World Organisation for Animal Health

Ashley Banyard - - UNITED_KINGDOM

# WOAH Reference Laboratory Reports Activities 2024

**This report has been submitted: 3 février 2025 11:53**

## LABORATORY INFORMATION

| | |
|---|---|
| ***Name of disease (or topic) for which you are a designated WOAH Reference Laboratory:** | Avian influenza |
| ***Address of laboratory:** | APHA, Woodham Lane, Weybridge |
| ***Tel:** | +441483232441 |
| ***E-mail address:** | ashley.banyard@apha.gov.uk |
| **Website:** | https://science.vla.gov.uk/fluglobalnet/index.html |
| ***Name (including Title) of Head of Laboratory (Responsible Official):** | Prof Ashley C. Banyard |
| ***Name (including Title and Position) of WOAH Reference Expert:** | Prof Ashley C. Banyard |
| ***Which of the following defines your laboratory? Check all that apply:** | Governmental |

## TOR1: DIAGNOSTIC METHODS

1. Did your laboratory perform diagnostic tests for the specified disease/topic for purposes such as disease diagnosis, screening of animals for export, surveillance, etc.? (Not for quality control, proficiency testing or staff training)

Yes

| Diagnostic Test | Indicated in WOAH Manual (Yes/No) | Total number of test performed last year | |
|---|---|---|---|
| Indirect diagnostic tests | | Nationally | Internationally |
| HI | Yes | 10756 | 75 |

| | | | |
|---|---|---|---|
| AGID | Yes | 8105 | 0 |
| ELISA | Yes | 0 | 0 |
| Direct diagnostic tests | | Nationally | Internationally |
| Real-time RT-PCR M gene | Yes | 14911 | 1805 |
| Real-time RT-PCR H5 | Yes | 875 | 120 |
| Real-Time RT-PCR H5 Pathotyping | Yes | 4537 | 1225 |
| H5 genetic analyses by Sanger sequencing | Yes | 2 | 0 |
| Real-time RT-PCR N5 | Yes | 459 | 0 |
| Real-time RT-PCR N6 | Yes | 1 | 0 |
| Real-time RT-PCR N7 | Yes | 1 | 0 |
| Real-time RT-PCR N8 | Yes | 3 | 0 |
| Real-time RT-PCR N9 | Yes | 1 | 0 |
| Real-time RT-PCR N1 | Yes | 2299 | 628 |
| Real-time RT-PCR H7 | Yes | 938 | 4 |
| H7 genetic analyses by Sanger sequencing | Yes | 0 | 0 |
| Real-time RT-PCR H9 | No | 0 | 580 |
| Pan H9 RT-PCR | No | 0 | 380 |
| Next Generation Sequencing - Illumina | Yes | 0 | 577 |
| Next Generation Sequencing - ONT | No | 140 | 60 |
| Egg inoculation/HA | Yes | 435 | 181 |
| IVPI | Yes | 0 | 0 |

# TOR2: REFERENCE MATERIAL

2. Did your laboratory produce or supply imported standard reference reagents officially recognised by WOAH?

No

3. Did your laboratory supply standard reference reagents (nonWOAH-approved) and/or other diagnostic reagents to WOAH Members?

Yes

| Type of reagent available | Related diagnostic test | Produced/ provide | Amount supplied nationally (ml, mg) | Amount supplied internationally (ml, mg) | No. of recipient WOAH Member Countries | Country of recipients |
|---|---|---|---|---|---|---|
| | | | | | | AUSTRIA, BRAZIL, |

| | | | | | | |
|---|---|---|---|---|---|---|
| Antisera | HI | Produced and Provided | 17.5ml | 115.5ml | 14 | GERMANY, HONG KONG, ITALY, LITHUANIA, NORWAY, OMAN, PARAGUAY, PHILIPPINES, SIERRA LEONE, SWEDEN, |
| Antigen | HI | Produced and provided | 156ml | 260ml | 14 | BRAZIL, HONG KONG, ITALY, KOREA (REP. OF), LITHUANIA, NORWAY, OMAN, PARAGUAY, PHILIPPINES, SIERRA LEONE, SWEDEN, UNITED STATES OF AMERICA, |

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to WOAH Members?

No

# TOR3: NEW PROCEDURES

6. Did your laboratory develop new diagnostic methods for the designated pathogen or disease?

Yes

7. Did your laboratory validate diagnostic methods according to WOAH Standards for the designated pathogen or disease?

Yes

| Name of the new test or diagnostic method developed | Description and References (Publication, website, etc.) |
|---|---|
| Validation of a reduction in time for avian influenza virus isolation | The international gold standard for avian influenza virus (AIV) diagnosis is virus isolation (VI) in specific pathogen-free embryonated chickens' eggs (ECEs). AIV isolation typically involves a 6-day turnaround during which premises under suspicion for notifiable AIV infection are held under restriction, regardless of molecular diagnoses, often with significant welfare implications. A reduction in time for negation of PCR negative premises by VI was investigated following experimental inoculation of AIV from known-positive original clinical material into ECEs. VI data derived from over 600 case investigations from epizootics of high pathogenicity AIV (HPAIV) in Great Britain (GB) since 2016, and from low pathogenicity AIV (LPAIV) cases in GB since 2014 were examined to support a reduction in test timing using alternative regimens (Validation of a reduction in time for avian influenza virus isolation using specific pathogen-free embryonated chicken eggs - |

| | |
|---|---|
| using specific pathogen-free embryonated chickens' eggs | PMC). HPAIVs were isolated during the first passage and for LPAIV VI, the second passage could be reduced to two days. Power analysis showed that the benefit of reducing the number of days outweighed the risk of missing a positive isolate. Limited data was available from experimental inoculations. This truncated methodology, enabling an earlier release of restrictions, will substantially ease economic implications of restriction. It will also reduce bird welfare implications and improve international standards without loss of test performance. Data regarding negation of premises under suspicion for Newcastle disease is also being gathered in parallel to further support a change in this methodology that encompasses all notifiable avian diseases, since disease suspicions cannot safely exclude one disease from the other and both are relevant for exclusion of exotic avian viral disease. |

