

# VETERINARY VACCINOLOGY NETWORK

## Veterinary Vaccinology Network Annual Newsletter 2015

### THE NETWORK'S FIRST YEAR

What a fantastic first year for BBSRC funded UK Veterinary Vaccinology Network. We now have over 350 members ranging from PhD researchers, those that work in industry, academics, regulators, policymakers, funders and CEOs of various institutes, including some further afield than the UK.

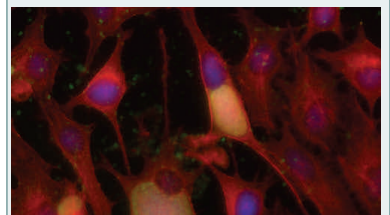
The network has had great support from it's members as well as the Biotechnology and Biosciences Research Council (BBSRC) who simultaneously released the new BBSRC Veterinary Vaccinology Network Strategy 2015-2020.

#### *Multidisciplinary collaborations for the development of innovative Veterinary Vaccines*

The year started with the Network's first annual conference hosted at the ICC in Birmingham in February. Several public engagement events closely followed, whilst the end of the year focused on three veterinary Vaccinology topic specific workshops funded by the network including: Career Development workshop, hosted at the Moredun Institute; Bioinformatics workshop, hosted at The Roslin Institute and an Antigen Discovery and Proteomics of Host immune response workshop hosted at the University of Liverpool.

The network continues to update it's website, twitter page and monthly newsletter with relevant information including recent news, new papers, funding opportunities and Vaccinology events throughout the world.

**Veterinary Vaccinology Network Conference 2016**  
**5th–6th January 2016**  
**Manchester Conference Centre**



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#### SPECIAL POINTS OF INTEREST

- BBSRC Veterinary Vaccinology Strategy 2015– 2020
- Government: UK Vaccine Initiative
- Journal Clubs
- Network Blogs
- Recent publications



## Highlights of the VetVaccNet Conference 2015

### Livestock vaccines in sustainable livestock development and health

Professor Brian Perry

### Viral Vected Vaccines for Veterinary Vaccines

Professor Sarah Gilbert

### Fish Vaccines—A remarkable journey

Professor Patrick Smith

### Fasciola hepatica vaccines - a case study

Professor John Dalton

### Barbevax: the first commercially available sub-unit vaccine for a nematode parasite

Professor David Smith

### Disease and protective immunity in respiratory viral infections

Professor Openshaw

### Novel Tools and Technologies to accelerate vaccine research

Dr Georgina Dury

### European Commission Perspective on Veterinary Vaccines

Dr Jean-Claude Cavitte

### Veterinary Vaccines R&D—A commercial perspective

Dr Michael Francis

### Economic Impact of Disease Control— Veterinary Vaccination Strategies

Professor Jonathan Rushton



## UK VETERINARY VACCINOLOGY NETWORK CONFERENCE 2015

### Launch Meeting of the Veterinary Vaccinology Network

The first meeting of the BBSRC UK Veterinary Vaccinology Network was held at the ICC in Birmingham on 16-17 February 2015. The meeting was organised around four themes comprising: (1) Epidemiology and Economics; (2) Novel Tools and Technologies; (3) Protective Immunity; and (4) Immunogen Design. The meeting was attended by 130 delegates from a wide variety of backgrounds including academia/research institutes, veterinary pharma/private sector and funding bodies. The invited speakers also represented these backgrounds and gave expert and diverse perspectives on the successes and future challenges of both veterinary and human vaccinology.

The talks were interspersed with breakout sessions in the form of 'Case Studies' based on selected talks. In these sessions, smaller groups of delegates were encouraged to discuss opportunities, barriers to progress and potential solutions relating to specific areas of veterinary vaccinology. Rapporteurs were identified for each group with the purpose of capturing the key discussion points and reporting these back to the collective delegation in the form of one slide. The breakout sessions provided an excellent opportunity for the delegates to interact in an informal setting and generate ideas to progress vaccine development. They also helped the Network Co-ordination Group identify topics for further meetings/workshops and indicated to funders of gaps in capability and how these might be addressed.

The programme of the meeting can be found at [here](#) and a copy of the presentations can be found on the [highlights of the Veterinary Vaccinology Network Conference 2015 page](#).



