OIE Collaborating Centres Reports Activities

Activities in 2018

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Title of collaborating centre:	Research on Emerging Avian Diseases
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Name (including Title and Position) of Head of the Collaborating Centre (formally OIE Contact Point):	David E Swayne Laboratory Director and Supervisory Veterinary Medical Officer
Name of writer:	David E Swayne

ToR: To provide services to the OIE, in particular within the region, in the designated specialty, in support of the implementation of OIE policies and, where required, seek for collaboration with OIE Reference Laboratories

ToR: To identify and maintain existing expertise, in particular within its region

1. Activities as a centre of research, expertise, standardisation and dissemination of techniques within the remit of the mandate given by the OIE

Epidemiology, surveillance, risk assessment, modelling	
Title of activity	**Scope**
Avian influenza, research	Highly pathogenic avian influenza was detected in chickens in Tennessee during March 2017. Examination for other avian influenza viruses in the area and genetic analysis of such viruses supported multiple independent introductions of a low pathogenic avian influenza virus from wild bird to farms at the border of Tennessee and Alabama. On one farm, the mild form changed to the deadly form by mutation and subsequent spread to a second farm. This information is important for understanding outbreaks of avian influenza in poultry.
Newcastle disease, research	Formalin-fixed paraffin-embedded (FFPE) samples from North American pigeons obtained from 10 mortality events in USA (2010-2016) contained variants of genotype VI Newcastle disease virus. The whole-genome sequence of the genotype VI Newcastle disease viruses obtained from formalin-fixed paraffin-embedded tissues revealed the utility of the technique to track virulent viruses to allow improved epidemiological findings and monitor evolution and genetic diversity of the virus.
Newcastle disease, research	Variant Newcastle disease virus (NDV) were isolated and characterized from farms that reported vaccine failures in Eastern Europe, Asia, and Africa. Eight genetically related NDV isolates from Pakistan (2014-2016) that define a new sub-genotype (VIm) were isolated demonstrating that there is still unrecognized diversity in the field.
Newcastle disease, research	ARS researchers and collaborators in Mexico determine epidemiological risk factors for transmission of infectious agents between poultry and synantropic birds. 82 species of wild birds were identified in the study with the highest ranked species being Mexican Great-tailed Grackle and the Barn Swallow. The ability to demonstrate epidemiological connections between wildlife and poultry is important to understand the risk to the poultry industry from wild birds.
Avian diseases	
Title of activity	**Scope**
Newcastle disease, research	Random sequencing of nucleic acids obtained from poultry (a pigeon, a duck, and chickens) respiratory samples from Newcastle disease surveillance in Pakistan and Nigeria identified a previously unrecognized bacteria for the genus Ochrobactrum which contain contained multiple antibiotic resistance genes. Pathogenesis studies are in progress.

Infectious laryngotracheitis, research	Researchers developed two vector system to reconstitute ILTV which can be easily manipulated in vitro to generate vaccine strains as well as vaccines containing multiple antigens.
Infectious laryngotracheitis, research	Researchers identified 6 single nucleotide polymorphisms (SNPs) within a single locus that can differentiate ILTV strains into 4 genotypes. A simple PCR-based method was developed using a single pair of primers, and the sequencing of the PCR products is amendable to both dideoxy (Sanger) sequencing as well as third generation sequencing technology based on nanopore sequencing (MinION). This assay is highly sensitive with a short turnaround time and can be multiplexed with other DNA/cDNA-based diagnostic assays when barcoded primers are included.
Avian influenza, research	Chickens infected with infectious bursal disease virus (IBDV) and then vaccinated for AIV were not as well protected as chickens that had not been infected with IBDV. The importance of this is that for vaccination for AIV to be successful, IBDV must be controlled as well. This also helps to explain why vaccinated chickens can still become sick and die from AIV in the field.
Avian influenza, research	Researchers conducted studies testing different temperatures with used poultry bedding that was contaminated with AIV and determined poultry houses can be decontaminated more efficiently with than chemical methods.
Avian influenza, research	Researchers detected infectious droplets and aerosols with highly pathogenic avian influenza virus (HPAIV) during laboratory-simulated processing of chickens infected with human- and avian- origin H5N1 viruses. In contrast, processing of infected ducks was less efficient in generating infectious airborne particles. Naïve chickens and ferrets exposed to the same air space as the processing of virus-infected chickens became infected, suggesting that the slaughter of infected chickens is an efficient source of airborne virus for avian and mammalian infections. The results support the tenet that airborne transmission of HPAI viruses can occur among poultry and from poultry to humans during home or live-poultry market slaughter of infected poultry.
Avian influenza, research	Researchers determined minor gallinaceous poultry species (Japanese quail, Bobwhite quail, Pearl guinea fowl, Chukar partridges, and Ring-necked pheasants) inoculated with H5N2 high pathogenic avian influenza virus (HPAI) had high virus infectivity, sustained virus shedding with transmission to contact-exposed birds, and alongside long incubation periods, could enable unrecognized dissemination and adaptation to other gallinaceous such as chickens and turkeys. The findings suggest that these gallinaceous poultry are permissive for infection and sustainable transmissibility with 2014 initial wild bird-adapted clade 2.3.4.4 virus, with potential acquisition of mutations leading to adaptation to other hosts. This information is critical in understanding the epidemiology of HPAI virus and its control
Avian influenza, research	Researchers demonstrated that induced heterosubtypic immunity (HIS) resulted in increasing levels of challenge virus necessary to establish infection in mallards. In addition, the ability of HSI to increase resistance to infection was directly correlated to the genetic relatedness between the viruses. Thus, the closer the viruses were related, the more increased HSI was observed. These findings are important as they explain the dynamics of AIV subtype diversity in mallards.