8. Did your laboratory develop new vaccines for the designated pathogen or disease?

No

9. Did your laboratory validate vaccines according to WOAH Standards for the designated pathogen or disease?

No

# TOR4: DIAGNOSTIC TESTING FACILITIES

10. Did your laboratory carry out diagnostic testing for other WOAH Members?

Yes

| Name of WOAH Member Country seeking assistance | Date | Which diagnostic test used | No. samples received for provision of diagnostic support | No. samples received for provision of confirmatory diagnoses |
|---|---|---|---|---|
| FALKLAND (ISLANDS) | 2024-02-06 | Real-time RT-PCR M gene, Real-time RT-PCR N1, Real-Time RT-PCR H5 Pathotyping | 53 | 0 |
| FALKLAND (ISLANDS) | 2024-03-01 | Real-time RT-PCR M gene, Real-time RT-PCR N1, Real-Time RT-PCR H5 Pathotyping | 15 | 0 |
| FALKLAND (ISLANDS) | 2024-03-20 | Real-time RT-PCR M gene, Real-time RT-PCR N1, Real-Time RT-PCR H5 Pathotyping | 15 | 0 |
| FALKLAND (ISLANDS) | 2024-04-12 | Real-time RT-PCR M gene, Real-time RT-PCR N1, Real-Time RT-PCR H5 Pathotyping | 18 | 0 |
| FALKLAND (ISLANDS) | 2024-05-22 | Real-time RT-PCR M gene, Real-time RT-PCR N1, Real-Time RT-PCR H5 | 6 | 0 |

| | | | | |
|---|---|---|---|---|
| | | Pathotyping | | |
| FALKLAND (ISLANDS) | 2024-10-22 | Real-time RT-PCR M gene, Real-time RT-PCR N1, Real-Time RT-PCR H5 Pathotyping | 13 | 0 |
| FALKLAND (ISLANDS) | 2024-11-26 | Real-time RT-PCR M gene, Real-time RT-PCR N1, Real-Time RT-PCR H5 Pathotyping | 10 | 0 |
| KAZAKHSTAN | 2024-01-31 | Real-time RT-PCR M gene, Real-time RT-PCR N1, Real-time RT-PCR H5, Real-time RT-PCR H7 | 0 | 4 |
| BANGLADESH | 2024-01-30 | Real-time RT-PCR M gene, Real-time RT-PCR H5, Real-time RT-PCR H9, Pan H9 RT-PCR | 0 | 99 |
| BANGLADESH | 2024-05-13 | Real-time RT-PCR M gene, Real-time RT-PCR H9, Real-Time RT-PCR H5 Pathotyping | 0 | 198 |
| BANGLADESH | 2024-05-13 | Real-time RT-PCR M gene, Real-time RT-PCR H9, Real-Time RT-PCR H5 Pathotyping, Pan H9 RT-PCR | 0 | 281 |
| BANGLADESH | 2024-05-13 | Real-time RT-PCR M gene, Real-time RT-PCR H9, Real-Time RT-PCR H5 Pathotyping | 0 | 2 |
| OMAN | 2024-09-23 | Real-time RT-PCR M gene, Pan H9 RT-PCR | 0 | 35 |
| SEYCHELLES | 2024-12-06 | Real-time RT-PCR M gene, Real-Time RT-PCR H5 Pathotyping | 1030 | 0 |

11. Did your laboratory provide expert advice in technical consultancies on the request of an WOAH Member?

Yes

| Name of the WOAH Member Country receiving a technical consultancy | Purpose | How the advice was provided |
|---|---|---|
| ARGENTINA BANGLADESH BENIN BOTSWANA BRAZIL CAMBODIA CHILE COLOMBIA COSTA RICA CROATIA CUBA DOMINICAN (REP.) ECUADOR EGYPT EL SALVADOR ETHIOPIA GEORGIA GERMANY GHANA GUATEMALA HONDURAS IRELAND ISRAEL ITALY LIBERIA NICARAGUA NIGERIA PANAMA PARAGUAY PERU SIERRA LEONE SOUTH AFRICA SPAIN THAILAND TURKEY UKRAINE URUGUAY ZAMBIA | PT Scheme Participant | Email, Reagents |

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|---|---|---|
| AUSTRALIA | Research | Email |
| BANGLADESH OMAN UNITED STATES OF AMERICA | Diagnostic testing/research | Email |
| KAZAKHSTAN SEYCHELLES | Diagnostic testing/research | Email, Online Meeting |
| CANADA | Request of material | Email |
| GHANA | Training workshop visit | In person visit |
| INDONESIA VIETNAM | Offer of linkage | Email, Online Meeting |
| TANZANIA UGANDA | Offer of linkage | Email |
| OMAN | Sharing protocols | Email, In person visit |
| OMAN | Twinning project visits | In person visits |
| SIERRA LEONE | Exchange of material | Email |
| TAJIKISTAN | Twinning project | Email, In person vist |

# TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

12. Did your laboratory participate in international scientific studies in collaboration with WOAH Members other than the own?

Yes

| Title of the study | Duration | Purpose of the study | Partners (Institutions) | WOAH Member Countries involved other than your country |
|---|---|---|---|---|
| One Health Poultry Hub | 2019-2024 | Hub researchers have characterised the networks through which chickens are produced and chickens and chicken products are distributed to identify points of high disease risk as well as where and how interventions to mitigate disease risk are best made. Hub researchers are assessing how pathogens and genes can transmit between chickens and from chickens to people and back again - focusing in particular on how this is influenced by how chickens are kept and traded. This is vital information to inform potential interventions. https://www.onehealthpoultry.org | Our Hub is led by the Royal Veterinary College (RVC) London, and comprises partners in Asia, Europe and the UK. 27 partners in total. Key focus for programme Vietnam, India, Sri Lanka and Bangladesh. This project has enabled a significant increase in the amount of genomic data generated for H9 and H5 subtype avian influenza viruses | BANGLADESH INDIA SRI LANKA VIETNAM |
| OFFLU VCM | Ongoing – annual | APHA has carried out testing and contributed reagents, data and expertise to the biannual WHO VCM activities. | OFFLU network/WHO | AUSTRALIA ITALY UNITED STATES OF AMERICA |
| Centers of Excellence for Influenza Research and response (CEIRR) | 2021-2024 | Development of pipelines for evaluation of the emergence of avian influenza viruses of pre-pandemic or pandemic risk. CEIRR Network (ceirr-network.org) | NIAID funded programme. APHA supported via interactions with Royal Veterinary College | BANGLADESH UNITED STATES OF AMERICA |