Across the four major sessions of the meeting some common themes emerged:

Vaccination is one component of disease management and comes at a cost. The development and implementation of vaccines should be evaluated on a cost-benefit analysis. Several examples were provided where the evidence-base for vaccination in disease prevention and control was very strong.

Control of disease in animals has a positive impact on global economies and human health in multiple ways: reducing zoonotic infections, reducing greenhouse gas emissions, improving food security and enhancing food safety;

Prevention is better than cure and vaccination is a desirable and sustainable alternative to the use of antibiotics and antihelminthics. The impact of vaccination on reducing antibiotic usage was shown very succinctly in aquaculture. This not only reduces the likelihood of antibiotic resistance developing, but also reduces the likelihood of antibiotic residues in food animals and the environment.

The 'low hanging fruit' for vaccine development has gone and empirical 'trial and error' approaches to vaccine design have been exhausted. We now need creative and concerted efforts between epidemiologists, structural biologists, chemists, bioinformaticians, immunologists, social scientists, industry and regulatory authorities in consultation with stakeholders to develop the next generation of deployable veterinary vaccines.

Finally, there was a very notable and perceptive 'buzz' throughout the meeting between delegates. There are very positive and clear indications that the Network is providing a forum that promotes inclusive and inter-disciplinary discussions on veterinary vaccinology for scientists, industry and funders and by nourishing these interactions we should improve animal health and welfare, food security and economies at a national and international level.

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## BBSRC Veterinary Vaccinology Strategy

2015– 2020



World-leading BBSRC-supported bioscience research will transform the development and translation of next generation veterinary vaccines to improve animal health and welfare, reduce the impact of zoonoses on public health and strengthen the UK as a centre of excellence for veterinary vaccine research and development.

The strategy will focus on three main goals to enable prevention/eradication of diseases and maintenance of disease free status to sustainably increase productive and address welfare issues:

- To address current 'unmet' needs by developing vaccines for both endemic and exotic diseases which are not yet controlled by vaccination through advancement in underpinning bioscience knowledge
- To improve current vaccines by developing novel tools and technology platforms that will help produce vaccines that approach the "ideal" as closely as possible

To prepare for future threats by empowering the research community with innovative technological and immunological platforms to deliver a step change in vaccinology research, enabling a rapid response to emerging threats.



Dr John Schwartz, Post-doctoral researcher, The Pirbright Institute (and Dolly the Sheep!)

## BIOINFORMATICS WORKSHOP 26TH OCT

On 26th October 2015 the BBSRC Veterinary Vaccinology Network hosted a Bioinformatics workshop at The Roslin Institute, Edinburgh. The workshop was attended by over 50 delegates from a variety of organisations around the UK and the USA. This workshop was held after a joint US-UK Funders and Research workshop hosted in Washington earlier on in the year had established the need for further collaborative discussions on applying bioinformatics to veterinary vaccinology. The aim of this workshop was to understand what is currently being worked on, what resources are currently available, highlight gaps in current knowledge and resources, and ultimately identify future research priorities.

Dr John Hammond, The Pirbright Institute opened the workshop by discussing the potential of functional genomics to improve animal health, setting the scene for the day. The workshop identified several aims including identifying pipelines and sharing methods within bioinformatics applicable to comparative and veterinary immune research.

### *Applications of studying bioinformatics in veterinary vaccinology were highlighted:*

*Response to vaccination v natural infection*  
*Tissue or cell specific interactions*  
*Markers or correlates of protection*  
*Splice variation*

Dr. Hammond's presentation led on to discussing the importance of characterising variable immune gene complexes including repetitive immune gene complexes, highlighting research on KIR and MHC genes. Dr Hammond emphasized that at present the human genome is used as a gold standard for research and there remains many gaps in livestock genome assembly and annotation. The variable genes associated with reproduction and the immune system represents a major challenge. Further research should consider the quality of reference genomes used.

Dr Tim Connelley, The Roslin Institute outlined T cell receptor repertoire analysis identifying new bioinformatic programs including miTCR and MIGEC whilst a complementary presentation from Dr Anna Fowler, University of Oxford focused on collaborative work with The Pirbright Institute on analysing antibody repertoires in the absence of a germline sequence. Dr Adaikalavan Ramasamy provided a background on the transcriptomics facility based at Jenner Institute based at the University of Oxford and described current research on the analysis of immune function during vaccination.



