Toward Rabies Elimination in Asia-Pacific

- From Theory to Practice

September 25-26, 2019

Bangkok, Thailand

สถาบันวัคซีนแห่งชาติ
National Vaccine Institute

Co-organized by IABS and NVI

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About the Conference

The meeting aims at snowballing efforts and achieving substantial progress in rabies control in the Asia-Pacific region of the world in the near future. As the key focus is placed on canine rabies the meeting will be an important contribution to the initiative of the United Against Rabies collaboration of the World Health Organization (WHO), World Organisation for Animal Health (OIE), Food and Agriculture Organization of the United Nations (FAO), and Global Alliance for Rabies Control (GARC) of ending human dog-mediated rabies by 2030. Recognized international and local experts will give insights into state-of-the art intersectoral One Health approaches, standards, available tools and guidelines developed by international organizations and institutions and best-practice examples from the region on how to prevent human rabies by eliminating rabies at its animal source. As such the meeting provides a platform for health and veterinary services, managers of national and local rabies eliminations programs, researchers and other people interested in advancing knowledge of rabies surveillance, prevention and control, to meet each other, to share their experience and also to discuss challenges to overcome. The meeting is considered to be a starting point for a continuous professional exchange on the way to a rabies free Asia-Pacific.

Scientific & Organizing Committees

SCIENTIFIC COMMITTEE

Dr. Nakorn Premsri, National Vaccine Institute, Thailand
Dr. Karoon Chanachai, Department of Livestock Development (DLD), Thailand
Dr. Thomas Müller, Chair, Friedrich-Loeffler-Institut, Germany
Dr. Conrad Freuling, Friedrich-Loeffler-Institut, Germany
Dr. Bernadette Abela-Ridder, World Health Organization, Switzerland
Dr. Ivana Knezevic, World Health Organization, Switzerland
Dr. Gregorio Torres, World Organization for Animal Health (OIE), France
Dr. Katinka de Balogh, Food and Agricultural Organization of the UN (FAO), Italy
Dr. Carmen Jungbäck, International Alliance for Biological Standardization (IABS), Germany
Dr. Gowri Yale, Mission Rabies, India
Prof. Louis Nel, Global Alliance for Rabies Control, South Africa
Dr. Ryan Wallace, Centres for Disease Control and Prevention, U.S.A

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Scientific Program

Tuesday, September 24, 2019

Speaker Abstracts begin on Page 10

17:00 **Registration**

Day 1 Wednesday, September 25, 2019

8:00 **Registration**

Opening session

Chairpersons: **Dr. Nakorn Premsri,** National Vaccine Institute, Thailand
Dr. Joris Vandeputte, President, International Alliance or Biological Standardization
Dr. Cheerasak Pipatpongsopon, Department of Livestock Development, Thailand
Dr. Suwannachai Wattanayingcharoenchai, Department of Disease Control, Thailand

9:00 **Welcome remarks**

Session 1 - Canine Rabies Control

Chairpersons: **Dr. Gowri Yale,** Mission Rabies Office, India
Dr. Karoon Chanachai, Department of Livestock Development, Thailand

10:00 Global Strategic Plan for the elimination of dog-mediated human rabies
Prof. Louis Nel, Global Alliance for Rabies Control (GARC), South Africa

10:20 Fighting rabies by vaccinating dogs – fundamental principles and setbacks
Dr. Katinka de Balogh, Food & Agriculture Organization, Italy

10:40 Morning tea break

11:10 Rabies control: experiences from Latin America
Dr. Victor Del Rio Vilas, University of Surrey, United Kingdom

11:30 Tools for eliminating dog-mediated human rabies through mass dog vaccination campaigns - example Haiti
Dr. Ryan Wallace, Centers for Disease Control and Prevention (CDC), U.S.A.

11:50 Dog rabies control in India
Dr. Abdul Rahman, Commonwealth Veterinary Association, India

12:10 Thailand's experience in controlling dog rabies
Dr. Pranee Panichabhongse, Department of Livestock Development, Thailand

12:30 Planery discussion
All speakers

13:00 Lunch break

Scientific Program

Session 2- Oral Vaccination of Wildlife and Dogs

Chairpersons: **Dr. Ryan Wallace,** Centers for Disease Control and Prevention (CDC), U.S.A.
Dr. Katinka de Balogh, Food & Agricuture Organization, Italy

14:30 Oral vaccination of wildlife: an overview
Dr. Thomas Müller, Friedrich-Loeffler-Institut, Germany
Dr. Conrad Freuling, Friedrich-Loeffler-Institut, Germany

14:50 Oral vaccination against rabies; what prevents us from doing so?
Dr. Ad Vos, CEVA Santé Animale, Germany

15:10 Specific aspects with oral vaccines to be used in dogs and various species
Dr. Miia Jakava-Viljanen, European Medicines Agency, The Netherlands.

15:30 A model for quantifying the risk of human and animal adverse events following environmental distribution of modified live-virus vaccines
Dr. Jesse Blanton, Centers for Disease Control and Prevention (CDC), U.S.A.

15:50 Afternoon tea break

16:30 Oral bait vaccine - need in India ?
Dr. Gowri Yale, Mission Rabies Office, India

16:50 Oral vaccination of dogs against rabies in Thailand: preliminary studies
Dr. Suwicha Kasemsuwan, Kasetsart University, Thailand

17:10 Planery discussion
All speakers

17:45 End of the session

Scientific Program

Day 2 Thursday, September 26, 2019

Session 3- Pre- and Post-exposure Prophylaxis

Chairpersons: **Dr. Thomas Müller,** Friedrich-Loeffler-Institut, Germany
Dr. Conrad Freuling, Friedrich-Loeffler-Institut, Germany

8:30 Pre- and post-exposure prophylaxis in humans – an update
Dr. Charles Rupprecht , LYSSA LLC, U.S.A.

8:45 The R36, a Thailand's post-exposure prophylaxis surveillance system
Dr. Onpirun Yurachai, Ministry of Public Health, Thailand

9:00 PrEP and PEP in Thailand - good practice and latest study
Prof. Terapong Tantawichien, Chulalongkorn University, Thailand

9:15 A community-level, digital, integrated bite case management system in The Phillipines
Anna Charinna B. Amparo, Global Alliance for Rabies Control (GARC), The Philippines

9:30 Is there a rationale to use rabies postexposure prophylaxis in animals?
Dr. Charles Rupprecht, LYSSA LLC, U.S.A.

9:45 Planery discussion
All speakers

10:00 Morning tea break

Session 4- Production and Evaluation of Quality, Safety and Efficacy of Human and Veterinary Rabies Vaccines

Chairpersons: **Dr. Richard Hill,** International Alliance or Biological Standardization (IABS)
Dr. Ronel Abila, World Organization for Animal Health (OIE),
OIE Sub-regional representative

10:30 Provisions for rabies vaccines – the Thai FDA perspective
Mr. Wittawat Viriyabancha, Ministry of Public Health, Thailand

10:50 Regulatory provisions for animal rabies vaccines
Dr. Richard Hill, International Alliance for Biological Standardization (IABS), U.S.A.

11:10 Quality of veterinary rabies vaccines - a producer in vitro approach
Dr. Jacques Lechenet, Boehringer-Ingelheim, France

Scientific Program

11:25 Human rabies vaccines – regulatory requirements
Dr. Heidi Meyer, Paul-Ehrlich-Institut, Germany

11:45 New rabies vaccine regimens: the manufacturer perspective
Dr. Guy Houillon, Sanofi Pasteur, France

12:00 The OIE vaccine bank for rabies
Dr. Ronel Abila, World Organization for Animal Health (OIE), Sub-regional representative

12:15 Planery discussion
All speakers

12:30 Lunch break

Session 5- Research and Innovation in Vaccines and Biologicals: Why Do We Need Something Better?

Chairpersons: **Dr. Charles Rupprecht ,** LYSSA LLC, U.S.A.
Prof. Louis Nel, Global Alliance for Rabies Control (GARC), South Africa

14:00 New human rabies vaccines in the pipeline - experimental use of a recombinant rabies-simian adenovirus vaccine
Dr. Hildegund Ertl, The Wistar Institute, U.S.A.

14:20 Developing chimeric lyssavirus vaccines
Dr. Ashley Banyard, Animal Plant Health Agency, United Kingdom

14:40 Development of an inexpensive, thermostable, plasmid-launched, live-attenuated, recombinant flavivirus-rabies vaccine
Dr. Kai Dallmeier, Katholieke Universiteit Leuven, Belgium

15:00 Panel discussion for sessions 4 & 5
All speakers

Closing of the meeting

Chairpersons: **Dr. Joris Vandeputte,** International Alliance for Biological Standardization (IABS), Belgium
Dr. Karoon Chanachai, National Institute of Animal Health, Thailand

15:45 Summary & Conclusions

16:00 Closing of Conference

16:10 End of Conference

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Upcoming IABS Conferences and Workshops

2019-2020

>> Towards rabies elimination in Asia-Pacific: from theory to practice
September 25-26, 2019 – Bangkok, Thailand

>> Quality of challenge agent
October 22, 2019 – Paul-Ehrlich Institute, Langen, Germany

>> 2nd Next Generation Sequencing for adventitious virus detection in biologics
November 13-14, 2019 – Ghent University, Het Pand, Belgium

>> 2nd Setting Specifications for Biological Products: A Pathway to Harmonization
December 2-3, 2019 – Rockville, Maryland, U.S.A.

>> Non-Animal testing of vaccines – A global congress
December 3-4, 2019 – Bangkok, Thailand

>> 3rd Human Challenge Trials
February 6-7, 2020 – Oxford, United Kingdom

>> IABS 65th Anniversary: A global health conference
February 26-28, 2020 – Lyon, France

>> 5th Cell & Gene Therapy
Q1 – Tokyo, Japan

>> Maintaining the quality of vaccines through the use of references standards
Q2 2020, Canada

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Speaker Abstracts

Bernadette **Abela-Ridder**
World Health Organization, Switzerland

Ronel **Abila**
World Organization for Animal Health, France

Anna Charinna B. **Amparo**
Global Alliance for Rabies Control, The Philippines

Ashley C. **Banyard**
Animal Plant Health Agency, United Kingdom

Jesse **Blanton**
Centers for Disease Control and Prevention (CDC), U.S.A.

Kai **Dallmeier**
Katholieke Universiteit Leuven, Belgium

Katinka **de Balogh**
Food & Agriculture Organization, Italy

Victor **del Rio Vilas**
University of Surrey, United Kingdom

Hildegund **Ertl**
The Wistar Institute, U.S.A.

Conrad **Freuling**
Friedrich-Loeffler-Institut, Germany

Richard **Hill**
International Alliance for Biological Standardization (IABS)

Guy **Houillon**
Sanofi Pasteur, France

Miia **Jakava-Viljanen**
European Medicines Agency, The Netherlands

Suwcha **Kasemuwan**
Kasetsart University, Thailand

Jacques **Léchenet**
Boehringer-Ingelheim, France

Heidi **Meyer**
Paul-Ehrlich-Institut, Germany

Thomas **Müller**
Friedrich-Loeffler-Institut, Germany

Louis **Nel**
Global Alliance for Rabies Control, South Africa

Pranee **Panichabhongse**
Department of Livestock Development, Thailand

Sira Abdul **Rahman**
Commonwealth Veterinary Association, India

Charles **Rupprecht**
LYSSA LLC, U.S.A.

Terapong **Tantawichien**
Chulalongkorn University, Thailand

Wittawat **Viriyabancha**
Ministry of Public Health, Thailand

Ad **Vos**
CEVA Santé Animale, Germany

Ryan **Wallace**
Centers for Disease Control and Prevention (CDC), U.S.A.