| | | | | |
|---|---|---|---|---|
| | | | (RVC) and PennCEIRR. | |
| Avian influenza matching (AIM1 donor funded through FAO) | 2022-2025 | Antigenic characterisation of emerging HP- and LPAIV H5Nx viruses to inform vaccine matching. | Alongside FAO through OFFLU interactions. This consortia includes IZSVE, Italy Francis Crick Institute, UK CSIRO, Australia USDA, USA | AUSTRALIA ITALY UNITED STATES OF AMERICA |
| Flu-Switch: Identification of factors driving the emergence and spread of avian influenza viruses with zoonotic potential | 2023-2026 | International coordination of research on infectious animal diseases (ICRAD) This project aims to identify the factors that contribute to the evolution of AIV pathogenicity in poultry, and subsequent increased zoonotic potential that shapes its host range with the goal of defining risk factors to crossing species barriers | Roslin institute, Edinburgh, UK Friedrich-Loeffler-Institut, Insel, Riems; Animal and Plant Health Agency, Weybridge Linnaeus University; Instituto Zooprofilattico Sperimentale delle Venezie All led by : Ecole nationale vétérinaire de Toulouse | FRANCE GERMANY ITALY SWEDEN |
| Kappa-Flu: Ecology and biology of HPAIV H5 | 2023-2026 | HORIZON-FARM2FORK Aims at understanding the connectivity and dynamics of H5 HPAI in wild birds, poultry and the environment, including the impact of climate change. | Friedrich-Loeffler-Institut, Insel, Riems; Erasmus Universitair Medisch Centrum, Rotterdam; Animal and Plant Health Agency, Weybridge; Linnaeus University; Instituto Zooprofilattico Sperimentale delle Venezie; Royal Veterinary College, University of London; Swiss Ornithological Institute (SOI) | GERMANY ITALY SWEDEN SWITZERLAND THE NETHERLANDS |
| UK Ministry of Defence (MOD) Biothreat reduction programme (BTRP) | 2022-2026 | Establishing a West African network for laboratory capability in avian influenza and Newcastle disease virus: Developing capability and capacity to define disease burden. | APHA, various laboratories across West Africa | GHANA GUINEA LIBERIA MALI SIERRA LEONE |
| Development of a Central Asian hub for AI and NDV | 2020-2024 | Organization of a workshop and technical support to Tajikistan – evaluating the current burden of avian influenza and Newcastle disease virus across Central Asia. | Ministry of Defence | TAJIKISTAN |

13. In exercising your activities, have you identified any regulatory research needs* relevant for WOAH?

No

# TOR6: EPIZOOLOGICAL DATA

14. Did your Laboratory collect epidemiological data relevant to international disease control?

Yes

If the answer is yes, please provide details of the data collected:

Collection and characterisation of a range of AIV samples including meta data within the UK and internationally to provide an epidemiological picture of global disease spread. Clinical samples have been received from British Overseas Territories and research partners in the Antarctic where we continue to monitor the spread of H5 HPAIV in the region.
Characterisation of AIV samples collected in Bangladesh from various studies associated with projects under partnered with Centers of Excellence for Influenza Research and response (CEIRR) and the One Health Poultry Hub.

15. Did your laboratory disseminate epidemiological data that had been processed and analysed?

Yes

If the answer is yes, please provide details of the data collected:

An analysis of the epidemiological data collected nationally and internationally was disseminated through governmental outputs and in peer-reviewed publications, detailing the evolution of AIV and the epidemiological picture with reference to the global situation.

- Ross, Craig S., et al. "Genetic Analysis of H5N1 High-Pathogenicity Avian Influenza Virus following a Mass Mortality Event in Wild Geese on the Solway Firth." Pathogens 13.1 (2024): 83.
- Shemmings-Payne, Wesley, et al. "Repeatability and reproducibility of hunter-harvest sampling for avian influenza virus surveillance in Great Britain." Research in Veterinary Science 173 (2024): 105279.
- Banyard, Ashley C., et al. "Detection and spread of high pathogenicity avian influenza virus H5N1 in the Antarctic Region." Nature Communications 15.1 (2024): 7433.

16. What method of dissemination of information is most often used by your laboratory? (Indicate in the appropriate box the number by category and list the details in the box)

a) Articles published in peer-reviewed journals:

*19*

*Craig S. Ross, Alexander M. P. Byrne, Sahar Mahmood, Saumya Thomas, Scott Reid, Lorna Freath, Larry R. Griffin, Marco Falchieri, Paul Holmes, Nick Goldsmith, Jessica M. Shaw, Alastair MacGugan, James Aegerter, Rowena Hansen, Ian H. Brown, and Ashley C. Banyard. "Genetic Analysis of H5N1 High-Pathogenicity Avian Influenza Virus following a Mass Mortality Event in Wild Geese on the Solway Firth." Pathogens, Volume 13, Issue 1 (2024): https://doi.org/10.3390/pathogens13010083*

*Amanda H. Seekings, Yuan Liang, Caroline J. Warren, Charlotte K. Hjulsager, Saumya S. Thomas, Fabian Z. X. Lean, Alejandro Nunez, Paul Skinner, David Selden, Marco Falchieri, Hugh Simmons, Ian H. Brown, Lars E. Larsen, Ashley C. Banyard, and Marek J. Slomka. "Transmission dynamics and pathogenesis differ between pheasants and partridges infected with clade 2.3.4.4b H5N8 and H5N1 high-pathogenicity avian influenza viruses." Journal of General Virology, Volume 105, Issue 1 (2024): https://doi.org/10.1099/jgv.0.001946*