## BIOINFORMATICS WORKSHOP CONT.

The workshop also included presentations from scientists from the United States Department of Agriculture Animal Research Service. Dr Tim Smith, US Meat Animal Research Centre discussed the use of improving reference genomes with long read length sequencing methods including strategies to counteract assembly issues using hybrid strategies, piecing short reads together. Dr Derek Bickhart took this discussion further by discussing optical mapping technologies used with PacBio-based assemblies whilst Dr Tyler Thaker provided an overview of the work his research group have conducted on transcriptomic analysis of TB infection in cattle.

The final three presentations were conducted by researchers from The Roslin Institute, Dr Tom Freeman, highlighted network based analysis and visualization of biological databases. Notably [www.biolayout.org](http://www.biolayout.org) and [www.virtuallyimmune.org](http://www.virtuallyimmune.org) which includes a model of the influenza A life cycle and host defense systems. Integrating omics data between host and parasites were discussed by Dr Tom Michael.

The final presentation of the workshop was presented by Dr Mick Watson who provided an overview of the recently established FAANG network (Functional Annotation of Animal Genomes Network). [@faangomics](http://www.faang.org). Dr Watson highlighted the aims of the network which includes standardising:

- Bioinformatic pipelines
  - Pre-publication sharing of data
- Before ending with a comparison of different transcriptomic mapping strategies, highlighting problems and potential solutions.

The workshop provided a platform to map out the current research in bioinformatics and will hopefully enable more joined up, collaborative approaches with regard to future research in the area.

Special thanks go to the staff at the Roslin Institute for supporting the workshop.



### THE ROSLIN INSTITUTE

- Top-class basic and translational science to tackle some of the most pressing issues in animal health and welfare
- Implication for human health
- Role of animals in the food chain
- Established in 2008 it is based at the University of Edinburgh's Veterinary Campus at Easter Bush
- The institute provides holistic solutions to global challenges in human and veterinary medicine and the livestock industry



THE MOREDUN  
INSTITUTE

- The Moredun Foundation was established in 1920 and is dedicated to the improvement of animal health and wellbeing through research and education at Moredun Research Institute.
- The Institute is based outside of Edinburgh at the Pentlands Science Park.
- The Moredun Scientific is an institute affiliated company that commercially sponsors some of the research carried out at The Moredun Institute.



## CAREER DEVELOPMENT WORKSHOP 27TH OCT 2015

The BBSRC UK Veterinary Vaccinology Network held a workshop at Moredun Research Institute on 27 October 2015 for early-career scientists in veterinary vaccinology. The workshop was attended by 19 delegates from a variety of organisations from all over the UK. The event evolved in response to feedback from the first BBSRC UK Veterinary Vaccinology Conference in Birmingham in February, where a gap was identified in training specifically geared towards veterinary vaccinology. The programme of the workshop reflected this, with presentations and discussions on grant writing, funding opportunities, career development and the practical aspects of veterinary vaccines to meet the needs of the agricultural industry.

The workshop opened with a presentation by Tom Wileman (University of East Anglia) giving his perspective on the fundamental 'do's and don'ts' of grant writing. Tom has been a long-standing Introducing Member on BBSRC Committees and has extensive experience of the grant review process. He emphasised the importance of clarity, making sure that the research plan addresses the hypothesis and aims, and ensuring that the impact plan is specifically related to the research activities of the grant application. Tom also produced a short prototype grant application for the delegates to work on together to help them recognise the strengths and weaknesses of grant applications. His talk was complemented by presentations by Alexandra Spittle (BBSRC) and Matt Thakur (Wellcome) who gave the funders perspective on grant applications. They highlighted the funding streams that are targeted towards early-career researchers and how these can serve as platforms for career development towards being an independent Principal Investigator.

Willie Donachie (Moredun) talked about his career from his first degree, through his PhD as part of his employment and the identification iron-regulated proteins as potential vaccine candidates to protect against bacterial pneumonia in ruminants. Willie discussed the importance and challenges of protecting intellectual property when commercialising a prototype vaccine and explained how external factors that are outwith the control of researchers can create unforeseen hurdles. Jennie Batt (Larkmead Veterinary Practice) gave the final presentation of the day, describing her experiences of vaccination to improve productivity in pig farming. Jennie identified the key factors that she perceived to be important for new vaccines that will be fit for purpose.