Gowri **Yale**
Mission Rabies, India

Opirun **Yurachai**
Thai Minsitry of Health, Thailand

Speaker Abstracts

Bernadette Abela-Ridder

Pre- and post-exposure prophylaxis in humans – an update

Bernadette Abela-Ridder, Kaushi Kanakege (WHO Intern)

Rabies is a neglected zoonotic disease responsible for an estimated 59,000 human deaths annually, affecting mainly the developing economies in Africa and Asia. Deaths due to rabies are preventable through timely and adequate pre (PrEP) and post-exposure prophylaxis (PEP) to people at high risk or comply under WHO category II and III exposures. While previously WHO-recommended rabies vaccine schedules remain acceptable, WHO also recommends newer, shorter vaccine regimens that reduce costs, quantity of vaccine, and number of clinic visits required for both PEP and PrEP. Evidence shows that intradermal (ID) administration of modern intramuscular (IM) rabies vaccines (>2.5IU/IM dose), for either PEP or PrEP, is comparable to IM administration. This cost-effective multi-site ID vaccination is suited for high burden countries. Rabies vaccines and Rabies immunoglobulin (RIG) are considered safe to use in pregnant/lactating women and immunocompromised individuals. Vigorous wound washing with soap, detergent and copious amounts of water should be performed immediately for all exposures. If a limited amount of RIG is available, its allocation should be prioritised for patients with high risk and category III exposures. RIG should be administered only once, preferably at initiation of PEP and not more than 7 days following the first rabies vaccine dose. When the calculated RIG dose is too large to infiltrate around the wound site, WHO no longer recommends IM injecting the remainder at a site distant from the wound. PrEP should only be considered for persons at high risk of rabies exposure such as dog vaccinators, bat handlers and other animal health workers in endemic areas. The PrEP schedules that are now recommended for people in all age groups are (a) 2-site ID on days 0 and 7, or (b) 1-site IM on days 0 and 7. The PEP schedules for immunologically naïve individuals for all age groups include (a) 2-site ID on days 0, 3 and 7 or (b) 1-site IM on days 0, 3, 7 and a final dose between days 14-28. These schedules are considered to have advantages of reducing time, cost, improving adherence/compliance, as well as reducing the volume of patients. Along with partners, WHO is invested in future research on rabies prevention using internationally standardized questionnaires and surveillance to improve cost-effectiveness, programmatic feasibility and acceptability to patients and clinicians.

Speaker Abstracts

Ronel Abila

Speaker Abstracts

Anna Charinna Amparo

A community-level, digital, integrated bite case management system in The Philippines

Anna Charinna Amparo, Sarah Jayme, Maria Concepcion Roces, Terence Scott, Louis Nel

Background - An estimated 23,600 children and 35,400 adults die an agonizing death each year from rabies transmitted by dogs in neglected communities in Africa and Asia. Many millions more live in fear of this fatal disease. Yet rabies deaths are all preventable by access to vaccine for people and dogs.

In The Philippines, there is a national rabies control strategy which invested heavily in over 500 Animal Bite Treatment Centers to provide Post Exposure Prophylaxis to bite victims. In 2017 alone, over 1 million bite victims sought treatment in these centers, yet over 200 deaths per year continue to occur. Dog vaccination campaigns have not stopped rabies transmission and these, along with surveillance of animals, still need to be strengthened.

Challenges - Poor reporting of rabies contributes to poor control efforts, inadequate access to vaccine and continues the vicious cycle of neglect. A lack of accurate and timely rabies data leads to a lack of emphasis on its control. Incomplete reporting of data based on paper records of bite victims and cases collated on an annual basis is not sufficient to design a responsive control strategy that ensures vaccine is always available to treat patients and dogs in the most high-risk areas are vaccinated.

Approach being taken - Facilitating more extensive health worker networks to support and direct resource limited veterinary services could provide a vital intersectoral link and transform the development of cost effective veterinary control of this public health threat. Adapting DHIS-2 platform for disease reporting within a community provides a powerful means to establish an early warning and response system between the medical and animal health sector which can be replicated in other parts of the country as well as in other countries.

Conclusion - This study focuses on the surveillance component by setting up a community-based rabies surveillance system using the One Health Approach, and will try to determine the feasibility and usefulness of such a system in determining the rabies situation in a highly urbanized city.

Speaker Abstracts

Ashley C. Banyard

Developing chimeric lyssavirus vaccines

Shipley, R.[1,2], Selden, D.[1], Wu, G.[1], Wright, E.[2], A.R. Fooks[1,3,4] and Banyard, A. C.[1,2,4]
[1] Wildlife Zoonoses and Vector-borne Diseases Research Group, Animal and Plant Health Agency (APHA), Weybridge-London, UK,
[2] School of Life Sciences, University of Sussex, Falmer, Brighton, BN1 9QG
[3] Department of Clinical Infection, Microbiology and Immunology, Institute of Infection and Global Health, University of Liverpool, Liverpool, UK.
[4] Institute for Infection and Immunity, St. George's Hospital Medical School, University of London, London, UK

Background:

Rabies virus is one pathogen in a genus of 16 distinct viral species are capable of causing rabies disease. The human and animal burden attributed to each lyssavirus viruses is unknown. However, it is understood that current rabies vaccines are only able to elicit a neutralising response to a subset of viruses within the genus.

Material and Methods:

Both pseudotype virus and live recombinant viruses have been utilised to assess the potential for recombinant viruses and glycoprotein presentation in eliciting neutralising responses. Specific sera raised against each lyssavirus have enabled a definition of the minimum requirements needed for a pan lyssavirus vaccine.

Results:

Whilst existing rabies vaccines induce a humoral response that is broadly reactive against phylogroup I lyssaviruses, no protection is afforded against phylogroup II or III viruses. Our data has demonstrated minimal intra or inter phylogroup neutralisation between phylogroup II and III lyssaviruses when assessing all species including the four Lagos Bat Virus lineages. Chimeric G proteins have indicated potential requirements for G functionality.

Conclusions:

The target of eliminating dog mediated rabies by 2030 should not be hampered by infection with non-rabies lyssaviruses in terrestrial carnivores. Existing evidence of infection with a non-rabies lyssavirus suggests that host switching rarely occurs and the risk of an epizootic in animals is negligible. However, approaches to the development of broadly relevant vaccines must be further developed to ensure adequate future provision should infection in humans with the other lyssaviruses become problematic.

Speaker Abstracts

Jesse Blanton

A model for quantifying the risk of human and animal adverse events following environmental distribution of modified live-virus vaccines.

Background: Vaccination of animals is an effective means of protecting human health through the reduction of zoonotic pathogens and protection of agricultural animals. While programs for the parenteral vaccination of most domestic animals are well established, vaccination of wildlife or free-roaming domestic animals (e.g. stray dogs) by the parenteral route remains a challenge. Improving vaccination access to these difficult to reach species is critical considering that >60% of emerging infectious diseases are caused by zoonotic pathogens. The use of oral animal baits containing live-virus vaccines has been a successful model for vaccinating different domestic and wildlife species and against a variety of diseases, including rabies, brucellosis, Lyme disease, bovine tuberculosis, plague, and anthrax. However, the presence of live, replication-competent organisms used in these baits continue to raise concerns for their distribution and unsupervised presence in the environment, particularly where humans cohabitate. Subsequently human risk assessment is a critical process to evaluate oral rabies vaccines and distribution factors before considering large-scale distribution of oral vaccines.

Methods: We mapped possible exposure pathways by which oral vaccination distribution could reslt in the inoculation of people and applied a Markov chain model to estimate the number of severed adverse events resulting from a simulated oral vaccination campaign.

Results: Three oral rabies vaccination campaigns were simulated using: SAD-B19 vaccine in foxes, SAD-B19 in dogs, and SPBN GASGAS in dogs. Risk of SAD-B19 associated human deaths were 19 times higher when distributed among dogs compared to foxes. The model found no human deaths associated with SPBN GASGAS in the simulation.

Conclusions: This model highlighted the safety of third generation rabies vaccines and that it can serve as a platform for standardized approaches to risk assessment of vaccination programs utilizing environmentally distributed live vaccines.

Speaker Abstracts

Kai Dallmeier

Development of an inexpensive, thermostable, plasmid-launched live-attenuated recombinant flavivirus-rabies vaccine

Kai Dallmeier, KU Leuven Department of Microbiology, Immunology and Transplantation, Rega Institute, Laboratory of Virology and Chemotherapy, Molecular Vaccinology and Vaccine Discovery, Leuven, Belgium

Background—Rabies is a devastating disease mainly affecting children and the poorest regions of the world. Its elimination in humans remains a due responsibility for global public health. Rabies elimination has proven feasible in some parts of the world, in particular where the zoonotic reservoir can be targeted. However, it can be questioned whether all tools are available to achieve global elimination. We propose to include routine rabies prophylaxis in children as a possible new paradigm. To that end, we are developing novel potent thermostable vaccines that are affordable, may fit in the standard pediatric immunization schedule and could be deployed at large scale.

Materials & Methods—We developed a vaccine platform called PLLAV (Plasmid-Launched Live-Attenuated Vaccine) that is based on a Bacterial Artificial Chromosome carrying the full genome of the potent and safe live-attenuated yellow fever 17D vaccine (YFV-17D). PLLAV-YF17D can be grown in fermenters at high yield, without the need for complex cellular substrates such as embryonated eggs or primary cells for vaccine manufacture. When administered parenterally (e.g. by needle-free jet injection), PLLAV-YF17D induces protective immunity against viral challenge as demonstrated in several preclinical animal models. Using PLLAV-YF17D as vector and RabG as protective antigen, we engineered PLLAV-YF17D/RabG, a dual plasmid-launched recombinant flavivirus-rabies vaccine. The immunogenicity and efficacy of PLLAV-YF17D/RabG was profiled in different mouse models (interferon-deficient AG129 mice, wild-type Balb/c mice) of yellow fever and rabies virus infection in head-to-head comparison to the two licensed vaccines Stamaril® and Rabipur®.

Results—In AG129 mice, PLLAV-YF17D/RabG induced neutralizing antibodies (nAb) against both, yellow fever and rabies, after a single low µg dose of purified plasmid DNA. Seroconversion kinetics to rabies-specific nAb, as well as the longevity and boostability of humoral responses, were comparable to those achieved using Rabipur® following a two-dose regimen. The live-attenuated YF17D/RabG vaccine virus conferred protective immunity in Balb/c mice against a stringent lethal intramuscular challenge with a rabies street virus isolate.

Conclusions—PLLAV-YF17D/RabG is a plasmid-based thermostable and easy to produce vaccine candidate that can efficiently induce long-lasting protective immunity against two pathogens, yellow fever and rabies. The antigenicity of PLLAV-YF17D/RabG can readily be modified to fit the demand of regional or changing epidemiologies, e.g. conferring protection against other flaviviruses such as the Japanese encephalitis virus, or against emerging lyssaviruses from other phylogroups that are not covered by current rabies vaccines.

Speaker Abstracts

Katinka de Balogh

Fighting rabies by vaccinating dogs – fundamental principles and setbacks

Katinka de Balogh & Yoenten Phuentshok
Food and Agriculture Organization of the United Nations

Background

Rabies is a vaccine-preventable viral disease, which occurs in more than 150 countries and territories and in most parts of the world; dogs are the main source of human rabies deaths. Vaccination of dogs against rabies remains the most cost-efficient way of eliminating dog-mediated human rabies.

Issues

The use of quality vaccines imparting long-lasting immunity and a satisfactory vaccination coverage of dogs remain key for successful control and eventual elimination of the disease. Besides ensuring a reliable cold chain, sufficient quality vaccine and trained vaccinators, mass dog vaccination campaigns require strategic planning and ensuring accessibility of dogs for vaccination. The latter can be specifically a problem in Asia where large number of dogs roam freely without anybody taking responsibility for having them vaccinated.

Proposed actions

Insights into prevailing dog-human relations and the diverse socio-cultural and geographic environments dogs live in should be part of any rabies vaccination strategy development. This includes deciding on central point vs door-to-door vs netting of difficult dogs or a combination of these methods as well between whole country vaccination or a risk based selection of areas to be vaccinated. Timing of vaccination campaigns can also influence success. As often children and especially young boys bring animals for vaccination, timing vaccination campaigns during school holidays has been adopted in several parts of the world. The aim is always to assure the highest dog rabies vaccination coverage with available resources.