*Alice Fusaro, Bianca Zecchin, Edoardo Giussani, Elisa Palumbo, Montserrat Agüero-García, Claudia Bachofen, Ádám Bálint, Fereshteh Banihashem, Ashley C. Banyard, Nancy Beerens, Manon Bourg, Francois-Xavier Briand, Caroline Bröjer, Ian H. Brown, Brigitte Brugger, Alexander M. P. Byrne, Armend Cana, Vasiliki Christodoulou, Zuzana Dirbakova, Teresa Fagulha, Ron A. M. Fouchier, Laura Garza-Cuartero, George Georgiades, Britt Gjerset, Beatrice Grasland, Oxana Groza, Timm Harder, Ana Margarida Henriques, Charlotte K. Hjulsager, Emiliya Ivanova, Zygimantas Janeliunas, Laura Krivko, Ken Lemon, Yuan Liang, Aldin Lika, Péter Malik, Michael J. McMenamy, Alexander Nagy, Imbi Nurmoja, Iuliana Onita, Anne Pohlmann, Sandra Revilla-Fernández, Azucena Sánchez-Sánchez, Vladimir Savic, Brigita Slavec, Krzysztof Smietanka, Chantal J. Snoeck, Mieke Steensels, Vilhjálmur Svansson, Edyta Swieton, Niina Tammiranta, Martin Tinak, Steven Van Borm, Siamak Zohari, Cornelia Adlhoch, Francesca Baldinelli, Calogero Terregino, and Isabella Monne. "High pathogenic avian influenza A(H5) viruses of clade 2.3.4.4b in Europe—Why trends of virus evolution are more difficult to predict." Virus Evolution, Volume 10, Issue 1 (2024): https://doi.org/10.1093/ve/veae027*

*Michelle Wille, Ralph E. T. Vanstreels, Marcela Uhart, Scott Reid, Meagan Dewar, and Ashley C. Banyard. "Reply to León et al. (2024): Interpretation and Use of In-Field Diagnostics for High Pathogenicity Avian Influenza (HPAI) in Antarctica– A Cautionary Tale." Preprint (2024): https://www.preprints.org/manuscript/202404.1498/v1*

*Wesley Shemmings-Payne, Dilhani De Silva, Caroline J. Warren, Saumya Thomas, Marek J. Slomka, Scott M. Reid, Joe James, Ashley C. Banyard, Ian H. Brown, and Alastair I. Ward. "Repeatability and reproducibility of hunter-harvest sampling for avian influenza virus surveillance in Great Britain." Research in Veterinary Science, Volume 173 (2024): https://doi.org/10.1016/j.rvsc.2024.105279*

*Caroline J. Warren, Sharon M. Brookes, Mark E. Arnold, Richard M. Irvine, Rowena D. E. Hansen, Ian H. Brown, Ashley C. Banyard, and Marek J. Slomka. "Assessment of Survival Kinetics for Emergent Highly Pathogenic Clade 2.3.4.4 H5Nx Avian Influenza Viruses." Viruses, Volume 16, Issue 6 (2024): https://doi.org/10.3390/v16060889*

*Jenna Schafers, Caroline J. Warren, Jiayun Yang, Junsen Zhang, Sarah J. Cole, Jayne Cooper, Karolina Drewek, B Reddy Kolli, Natalie Mcginn, Mehnaz Qureshi, Scott M. Reid, Thomas P. Peacock, Ian Brown, Joe James, Ashley C. Banyard, Munir Iqbal, Paul Digard, and Ed Hutchinson. "Pasteurisation temperatures effectively inactivate influenza A viruses in milk." MedRxiv (2024): https://doi.org/10.1101/2024.05.30.24308212*

*Marco Falchieri, Scott M. Reid, Akbar Dastderji, Jonathan Cracknell, Caroline J. Warren, Banjamin C. Mollett, Jacob Peers-Dent, Audra-Lynne D. Schlachter, Natalie Mcginn, Richard Hepple, Saumya Thomas, Susan Ridout, Jen Quayle, Romain Pizzi, Alejandro Núñez, Alexander M. P. Byrne, Joe James, and Ashley C. Banyard. "Rapid mortality in captive bush dogs (Speothos venaticus) caused by influenza A of avian origin (H5N1) at a wildlife collection in the United Kingdom." Emerging Microbes and Infections, Volume 13, Issue 1 (2024): https://doi.org/10.1080/22221751.2024.2361792*

*Scott M. Reid, Alexander M. P. Byrne, Fabian Z. X. Lean, Craig S. Ross, Andrei Pascu, Richard Hepple, Maria Dominguez, Susanne Frost, Vivien J. Coward, Alejandro Núñez, Joe James, Levon Stephan, James N. Aegerter, Ian H. Brown, and Ashley C. Banyard. "A multi-species, multi-pathogen avian viral disease outbreak event: Investigating potential for virus transmission at the wild bird – poultry interface." Emerging Microbes and Infections, Volume 13, Issue 1 (2024): https://doi.org/10.1080/22221751.2024.2348521*

*Joe James, Saumya S. Thomas, Amanda H. Seekings, Sahar Mahmood, Michael Kelly, Ashley C. Banyard, Alejandro Núñez, Sharon M. Brookes, and Marek J. Slomka. "Evaluating the epizootic and zoonotic threat of an H7N9 low-pathogenicity avian influenza virus (LPAIV) variant associated with enhanced pathogenicity in turkeys." Journal of General Virology, Volume 105, Issue 7 (2024): https://doi.org/10.1099/jgv.0.002008*

*Jiayun Yang, Rebecca Daines, Pengxiang Chang, Thusitha K. Karunarathna, Mehnaz Qureshi, Jean-Remy Sadeyen, Joe James, Ashley C. Banyard, Marek Slomka, Ian H. Brown, and Munir Iqbal. "The Haemagglutinin Genes of the UK Clade 2.3.4.4b H5N1 Avian Influenza Viruses from 2020 to 2022 Retain Strong Avian Phenotype." BioRxiv (2024): https://doi.org/10.1101/2024.07.09.602706*

