

WOAH Reference Laboratory Reports Activities 2023

Activities in 2023

This report has been submitted : 7 juin 2024 04:24

Laboratory Information

| | |
|---|---|
| Name of disease (or topic) for which you are a designated WOAH Reference Laboratory: | Avian Influenza |
| Address of laboratory: | Animal and plant quarantine Agency, Ministry of Agriculture, Forest and Rural Affairs |
| Tel.: | +82549120968 |
| E-mail address: | ensemble@korea.kr |
| Website: | http://www.qia.go.kr |
| Name (including Title) of Head of Laboratory (Responsible Official): | JungHee Kim (Commissioner, APQA) |
| Name (including Title and Position) of WOAH Reference Expert: | Dr. Eun-Kyoung Lee, Senior Researcher of Avian influenza Research and Diagnostic Division(ARDD) |
| 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 | |
|---|-----------------------------------|--|-----------------|
| | | Nationally | Internationally |
| Indirect diagnostic tests | | | |
| c-ELISA (AI type A) | | 123 | 0 |
| HI (H5/H7) | | 2567 | 0 |
| Direct diagnostic tests | | | |
| Virus isolation | | 552 | 63 |
| RT-PCR | | 13279 | 31 |
| H5/H7 pathotyping by Sanger sequencing | | 65 | 32 |
| Next Generation Sequencing for AIV gene | | 262 | 63 |

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 |
|---------------------------|-------------------------|-------------------|-------------------------------------|--|--|-----------------------|
| rRT-PCR kit | H5 gene detection | provide | - | 200 tests | 1 | MONGOLIA, |
| | | | | | | |

| | | | | | | |
|--|---------|-----------------|--------------|---|----|------------------|
| Antigen (H5, H7, H9) Antiserum (H5, H7, H9) | HI test | Produce Provide | 150000 tests | 0 | 38 | KOREA (REP. OF), |
|--|---------|-----------------|--------------|---|----|------------------|

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to WOAHA 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 WOAHA Standards for the designated pathogen or disease?

Yes

| NAME OF THE NEW TEST OR DIAGNOSTIC METHOD DEVELOPED | DESCRIPTION AND REFERENCES (PUBLICATION, WEBSITE, ETC.) |
|--|---|
| Novel multiplex rRT-PCR of subtype H5, H7, H9 according to WOAHA standards | - patent application No. : KR-10-2023-0071928(2023.6.2.) - Publication - Development and evaluation of a multiplex real-time RT-PCR assay for simultaneous detection of H5, H7, and H9 subtype avian influenza viruses. An et al. J Virol Methods. 2024. Jun:327:114942 |

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

Yes

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

Yes

| NAME OF THE NEW VACCINE DEVELOPED | DESCRIPTION AND REFERENCES (PUBLICATION, WEBSITE, ETC.) |
|--|--|
| Clade 2.3.2.1d/2.3.4.4b multivalent vaccines | The clade 2.3.2.1d/2.3.4.4b multivalent vaccine was newly validated for emergency preparedness in Korea (patent application No. : KR-10-2023-0061365(2023.5.11.) |

TOR4: DIAGNOSTIC TESTING FACILITIES

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

Yes

| NAME OF WOAHA 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 |
|---|------------|----------------------------|--|--|
| MONGOLIA | 2023-10-02 | Real-time RT-PCR, NGS | 0 | 31 |
| LAOS | 2023-09-20 | NGS | 0 | 13 |
| CAMBODIA | 2023-09-20 | NGS | 0 | 19 |

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

Yes

| NAME OF THE WOAHA MEMBER COUNTRY RECEIVING A TECHNICAL CONSULTANCY | PURPOSE | HOW THE ADVICE WAS PROVIDED |
|--|--|---|
| MALAYSIA | To share information on the international AI proficiency tests organized by OFFLU, APHA, IZSve and South Korea | The PT information internationally provided by the organizers was shared, and the PT program organized by South Korea in 2024 was provided. |

TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

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

Yes

| Title of the study | Duration | PURPOSE OF THE STUDY | PARTNERS (INSTITUTIONS) | WOAHA MEMBER COUNTRIES INVOLVED OTHER THAN YOUR COUNTRY |
|--|------------------|---|--|---|
| The monitoring and characteristic studies for avian influenza and foot and mouth | 10 years (15-24) | Monitoring of high pathogenicity avian influenza in | National Center for Veterinary Diagnosis | VIETNAM |

| disease viruses in Vietnam | | Vietnam | | |
|--|-----------------|--|---|---------------|
| Studies on genetic characterization of foot and mouth disease viruses and avian influenza virus in FMD and AI endemic countries (Cambodia and LAO PDR) | 5 years (23-27) | Monitoring of high pathogenicity avian influenza in Cambodia and LAO PDR | National Animal Health and Production Research Institute (Cambodia) National Animal Health Laboratory (Lao PDR) | CAMBODIA LAOS |
| The monitoring and characteristic studies for Avian Influenza viruses in migratory habitats of Mongolia | 5 years (21-25) | Monitoring of high pathogenicity avian influenza in Mongolia | Mongolian University of Life Sciences(MULS) | MONGOLIA |

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

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:

- (For HPAI outbreaks in Korea) For all the HPAI outbreaks of Korea in 2023, the epidemiological data are collected in APQA and all the laboratory works for characterization of viruses are performed for official announcement.
- (For international HPAI outbreaks) The information on the isolated viruses of avian influenza, e.g. origin, subtype, pathotype or nucleotide sequences, for the molecular epidemiological studies on the outbreaks of HPAI in Vietnam, Cambodia and LAO PDR.
- (International active surveillance on migratory birds) Characterization of the avian influenza viruses detected from the migratory birds during collaborative active surveillance in Mongolia e.g. origin, subtype, pathotype or nucleotide sequences. The molecular epidemiological results of this study were published for data sharing.

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:

We disseminated those data concerning molecular epidemiological characterization of avian influenza viruses isolated from wild birds or poultry in South Korea and other countries through research paper publications and presentation in the workshops hosted by WOA?H several times.

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:

9

1. Sagong MG, Lee KN, Lee EK, Kang HM, Choi YK, Lee YJ. Current situation and control strategies of H9N2 avian influenza in South Korea. *J. of veterinary science*. 2023 Jan. 24(1):e5
2. An SH, Heo GB, Kang YM, Sagong MG, Kim NY, Lee YJ, Lee KN. Statistical analysis of the performance of local veterinary laboratories in molecular detection (rRT-PCR) of avian influenza virus via national proficiency testing performed during 2020-2022. *Viruses*. 2023 Mar 15(4), 823.
3. Kang YM, Heo GB, An SH, Lee YN, Cha RM, Cho HK, Sagong MG, Kim DH, Lee EK, Kang HM, Lee KN, Lee YJ. Introduction of multiple novel high pathogenicity avian influenza (H5N1) Virus of clade 2.3.4.4b into South Korea in 2022. *Transboundary and Emerging disease*. 2023 Apr. ID8339427.
4. Cha RM, Lee YN, Park MJ, Baek YG, Shin JI, Jung CH, Sagong MG, Heo GB, Kang YM, Lee KN, Lee YJ, Lee EK. Genetic Characterization and Pathogenesis of H5N1 High Pathogenicity Avian Influenza Virus Isolated in South Korea during 2021-2022. *Viruses*. 2023 Jun. 15(6);1403.
5. Cho HK, Kang YM, Sagong MG, Kim JH, Kim HJ, An SJ, Lee YJ, Kang HM. Protection of SPF Chickens by H9N2 Y439 and G1 Lineage Vaccine against Homologous and Heterologous Viruses. *Vaccines*. 2023 Mar. 11(3);538.
6. Kim HJ, Cho HK, Kang YM, Sagong MG, An SJ, Kim SY, Lee YJ, Kang HM. Protective efficacy of a bivalent H5 influenza vaccine candidate against both clades 2.3.2.1 and

2.3.4.4 high pathogenic avian influenza viruses in SPF chickens. *Vaccine*. 2023. Apr. 41(2023) 2816-2823.

7. Baek YG, Lee YN, Cha RM, Park MJ, Lee YJ, Park CK, Lee EK. Comparative evaluation of pathogenicity between subgroups of H5N6 high pathogenicity avian influenza viruses detected in South Korea. *Poult Sci*. 2023 Nov. 103(2);103289.