Conclusion

Attaining satisfactory dog rabies vaccination coverage through well-designed and sufficiently funded rabies control programmes as well as community engagement are key for the elimination of dog-transmitted human rabies also in Asia.

Speaker Abstracts

Victor J Del Rio Vilas

Experiences from Latin America

School of Veterinary Medicine, University of Surrey, Guildford, UK
Centre on Global Health Security, Chatham House, London, UK

Introduction: The global strategic plan to end human deaths from dog-mediated rabies by 2030 is well underway. Latin American countries (LAC) have gone through four elimination goals in the past 30 years. Against this background, we review and discuss the most relevant challenges LAC faced in their pursuit of the elusive elimination goal, and relate these to the current global objective.

General considerations: The 2030 global plan is supported by the major international agencies and builds on their joint actions across domains, in a truly One Health approach. This is different from the regional programme in the Americas, led solely by the Pan American Health Organization (PAHO). This almost monopolistic approach could have its origin in the predominant role of the Ministries of Health in the delivery of rabies programmes across the region. Although such exclusive regional and country operational model could have simplified the deployment of rabies programmes, it could have also prevented the innovation that comes from the enhanced scrutiny and competition of a multi-sectoral setting. Innovation acquires greater relevance during the frustrating last mile when the declining slopes of case counts in the control phase turn into stubborn flat lines with the occasional spike. This frustration can be compounded by the fact that, despite gains in efficiency due to well-trained processes throughout the life of the rabies programme, or perhaps because of it, ascertainment of progress may require more resource per unit of performance gained. The need for larger volumes of data and analytical power follows.

Conclusions: Although the 2030 plan lists multiple activities, distributed across standard rabies capacities such as surveillance, to facilitate the delivery of a number of catalysing tools and structures to address the multiple challenges ahead, robust prioritisation must follow. The challenge is multi-dimensional in nature, across geographies, time, risks and capacities. To this effect, we will describe a spatial and temporally explicit multi-criteria portfolio solution applied to other threats and settings.

Speaker Abstracts

Hildegund Ertl

New human rabies vaccines in the pipeline - Experimental use of a recombinant rabies-simian adenovirus vaccine

Wistar Institute
3601 Spruce Street, Philadelphia, PA

In spite of the availability of efficacious and safe vaccines, rabies still claims > 55,000 human lives each year. Usually rabies vaccines are given to humans after their exposure to a rabid animal. Pre-exposure vaccination is largely reserved for humans at high risk for contacts with the virus. In most cases, rabies is transmitted to humans by infected dogs. Mass canine rabies vaccination campaigns combined with surveillance programs has led to a decline of human rabies in some but not all countries. Animal vaccination programs can also not prevent rabies transmission by bats, which is common in some Central American countries. More widespread pre-exposure vaccination especially in highly endemic remote areas could be implemented. Current vaccines require multiple dose regimens and they are too expansive to make pre-exposure vaccination cost effective. The development of new rabies vaccines, which are as safe as current vaccines, achieve protective immunity after a single dose and are less costly to allow for mass pre-exposure vaccination of children is thus warranted. This talk will briefly summarize novel rabies vaccines that have undergone clinical testing and then focus on the potential of an E1-deleted chimpanzee-origin adenovirus vector expressing the rabies virus glycoprotein that is scheduled for a phase IA study in the UK followed by a phase Ib study in Tanzania.

Speaker Abstracts

Conrad Freuling

Oral vaccination of wildlife: an overview

Müller, T.[1], Freuling, C.M.[1], Vos, A.[2], Chipman, R.[3]
[1] Institute of Molecular Virology and Cell Biology, Friedrich-Loeffler-Institut, Greifswald-Insel Riems, Germany,
[2] CEVA Santé Animale, Germany
[3] USDA, APHIS, Wildlife Services, Concord, New Hampshire, U.S.A

Introduction: Dog-mediated rabies has been eliminated from the U.S, Canada and Western Europe and as a result rabies management is now focused on wildlife rabies. Various wild meso-carnivores such as foxes, raccoon dogs, raccoons, skunks, coyotes, grey foxes, arctic foxes and mongooses serve as reservoir hosts harbouring several distinct rabies virus variants. With the pioneering development of safe and efficacious modified live rabies vaccines, oral rabies vaccination (ORV) has proven effective in controlling the spread and eliminating rabies at the local, regional and national level.

Challenges OR Issues: Despite notable regional successes in eliminating wildlife rabies in Europe and North America through ORV, the complete elimination of rabies in terrestrial hosts is far from becoming a reality. Raccoon and skunk rabies control continues to present the greatest challenges. Diverse complexities and challenges are commonplace when applying ORV to control rabies in wild meso-carnivores, in particular minimum vaccine titres and species specific baits are needed to induce an optimal protective immune response in different reservoir species. Expanding ORV to more sub-tropical areas like Puerto Rico may prove difficult if the thermos-stability of vaccine baits is compromised.

Proposed Approach, Proposed Solutions: Sustained governmental commitment with adequate funding, inter-jurisdictional collaboration, concerted cross-border collaboration as well as formation of national and local rabies committees and task forces are critical for implementing coordinated ORV programs. Further development and testing of new safe and highly efficacious bait-vaccine combinations that increase the chance for improved delivery and performance in diverse meso-carnivore rabies reservoir species in a variety of habitats under different climatic settings is needed. Devising alternative, large-scale vaccine strategies with an increased cost-benefit-ratio in particular for vast areas in North America, Eastern Europe and Asia where wildlife rabies has gained a broad geographic foothold remain a focus of future research. Optimization of rabies prevention and control strategies should also involve other subjects like cost-effective use of PEP, pet vaccination and targeted rabies messaging to stakeholders and the public to raise awareness and gain additional support for rabies management.

Conclusions: Europe and North America stand as exceptional examples of successful control of wildlife-mediated rabies. However, in the Americas, with the reservoir of RABV also residing in many bat species, a true elimination of wildlife rabies is not feasible at this time and risk-mitigating measures for spill-over infections must be in place. Future direction of wildlife rabies control lies in identifying practical solutions to control wildlife rabies in a range of potential reservoir hosts. Sufficient rabies surveillance in space and time and continued hyper-awareness and sustained vigilance is pivotal to ensure that regions freed from terrestrial rabies are not jeopardised by reinfection.

Speaker Abstracts

Richard Hill

Regulatory Provisions for Animal Rabies Vaccines

International Alliance for Biological Standardization

Background: The historic injection of nine-year-old Joseph Meister in 1885 with rabies virus-infected rabbit neural tissue highlights the history and saga of human rabies post-exposure treatment. This milestone in vaccinology was based, in part, on Louis Pasteur's earlier experiments with rabies in animals.

Issues: Today, regulated rabies vaccines provide one of the most powerful tools in the battle against rabies virus for many wild and domestic animal species worldwide. Although neural-tissue derived vaccines dominated the early market, the advent of safer and more effective inactivated non-nervous tissue culture-based vaccines provided the means to dramatically change the incidence of rabies in domestic animal species. Starting in the 1970s, safe and effective vaccines for wildlife were developed, also changing the incidence of rabies in many different wildlife species. Oral and recombinant-technology vaccines continued to advance rabies control efforts.

Relevant Guidance: Regulatory control systems throughout the world have adapted to the challenge of providing production and testing standards as safer and more effective rabies virus vaccines were developed. This presentation will highlight the primary regulatory considerations for approving animal rabies vaccines as provided by the European Union, the Unites States, and the World Organisation for Animal Health (OIE) and highlight key regional milestones in rabies control that resulted from the availability of quality rabies biologics.

Speaker Abstracts

Guy Houillon

NEW RABIES VACCINE REGIMENS: THE MANUFACTURER PERSPECTIVE

Sanofi Pasteur, Lyon, France

Sanofi Pasteur has longstanding expertise in rabies vaccine production with more than 100 million doses used in over 100 countries. Building on more than 40 years of robust clinical experience, the company is pursuing the investigation of new vaccine regimens as recommended by WHO since 2018. If data are available for almost all vaccine regimens, some documentation may not comply with regulatory requirements, and consequently they cannot be added to the leaflet of licensed vaccines until company data are available. This is currently the situation for some Post-Exposure Prophylaxis (PEP) intradermal (ID) regimens namely IPC (Institut Pasteur Cambodia) or abbreviated Pre-Exposure (PrEP) regimens (day [D]0-D7). In Asia, ID administration of purified Vero cell rabies vaccine (PVRV) is part of country leaflets for PEP since 1996 in mainly Thailand, The Philippines, Vietnam, and Cambodia and the regimen recommended is the Thai Red Cross (T.R.C). There is accumulating evidence that PEP can be shortened to 3 visits in one week without affecting seroconversion rates or immune memory. One of these new regimens is identified as the (4-4-4-0-0) and since 2018, WHO has promoted the (2-2-2-0-0), a shortened TRC regimen identified as IPC. To generate new data and follow WHO recommendation, Sanofi Pasteur has initiated two large Phase III clinical trials which are ongoing. In the first study, 600 patients aged ≤50 years exposed (Category II and III) to suspected rabid animals were allocated into 3 groups: group (G1), 1 week-4 site (4-4-4-0-0) without rabies immune globulins (RIGs); G2, 1 week-4 site with RIGs; and G3, TRC (2-2-2-0-2) with RIGs. Seroconversion rate was assessed by the proportion (%) of vaccinees with RVNA titers ≥0.5 IU/mL measured by rapid fluorescent focus inhibition test (RFFIT) at D14; D90, and every year (Y) until Y5 when a 4 site single day booster was administered. The second study compares either for PVRV and HDCV, in ID and intramuscular (IM) route, the PrEP regimen D0-D7 versus the reference 3 doses D0-D7-D21 in 570 subjects (5 groups). A simulated post exposure (D0-D3) after 1 year will be done to confirm the booster effect. Results from both studies will document new regimens and facilitate their adoption when required by Regulatory Authorities.

Speaker Abstracts

Miia Jakava-Viljanen

Specific aspects with oral vaccines to be used in dogs and various species

European Medicines Agency, The Netherlands

Background—In the EU, vaccines against rabies used for oral administration need to have marketing authorisation and be monitored continuously to ensure their quality, safety and efficacy.

Issues—Oral vaccines are presented as baits attractive to the target species, with a suspension inside containing a live attenuated rabies virus as active substance. The bait may contain a biomarker. Due to the unique method of administration (vaccine released in the habitat of the species), the stability of the bait casing, biomarker and the thermal stability of the vaccine virus are tested. The virus strain has one or more stable genetic markers that discriminates the vaccine strain from other rabies virus strains. The vaccine should be safe for humans, target species and for major endemic non-target species likely to be attracted by the baits. The efficacy of the vaccine should be demonstrated in the target species for at least 6 months after administration of the vaccine bait. Testing that the vaccine potency remains the same in the baits before and after distribution, provides evidence that the vaccine will induce an adequate immune response.

Relevant guidance—In the EU, quality, safety and efficacy of vaccines need to be demonstrated in compliance with Directive 2001/82/EC, and amongst other the Guideline on requirements for the production and control of immunological veterinary medicinal products (EMA/CVMP/IWP/206555/2010) and the relevant monographs of the European Pharmacopoeia. Guidance on quality, safety and efficacy is also available from the World Organisation for Animal Health (OIE) and from World Health Organisation (WHO), and for target animal safety from VICH (Topic GL41). Many of the modern oral vaccines are recombinant products and as such may involve additional regulatory standards applicable to genetically-modified organisms intended for environmental release.

Conclusions—On the scientific evaluation of the marketing authorisation application and monitoring and control of oral vaccines it is important to consider the unique aspects of the vaccine and specific method of administration to ensure that their benefits outweigh their risks.

Speaker Abstracts

Suwicha Kasemsuwan

Oral vaccination of dogs against rabies in Thailand; preliminary studies.