*Michael J. McMenamy, Robyn McKenna, Valerie B. Bailie, Ben Cunningham, Adam Jeffers, Kelly McCullough, Catherine Forsythe, Laura G. Cuartero, Orla Flynn, Christina Byrne, Emily Connaghan, John Moriarty, June Fanning, Stephanie Ronan, Damien Barrett, Alice Fusaro, Isabella Monne, Calogero Terregino, Joe James, Alexander M. P. Byrne, Fabian Z. X. Lean, Alejandro Núñez, Scott M. Reid, Rowena Hansen, Ian H. Brown, Ashley C. Banyard, and Ken Lemon. "Evaluating the Impact of Low-Pathogenicity Avian Influenza H6N1 Outbreaks in United Kingdom and Republic of Ireland Poultry Farms during 2020." Viruses, Volume 16, Issue 7 (2024): https://doi.org/10.3390/v16071147*

*Ashley C. Banyard, Ashley Bennison, Alexander M. P. Byrne, Scott M. Reid, Joshua G. Lynton-Jenkins, Benjamin Mollett, Dilhani De Silva, Jacob Peers-Dent, Kim Finlayson, Rosamund Hall, Freya Blockley, Marcia Blyth, Marco Falchieri, Zoe Fowler, Elaine M. Fitzcharles, Ian H. Brown, and Joe James. "Detection and spread of high pathogenicity avian influenza virus H5N1 in the Antarctic Region." Nature Communications, Article 7433 (2024): https://doi.org/10.1038/s41467-024-51490-8*

*Stephen H. Vickers, Jayna Raghwani, Ashley C. Banyard, Ian H. Brown, Guillaume Fournie, and Sarah C. Hill. "Utilizing citizen science data to rapidly assess changing associations between wild birds and avian influenza outbreaks in poultry." Proceedings of the Royal Society, Volume 291, Issue 2031 (2024): https://doi.org/10.1098/rspb.2024.1713*

*Ashley Bennison, Stacey Adlard, Ashley C. Banyard, Freya Blockley, Marcia Blyth, Emma Browne, George Day, Michael J. Dunn, Marco Falchieri, Elaine Fitzcharles, Jaume Forcada, Jennifer F. Davidson, Anthony Fox, Rosamund Hall, Elizabeth Holmes, Kevin Hughes, Joe James, Joshua Lynton-Jenkins, Steve Marshall, Dan McKenzie, Simon A. Morley, Scott M. Reid, Isabel Stubbs, Norman Ratcliffe, and Richard A. Phillips. "A case study of highly pathogenic avian influenza (HPAI) H5N1 at Bird Island, South Georgia: the first documented outbreak in the subantarctic region." Bird Study (2024): https://doi.org/10.1080/00063657.2024.2396563*

*Fiona Greco, Hannah M. Ravenswater, Francisco Ruiz-Raya, Chiara D'Avino, Mark A. Newell, Josie Hewitt, Erin Taylor, Ella Benninghaus, Francis Daunt, Gidona Goodman, David Steel, Jenny Park, Emma Philip, Saumya Thomas, Marek J. Slomka, Marco Falchieri, Scott M. Reid, Joe James, Ashley C. Banyard, Sarah J. Burthe, and Emma J. A. Cunningham. "Asymptomatic infection and antibody prevalence to co-occurring avian influenza viruses vary substantially between sympatric seabird species following H5N1 outbreaks." BioRxiv (2024): https://doi.org/10.1101/2024.09.26.614314*

*Simeon Lisovski, Anne Günther, Meagan Dewar, David Ainley, Fabián Aldunate, Rodrigo Arce, Grant Ballard, Silke Bauer, Josabel Belliure, Ashley C. Banyard, Thierry Boulinier, Ashley Bennison, Christina Braun, Craig Cary, Paulo Catry, Augustin Clessin, Maelle Connan, Edna Correia, Aidan Cox, Juan Cristina, Megan Elrod, Julia Emerit, Irene Ferreiro, Zoe Fowler, Amandine Gamble, José P. Granadeiro, Joaquin Hurtado, Dennis Jongsomjit, Célia Lesage, Mathilde Lejeune, Amanda Kuepfer, Amélie Lescroël, Amy Li, Ian R. McDonald, Javier Menéndez-Blázquez, Virginia Morandini, Gonzalo Moratorio, Teresa Militão, Pilar Moreno, Paula Perbolianachis, Jean Pennycook, Maryam Raslan, Scott M. Reid, Roanna Richards-Babbage, Annie E. Schmidt, Martha Maria Sander, Lucy Smyth, Alvaro Soutullo, Andrew Stanworth, Léo Streith, Jérémy Tornos, Arvind Varsani, Ulrike Herzschuh, Martin Beer, Michelle Wille. "Unexpected Delayed Incursion of Highly Pathogenic Avian Influenza H5N1 (Clade 2.3.4.4b) Into the Antarctic Region." Influenza and Other Respiratory Viruses, Volume 18, Issue 10 (2024): https://doi.org/10.1111/irv.70010*

*Scott M. Reid, Vivien J. Coward, Joe James, Rowena D. E. Hansen, Colin Birch, Mayur Bakrania, Sharon M. Brookes, Ian H. Brown, and Ashley C. Banyard. "Validation of a reduction in time for avian influenza virus isolation using specific pathogen-free embryonated chicken eggs." VetRecord (2024): https://doi.org/10.1002/vetr.4842*

*Ian H. Brown, and Ashley C. Banyard. "High pathogenicity avian influenza H5N5: the next threat?" VetRecord, Volume 195, Issue 12 (2024): https://doi.org/10.1002/vetr.5046*

b) International conferences:

*15*

*Dr Joe James: "International work on Animal Influenza and Newcastle Disease", Ghana AIV/NDV Sequencing workshop, 13.05.2024*