8. Noh EB, Heo GB, Lee KN, Kang YM, An SH, Kim NY, Lee YJ. Subtype specific virus enrichment with immunomagnetic separation method followed by NGS unravels the mixture of H5 and H9 avian virus. *J Virol Methods*. 2023 Oct. 320:114773.

9. Sagong MG, Kang YM, Kim NY, Nog EB, Heo GB, An SH, Lee YJ, Choi YK, Lee KN. Development of a novel Korean H9 specific rRT-PCR assay and its application for AIV surveillance in Korea. *J Microbiol*. 2023 Oct. 61(10):929-936.

b) International conferences:

5

1. Pathogenesis of clade 2.3.4.4b H5N1 high pathogenicity avian influenza virus isolated from South Korea in 2021-2022(ESWI, 2023.9.16. Spain)

2. Introduction of multiple and novel High Pathogenicity Avian influenza(H5N1, clade 2.3.4.4b) Virus, South Korea, 2022 (2023 WVPA, 2022.9.4. Italy)

3. Protective efficacy of synthetic vaccine candidates for updating national antigen bank against H5Nx clades 2.3.2.1 and 2.3.4.4 high pathogenicity avian influenza viruses in Korea (2023 WVPA, 2023.9.4. Italy)

4. Statistical analysis of the five successive proficiency testing rounds of the provincial veterinary service laboratories about real-time RT-PCR of avian influenza virus during 2020-2022 (2023 WVPA, 2023.9.4. Italy)

5. HPAI outbreaks situation in Korea (Japanese AI forum, 2023.9.23.)

c) National conferences:

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1. Production of the recombinant trimeric hemagglutinin protein from avian influenza virus using the baculovirus expression system (The Korean Society of Vet, Sci., 2023.4.20.)

2. Development of bivalent H5 influenza vaccine candidate consisting clades 2.3.2.1 and 2.3.4.4 high pathogenicity avian influenza viruses (The Korean Society of Vet, Sci., 2023.4.20.)

3. Development and industrialization of LPAI (Excellence performance presentation in APQA, 2023.5.15.)

4. Genetic characterization of H5Nx low pathogenicity avian influenza virus Isolated from Wild Birds in South Korea (The Korean society of preventive veterinary medicine, 2023.7.7.)

5. Recent HPAI outbreaks and surveillance system in Kore. AI symposium at APQA, Korea (2023.9.12.)

6. Molecular characterization of H5Nx high pathogenicity avian influenza virus in Vietnam during 2021-2022 (The Korean society for zoonoses, 2023.11.23-24.)

7. Genetic features and pathogenesis of H5N1 high pathogenicity avian influenza virus isolated from South Korea in 2021-2022 (The Korean society for zoonoses., 2023.11.23-24.)

8. Resolving the biases of coverage depth along the gene segments of avian influenza virus for amplicon sequencing with nanopore (2023 JVS, 2023.11.30.)

9. Evaluation of the inactivation of avian influenza virus in duck meat through electron beam irradiation. (2023 JVS, 2023.11.30.)

10. Antigen requirement of recombinant vaccine candidates against high pathogenicity avian influenza H5 and H7 viruses (2023 JVS, 2023.11.30.)

11. Protective efficacy of the H5 bivalent vaccine in SPF and breeder chickens (2023 JVS, 2023.11.30.)

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

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

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

Yes

a) Technical visit : 0

b) Seminars : 1

c) Hands-on training courses: 1

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 |
|--|---|---|
| B | KOREA (REP. OF) | 12 |
| C | KOREA (REP. OF) | 12 |

TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Yes

| Quality management system adopted | Certificate scan (PDF, JPG, PNG format) | |
|-----------------------------------|---|---|
| ISO/IEC 17025:2017 | Certificate (PDF) | 20230203_KT372_Animal and Plant Quarantine Agency(Department of Animal and Plant Health Research)_Eng.pdf |

19. Is your quality management system accredited?

Yes

| Test for which your laboratory is accredited | Accreditation body |
|--|---|
| Identification of the agent (Molecular techniques) | KOLAS-Korea Laboratory Accreditation Scheme |
| Serological test(HA and HI) | KOLAS-Korea Laboratory Accreditation Scheme |