Karoon Chanachai, Tanu Pinyopummintr, Kansuda Leelahapongsathon, Parinya Phawaphutayanchai, Nirut Aiyara , Ad Vos

BACKGROUND - As in many countries in Asia, the large free-roaming dog population in Thailand, inaccessible for parenteral vaccination during central point or door-to-door mass dog vaccination campaigns, hinders the elimination of dog-mediated human rabies. To be able to reach this ambiguous goals, additional cost-effective tools are required. A promising candidate is oral vaccination of dogs against rabies (ORV), which is presently under investigation in Thailand.

MATERIAL AND METHODS - The ORV concept is based on three components; vaccine, bait and distribution system. Here, we will present the results of the first two components; vaccine candidate and a suitable bait that is not only well accepted by dogs but also capable of effective vaccine release in the oral cavity. During bait studies on the campus of the Kasetsart University in Kamphaeng Sean, different placebo baits were offered to free-roaming dogs to determine bait acceptance and - handling. Based on the results of these studies, the boiled intestine bait containing the oral rabies virus vaccine, SPBN GASGAS, was offered to 15 dogs under controlled conditions to test the immunogenicity of this vaccine virus. Ten additional dogs received the same vaccine by direct oral instillation (d.o.i.) and another 10 animals were vaccinated by the parenteral route (s.c.) using a commercial available vaccine (n=10). Furthermore, in 7 cages a naïve contact animal was housed together with a dog offered a vaccine bait. None of the 42 dogs had been vaccinated previously against rabies and tested seronegative prior to vaccination.

RESULTS - It was shown that significant differences existed in bait acceptance and – handling between the bait types investigated (boiled-intestine, egg-flavored and fish meal). A large portion of the free-roaming dog population in this study could be reached by offering the boiled-intestine or egg-flavored baits. The fish-meal bait was poorly accepted and was also not well suited to release the vaccine in the oral cavity. During the immunogenicity study, all dogs vaccinated (bait, d.o.i, s.c.) developed a detectable immune response (ELISA), except one dog that received the oral rabies vaccine by d.o.i. None of the contact animals seroconverted indicating no horizontal transmission of the vaccine virus.

CONCLUSIONS - ORV of dogs in Thailand seems a promising complementary method increasing the vaccination coverage of the dog population to levels needed to break the transmission cycle of rabies among dogs.

Speaker Abstracts

Jacques Léchenet

Quality of veterinary rabies vaccines - a producer in vitro approach

Sigoillot-Claude C, Battaglio M, Fiorucci M, Gillet D, Vimort AS, Giraud Y, Laurent S, Vaganay A, Poulet H.

RABISIN® and IMRAB® are renowned rabies vaccines. Their consistency of quality, safety and efficacy has been fully proven, and these products are trusted worldwide. Under current regulations, potency test requires vaccination of mice followed by rabies challenge, or a serum virus neutralization assay in Ph.Eur..

In the context of the 3R's, Boehringer-Ingelheim Animal Health has developed and validated an ELISA measuring the rabies virus glycoprotein G content and implemented it in EU. The selection of the antibodies, the performance of this ELISA and its relevance as release test have been published (Sigoillot-Claude et al. 2015) and will be briefly presented.

The regulatory pathway to get this test in the release specifications of RABISIN® was successful in EU with only few clarifications (e.g. relationship between challenge in mice and ELISA results) in spite of this being a completely new approach (for rabies).

The main challenge is now with the worldwide acceptance of this full in vitro approach. Several current initiatives in various instances (EDQM, Ph.Eur., VAC2VAC, AhE, US-CVB, NICEATM, AHI) are supportive of better understanding of this approach (known as consistency approach) by all regulators and manufacturers. This should allow the alignment and global acceptance of the BI's ELISA for RABISIN® as well as IMRAB®.

Speaker Abstracts

Heidi Meyer

Human rabies vaccines – regulatory requirements

One of the most important elements in the effective control of human rabies is the use of safe and efficacious vaccines. The first rabies vaccines were produced in mammalian neural tissues over 100 years ago. Due to technological advances in the last century new inactivated rabies vaccines produced in cell culture and embryonated eggs became available, which are still in use today. The use of modern manufacturing processes and the introduction of reduced dosage through intradermal regimens facilitated vaccine access globally and contributed to a significant decrease in the incidence of human rabies. Currently new rabies vaccine concepts are under development such as nucleic acid based vaccines to global supply.

Licensing of a vaccine relies on a robust and consistent manufacturing process and an effective control strategy as well as a clinical development program that permits a risk-benefit assessment of the product in the target population. International guidelines on the quality, safety and efficacy of inactivated rabies vaccines of human use produced in cell culture or embryonated eggs are available through WHO, while no such guidelines for vaccines produced by advanced technologies exist.

This report summarizes regulatory points for consideration on the development of new vaccines and reflects on current discussions on the replacement of the internationally accepted in vivo potency assay.

Speaker Abstracts

Thomas Müller

Oral vaccination of wildlife: an overview

Müller, T.[1], Freuling, C.M.[1], Vos, A.[2], Chipman, R.[3]
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[2] CEVA Santé Animale, Germany
[3] USDA, APHIS, Wildlife Services, Concord, New Hampshire, U.S.A

Introduction: Dog-mediated rabies has been eliminated from the U.S, Canada and Western Europe and as a result rabies management is now focused on wildlife rabies. Various wild meso-carnivores such as foxes, raccoon dogs, raccoons, skunks, coyotes, grey foxes, arctic foxes and mongooses serve as reservoir hosts harbouring several distinct rabies virus variants. With the pioneering development of safe and efficacious modified live rabies vaccines, oral rabies vaccination (ORV) has proven effective in controlling the spread and eliminating rabies at the local, regional and national level.

Challenges OR Issues: Despite notable regional successes in eliminating wildlife rabies in Europe and North America through ORV, the complete elimination of rabies in terrestrial hosts is far from becoming a reality. Raccoon and skunk rabies control continues to present the greatest challenges. Diverse complexities and challenges are commonplace when applying ORV to control rabies in wild meso-carnivores, in particular minimum vaccine titres and species specific baits are needed to induce an optimal protective immune response in different reservoir species. Expanding ORV to more sub-tropical areas like Puerto Rico may prove difficult if the thermos-stability of vaccine baits is compromised.

Proposed Approach, Proposed Solutions: Sustained governmental commitment with adequate funding, inter-jurisdictional collaboration, concerted cross-border collaboration as well as formation of national and local rabies committees and task forces are critical for implementing coordinated ORV programs. Further development and testing of new safe and highly efficacious bait-vaccine combinations that increase the chance for improved delivery and performance in diverse meso-carnivore rabies reservoir species in a variety of habitats under different climatic settings is needed. Devising alternative, large-scale vaccine strategies with an increased cost-benefit-ratio in particular for vast areas in North America, Eastern Europe and Asia where wildlife rabies has gained a broad geographic foothold remain a focus of future research. Optimization of rabies prevention and control strategies should also involve other subjects like cost-effective use of PEP, pet vaccination and targeted rabies messaging to stakeholders and the public to raise awareness and gain additional support for rabies management.

Conclusions: Europe and North America stand as exceptional examples of successful control of wildlife-mediated rabies. However, in the Americas, with the reservoir of RABV also residing in many bat species, a true elimination of wildlife rabies is not feasible at this time and risk-mitigating measures for spill-over infections must be in place. Future direction of wildlife rabies control lies in identifying practical solutions to control wildlife rabies in a range of potential reservoir hosts. Sufficient rabies surveillance in space and time and continued hyper-awareness and sustained vigilance is pivotal to ensure that regions freed from terrestrial rabies are not jeopardised by reinfection.

Speaker Abstracts

Louis Nel

Global Strategic Plan for the elimination of dog-mediated human rabies

Louis Nel
on behalf of the United Against Rabies Collaboration

In 2016 the WHO, OIE, FAO and the Global Alliance for Rabies Control (GARC) joined forces, as the United Against Rabies collaboration (UAR), to develop and coordinate the implementation of a Global Strategic Plan (GSP) to eliminate dog-mediated human rabies by 2030. This GSP (Zero by 300 is country-centric, identifies critical success factors and prioritizes the societal changes needed to reach the elimination goal. It is emphasized that an investment in rabies elimination saves lives and strengthens human health and veterinary health systems. The plan also seeks to minimize duplication and improve efficiencies by pooling resources and developing strong health service networks in order to make the most of limited resources.

The GSP has three fundamental objectives viz: (1) Effective use of vaccines, medicines, tools and technologies (2) To generate, innovate and measure impact and (3) To sustain commitment and resources. To reach these objectives, a pragmatic phased approach to elimination was proposed. The three phases are start-up (2018-2020), scale-up (2021-2025) and mop-up (2026-2030). In the first phase the strategy is focused on building a strong foundation for rabies elimination by preparing and improving normative tools and structures supporting countries to prepare robust, budgeted, effective and sustainable national rabies elimination plans following a One Health approach.

The UAR therefore aims to leverage existing tools and expertise in a coordinated way to empower countries to lead efforts and to support the creation of sustainable institutional capacity to end human deaths from dog-mediated rabies. The UAR endeavors to engage partners across countries and sectors, bringing together public and private development partners and catalysing communities, nations and regions to implement and own the contribution of their own ideals and strategies towards the ultimate elimination of dog rabies.

Speaker Abstracts

Pranee Panichabhongse

Speaker Abstracts

Sira Abdul Rahman

Dog Rabies Control in India

The present estimate of human rabies burden of 20,000 per year is based on a WHO-APCRI national multicentric survey done in 2003 that is now redundant. Since then, the availability of tissue culture vaccines,immunolglobulins,intradermal vaccination, tools for seromonitoring of anti rabies vaccinal antibodies and the overall socioeconomic improvements have led to better rabies awareness.This has shown a remarkable reduction in the human rabies incidence in the isolation/infectious disease hospitals.

The estimated population of stray dogs is about 30 million and pet animals (mostly dogs) is about 10 million. However, information on incidence of dog rabies in India is lacking and the various published reports are contradictory. There is lack of information from rural areas. Dog population figures, both pet and stray, actual rabies virus exposure rates, rabies virus prevalence in dogs or wildlife is lacking. The problem is acute in India because it has not implemented rabies-prevention strategies successfully, be it vaccination or sterilisation of dogs. Earlier attempts to control canine rabies through animal birth control programmes and vaccination have met with limited success mainly due to the haphazard method of implementation.

The National Rabies Control programme started In 2015 as a pilot project to sterilise and inoculate stray dogs in Haryana's Gurugram and Hisar districts was discontinued in December 2016 due to inter-ministerial complications related to funding. Also, no baseline study was done on the number of stray dogs and number of attacks before undertaking the project.

Mass vaccination of dogs is the highly successful method of controlling Rabies in dogs as has been illustrated by Mission rabies in the state of Goa. However, in a vast country like India it is a difficult task. hence the existing vaccination campaigns do not turn out to be entirely successful. If oral rabies vaccines were available, efficiency and vaccination coverage in the free-roaming dog population would benefit rabies control activities.

Several challenges exist for implementing efficient dog vaccination and population management, including accessing a sufficient proportion of the dog population, ensuring the sustainability of interventions and the use of tools that are suitable for the location and resources available. These challenges and potential solutions will be discussed in the presentation.

Speaker Abstracts

Charles. E. Rupprecht

Is there a rationale to use rabies postexposure prophylaxis in animals?

Background-Rabies is uncommon in properly vaccinated animals. All domestic mammalian species at risk of lyssavirus exposure should be vaccinated against rabies. In addition, properly vaccinated animals should receive additional regular future vaccine doses depending upon the demonstrated duration of immunity of each licensed product, and immediate booster vaccination upon subsequent bites from suspect rabid animals.

Challenges-Unfortunately, postexposure prophylaxis (PEP) in the naïve animal subject is controversial. Historically, such animals are either euthanized or placed in quarantine for several months and vaccinated prior to release. No data are available as to the global burden from such actions. As one example, in the U.S.A alone, thoU.S.Ands of unvaccinated domestic species are killed annually due to rabid animal exposure. Opportunities are available for alternative safe and effective management in such cases.