*Dr Joe James: "Avian Influenza Research work at APHA", Kappaflu Annual Meeting, 01.06.2024*

*Prof Ashley C. Banyard: "Introducing the IRL and AIM programme", OFFLU Technical reporting meeting, FAO, 02.07.2024-04.07.2024*

*Prof Ashley C. Banyard: "Avian Influenza Matching (AIM) for poultry vaccines: Developing linkages" International webinar, 10.07.2024*

*Alice Fusaro: "HPAI in Europe: update on the genetic characteristics", Instituto Zooprofilattico Sperimentale delle Venezie (IZSVe), 11.07.2024*

*Prof Ashley C. Banyard: "Situation and global context of Avian Influenza and OFFLU overview", Regional training course on the production of secondary reference materials, SENACSA, 05.08.2024*

*Prof Ashley C. Banyard: "Avian Influenza: Laboratory diagnostic guidelines, sampling, analysis, and interpretation of results", Regional training course on the production of secondary reference materials, SENACSA, 05.08.2024*

*Prof Ashley C. Banyard: "Production of SRMs for PCR according to international standards", Regional training course on the production of secondary reference materials, SENACSA, 05.08.2024*

*Prof Ashley C. Banyard: "Avian Influenza: Laboratory diagnostic pipelines and quality systems", Regional training course on the production of secondary reference materials, SENACSA, 06.08.2024*

*Prof Ashley C. Banyard: "The use of proficiency panels and the role of the international reference laboratory for avian influenza, swine influenza and Newcastle disease", Regional training course on the production of secondary reference materials, SENACSA, 06.08.2024*

*Prof Ashley C. Banyard: "Avian Influenza Matching (AIM) for poultry vaccines: Project background", Regional training course on the production of secondary reference materials, SENACSA, 06.08.2024*

*Prof Ashley C. Banyard: "The use of proficiency panels and an introduction to quality management systems", Regional training course on the production of secondary reference materials, SENACSA, 06.08.2024*

*Dr Josh Lynton-Jenkins: "Avian Influenza Antigen/Antisera Production", Regional training course on the production of secondary reference materials, SENACSA, 08.08.2024*

*Dr Josh Lynton-Jenkins: "Genotyping Viruses in Ref. Labs", Regional training course on the production of secondary reference materials, SENACSA, 08.08.2024*

*Prof Ashley C. Banyard: "Global situation update on avian influenza viruses 'Highlighting zoonotic potential and the role of reference laboratories'", FAO Global Conference of Animal Health Innovation, Reference laboratories and vaccines, 22.09.2024-25.09.2024*

c) National conferences:

*23*

*Prof Ashley C. Banyard: "An overview of assessing zoonotic risk at the animal:human interface", British Antarctic Survey update meeting, 18.01.2024*

*Prof Ashley C. Banyard: "An update on avian influenza has the zoonotic risk changed?", UKHSA regional network meeting, 19.01.2024*

*Dr Joe James: "Influenza at the animal-human interface", Sheffield Virology Scientific Meeting, 27.01.2024*

*Prof Ashley C. Banyard: "From FluMap to FluTrailMap and beyond: National and international activities with avian influenza", National Farmers Union (NFU) annual meeting, 19.03.2024*

*Prof Ashley C. Banyard: "Celebrating the Uks international collaborations on animal health and welfare: Avian Influenza Virus", WOAH Centenary event at APHA, 25.04.2024*

*Dr Joe James: "Animal Influenza and Newcastle Disease at APHA", UK:Ukraine animal diseases event, 25.04.2024*

*Prof Ashley C. Banyard: "Recent developments in the world of avian influenza", Veterinary Investigating Officer National annual meeting, 10.07.2024*

*Prof Ashley C. Banyard: "HPAI in cattle (or mammals); what do we know, what are we doing about it", Government Veterinary Science meeting, 11.07.2024*

*Prof Ashley C. Banyard: "An update on the current HPAIV situation and risk at the animal:human interface", British Antarctic Survey meeting, 22.08.2024*

*Prof Ashley C. Banyard and Dr Joe James "Update on avian influenza in the UK and externally funded projects", Defra policy group meeting, 02.09.2024*

*Prof Ashley C. Banyard: "An update on the genetics of current HPAIV situation", Core (industry and policy) group meeting, 09.09.2024*

*Dr Joe James: "An update on the current HPAIV situation in wild birds", avian expert (industry and policy) group meeting, 30.09.2024*

*Prof Ashley C. Banyard: "Situation update: Where are we now with high pathogenicity avian influenza?", BVPA Winter meeting, 10.10.2024*

*Dr Joe James: "H5 situation in GB and Europe", UKHSA and NHS Winter Influenza Season 2024/25, 24.10.24*

*Dr Joe James: "Flu-TRAILMAP:  Research on H5 HPAI virus in the natural host and environment", UKHSA mini-symposium on H5 HPAIV, 05.11.24*

*Dr Joe James: "Risk assessment of H5Nx HPAIV in the UK", UKHSA mini-symposium on H5 HPAIV, 05.11.24*

*Prof Ashley C. Banyard: "Avian influenza in the UK: November 2024", Avian influenza and Biosecurity stakeholder meeting, 11.11.2024*

*Cecilia Di Genova: "Using serological approaches to investigate incursions of non-notifiable low pathogenicity avian influenza virus into UK poultry over a 10-year period", UK-China Avian Flu Control and Flu-Trail Map Workshop, 11.11.2024-12.11.2024*

*Dr Joe James: "Situation update: Where are we now with high pathogenicity avian influenza (HPAIV)?", Avian expert (industry and policy) group annual meeting, 13.11.24*

*Prof Ashley C. Banyard: "Utility of WGS approaches in Notifiable Avian Disease (NAD) outbreak response", Whole genome sequencing science and policy day, 27.11.2024*

*Prof Ashley C. Banyard: "An overview of the current situation with high pathogenicity avian influenza (HPAIV)", British Free Range Poultry*