## CAREER DEVELOPMENT CONT.

These were not specific to pig farming but have broad relevance for veterinary vaccinology, namely to reduce the regulations on combination vaccines, to support research into the refinement of delivery methods, to identify protective antigenic components for the disease in questions and to create gene-deleted vaccines that allow discrimination between infected and vaccinated animals (DIVA). She also highlighted the practical and economic aspects of vaccines and how these are equally as important as basic scientific elements to allow commercial adoption. This brought the presentations full circle from the grant writing to recognising stakeholder relevance and impact which are criteria by which funding applications are judged.

In addition to the presentations there was a Q&A session with Tom Wileman, Willie Donachie and Gary Entrican (Moredun and Member of the BBSRC UK Veterinary Vaccinology Steering Committee) on the factors that make a good grant application. There was also a speed-networking session where the delegates had the chance to interact with each other and make links that will hopefully translate to high-quality funding applications by the next generation of veterinary vaccinologists.

Presentations can be found within [Vaccinology Resources](#)



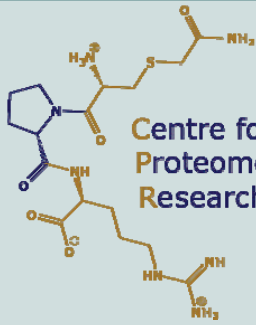
## USEFUL RESOURCES

[How to write a Grant pdf](#)—Professor Tom Wileman, University of East Anglia

[The Wellcome Trust Funding Opportunities pdf](#)—Dr Matthew Thakur and Dr Phil Price, The Wellcome Trust

[How to Win a Grant—a Funding Bodies Perspective pdf](#)—Dr Alexandra Spittle, BBSRC





Centre for  
Proteome  
Research

CENTRE FOR PROTEOME  
RESEARCH

- Centre which focuses on the application of proteomics and analytical mass spectrometry to the analysis of biological systems.
- Global quantitative proteome profiling
- Proteome-wide analysis of protein turnover
- Positional proteomics
- Discovery and comparative proteomics in a range of systems



Cosmin-Chintoan-Uta presenting his 'Dragon's Den pitch' Antigen Discovery Workshop



## ANTIGEN DISCOVERY AND PROTEOMICS OF HOST IMMUNE RESPONSE WORKSHOP

18TH NOVEMBER 2015, UNIVERSITY OF LIVERPOOL

On 18th November the BBSRC Veterinary Vaccinology Network co-hosted an Antigen Discovery and Proteomics of the Host immune Response workshop with Professor Rob Beynon at the University of Liverpool. The workshop was attended by 24 delegates from a variety of organizations around the UK. This workshop was held after suggestions made at the UK Veterinary Vaccinology Network Conference 2015.

The aim of this workshop was to provide attendees with an understanding of what current research and techniques are being used for Antigen Discovery and Proteomics of the host immune response. This included presentations from Dr Alasdair Nisbet, The Moredun Institute, Professor Julian Hiscox, University of Liverpool and Dr David Matthews, University of Bristol.

Dr Alasdair Nisbet introduced the subject by discussing parasite vaccine antigen discovery – rational, pragmatic and common-ground approaches. This included research on Poultry Red Mite Vaccine Development as a pragmatic approach to vaccine discovery followed by a rational approach developing a vaccine to *Teladorsagia circumcincta*.

Professor Julian Hiscox discussed high resolution approaches in the recent Ebola outbreaks, analysing protein abundances of Ebola and their interaction with the host as part of the European Horizon 2020 EVIDENT Program. Using techniques such as Mi-Seq to analyse genetic changes of the Ebola virus over time, Results also highlighted the underreporting of Malaria in the region.

Dr David Matthews presented on tools used in proteome analysis, including deep sequencing of the transcriptome to refine the proteome. Here, David discussed SILAC approach using Adenovirus as a model as well as the cloud-based system Galaxy which enables integration of omics data.



The workshop also included a tour of the centre for proteomic research and centre for genomic research at the University of Liverpool. The centre for Proteome research was established by Professor Rob Beynon in 2000. The facility operates 14 mass spectrometry platforms that support a wide range of techniques. The Centre is run under the University of Liverpool's Technology Directorate and it's specialized staff also offer full consultancy and support in the use of the techniques available at the centre to ensure the best quality data is gained from such equipment. The tour provided a brief overview of how proteomics and genomics could be applied to different research areas.