Approach-Within a One Health context, the combined strategy of wound care, infiltration of rabies immune globulin (RIG) and administration of modern rabies vaccine is highly effective as the basis for routine PEP, based upon application in humans. The current development of neutralizing monoclonal antibodies (Mabs) for humans as an alternative to RIG may also be applicable for PEP in the naïve domestic animal. From an ethical standpoint, domestic animals are used as human surrogates now, during the pre-clinical development of biologics and should be considered as relevant recipients in their own capacity, as obvious for other veterinary biologics. Regarding efficacy, passive immunity using virus-neutralizing antibodies (VNA), will protect such animals after experimental rabies virus infection, with or without vaccine, whereas the use of commercial vaccine alone is not effective against severe viral exposure to naïve individuals (just as in human PEP). Concerning health economics, successful administration of a source of VNA would be less expensive than lengthy quarantine or overt euthanasia, especially considering the value of livestock to the small producer and the psychological support provided from the survival of a beloved puppy or kitten, missed at primary immunization. Moreover, given the relatively recent introduction of Mabs for human PEP, similar application to naïve domestic taxa, exposed naturally to a diversity of lyssaviruses, may also be of long-term epidemiological benefit for product evaluation during post-marketing surveillance, to help ensure long term safety under a variety of field conditions.

Conclusions-Just as primary canine rabies immunization was once a heretical topic, so too the modern management of lyssavirus exposure in the unvaccinated domestic animal should be resolvable by the generation of applicable evidence in support of routine PEP in veterinary practice, as comparable to human medicine today, based in part upon both ethical and economic considerations at a minimum.

Speaker Abstracts

Terapong Tantawichien

PreP and PEP in Thailand-good practice and latest study

Division of Infectious Diseases, Department of Medicine, Faculty of Medicine, Chulalongkorn University and Queen Saovabha Memorial Institute, The Thai Red Cross Society, Bangkok, Thailand,10330.

The keys to the success of a substantial reduction of human rabies deaths from 370 reported deaths in 1980 to 15 human deaths in 2010 in Thailand has been because of increasing accessibility to PEP using intradermal regimen improved rabies vaccination, assessing the impact of the vaccination through intensified follow-up of patients exposed to suspected and laboratory-confirmed rabid animals, public education, mass dog vaccination and sterilization programs, and control of stray dogs. Attempts to reduce costs of PEP by lowering vaccine volume and reducing the number of visits have produced several variations on the vaccine regimen. This rationale might also help increase compliance with the complete PEP. In Thailand, one of the most substantial improvements in PEP has been the use of the two-site intradermal regimen (TRC-ID regimen; 2-2-2-0-2-0) with cell-culture vaccine. This TRC-ID regimen is a scientifically rational, highly efficacy, immunogenic, safe and economical vaccination. PEP failures after TRC-ID regimen are exceedingly rare and the cases reported here represent a very small number, compared to the millions of PEPs that are administered in Thailand every year. We also need to continue our effort to make the tools for PEP (more widely available vaccines and immunoglobulins) and health care providers must be better educated regarding wound care and PEP. The safety and cost of vaccination are the prime concerns, the amount of vaccine and the number of clinic visits, in addition to the immunogenicity of vaccination, should be taken into account when choosing the regimen for PEP in Thailand. The shorten PEP regimen as 1-week 4-site intradermal PEP that was able to induce neutralizing antibody well above the accepted protective level of neutralizing antibody titers to rabies virus should be considered for PEP in Thailand. Our unpublished study showed that 2-week intradermal regimen of PEP (ID 2-2-2-2-0) without immunoglobulin induced significantly lower Nab titers than TRC-ID regimen on day 90 after vaccination and our immunologic study of IPC-ID regimen is ongoing, so until now the shorten 1- or 2-week intradermal PEP regimens are not recommended for PEP in Thailand. PreP of Thai population in such rabies hyperendemic areas must be seriously considered and has been shown to be feasible though currently still far to expense. Recognized the risk of children being severely bitten by dogs, Thai pediatricians recommended that rabies PreP be proposed as an optional vaccine for children who are at a higher risk of exposure and live in the worst canine rabies – endemic regions. In order to reduce non-medical expenses such as transportation to the clinics and to increase compliance, PreP is to simplify the standard with the 2-site intradermal pre-exposure regimen of PVRV, 2 visits on days 0 and day 7-21.

Speaker Abstracts

Wittawat Viriyabancha

Regulatory strategies for rabies vaccines: Thai FDA perspective

Rabies is a well-known harmful viral infectious disease for human and other mammals. It could be controlled by its preventive vaccine so called "Rabies vaccine". Thailand has had rabies vaccines to serve in the public health system for the prevention of the disease both in humans and animals. All of the vaccines using in the Thailand have been ensured for the product quality, safety, and efficacy by Bureau of Drug control (BDC), Thailand Food and Drug Administration (Thai FDA), and after drug approval, each batch of the vaccines has to be conducting through the lot release process for ensuring the product quality before entering or using in the country public health system. With many efforts to eliminate the disease from the country, Thailand, however, had an emergency issue due to the rabies outbreak in 2018. Although the quality of the products has been ensured through stringent regulatory process described above, questions regarding to the quality of rabies vaccine in Thailand remained sometimes a public issue. With this reason, BDC has set up strategies in order to promote the national drug security especially on vaccines, and to prevent the issue reoccurring by strengthening the regulatory system for rabies vaccine as well as other medicinal products. The activities for this regulatory system improvement include improving processes necessary to ensure the product attributes with the implementation of quality drug lifecycle management approach, together with the strategy to encourage domestic medicinal product research and development units or industries for developing the medicinal products needed for Thailand public health system. Nonetheless, not only strengthening the regulatory system within Thai FDA itself is concerned, collaboration from other agencies in the network is also vital for the effectiveness for the control and or elimination of the disease in Thailand.

Speaker Abstracts

Ad Vos

Oral vaccination against rabies; what prevents us from doing so?

Introduction – Oral rabies vaccination (ORV) targeted at certain wildlife reservoir species like red fox, coyote, raccoon dog and gray fox have been extremely successful. In many countries, ORV campaigns have led to the elimination of rabies in these species. However, the global rabies burden is predominantly caused by dog-mediated rabies. ORV of dogs has been suggested as a potential complementary tool to mass dog vaccination campaigns by the parenteral route. ORV would not only increase the overall vaccination coverage of the dog population but is specifically targeted at the free-roaming dogs that play a decisive role in rabies transmission.

Challenges – Unfortunately, 30 years after the first WHO Consultation Meeting on ORV of dogs, this promising tool is still not part of established dog rabies control programmes. The major constraints identified for not using ORV of dogs are safety concerns associated with the use of live replication-competent vaccine viruses and conceived high costs.

Proposed approach – Scientific-based evidence from recent experimental - and field studies on safety and cost-effectiveness were able to counter these misconceptions. Hence, additional mass dog vaccination studies including ORV should be implemented in different settings to provide sufficient data for policy makers to integrate ORV in their policy to eliminate dog-mediated human rabies.

Conclusions – ORV offers a possibility to reach dogs inaccessible for parenteral vaccination during mass dog vaccination campaigns. Furthermore, it increases efficiency of campaigns by reducing time and resources required to capture and restrain dogs. ORV also reduces capture stress for dogs and vaccination fatique of the vaccinators. Finally, ORV of dogs as a complementary tool to parenteral vaccination can increase herd immunity to levels required to interrupt the transmission cycle.

Speaker Abstracts

Ryan Wallace

Speaker Abstracts

Gowri Yale

Oral Bait Vaccine, need in India?

G Yale, AD Gibson, J Corfmat, A Vos, V Naik, S Desai, J Atkinson, A King, RJ Mellanby, N Otter, L Gamble, S Mazeri

Introduction: Rabies has profound public health, social and economic impacts on developing countries. In India 98% of human rabies are dog mediated causing an estimated loss of 1.24 Billion USD per year through premature death, bite treatment, loss of labour, livestock losses, post exposure prophylaxis and immunoglobulin .

WHO, OIE, FAO and GARC advocate mass dog vaccination as the most effective strategy to control rabies in endemic countries but this remains challenging to achieve due to large free roaming dog population and high proportion that cannot be readily handled for parenteral vaccination.

In Goa, Mission Rabies and the Govt of Goa established a systematic mass dog vaccination, community education and enhanced surveillance in Goa state from 2014 to 2018 which has resulted in a dramatic decline in human and canine deaths from rabies. The mass vaccination programme vaccinated 107,000 dogs in the 2018 cycle through a combined door-to-door (hand catching) and catch-vaccinate-release (CVR-net catching) approach. This is the first large scale attempt of dog rabies elimination in India.

Challenges/Issues: For successful elimination of rabies, it must be feasible to achieve sustained, high vaccination coverage across all land types. The challenges in CVR method include catching dogs in open areas, dogs becoming vigilant of nets and catchers over time, cost, training, safety of dogs, staff and public on busy roads creates the potential for pockets of low vaccination coverage and therefore regions where sustained endemic transmission may occur.

Furthermore, a short, intensive campaigns have many advantages over a continuous year-round campaigns, with concentration of resources and mass public awareness being of most benefit. To condense the current 12-month campaign in Goa into one month (24 working days) would require 95 teams, 95 trucks and 660 staff, which is not feasible from a recruitment, training and infrastructure perspective.

Proposed Solutions: A cost comparison and feasibility study was conducted in Goa to build evidence towards more efficient vaccination methods for the country. Two methods for the vaccination of dogs that could not be handled for injection were compared in Goa, India; the oral bait handout (OBH) method, where teams of two travelled by scooter offering dogs an empty oral bait construct, and the catch-vaccinate-release (CVR) method, where teams of seven travel by supply vehicle and use nets to catch dogs for parenteral vaccination. Both groups parenterally vaccinated any dogs that could be held for vaccination.

The OBH method resulted in massive human resource savings, as OBH teams were able to vaccinate 32 dogs per person per day, as compared to 9 dogs per person with CVR. Fixed running costs of CVR were four times higher than OBH resulting in reduced cost-efficiency in lower density areas. The OBH method was able to access a significantly higher proportion of sighted dogs at 69% as compared to 58% with CVR.

Conclusions: To achieve the global goal of canine mediated human rabies elimination by 2030 there is an urgent need to scale up mass dog vaccination activities in regions with large populations of dogs that are difficult to access, a situation which is common place in much of India. Oral rabies vaccination may enable the vaccination of free-roaming dogs that are inaccessible o parenteral vaccination and therefore increase feasibility of elimination.

Speaker Abstracts

Opirun Yurachai

The R36, a Thailand's post-exposure prophylaxis surveillance system

Dr. Onphirul Yurachai, D.V.M
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Rabies, the vaccine preventable disease, has been endemic disease in Thailand for more than 100 years. As a result of the rabies prevention and control measure, developed and implemented for at least 3 decades, the rabies situation both in animals and human have been decreasing significantly. From our lesson learn, to prevent death from rabies in human, the dog vaccination should be covered more than 80 percent in dog populations and all victims who bitten from confirmed dog must receive 100 percent post-exposure prophylaxis and timely. Moreover, Rabies has been well-managed in Thailand, with only 46 human rabies deaths between 2010 – 2015. This has largely been achieved through improved access to rabies PEP; currently Thailand provides more than 600,000 PEP treatments annually.

Even though, Human rabies is a notifiable event in Thailand, however, suspected rabies exposures are not. To improve the understanding of rabies exposures, three hospital-based electronic systems were developed, each of which captures related, but different factors. ICD10 is the most commonly used system in Thailand for capturing suspected rabies exposures, but it does not collect characteristics of the exposure or PEP decisions. An Injury Surveillance (IS) system collects more characteristics than ICD10, but is only implemented in 33 hospitals, nationwide. The web-based R36 system was established in 2004 and collects detailed information for all individuals presenting for a suspected rabies exposure, as well as the PEP recommendations and adherence to those recommendations. Its platform collects demographic data of the exposed person, date of exposure, risk factors of the biting animal, severity of the bite, treatment recommended, and adherence to the PEP regimen. R36 is web-based, and can track patient data across any hospital which utilizes the platform; if persons seek care at multiple health centers their data is linked through a unique patient identification number. However, R36 is a voluntary, hospital-based reporting platform that is used by 820 hospitals throughout Thailand.