*Association Annual Meeting, 28.11.2024*

*Prof Ashley C. Banyard: "An overview of the National Reference Laboratory for Avian influenza and the role of the National Reference Laboratory, Weybridge", Stop the spread webinar, 02.12.2024*

*Dr Joe James: "An overview of the current situation with high pathogenicity avian influenza (HPAIV) and top-level research activities", JNCC, 06.12.2024*

d) Other (Provide website address or link to appropriate information):

*13*
*Prof Ashley C. Banyard: "FluTrailMap: The role of host factors and immunity in infection, epidemiology and mitigation", 08.02.2024*

*Prof Ashley C. Banyard and Dr Joe James: "Oman WOAH training mission Feb 2024 observations and recommendations", 27.02.2024*

*Prof Ashley C. Banyard: "FluTrailMap One Health: National and International HPAIV Situation update", 12.03.2024*

*Prof Ashley C. Banyard: "One Health and Influenza viruses: the continuing challenge of veterinary viruses to public health", St George's Medical school, 24.03.2024*

*Prof Ashley C. Banyard: "An overview of the challenges of veterinary viruses: Avian influenza", Cornwall college, 26.04.2024*

*Prof Ashley C. Banyard: "Avian and swine influenza viruses: Emergence and zoonotic risk", University of Sussex, 26.04.2024*

*Prof Ashley C. Banyard: "H5N1 avian influenza virus: the UK situation and emerging events in cattle in the US", Bristol Veterinary school, 23.05.2024*

*Prof Ashley C. Banyard: "An update on HPAIV in Antarctica and Southern America", 10.06.2024*

*Prof Ashley C. Banyard: "FluTrailMap: Cross-government meeting overview", 27.06.2024*

*Dr Joe James: "FluTrailMap: The role of host factors and immunity in infection, epidemiology and mitigation", 01.07.2024*

*Prof Ashley C. Banyard: "Avian Influenza Outbreak response: What happens at the National Reference Laboratory for Avian Influenza and Newcastle disease in Weybridge", 01.08.2024*

*Prof Ashley C. Banyard: "Overview of the Influenza and Avian Influenza workgroup", Defra senior management meeting, 10.08.2024*

*Prof Ashley C. Banyard: "Attempting to control viral pathogens- Successes, failures and the challenges ahead", Royal Veterinary College, 29.11.2024*

# TOR7: SCIENTIFIC AND TECHNICAL TRAINING

17. Did your laboratory provide scientific and technical training to laboratory personnel from other WOAH Members?

Yes

a) Technical visit : 0

b) Seminars : 0

c) Hands-on training courses: 37

d) Internships (>1 month) 0

| Type of technical training provided (a, b, c or d) | Country of origin of the expert(s) provided with training | No. participants from the corresponding country |
|---|---|---|
| C | GHANA | 12 |
| C | OMAN | 4 |
| C | PARAGUAY | 5 |
| C | BRAZIL | 2 |
| C | ARGENTINA | 1 |
| C | CHILE | 1 |
| C | CUBA | 1 |
| C | ECUADOR | 1 |
| C | COLOMBIA | 1 |
| C | COSTA RICA | 1 |
| C | DOMINICAN (REP.) | 1 |
| C | EL SALVADOR | 1 |
| C | GUATEMALA | 1 |
| C | HONDURAS | 1 |
| C | NICARAGUA | 1 |
| C | PANAMA | 1 |
| C | PERU | 1 |
| C | URUGUAY | 1 |

# TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Yes

| Quality management system adopted | Certificate scan (PDF, JPG, PNG format) | |
|---|---|---|
| ISO 17025 | ISO17025 Certificate.pdf | ISO17025 Certificate.pdf |
| ISO 9001 | Certificate UK013916 - ISO 9001 | ANIMAL PLANT HEALTH AGENCY - Certificate UK013916 - ISO 9001 - exp. 25-07-2026.pdf |

19. Is your quality management system accredited?

Yes

| Test for which your laboratory is accredited | Accreditation body |
|---|---|
| Haemagglutination inhibition test | UKAS |
| AGIDT | UKAS |
| Matrix (M)-gene PCR | UKAS |
| H5 real-time PCR (HA2) | UKAS |
| H5 real-time PCR (Pathotyping) | UKAS |
| H7 real-time PCR (cleavage site) | UKAS |
| Real-time RT-PCR N1 | UKAS |
| Real-time RT-PCR N5 to N9 | UKAS |
| Next Generation Sequencing | UKAS |
| H7 real-time PCR (HA2) | UKAS |
| Avian influenza virus Sanger nucleotide sequencing | UKAS |
| Neuraminidase inhibition | UKAS |
| Virus isolation in goose eggs (via allantoic cavity) | UKAS |
| Virus isolation in SPF chicken eggs (via allantoic cavity) | UKAS |
| IVPI | UKAS |

20. Does your laboratory maintain a "biorisk management system" for the pathogen and the disease concerned?

Yes

APHA maintains a complete and functioning laboratory biological risk management system which ensures that the laboratory is in compliance with applicable local, national (UK Health and Safety Executive), regional and international standards and requirements for biosafety and laboratory biosecurity.

# TOR9: SCIENTIFIC MEETINGS

21. Did your laboratory organise scientific meetings related to the pathogen in question on behalf of WOAH?

Yes

| National/ International | Title of event | Co-organiser | Date | location | No. Participants |
|---|---|---|---|---|---|
| International | Avian Virology Diagnostics Training: Oman Twinning Workshop | Central Laboratory for Animal Health, Oman | 2024-09-08 | APHA Weybridge, UK | 4 |

22. Did your laboratory participate in scientific meetings related to the pathogen in question on behalf of WOAH?

Yes

| Title of event | Date | location | Role (speaker, presenting poster, short communications) | Title of the work presented |
|---|---|---|---|---|
| WOAH Centenary event at | 2024-04-27 | UK | Speaker | Celebrating the UK's international collaborations on animal |

| | | | | |
|---|---|---|---|---|
| APHA | | | | health and welfare: Avian Influenza Virus |

# TOR10: NETWORK WITH WOAH REFERENCE LABORATORIES

23. Did your laboratory exchange information with other WOAH Reference Laboratories designated for the same pathogen or disease?