The workshop concluded with a Dragon's Den session awarding a prize to complete a proteomics study that will be conducted at the centre for proteome research in Liverpool. Participants had 5 minutes to present their research idea for using the Centre of Proteome research to a panel of judges after which a 5 minutes Q&A session was instigated.

The candidates were asked to describe the question they wish to pursue, the hypothesis, study design and the type of proteomic analysis they wish to conduct.

The winner was Cosmin Chintoan- Uta from The Roslin Institute, who will use the Centre for Proteome Research to carry out research on Histomonas in Turkeys and Chickens, analysing the outermembrane for surface targets and therefore identify prime candidates for vaccine development.



Picture 1. From the left: Prof. Julian Hiscox, Dr Alasdair Nisbet, Dr Pip Beard, Dr David Matthews 'Dragon's Panel'

Picture 2. Dr. Darren Leneghan presenting his 'Dragon's Den pitch' Antigen Discovery Workshop, University of Liverpool

## CENTRE FOR GENOMIC RESEARCH

- Facilitates cost-effective access to multiplatform sequencing and array technologies for researchers worldwide
- The centre is equipped with state-of-the-art next generation and 3rd generation sequencing platforms.
- The centre also includes robotics, sequence capture and array capabilities
- The centre offers optimum tailor-made solutions across a wide range of biological applications.
- Mission: the centre of a non-for-profit service provider for the global research community, combining a wealth of experience and expertise with cutting edge technologies in genomics and bioinformatics.

## Journal Club

As part of the network early career vaccinologists have collaborated together to run virtual video conferencing journal clubs throughout the year.

**'Structural basis for epitope masking and strain specificity of a conserved epitope in an intrinsically disordered malaria vaccine candidate'** Morales et al. 2015 *Nature*—hosted by Dr Alexander Corbishley, The Roslin Institute

**'Deliberate reduction of hemagglutinin and neuraminidase expression of influenza virus leads to an ultraprotective live vaccine in mice'** Yang et al. 2013 *PNAS*—hosted by Dr Andrew Broadbent, The Pirbright Institute

## BSGCT: VACCINES AND INFECTIOUS DISEASES DAY

As part of the Oxfordshire Science Festival, the Jenner institute in collaboration with the British Society of Gene and Cell therapy, the British Society for Immunology and NIHR BRC hosted a Vaccines and Infectious Diseases day at the Oxford University of Natural History on 6th March 2015.

This one day event hosted a range of fantastic presentations from high profile vaccinology speakers. Aimed at GCSE and A level students, presentations ranged from an introduction to immunity and infection as well as novel vaccines for Malaria, TB and Meningitis and a guest lecture from Professor Peter Piot, co-discoverer of the Ebola Virus.

The day was a great success, providing an opportunity for the public to discuss and debated cutting edge research with scientists, patients, research students and clinicians/nurses and to consider the impact that vaccine and infectious disease research has on society.

The Veterinary Vaccinology Network, The Pirbright Institute and Jenner Vaccine Trials were among many of the exhibitors dotted around the museum and allowed the chance for students and the public to discuss topics within Vaccines and Infectious Diseases as well as play host to hands-on activities

including DNA origami, making your own Foot and Mouth Disease virus and guess the disease.

**The event provided a fantastic opportunity to inspire young scientists and for them to learn more about the range of perspectives and career paths that Vaccines, Infectious Diseases and science in general have to offer.**



Madeleine Clark, Veterinary Vaccinology Network Coordinator at BSGCT: Vaccines and Infectious Diseases Day, Oxford

## SSERCMEET IMMUNOLOGY

Professor Gary Entrican, The Moredun Institute participated in an online webcast for Scottish School Teachers organized by the Scottish Schools Education Research Centre on 25<sup>th</sup> march 2015 (<http://www.sserc.org.uk/>). The activity was attended by over 20 schools. The objective was to assist teachers with elements of immunology, vaccination and health that appear in the Higher Biology syllabus. <http://www.vetvaccnet.ac.uk/about-us/outreach-and-education>

## NETWORK BLOG

Interested in communicating your science research to a wider audience? The UK Veterinary Vaccinology Network hosts a blog page on its website aimed at providing interesting articles on Vaccinology research to a wider audience including the general public. <http://www.vetvaccnet.ac.uk/blog>



*Dr Bryan Charleston, Chairman of the Veterinary Vaccinology Network at the Veterinary Vaccinology Network Conference 2015, Birmingham*

## UK VACCINE INITIATIVE

In June 2015 the UK Prime minister set out plans for how the UK will step up its efforts to combat the outbreak and spread of deadly viruses.