In the past four years, the number of human rabies deaths in Thailand has dropped to less than 10 cases annually. Over 90% of current human rabies deaths result from PEP non-compliance (did not initiate or discontinued PEP against medical advice). The primary function of R36 is to improve patient adherence to the PEP regimen through real-time electronic tracking of medical provider recommendations and hospital visits for vaccination. However, less than 50% of hospital volunteer to use this system. Thus, given the patient tracking-capacity of the platform and utility for monitoring trends in rabies exposures and PEP adherence, more hospitals should consider utilizing R36. And surveillance evaluation regarding to the system should be conduct to improve the feasibility and simplicity of the reporting system.

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Chari Amparo is the Public Health Research Officer of the Global Alliance for Rabies Control. She received her BS degree in Public Health and Master units in Epidemiology from the College of Public Health, University of The Philippines Manila. Prior to working with GARC, she worked in other surveillance programs for different diseases for elimination or eradication at the Research Institute for Tropical Medicine. She is based in The Philippines and has been involved in different rabies field projects such as the Communities Against Rabies Exposure project and the Evaluation of Animal Bite Treatment Centers. She has co-authored several papers on various rabies projects. She has also helped in the development of the Stepwise Approach towards Rabies Elimination tool. Currently, she is overseeing the setting up of the Community-Based Rabies Surveillance in partnership with the local government in one city in The Philippines.

Biosketch

Ashley C. Banyard; Ph.D.

Head of Rabies Research

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Dr Ashley C. Banyard has over 10 years experience in the lyssavirus field having initiated his career working with morbilliviruses. During his time working with rabies and the lyssaviruses he has led teams that have identified and characterised novel lyssaviruses from both bats and terrestrial carnivores. Studies have centered around defining correlates of protection for the lyssaviruses with a strong interest in generating novel vaccines against the most divergent lyssaviruses and pan-lyssavirus vaccine design. He has published extensively in the lyssavirus field, often being being invited to contribute as an expert in bat lyssavirology, as well as contributing to manuscripts across the broader rabies community. He currently leads the rabies and lyssavirus research team at the Animal and Plant Health agency (United Kingdom) and has a strong interest in viral zoonoses and negative sense RNA viral pathogens in general.

Biosketch

Jesse D. Blanton, MPH DrPH

Head of Rabies Research

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Jesse D. Blanton is an epidemiologist at the Centers for Disease Control and Prevention (CDC) in the National Center for Emerging and Zoonotic Infectious Diseases (NCEZID). He received his DrPH from the University of Georgia in 2017 and his MPH from Emory University in 2003. Dr. Blanton has worked on rabies prevention and control since 2001. He started with the laboratory diagnostics team and worked on vaccine safety and efficacy trials before becoming the national rabies surveillance coordinator at CDC in 2004. His research focuses on the epidemiology of rabies in the United States, control and elimination of canine rabies, evaluation of interventions such as oral rabies vaccinations, and establishment of zoonotic disease surveillance systems. Dr. Blanton has been a member of several advisory groups on infectious disease surveillance, vaccine safety, and national immunization guidelines. In addition, he has participated in several public health response activities including 2009 pandemic influenza, 2014-2015 Ebola in West Africa, 2016 Zika virus in Puerto Rico, and 2018-2019 Ebola in DRC.

Biosketch

Dr. Karoon Chanachai

Senior Veterinary Officer
Chief of the Coordinating Center for Laboratory Network and Veterinary Epidemiology

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Karoon Chanachai received Doctor of Veterinary Medicine degree from Chulalongkorn University, Thailand and Master degree from University of Edinburgh, Scotland. He worked as field veterinarian under Department of Livestock Development (DLD) for 7 years and moved to DLD Central Office. He graduated from 26th batch of Thailand Field Epidemiology Training Program and became one of founders of FETP for Veterinarian (FETPV) after graduation. He experienced in animal disease surveillance control and prevention planning and conducting outbreak investigation in animal. Currently, he is the chief of Coordinating Center of Laboratory-Epidemiology Network, National Institute of Animal Health, DLD and manager of Regional Field Epidemiology Training Program for Veterinarian that shares resources with FETP-Thailand to train veterinarians from Thailand and the region.
For international activities experience, he is Thailand representative of the ASEAN Veterinary Epidemiology Group (AVEG), ASEAN Coordinating Centre for Animal Health and Zoonoses Preparatory Committee and World Animal Health Information System for terrestrial animal disease.

Biosketch

Kai Dallmeier, Ph.D. (Dr. rer. nat.)

Group Leader Molecular Vaccinology and Vaccine Discovery

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Dr. Kai Dallmeier studied molecular biology, microbiology and biophysics at the University of Bremen, Germany and obtained his Ph.D. from the University of Freiburg, Germany for his work on animal models of hepatitis B virus infection. In 2008 he joined the group of Prof. John Neyts at the Rega Institute, University of Leuven (KU Leuven), Belgium (www.antivirals.be), initially focusing on novel therapeutic approaches for neglected tropical diseases caused by flaviviruses such as the dengue, yellow fever and Zika viruses. Currently he is heading the Molecular Vaccinology and Vaccine Discovery group at the KUL Division of Virology and Chemotherapy.

Dr. Dallmeier is inventor of the PLLAV (Plasmid-Launched Live-Attenuated Vaccine) technology that is currently used as platform to develop novel easy-to-produce and thermostable plasmid-based vaccines against neglected and emerging infections such as yellow fever, rabies, Zika and Ebola, in collaboration with more than 20 partnering institutions on four continents. Projects headed and coordinated by Dr. Dallmeier are funded by the NIAID/NIH, EU H2020 program, BMGF, FWO Excellence of Science (EOS) action, Chinese Research Council, Transvac, and KU Leuven IOF and DBOF actions.

Next to his academic and scientific duties, Dr. Dallmeier has been serving as external expert to the European Medicines Agency (EMA) and the Belgium Federal Agency for Medicines and Health Products (FAMHP/FAGG) consulting in the evaluation of new vaccine candidates seeking market authorization.

Biosketch

Dr. Katinka de Balogh

Senior Animal Health and Production Officer

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Dr. Katinka de Balogh was born in the Netherlands and grew up in Latin America. She studied veterinary medicine and obtained her doctorate in tropical parasitology from the Ludwig Maximilian University, Munich, Germany in 1984, specialized in tropical animal production and health in France and in Veterinary Public Health (VPH) in the Netherlands. She worked for over 9 years in diverse positions in Africa where she first encountered rabies cases. In the late 80's, she worked at the World Health Organization in Geneva as part of the VPH team and since 2002 for the Food and Agriculture Organization of the United Nations (FAO) initially in Rome, Italy leading the VPH activities including rabies and as FAO focal point on One Health. As of January 2016, she has taken up the position of Senior Animal Health and Production Officer at the FAO Regional Office for Asia and the Pacific in Bangkok, Thailand where she continues to be the focal point for rabies and FAO/OIE/WHO Tripartite collaboration.

Biosketch

Victor J Del Rio Vilas, DVM, MBA, MSc (Epi), Ph.D.

Consultant

Organization: The Royal Institute of International Affairs
The Royal Institute of International Affairs
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Dr Victor Del Rio Vilas (DVM, MBA, MSc (Epi), PhD) is currently at the Dept of Epidemiology, School of Veterinary Medicine, University of Surrey (UK), and at the Centre on Global Health Security at Chatham House, London. Until January 2018 he worked at the World Health Organization (WHO-Geneva) on the development of WHO's epidemic vulnerability evaluation framework. Until November 2016, Dr Del Rio was a consultant with the Pan American Health Organization (PAHO/WHO), based in Rio de Janeiro (Brazil) with regional responsibilities. In that capacity, Dr Del Rio advised Ministries/Departments of Health across the region on epidemiology, surveillance and control measures for a number of diseases such as rabies, leishmaniasis, yellow fever and on zoonoses programmatic issues. He also contributed to WHO's global response to the Ebola Virus Disease outbreak in Liberia in 2015; previously worked in Uzbekistan implementing the Biological Threat Reduction Program (Defense Threat Reduction Agency, US DoD), and as veterinary advisor and epidemiologist for UK´s Department for Environment, Food and Rural Affairs (Defra) and the Veterinary Laboratories Agency.

Biosketch

Hildegund C.J. Ertl, MD

Professor

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1971-1976	Medical School, Georg-August Universitaet Göettingen, Germany
1976-1977	Intern Year, University Hospital Göettingen, Germany
10/24/1977	License to practice medicine
11/22/1977	Doctor of Medicine for the thesis "Role of Histocompatibility Antigens in T Cell-Mediated Lysis of Vaccinia Virus-Infected Target Cells" with summa cum laude
1973-1974	Student, Max-Planck Institute for Experimental Medicine, Goettingen, Germany
1974-1976	Student, Medical Microbiology Institute, University of Goettingen, Germany
1977-1978	Scientific Fellow (Residency), Medical Microbiology Institute, University of Goettingen, Germany
1978-1980	Visiting Scientific Fellow, John Curtin School of Medical Research, Australian National University, Department of Microbiology, Canberra, Australia
1981	Visiting Scientific Fellow, University of Minnesota, Department of Pathology and Labo ratory Medicine, Minneapolis, MN
1981-1982	Instructor, Harvard Medical School, Department of Pathology, Boston, MA
1982-1987	Assistant Professor, Harvard Medical School, Pathology, and Dana-Farber Cancer Institute, Boston, MA
1987-1996	Associate Professor, The Wistar Institute, Philadelphia, PA
1992-present	Member, Immunology Graduate Group, Microbiology Graduate Group, University of Pennsylvania, Philadelphia, PA
1993-1996	Wistar Institute Associate Professor of Pathology and Laboratory Medicine, Associate Faculty of the School of Medicine, University of Pennsylvania, Philadelphia, PA
1994-2002	Member, Institute for Human Gene Therapy, University of Pennsylvania, Philadelphia, PA
1996-present	Professor, The Wistar Institute, Philadelphia, PA
1996-present	Wistar Institute Associate Professor of Pathology and Laboratory Medicine, Associate Faculty of the School of Medicine, University of Pennsylvania, Philadelphia, PA
2002-2012	Program Director, Immunology Program, The Wistar Institute, Philadelphia, PA
2005-present	Adjunct Professor of Pediatrics of the Children's Hospital of Philadelphia
5/2007-2017	Director, Wistar Vaccine Center
7/2011-2018	Caspar Wistar Professor in Vaccine Research
1/2018-present	Co-Director, Wistar Vaccine Center

Biosketch

Conrad Freuling, DVM

Senior Scientist

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Conrad Freuling studied veterinary medicine at TiHo Hannover from 1999 to 2004, Germany were he graduated 2004 as a veterinarian. In his postgraduate education, Conrad joined the rabies unit at the National Reference Laboratory for Rabies lead by Thomas Müller at the Friedrich-Loeffler-Institut (FLI) where he specialized in virology and completed his doctoral thesis on bat associated lyssaviruses. Conrad has been responsible for the WHO Rabies Bulletin Europe as editor, both for the journal and the database and website. After moving to the Isle of Riems, the headquarter of the FLI, animal experimental studies in a variety of species became an additional field of work and expertise. His current activities encompass fundamental and applied research, including epidemiological and diagnostic topics and he has been involved in several international projects on rabies control and diagnostics.
During the past three decades he (co-)authored more than 100 scientific peer-reviewed publications and several book chapters.