Yes

24. Do you network (collaborate or share information) with other WOAH Reference Laboratories designated for the same pathogen?

Yes

| NETWORK/DISEASE | ROLE OF YOUR LABORATORY (PARTICIPANT, ORGANISER, ETC) | NO. PARTICIPANTS | PARTICIPATING WOAH REF. LABS |
|---|---|---|---|
| OFFLU Avian Influenza | Participant, organiser and consultant | 15 | Canadian Food Inspection AgencyNational Centre for Foreign Animal Disease, Canada National Avian Influenza Reference Laboratory, Animal Influenza Laboratory of the Ministry of Agriculture, China Friedrich Loeffler Institute Federal Research Institute for Animal Health Institute of Diagnostic Virology, Germany CSIRO Australian Centre for Disease Preparedness, Australia National Veterinary Services Laboratories, USDA, APHIS, VS, USA Istituto Zooprofilattico Sperimentale delle Venezie, Research and Innovation Dept., USA Laboratório Federal de Defesa Agropecuária em Sao Paulo – LFDA-SPUnidade de Sanidade Aviária, Brazil Hokkaido University, Research Center for Zoonosis Control, Japan Indian Council of Agricultural Research (ICAR), National Institute of High Security Animal Diseases (NIHSAD), India Animal and Plant Quarantine Agency Ministry of Agriculture, Forest and Rural Affairs, South Korea Reference Laboratory for Veterinary Quality Control on Poultry Production, Egypt National Reference Laboratory for Avian Influenza and Newcastle Disease, Russia |

| | | | |
|---|---|---|---|
| | | | Southeast Poultry and Research Laboratory (SEPRL), United States Department of Agriculture (USDA), USA The Pirbright Institute, UK |

25. Did you organise or participate in inter-laboratory proficiency tests with WOAH Reference Laboratories designated for the same pathogen during the past 2 years?

Yes

| Purpose of the proficiency test: | Role of your Reference Laboratory (organiser/ participant) | No. participating Laboratories | Participating WOAH Ref. Labs/ organising WOAH Ref Lab |
|---|---|---|---|
| EURL Proficiency test | Participant | 83 | Instituto Zooprofilattico Sperimentale delle Venezie, Italy |
| OFFLU Proficiency test programme | Participant | 11 | CSIRO Australian Centre for Disease Preparedness, Australia |
| Proficiency Test Exercise: Molecular Panel | Organiser | 39 | Reference Laboratory for Veterinary Quality Control on Poultry Production, Egypt Laboratório Federal de Defesa Agropecuária em Sao Paulo – LFDA-SP, Brazil |
| Proficiency Test Exercise: Conventional Panel | Organiser | 16 | Reference Laboratory for Veterinary Quality Control on Poultry Production, Egypt |

26. Did your laboratory collaborate with other WOAH Reference Laboratories for the same disease on scientific research projects for the diagnosis or control of the pathogen of interest?

Yes

| Title of the project or contract | Scope | Name(s) of relevant WOAH Reference Laboratories |
|---|---|---|
| OFFLU VCM | APHA has carried out testing and contributed reagents, data and expertise to the biannual WHO VCM activities | Instituto Zooprofilattico Sperimentale delle Venezie, Italy National Veterinary Services Laboratories, USDA, USA |
| Avian influenza matching (AIM1 donor funded through FAO) | Antigenic characterisation of emerging HP- and LPAIV H5Nx | CSIRO Australian Centre for Disease Preparedness, Australia National Veterinary Services Laboratories, USDA, USA Instituto Zooprofilattico Sperimentale delle Venezie, Italy |
| Flu-Switch: Identification of factors driving the emergence and spread of avian influenza viruses with zoonotic potential | International coordination of research on infectious animal diseases (ICRAD) This project aims to identify the factors that contribute to the evolution of AIV pathogenicity in poultry, and subsequent increased zoonotic potential that shapes its host range with the goal of defining risk | Friedrich Loeffler Institute, Germany Instituto Zooprofilattico Sperimentale delle Venezie, Italy |

| | | |
|---|---|---|
| | factors to crossing species barriers | |
| Kappa-Flu: Ecology and biology of HPAIV H5 | HORIZON-FARM2FORK Aims at understanding the connectivity and dynamics of H5 HPAI in wild birds, poultry and the environment, including the impact of climate change. | Friedrich Loeffler Institute, Germany Instituto Zooprofilattico Sperimentale delle Venezie, Italy |

# TOR11: OTHER INTERLABORATORY PROFICIENCY TESTING

27. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than WOAH Reference Laboratories for the same pathogen during the past 2 years?

Yes

| Purpose for inter-laboratory test comparisons1 | Role of your reference laboratory (organizer/participant) | No. participating laboratories | Name of the test | WOAH Member Countries |
|---|---|---|---|---|
| Proficiency Test Exercise: Conventional Panel | Organiser | 16 | HAIT | BANGLADESH, BOTSWANA, CROATIA, EGYPT, GERMANY, GHANA, ISRAEL, NIGERIA, SOUTH AFRICA, SPAIN, TURKEY, |
| Proficiency Test Exercise: Molecular Panel | Organiser | 39 | RT-PCR | ARGENTINA, BANGLADESH, BENIN, BOTSWANA, BRAZIL, CAMBODIA, CHILE, COLOMBIA, COSTA RICA, CROATIA, DOMINICAN (REP.), ECUADOR, EGYPT, EL SALVADOR, GEORGIA, GERMANY, GHANA, GUATEMALA, HONDURAS, IRELAND, ISRAEL, NICARAGUA, NIGERIA, PANAMA, PARAGUAY, PERU, SOUTH AFRICA, SPAIN, TURKEY, UKRAINE, URUGUAY, ZAMBIA, |

# TOR12: EXPERT CONSULTANTS

28. Did your laboratory place expert consultants at the disposal of WOAH?

No

29. Additional comments regarding your report:

No