Newcastle disease, research	Experimental studies in Japanese quail (Coturnix japonica) with four virulent NDV strains showed moderate virulence, with mortality ranging from 10 to 28%. Contact birds showed no clinical signs or lesions. This study demonstrates that these virulent NDV strains have limited replicative potential and mild to moderate disease-inducing ability in Japanese quail.
Diagnosis, biotechnology and laboratory	
Title of activity	**Scope**
Avian influenza, research	Researchers applied NGS to poultry samples from Jordan to detect and directly sequence eleven H9N2 LPAI viruses. Sequence analysis demonstrated a high degree of heterogeneity at specific locations in the hemagglutinin (HA) gene, which targets increased specificity to receptors found on avian or mammalian species. Moreover, additional amino acid changes corresponding with increased replication and virulence were identified among the viruses detected. Therefore, the detection and characterization of these LPAI viruses is critical for identifying emerging strains in poultry with zoonotic potential.
Vaccines	
Title of activity	**Scope**
Avian influenza, research	Researchers tested commercial and experimental compounds including mineral oil, vegetable oil, calcium phosphate, and chitosan in vaccines and found that the mineral oil based adjuvants induced the best immune response. This will lead to better HPAIV vaccines and more efficient vaccination since lower doses can be administered
Avian influenza, research	Three recombinant herpes virus of turkey vaccines with H5 influenza gene inserts were developed and tested in chickens for their effectiveness against H5N2 highly pathogenic avian influenza virus. Two of the test vaccines had mixed protective results while one vaccine was 100% effective for survival and significantly reduced viral shedding from infected chickens.
Avian influenza, research	The efficacy of a reverse genetics avian influenza inactivated vaccine (rgH5N1), a recombinant herpesvirus turkey vectored vaccine (rHVT-H5), and an RNA particle vaccine (RP-H5) was assessed in White Leghorn chickens against clade 2.3.4.4 H5N2 HPAI virus challenge. The single (rHVT-H5) and prime-boost (rHVT-H5 + rgH5N1 or rHVT-H5 + RP-H5) vaccination strategies protected 3-week-old chickens with high levels of protective immunity and significantly reduced virus shedding. A single vaccination with either rgH5N1 or RP-H5 vaccines provided clinical protection in adult chickens and significantly reduced virus shedding. A double rgH5N1 vaccination protected adult chickens from clinical signs and mortality when challenged 20 weeks post-boost, with high levels of long-lasting protective immunity and significantly reduced virus shedding. These studies support the use of genetically related vaccines for emergency vaccination programs against clade 2.3.4.4 H5Nx HPAI virus in young and adult layers.