Biosketch

Richard E. Hill, Jr., DVM

Vice President

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Dr. Richard E. Hill, Jr., (Rick) received a D.V.M. degree from Michigan State University in 1983 and following graduation, worked in private veterinary practice. In 1985, he joined the USDA and worked as a field Veterinary Medical Officer before joining the Biologics Program in 1986. Rick worked as an Inspector, Epidemiologist, and Team Leader, for the Biologics Program where he was involved in regulatory compliance and coordination of the pharmacovigilance program. In 1990, he received an M.S. degree in Veterinary Preventive Medicine at Iowa State University and is a Diplomate in the American College of Veterinary Preventive Medicine. In 1995, Dr. Hill transferred to the position of Quality Assurance Manager, responsible for overseeing the Quality Assurance Program at the National Veterinary Services Laboratories and Center for Veterinary Biologics Laboratory. In November 1998, he rejoined the Center for Veterinary Biologics as Director of Licensing and Policy Development and then served as the Center Director from 2005 through 2013. In 2013, Dr. Hill assumed the position of Executive Director for Veterinary Services, National Import and Export Services until his retirement in 2016 after 30+ years of Federal service. Dr. Hill remains active in veterinary medicine through volunteer positions with the American Veterinary Medical Association and the American College of Veterinary Preventive Medicine. Dr. Hill is a long-term member of IABS, Biologicals Section Editor, and served as inaugural member and Chair of the Veterinary Scientific Conference Committee (now the Veterinary Biologicals Committee). He is currently serving on the Board as Vice President, and is President of the North American Affiliate (IABS-NA).

Biosketch

Guy Houillon, M.D.

Director Global Medical

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Guy Houillon, M.D has been working in pharmaceutical companies for more than 30 years, including 15 years in the vaccine industry at Sanofi Pasteur. After graduating in medicine in 1982 (Lille, France), he worked as a general practitioner for 2 years and then earned a master in Toxicology and Clinical Pharmacology in 1985 (Paris; France). Guy then joined several pharmaceutical companies working in the central nervous sytem (CNS) field as clinical project leader and country medical director for Lundbeck France (1992-2001). He received a master in Health Economics (Lyon; 1999) and joined Sanofi Pasteur in 2002 as a Medical Expert. Within the Global Medical Affairs department, his current areas of expertise include rabies vaccines and immunoglobulins, yellow fever vaccines, and Japanese encephalitis vaccine. He is a member of the International Society of Travel Medicine (ISTM), French Society of Travel Medicine (SMV), and the French Society of Tropical Medicine for 15 years.

Biosketch

Miia Jakava-Viljanen, Ph.D.

National Experts

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Dr Miia Jakava-Viljanen is National Expert at the European Medicines Agency.

Following positions at the Helsinki University in Finland in teaching microbiology, immunology and epidemiology, and research, as a veterinarian, she joined the Finnish Food Safety Authority as Head of Section involved in rabies diagnostic and oral vaccination campaigns, and batch release and testing of veterinary vaccines. She subsequently moved into the policy area, assuming the post of Government Counsellor at the Ministry of Agriculture and Forestry of Finland worked with Animal Health and Welfare legislation, veterinary eradication programmes, management of expenditure, EU legislation of pet movement and collaboration with Russia on rabies. Seconded to the European Commission, she was involved in the implementation of the EU legislation on Animal Health, and participated to the work on EU climate change. She was also involved in the EU co-financed vaccination programmes for rabies eradication.

She joined the European Medicines Agency in October 2014 as National Expert for Veterinary Biologicals and Emerging Therapies where she is responsible to provide consultation and expertise specifically in the area of immunological veterinary medicines and EU legislation and policy as scientific/content lead. She is an expert of EDQM European Pharmacopoeia Group 15V (vaccines and sera) since 2002.

Biosketch

Suwicha Kasemsuwan, D.V.M.

Assistant Professor

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Suwicha graduated with Doctor of Veterinary Medicine from Kasetsart University, Thailand in 1988 and Master of Philosophy from Massey University, New Zealand in 1996. As a lecturer in Faculty of Veterinary Medicine, Dr. Suwicha supervises master students on risk assessment, social network analysis and Epidemiology. She also serves as a lecturer for D.V.M. curriculum and a trainer for training courses in the area of Epidemiology. During 2008-2019 she had involved with several projects on risk assessment in Thailand and join the project with many international organizations such FAO, CIRAD.

Biosketch

Jacques Léchenet, DVM

Head of Regulatory Affairs Biologicals

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Dr Jacques Léchenet is a veterinary surgeon graduated from Veterinary School of Lyon.
He joined Rhone Mérieux in 1989 (then Merial, now part of Boehringer Ingelheim). Since that time, he is working in regulatory affairs for Biologicals for various species and geographies, as well as some quality control and quality assurance roles. He currently is responsible at world-wide level for regulatory affairs activities for Biologicals.
He was directly involved in successful registration of variety of vaccines such as vectored, emergency, multistrain vaccines and including a first fully in vitro tested vaccine before 2000.
Active in several trade associations, he currently chairs the Biologicals Working Party of Animal health Europe and the Immunological Veterinary Medicinal products group of SIMV (France) to work with regulators towards improvement of the regulatory framework. Part of this work was the collaboration to redefine the official control testing requirements in EU and support the consistency approach in European Pharmacopoeia.

Biosketch

Dr Heidi Meyer

Head Unit International Coordination/Regulatory Service

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Dr Heidi Meyer is a senior scientist at the Paul-Ehrlich-Institut (PEI), the German national regulatory agency responsible for licensing and batch release of vaccines and biomedicines. She is head of the WHO collaborating centre for the standardization and evaluation of vaccines at PEI. After her university career, she worked in the virology laboratories of Baxter AG, Austria on various aspects of the development, preclinical testing and production of viral vaccines as well as on virus safety studies. In 2002 she joined the PEI and, in her position, she is responsible for coordinating international activities and providing regulatory and scientific advice related to authorization of human vaccines and biotherapeutics. She acts as an expert for human vaccines, biologicals and biotechnological products to the European Medicines Agency and is a member of the Biologics Working Party.

Biosketch

Dr. Thomas Müller, D.V.M.

Senior Scientist

Organization: Friedrich-Loeffler-Institut, Federal Research Institute for Animal Health
OIE Reference Laboratory for Rabies and WHO CC for Rabies Surveillance and Research
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Thomas Müller studied veterinary medicine at the Veterinary Faculty of the Humboldt University Berlin, Germany, from 1984 to 1989, where he graduated as a veterinarian.
Thomas joined the Friedrich-Loeffler-Institut (FLI) in 1989 and has been working on rabies ever since. In 1994, he obtained his doctor's degree from the Veterinary Faculty of the University of Leipzig in rabies epidemiology and subsequently specialized in epidemiology and virology. Since 1995 he is head of the National Reference Laboratory for Rabies in Germany. Later on, he was nominated head of the WHO Collaborating Centre for Rabies Surveillance and Research and the OIE Reference Laboratory for Rabies at FLI.
His activities encompass fundamental and applied rabies research including diagnostics, rabies epidemiology and control with special emphasis on oral vaccination of wildlife and domestic dogs. Furthermore, he is member in various international expert panels pertaining to rabies including WHO, OIE, and EU.

During the past three decades he (co-)authored more than 190 scientific peer-reviewed publications and several book chapters.

Biosketch

Prof. Louis Nel

Director of GARC

Organization: Gobal Alliance for Rabies Control (GARC)
South Africa

Louis Nel is based at the University of Pretoria in South Africa where his research over the last 25 years has been primarily focused on a better understanding of lyssaviruses and the control of rabies. Professor Nel also assisted the Global Alliance for Rabies Control (GARC), a leading international nonprofit organization dedicated to rabies) in various capacities since 2008. In July 2014, he took over the leadership of GARC.

With his team at the University of Pretoria and his global collaborators (including Universities, Institutes, Intergovernmental agencies, NGO's and Industry), GARC then founded the Pan African Rabies Control Network (PARACON) in 2015, the Asian Rabies Control Network (ARACON) in 2018 and the Middle East, Eastern Europe and Northern African Rabies Control Network (MERACON), also in 2018. In this context his work ultimately remains focused on achieving elimination of dog rabies from those regions of the world that continue to be plagued by the disease, including the entire continental Africa and most of Asia.

Following the synthesis of a Global Framework for the Elimination of Dog-Mediated Human Rabies and the formation of the United Against Rabies collaboration (UAR = FAO, OIE, WHO and GARC) in 2016, he continues to serve on the steering committee for the development and implementation of the UAR Global Strategic Plan, entitled ZERO by 30.

Biosketch

Dr. Pranee Panichabhongse

Position:

Organization: Department of Livestock Development
Thaliand

Resume

Biosketch

Dr. Cheerasak Pipatpongsopon (D.V.M.)

Deputy Director General

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Dr.Cheerasak Pipatpongsopon graduated bachelor degree from faculty of Veterinary Medicine, Kasetsart University and Master degree in Public Administration, National Institute of Development Administration, Thailand.
He was the former Chief of Provincial Livestock Office at Lopburi, Tak and Chiang Mai province and was the Director of Regional Livestock Office 6. Currently, he is working as a Deputy Director General at Department of Livestock Development.

Dr.Cheerasak works in the animal health section as the policies provider. He took parts in Rabies elimination program for officers and with his strongly law enforcing and his 3+1 measure led team to work successfully in certain area of Thailand. With his leadership and his attention to work made Thailand's self-awareness in Rabies prevention increased since 2018. As the result, number of incidences of Rabies infection this year has been decreased in both human and animal.

Biosketch

Dr. Nakorn Premsri

Director of National Vaccine Institute (NVI)

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Dr. Nakorn Premsri is now a director of National Vaccine Institute (NVI), Ministry of Public Health (MOPH). He has just been appointed to this position since February 2019. He is a medical doctor graduated in 1993 from Chulalongkorn University and Epidemiologist by training in Field Epidemiology Training Program (FETP) in 1998. Most of his work has been in the field of public health and preventive medicine. Dr.Nakorn was involving with RV144 HIV Vaccine Thai Trial during 2003-2010 as a PI assistant and Co-Investigator. The trial has been the first ever efficacious HIV vaccine trial and as the historical landmark for further working on HIV Vaccine Development field. He also had worked at National Vaccine Committee Office (NVCO), Department of Disease Control during 2008-2010 which now NVCO itself has been transformed to be NVI. In addition, for 10 years (2010 to present) of his experience on 3 management positions in Department of Disease Control-MOPH, he was a director of HIV Vaccine trial office, Principal Recipient Office to The Global Fund, and Bureau of Epidemiology. His experiences relate to field clinical vaccine trial, epidemiology, public health emergency response and vaccine security.

Biosketch

Dr. Sira Abdul Rahman, Ph.D.

Executive Director

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Dr. S. Abdul Rahman graduated from Bangalore Veterinary College in 1965 with a BVSC degree and did his M.V.Sc from Madras University in 1969 and PhD in Veterinary Parasitology from University of Queensland, Australia in 1976. He was awarded the Fellowship of the Royal Veterinary College, Spain in 1990.
He is the Executive Director and Past President of Commonwealth Veterinary Association (CVA) and a Council Member of the World Veterinary Association (WVA).
He is the former Chairman of the World Organisation for Animal Health (OIE) Animal Welfare Working Group and a former Chairman and Member, OIE Ad hoc Group on Stray Dog Control ‘
He is the founder Trustee of Rabies in Asia Foundation (RIA) and Founder Life Member and President of Association for Prevention and Control of Rabies in India (APCRI). He is the Executive Director of the Alliance for Rabies Control (ARC), UK. And Country Head of Global Alliance for Rabies Control (GARC) India.
He is the International Coordinator of the OIE Rabies Twinning programme involving KVAFSU/CVA Rabies Diagnostic Laboratory, Veterinary College, Bangalore and CDC Atlanta and Animal and Plant Health Laboratory, UK.
He has 36 years of teaching experience ultimately retiring as Dean of the Veterinary School in Bangalore India. Dr. Rahman has published more than 125 scientific papers and has authored a book on Veterinary Parasitology.