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

Yes

A national biorisk management is designated to prevent disease among personnel and to protect the community from harm by preventing the release of infectious pathogen. In order to maintain the biorisk capacity of containment facilities in Korea, the national approval and management system for these facilities, such as Biosafety Level 3(BL3) facilities. Accreditation No. : KCDC-HP-16-3-03, KCDC 16-3-03. We have operated "Guideline for biosafety of infectious disease diagnosis and research (APQA-PR-BR-BL3)

TOR9: SCIENTIFIC MEETINGS

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

No

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

Yes

| Title of event | Date (mm/yy) | Location | Role (speaker, presenting poster, short communications) | Title of the work presented |
|--|--------------|-----------------|---|--|
| STAR-IDAZ Influenza meeting | 2023-01-31 | Online | Participants | - |
| The WOAHP webinar on the Observatory's annual report | 2023-03-20 | Online | Participants | - |
| WOAHP avian disease network in east Asia | 2023-06-08 | Online (Zoom) | Speaker | H5N1 outbreaks, Republic of Korea in 2022/23 |
| WOAHP Regional Expert Group Meeting for disease of poultry in Asian and the Pacific Region | 2023-08-31 | Qingdao (China) | Speaker | Avian Influenza update in South Korea |

TOR10: NETWORK WITH WOAHP REFERENCE LABORATORIES

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

Yes

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

Yes

| NETWORK/DISEASE | ROLE OF YOUR LABORATORY (PARTICIPANT, ORGANISER, ETC) | NO. PARTICIPANTS | PARTICIPATING WOAHP REF. LABS |
|-----------------|---|------------------|---|
| Avian influenza | participant | 2 | Hokkaido University, Research Center for Zoonosis Control |

25. Did you organise or participate in inter-laboratory proficiency tests with WOAHP Reference Laboratories designated for the same pathogen?

Yes

| PURPOSE OF THE PROFICIENCY TESTS: | ROLE OF YOUR REFERENCE LABORATORY (ORGANISER/ PARTICIPANT) | NO. PARTICIPANTS | PARTICIPATING WOAHP REF. LABS/ ORGANISING WOAHP REF. LAB. |
|-----------------------------------|--|------------------|---|
| 1 | | | |

| | | | |
|---|-------------|---|---|
| To improve accurate global detection and characterization of influenza in birds | Participant | information available from organizer, CSIRO/ACDP(Australia) | CSIRO/ACDP has conducted proficiency testing on behalf of OFFLU |
|---|-------------|---|---|

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

No

TOR11: OTHER INTERLABORATORY PROFICIENCY TESTING

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

Yes

| Purpose for inter-laboratory test comparisons1 | Role of your reference laboratory (organizer/participant) | No. participating laboratories | Name of the Test | WOAH Member Countries |
|---|---|--------------------------------|------------------|-----------------------|
| Annual national proficiency test for the diagnosis of avian influenza virus in viral genome detection method using real-time RT-PCR | Organiser | 38 | rRT-PCR, C-ELISA | KOREA (REP. OF), |

TOR12: EXPERT CONSULTANTS

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

Yes

| KIND OF CONSULTANCY | Location | SUBJECT (FACULTATIVE) |
|---|----------|---|
| Opinion on the five renewal of WOA registration for diagnostic kit Avian Influenza Disease Antibody Test Kit (BioCheck UK Ltd), requested by Science Department, WOA (2023.10.16) | e-mail | Reply to the four questions concerning the kit's suitability for its intended purpose |
| Provide ideas and informations during the STAR-IDAZ workshops by attending, requested by Science Department, WOA | Online | STAR-IDAZ workshop on influenza research roadmap – diagnostic tests development (2023.1.31) |
| Response on the questionnaire developed by the Biological Standards Commission, WOA (2023.6) | Online | For changes and improvements on the Reference Laboratory systems and processes. |
| Participation on the survey FAO/WOA 2008 Global Avian Influenza Control Strategy (GAICS) (2023.1) | Online | Revision of FAO/WOA 2008 GAICS |

29. Additional comments regarding your report:

No