Avian influenza, research	Researchers examined the efficacy of 2 vaccines for reduction of virus shedding and clinical signs of disease in turkeys at 6 and 16 weeks of age challenged with a clade 2.3.4.4 H5N2 HPAI virus. Three different vaccine regimes were used. Vaccinated turkeys showed significantly reduced virus shedding and mortality compared to unvaccinated control birds. However, the timing between vaccination and challenge affected the protective efficacy of the vaccine regimes tested. The study highlights the importance of examining not only different vaccine platforms but also vaccination strategies to maximize protection of poultry against HPAIV.
Newcastle disease, research	A collaborative Newcastle disease study in layers in Nigeria demonstrated vaccinated and non-vaccinated had a significant drop in egg production after virulent challenge, but only unvaccinated hens produced abnormal eggs with significant damage in oviducts followed by atrophy and shortening of the reproductive tract. This study is important to demonstrate that abnormal eggs and damage in oviduct can be significantly reduced in well vaccinated animals
Newcastle disease, research	Treatment of chicken allantoic fluids, macrophages and splenocytes using a commercial fixative preserved antigenicity of surface markers while inactivating Newcastle disease virus.
Newcastle disease, research	An independent transcription unit (ITU) and an internal ribosomal entry site (IRES) methods were used to generate a novel NDV LaSota strain-based recombinant virus vectoring the red fluorescence protein (RFP) and the green fluorescence protein (GFP) genes. Biological assessments of the recombinant virus, rLS/IRES-RFP/GFP, showed that it was slightly attenuated in vivo, yet maintained similar growth dynamics and viral yields in vitro when compared to the parental LaSota virus. Expression of both the RFP and GFP was detected from the virus-infected DF-1 cells by fluorescence microscopy. These data suggest that the rLS/IRES-RFP/GFP virus may be used as a multivalent vector for the development of vaccines and gene therapy agents.

ToR : To propose or develop methods and procedures that facilitate harmonisation of international standards and guidelines applicable to the designated specialty

2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the surveillance and control of animal diseases, food safety or animal welfare

Proposal title	Scope/Content	Applicable area
None	None	☐Surveillance and control of animal diseases ☐Food safety ☐Animal welfare

ToR: To establish and maintain a network with other OIE Collaborating Centres designated for the same specialty, and should the need arise, with Collaborating Centres in other disciplines

ToR: To carry out and/or coordinate scientific and technical studies in collaboration with other centres, laboratories or organisations

3. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same specialty, to coordinate scientific and technical studies?

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
Roslin Institute at the University of Edinburgh	United Kingdom	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	Collaboration on evolution of the high pathogenicity phenotype in avian influenza
OIE Reference Labs for Highly pathogenic avian influenza and low pathogenic avian influenza (poultry)	USA	☐Africa ☒Americas ☐Asia and Pacific ☐Europe ☐Middle East	Modelling of H5N2 highly pathogenic avian influenza virus epidemiology
OIE Reference Labs for Highly pathogenic avian influenza and low pathogenic avian influenza (poultry)	USA, UK, Canada	☐Africa ☒Americas ☐Asia and Pacific ☒Europe ☐Middle East	Modelling of H7 high and low pathogenic avian influenza viruses epidemiology
Kenya Agricultural and Livestock Research Organization	Kenya	☒Africa ☐Americas ☐Asia and Pacific ☐Europe ☐Middle East	Collaboration on active surveillance in chickens and passive surveillance in chickens, pigeons and wild species of birds to determine avian influenza viral distribution, and identification of ecological correlates in Kenya, and to develop a training program on genomic characterization, sequencing, and bioinformatics.
Wildlife Science and Conservation Center of Mongolia	Mongolia	☐Africa ☐Americas ☒Asia and Pacific ☐Europe ☐Middle East	Collaboration to determining the prevalence of avian influenza viruses that are reaching North America through the flyway routes that stopover in Mongolia.
Animal Health Research Institute Council of Agriculture in Taiwan	Taiwan	☐Africa ☐Americas ☒Asia and Pacific ☐Europe ☐Middle East	Collaboration to study the molecular epidemiology of avian influenza viruses of poultry that can potentially migrate between Eurasian and North American continents.

Institute of Experimental and Clinical Veterinary Medicine	Ukraine	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	Collaboration to monitor Avian Influenza viruses (AIV's) and Newcastle Disease viruses circulating in natural reservoirs through the use of sentinel birds at 5 stations in the Azov-Black Sea region of Ukraine.
World Health Organization Collaborating Center for Studies on the Ecology of Influenza in Animals and Birds, St.Jude Children's Research Hospital and University of Veterinary and Animal Sciences, Lahore, Pakistan	Pakistan, USA	☐Africa ☒Americas ☒Asia and Pacific ☐Europe ☐Middle East	Collaboration on Molecular Characterization of Avian Influenza Virus Collected During Active Surveillance of Backyard flocks and Live Bird Markets in Pakistan

4. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres, Reference laboratories, or organisations in other disciplines, to coordinate scientific and technical studies?

