://www.intvetvaccnet.co.uk).

### Twitter

Follow the IVVN on Twitter [@IntVetVaccNet](https://twitter.com/IntVetVaccNet) for daily updates from the Network and the veterinary vaccinology community.

### Newsletters

IVVN monthly newsletters provide updates on the activities of the Network and notification of news, events, publications, funding opportunities and training opportunities from the veterinary vaccinology community.

#### Newsletter Archive:

[July 2019](#)

[June 2019](#)

[May 2019](#)

[April 2019](#)

[March 2019](#)

[February 2019](#)

[January 2019](#)

[December 2018](#)

[November 2018](#)

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[March 2018](#)

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[September 2017](#)

Blog

The aim of the IVVN blog is to highlight IVVN member's research. If you would like to take part, please email Carly at [IVVN@roslin.ed.ac.uk](mailto:IVVN@roslin.ed.ac.uk) – we would love to hear from you!

Blog Archive:

[Dr. Brian Bigirwa, Brentec Vaccines](#)

[Afrigen Biologics and Vaccines & Afrivet](#)

[Professor Jacqui Matthews, Moredun Research Institute](#)

[TRANSVAC & VAC2VAC](#)

[Inaugural meeting of the PPR – Global Research and Expertise Network](#)

[Madeleine Clark, The Pirbright Institute](#)

[Professor Gary Entrican, Moredun Research Institute](#)

[Dr. Rebecca McLean, The Pirbright Institute](#)

[EuFMD Open Session 2018: Global Vaccine Security, Borgo Egnazia, Puglia, Italy](#)

[Veterinary Vaccines: A Silver Bullet for Animal Health in Low-and-Middle Income Countries](#)

## Concluding Comments

It has been another fantastic year for the IVVN and we would like to say a huge thank you to all of our members for their continued support. Excitingly, IVVN membership continues to grow and new members are very welcome!

By hosting networking events, providing funding to support IVVN member's vaccine research, promoting veterinary vaccinology through schools outreach activities and disseminating information to the global community, the IVVN hope to continue to work together internationally to improve vaccines for livestock and zoonotic diseases in LMICs.

**Thank you to the MRC, BBSRC and GCRF for funding the Network.**