- UK Drug Development is to focus on the most threatening diseases with additional investment from the private and research sector.
- A UK Vaccines Research and Development Network is to be established
- More transparency and greater co-operation will be required for clinical trials and disease control operations in the UK. This will include publication of all clinical trial results for vaccines.

A Rapid Reaction Unit will be established to be on permanent standby: to be deployed and respond to disease outbreaks.

The spending review has noted that it will invest a further £90 million in the UK Vaccines Network up to 2020 to total £110 million.



## Recent Publications from UK Veterinary Vaccinology Members

[Oral application of freeze-dried yeast particles expressing the PCV2b challenge in vivo](#)

Patterson, R., Eley, T., Browne, C., Martineau, HM and Werling, D.

[Vaccination with a live multi-gene deletion strain protects horses against virulent challenge with Streptococcus equi.](#)

Robinson, C., Heather, Z., Slater, J., Potts, N., Steward, KF., Maskell, DJ., Fontaine, MC., Lee, JJ., Smith, K and Waller, AS.

[Structure-based energetics of protein interfaces guides foot-and-mouth disease virus vaccine design](#)

Kotecha A, Seago J, Scott K, Burman A, Loureiro S, Ren J, Porta C, Ginn HM, Jackson T, Perez-Martin E, Siebert CA, Paul G, Huiskonen JT, Jones IM, Esnouf RM, Fry EE, Maree FF, Charleston B, Stuart DI.

[Optimizing the Protection of Cattle against Escherichia coli O157:H7 Colonization through Immunization with Different Combinations of H7 Flagellin, Tir, Intimin-531 or EspA](#)

McNeilly TN, Mitchell MC, Corbishley A, Nath M, Simmonds H, McAteer SP, Mahajan A, Low JC, Smith DG, Huntley JF, Gally DL.



## UPDATE THE NETWORK ON YOUR

### RECENT PUBLICATIONS, NEWS AND EVENTS

- The network website and newsletter needs your input.
- Do you have any news that the Veterinary Vaccinology Community would be interested in hearing?
- Do you have any recent publications you would like promote on the network website?
- Are you hosting a Vaccinology associated event in 2016 that may be of interest to network members?

If yes, please notify Madeleine Clark at:

[enquires@vetvaccnet.ac.uk](mailto:enquires@vetvaccnet.ac.uk)

who will be happy to publish your information.

### UK Veterinary Vaccinology Network The Pirbright Institute

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## UK VETERINARY VACCINOLOGY NETWORK

### Background

The UK Veterinary Vaccinology is a five-year grant funded by the Biotechnology and Bioscience Research Council (BBSRC).

The Veterinary Vaccinology Network is a multidisciplinary community who aim to address the unmet needs in veterinary vaccinology, continuing in the fight against animal diseases and consequently those that have the potential to spread to humans. The network aims to enhance collaborations between scientific researchers, industry, policy makers and regulators to design, develop and deliver safe and effective next-generation vaccines against new and (re)-emerging diseases.

Along with other activities, the network is able to fund topic specific workshops proposed by members of the network throughout the five years. If you are interested in proposing a topic specific workshop in the future please email a one-page proposal to the network email address at [enquiries@vetvaccnet.ac.uk](mailto:enquiries@vetvaccnet.ac.uk).

### The Veterinary Vaccinology Network Activities

#### The Vision

To foster a multi-disciplinary community to enhance the development and uptake of novel tools and technologies as well as address the “unmet” needs in protective immunity in the field of veterinary vaccinology.

#### Activities

- Scientific Topic Specific Workshops
- Network Members Directory
- Public Engagement Events
- Annual Veterinary Vaccinology Conference
- Career Development Opportunities
- Research Paper Depository
- Research Blog
- Newsletter
- latest news in Vaccinology