No

ToR: To place expert consultants at the disposal of the OIE.

5. Did your Collaborating Centre place expert consultants at the disposal of the OIE?

Yes

Name of expert	Kind of consultancy	Subject
David E Swayne	Scientific	OIE ad hoc Committee Avian Influenza Chapter, Terrestrial Animal Health Code
David E Swayne, David Suarez, Erica Spackman, Mary Pantin-Jackwood, Darrell R. Kapczynski	Scientific	OFFLU network expertise on Avian influenza; and OFFLU Avian Influenza, Vaccine Composition Meeting, Epidemiology and Wildlife Technical Activities
Diane Smith, Scott Lee	Training	Avian influenza PCR diagnostics to Bangladesh

ToR: To provide, within the designated specialty, scientific and technical training to personnel from OIE Member Countries

6. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by the OIE, to personnel from OIE Member Countries?

Yes
a) Technical visits: 0
b) Seminars: 0
c) Hands-on training courses: 2
d) Internships (>1 month): 11

Type of technical training provided (a, b, c or d)	Content	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
c	Epidemiology of Avian Influenza and Newcastle Disease	Pakistan	2
d	Learn the molecular biology techniques and get a training in reverse genetics technology, conduct research on enteric viral diseases of poultry and develop an enterotropic Newcastle disease virus (NDV) vaccine strain- based live recombinant vaccine against an enteric viral disease and NDV	Brazil (1), South Korea (1)	2
d	Epidemiology and pathobiology of Newcastle Disease and Avian Influenza	Brazil (2), South Korea (2), Spain (1), Poland (1), Bulgaria (1), Greece (1), Israel (1)	9

ToR: To organise and participate in scientific meetings and other activities on behalf of the OIE

7. Did your Collaborating Centre organise or participate in the organisation of scientific meetings on behalf of the OIE?

Yes

National/International	Title of event	Co-organiser	Date (mm/yy)	Location	No. Participants
International	OFFLU Executive and Steering Committee Meeting	OIE/FAO	11/18	Paris, France	10
International	OFFLU Contributors Meeting	OIE/FAO	04/18	Brighton, United Kingdom	100

ToR: To collect, process, analyse, publish and disseminate data and information

relevant to the designated specialty

8. Publication and dissemination of any information within the remit of the mandate given by the OIE that may be useful to Member Countries of the OIE

a) Articles published in peer-reviewed journals: 33

Ababneh M, Ferreira HL, Khalifeh M, Suarez DL, Afonso CL. First Genome Sequence of Newcastle Disease Virus of Genotype VIIi from Jordan. Microbiol Resour Announc. 2018 Dec 13;7(23).

Bertran K., Lee, D.H., Pantin-Jackwood, M.J., Spackman, E., Balzli, C., Suarez, D.L., Swayne, D.E. Pathobiology of clade 2.3.4.4 H5Nx high pathogenicity avian influenza virus infections in minor gallinaceous poultry supports early backyard flock introductions in Western U.S., 2014-2015. Journal of Virology, 2017 Oct 13;91(21). pii: e00960-17. doi: 10.1128/JVI.00960-17. http://jvi.asm.org/content/early/2017/08/03/JVI.00960-17.full.pdf+html or https://rdcu.be/5ueQ

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Bertran, K., Clark, A., Swayne, D.E. Mitigation strategies to reduce the generation and transmission of airborne highly pathogenic influenza virus particles during processing of infected poultry. International Journal of Hygiene and Environmental Health 221(2018):893-900, 2018. DOI: https://doi.org/10.1016/j.ijheh.2018.05.013

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Chrzastek K, Lee DH, Gharaibeh S, Zsak A, Kapczynski DR. Characterization of H9N2 avian influenza viruses from the Middle East demonstrates heterogeneity at amino acid position 226 in the hemagglutinin and potential for transmission to mammals. Virology. 2018 May;518:195-201. doi: 10.1016/j.virol.2018.02.016. Epub 2018 Mar 15.