Biosketch

Charles E. Rupprecht, VMD, MS, PhD

CEO

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EDUCATION

Institution Degree Year Field
Rutgers University B.A. 1977 Ecology
University of Wisconsin M.S. 1980 Zoology
University of Pennsylvania, School of Veterinary Medicine V.M.D. 1985 Veterinary Medicine
University of Wisconsin Ph.D. 1986 Biological Sciences

PROFESSIONAL EXPERIENCE

1979-80:Bat Biologist, Barro Colorado Island, Smithsonian Tropical Research Institute, Panama
1981:Research Assistant, Institute of Environmental Medicine, University of Pennsylvania
1982-92:Research Associate/Post-doctoral Fellow/Assistant/Associate Professor, The Wistar Institute, Philadelphia, PA
1992-93:Associate Professor, Thomas Jefferson University, Department of Microbiology and Immunology, Philadelphia, PA
1993-2012:Chief, National Rabies Program, CDC, Atlanta, GA
1993-2012:Director, World Health Organization (WHO) Collaborating Center for Rabies Reference and Research, CDC, Atlanta, GA
2003-2012:Adjunct Professor, Population Biology, Ecology, & Evolution Training Program, Emory University, Atlanta, GA
2010-2012:Head, World Organization for Animal Health (OIE) International Reference Laboratory for Rabies, CDC, Atlanat, GA
2012-14:Director of Research, Global Alliance for Rabies Control, Manhattan, KS
2012-present:WHO, Expert Technical Advisor on Rabies, Geneva, Switzerland
2012-present:Adjunct Professor, Wistar Institute, Philadelphia, PA
2012-present:CEO, LYSSA LLC, Atlanta, GA
2013-14:Adjunct Professor, Auburn University, Auburn, AL
2013-14:Associate Dean/Professor, Epidemiology & Public Heath, Ross University, School of Veterinary Medicine, St. Kitts, West Indies
2015-present: Independent biomedical consultant and regent of Lyssaland

HEALTH COMMUNICATIONS

To date, I have co-authored >400 peer-reviewed publications, reports and book chapters

Biosketch

Professor Terapong Tantawichien, M.D.

Chairman, Department of Medicine, Faculty of Medicine Chulalongkorn University, Thailand

Assistant Director of Queen Saovabha Memorial Institute

Thai Red Cross Society, Bangkok, Thailand

President of Infectious Disease Association of Thailand (2014-2015, 2016-2017)

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Terapong Tantawichien is Professor, the Division of Infectious Diseases, Department of Medicine, Faculty of Medicine at Chulalongkorn University, Thailand. He received his medical degree from Chulalongkorn University in 1987 and is board certified in internal medicine and infectious diseases (Thailand). He began his teaching career in 1993 when he started teaching infectious diseases at Department of Medicine, Faculty of Medicine, Chulalongkorn University. He was also President of the Infectious Diseases Association of Thailand (2014-15, 2015-2017). Presently he is chairman of Department of Medicine, Faculty of Medicine, Chulalongkorn University and Assistant Director of Queen Saovabha Memorial Institute, Thai Red Cross Society. He was awarded the 1st Young Investigator Award from the Infectious Diseases Association of Thailand in 2001 and the Research Award from the Royal College of Physician of Thailand in 2014. His main scientific interests are rabies vaccination, adolescent and adult immunization, dengue in adult, and infections in immunocompromised hosts.

Biosketch

Dr. Joris Vandeputte, DVM

President

Organization: International Alliance for Biological Standardization (IABS)

Joris Vandeputte was elected President of IABS (International Alliance for Biological Standardization) in June 2016. He is founding member of IABS-EU the European affiliate of IABS. IABS-EU implements the objectives of IABS at European level. IABS-EU is partner of the EU IMI (Innovative Medicines Initiative) projects ZAPI and VAC2VAC (www.IMI.eu, www.zapi-imi.eu, www.vac2vac.eu)

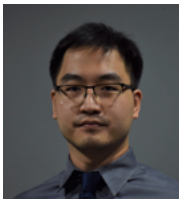
IABS hold its founding congress in Lyon in 1955. It is the global independent platform, interface, where stake-holders meet for exchange of science and issues related to vaccines, cell and gene therapy and human Biotherapeutics. IABS stimulates consensus building which might eventually be translated in regulatory frameworks and advises to decision makers.

Joris Vandeputte is also founder and president of TRIVAROP, a public affairs consultancy advising companies and associations in the area of global health-care. Joris has more than 30 years industry and international organisation's experience in vaccines, conceiving and developing vaccine policies at global level and towards developing countries in particular. Working with European institutions and policy-makers on innovation, health and development is his main activity. .

As a virologist at Ghent University (1976-1980), Joris discovered H1N1 flu as a pathogen for swine leading to a better understanding of H1N1 as a zoonosis. After his assignment as Veterinary Officer to control animal diseases in Belgium and the EU, Joris joined Institut Mérieux animal health which became Rhône Mérieux and later on Merial, where he occupied leading positions in global vaccine development, strategy, regulatory affairs, marketing and production,for animal vaccines and flu vaccines. In 2001 he joined The Vaccine Fund, where he coordinated relations with European institutions which led to substantial funding by the EU and European governments to GAVI. At Tuberculosis Vaccine Initiative (TBVI) in Lelystad, the Netherlands, Joris developed, with EU institutions, a financial and strategic framework about funding translation of innovation into vaccines for tuberculosis which would be accessible to global markets.

Joris is consultant for international organisations with particular emphasis on zoonoses, one Health approaches and health in developing countries.

Biosketch



Wittawat Viriyabancha, MS

Pharmacist, Professional level

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Wittawat Viriyabancha is a pharmacist working in Biological Product Unit, Pre-Marketing Control Division, Bureau of Drug Control in Thailand Food and Drug Administration (Thai FDA). He acts as an internal reviewer for biological products including biopharmaceuticals and vaccines. Along with his 6 years' experience for responsibility in biological product evaluation, he serves in several task forces for Thailand biological product regulatory system development and biological product policy development projects in Thai FDA such as advancing regulatory science implementation program for medicinal products, new regulatory pathway establishment for innovative medicinal products, scientific consultation system establishment in order to promote and support research and development of medicinal products in Thailand. Wittawat earned his Master's degree in Pharmaceutical Sciences and Graduate Certificate in Regulatory and Clinical Affairs from University of Southern California

Biosketch

Ad Vos, Ph.D.

Expert Science

Organization: CEVA Santé Animale
Am Pharmapark
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Germany
Tel: +49 34901 8855494
e-mail: ad.vos@ceva.com

Ad Vos has been working on oral delivery of biologicals to free-roaming animals for over 30 years, with a special interest in oral rabies vaccination. He graduated as a biologist from the State University in Utrecht, the Netherlands and received his Ph.D. from the Ludwig Maximilian University, in Münich, Germany, with a dissertation on the impact of the disappearance of rabies on the population dynamics of the red fox. During this study, he was employed at the former Federal Research Institute for Virus Diseases of Animals in Tübingen, Germany. Between 1994 and 2019, he has been emlpoyed by IDT Biologika GmbH and since July 2019 by CEVA Santé Animale

Biosketch

Ryan M. Wallace

Veterinary Epidemiologist

Organization: US Centers for Disease Control and Prevention
1600 Clifton Avenue
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Dr. Wallace is Veterinary Epidemiologist and lead of the Rabies Epidemiology Unit with the US Centers for Disease Control (CDC). He began his career in public health in 2004 at the Wisconsin Department of Health and Family Services, working on projects to improve refugee access to healthcare as well as tuberculosis control. In 2006, Dr. Wallace received his Master of Public Health from Emory University in Atlanta, Georgia with a focus on epidemiology and in 2012 his doctorate in Veterinary Medicine from the University of Wisconsin - Madison. Dr. Wallace joined the CDC Rabies Program in 2012 and trained for two years with the Epidemic Intelligence Service. Dr. Wallace serves as a World Health Organization (WHO) expert consultant for rabies and the Director of CDC's OIE rabies laboratory. He has led numerous domestic and international rabies investigations pertaining to both human deaths and animal disease outbreaks. Dr. Wallace has worked extensively with the international organizations to develop humane methods of animal control and effective vaccination practices in free roaming dogs. These efforts have focused on the collaborative efforts of multiple institutions to develop humane and effective animal rabies surveillance programs. Dr. Wallace spends the majority of his time focusing on the implementation of surveillance systems in developing countries and improving our understanding of how interspecies relationships impact the spread of rabies. In his free time Dr. Wallace enjoys camping and hiking with his wife, three kids, and two dogs.

Biosketch

Suwannachai Wattanayingcharoenchai

Director General

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e-mail: s018795587@yahoo.com.au

Outstanding Performance

Outstanding Government Officer of Khonkaen province (1999)

Second Runner – up outstanding academic award in Public Health Academic Seminar under the research entitled " Format for servicing diabetes patients at District Health Center" (1998)

Outstanding academic award in Public Health Academic Seminar under the research entitled " the development of service system for highblood pressure patients at District Health Center" (1999)

Outstanding academic award in Public Health Academic Seminar under the research entitled " GIS system for promoting a better health and environmental Health" (2003)

First outstanding award in Public Health Academic Seminar under the research entitled " e-care-1 :Primary Service System" (2005)

Honorable fame award from Ministry of Public health for leading Angthong to be a healthy Province (2005)

Leading Angthong to win the first award as the best province in competition under "To Be No 1" Project (2006)

Outstanding academic award in Public Health Academic Seminar under the research entitled " HosXp – PCU : a Program for promoting the quality of Primary Health Care Service" (2007)

Being a head of Public Health Emergency Response Center protecting people from disease outbreak during a severe flooding in Thailand (2011 -2012)

Being Co - founder of National Vaccine Institute

Biosketch

Gowri Yale, Ph.D.

Scientific and Technical Manager

Organization: Mission Rabies
Flat # B-C2
Veterinary Hospital Complex
Tonca, Miramar, Panaji
Goa- 403002
Tel: +91 9972449007
e-mail: gowri@missionrabies.com

Dr. Gowri Yale is a Veterinarian with a MS in Veterinary Public Health and a Ph.D. in Rabies Epidemiology, Diagnostics and Immune response. She has worked with animal shelters, Veterinary research institutes, been in small animal practice and a successful entrepreneur previously. Gowri started as the Scientific and Technical Manager for Mission Rabies – India from September 2016. She manages surveillance and rabies diagnostics aspects of the Goa Govt – Mission Rabies project in India. She coordinates research activities of Mission Rabies in Goa involving, epidemiology, oral bait studies, gene sequencing and sero-surveillance. She also corresponds with the Government of Goa, manages grant arrangements, and lobbies for ongoing and expanded partnerships to work towards a phased and sustainable exit strategy for Mission Rabies in Goa.

Biosketch

Dr Onphirul Yurachai

Professional level Veterinarian Officer

Organization: Zoonotic Section, Division of General Communicable Disease, Department of Disease Control, Ministry of Public Health, Thailand

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Nonthaburi 11000

Thailand

Tel: +662 590 3176-78

Fax: +662 965 9484

e-mail: dek_vet_ka@hotmail.com

Onphirul yurachai study veterinary medicine at the Faculty of Veterinary Medicine Kasetsart University, Bangkok, Thailand, from 2004 to 2010. She was working as a technician at Kesetsart Veterinary Hospital for 2 years. In 2012, she worked for the Department of Disease Control, Thailand-Ministry of Public Health and has been working on zoonotic disease, especially, rabies ever since. In 2015, she joined the 2 years course of Field Epidemiology Training Program in Thailand. In present, she is a professional level veterinarian officer.

Her main part of work is to surveillance, prevention and control on human rabies in Thailand, cooperated with Department of Livestock Development and Department of Local Administration on planning and measure development.

Her previous publication regarding to rabies was Survey of Knowledge, Attitude and Practice Initiated by an Investigation of a Human Rabies Death in Chanthaburi Province, Thailand, 2015, Outbreak, published in Surveillance and Investigation Report. And right now, she is waiting list for An epidemiological study of suspected rabies exposures and adherence to rabies post-exposure prophylaxis in Eastern Thailand, 2015 publication.