Davis, C. T., N. L. P. I. Dharmayanti, S. Thor, N. Zanders, R. Hartawan, A. Ratnawati, Y. Jang, M. Rodriguez, D.L. Suarez, G. Samaan, and P. Pudjiatmoko. Attenuation of highly pathogenic avian influenza A (H5N1) viruses in Indonesia following reassortment and acquisition of genes derived from low pathogenicity avian influenza A virus progenitors. Emerging Microbes & Infections. 7(1):147. doi: 10.1038/s41426-018-0147-5.

Hatta, M., G. Zhong, Y. Gao, N. Nakajima, S. Fan, S. Chiba, K. M. Deering, M. Ito, M. Imai, M. Kiso, S. Nakatsu, T. J. Lopes, A. J. Thompson, R. McBride, D. L. Suarez, C. A. Macken, S. Sugita, G. Neumann, H. Hasegawa, J. C. Paulson, K. L. Toohey-Kurth, Y. Kawaoka. 2018. Characterization of a Feline Influenza A(H7N2) Virus. Emerging Infectious Diseases 24(1);75-86.

He Y, Taylor TL, Dimitrov KM, Butt SL, Stanton JB, Goraichuk IV, Fenton H, Poulson R, Zhang J, Brown CC, Ip HS, Isidoro-Ayza M, Afonso CL. Whole-genome sequencing of genotype VI Newcastle disease viruses from formalin-fixed paraffin-embedded tissues from wild pigeons reveals continuous evolution and previously unrecognized genetic diversity in the U.S. Virol J. 2018 Jan 12;15(1):9)

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(gallus gallus domesticus) by immunohistochemical labelling. Journal of Comparative Pathology. 159:36-48

Kim, T., Hunt, H.D., Parcells, M.S., van Santen, V., Ewald, S.J. Two class I genes of the chicken MHC have different functions: BF1 is recognized by NK cells while BF2 is recognized by CTLs. Immunogenetics 70: 599-611, 2018. https://doi.org/10.1007/s00251-018-1066-2

Kim, T., John Dunn and Stephen Spatz. Protective efficacy of molecularly cloned Gallid alphaherpesvirus 3 vaccine strain 301b/1 against very virulent Marek's disease virus challenge. 43rd International Herpesvirus Workshop, Vancouver, Canada July 21-25, 2018

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Segovia KM, França MS, Leyson CL, Kapczynski DR, Chrzastek K, Bahnson CS, Stallknecht DE. Heterosubtypic immunity increases infectious dose required to infect Mallard ducks with Influenza A virus. PLoS One. 2018 Apr 26;13(4):e0196394. doi: 10.1371/journal.pone.0196394. eCollection 2018.

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b) International conferences: 34

Bertran K, Pathobiology of clade 2.3.4.4 Intercontinental Group A H5Nx HPAI virus in minor gallinaceous poultry, 10th International Symposium on Avian Influenza; Brighton, UK, 15-18 April 2018

Carnaccini, S. Pathology and tissue distribution of H5N2 HPAIV clade 2.3.4.4. in vaccinated and experimentally challenged turkeys. 10th ISAI, Brighton, United Kingdom, 15-18 April 2018.

Claudio L Afonso. Current status on Newcastle Disease at the University of San Marcos in Lima Peru. May 10, 2018Claudio L Afonso, Research and current status on Newcastle Disease at the University of Putra, in Kuala Lumpur Malaysia. July 25, 2018.

Claudio L Afonso, Next Generation Sequencing: The potential applications to the poultry industry at the "Influencers in Aviculture" Seminar, sponsored by Boehringer Ingelheim Animal Health Mexico. November 9, 2018.

Criado, M.F., Purported addition of N-glycosylation sites on the globular head of the hemagglutinin induced escape of a 2015 Mexican H7 HPAI strain from vaccinal immunity, 10th International Symposium on Avian Influenza, Avian influenza in poultry and wild birds; Brighton, United Kingdom, 15-18 April 2018

Kapczynski, D.R.. Heterosubtypic immunity induced following infection with low pathogenic avian influenza virus in mallards enhances protection against H5N8 highly pathogenic avian influenza virus challenge. 15th Avian Immunology Research Group meeting, Oxford, United Kingdom, 5-7 September, 2018.

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Kapczynski, D.R. Innate Immunity of poultry following viral infection. 11th Annual Aviagen-JAPFA Breeder Management, Nutrition, and Health Seminar, Jakarta, Indonesia, March 7-8, 2018.

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(Provide website address or link to appropriate information): 0