

OIE Reference Laboratory Reports Activities

Activities in 2020

This report has been submitted : 2021-01-31 15:49:33

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|--|--|
| Name of disease (or topic) for which you are a designated OIE Reference Laboratory: | Foot and mouth disease |
| Address of laboratory: | 177, Hyeoksin 8-ro Gimcheon-si Gyeongsangbuk-do, 39660 KOREA (REP. OF) |
| Tel.: | +82-54 912.09.06 |
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| Website: | www.qia.go.kr |
| Name (including Title) of Head of Laboratory (Responsible Official): | Bong-Kyun Park, Commissioner of APQA |
| Name (including Title and Position) of OIE Reference Expert: | Jong-Hyeon Park, Head of Center for FMD Vaccine Research |
| Which of the following defines your laboratory? Check all that apply: | Governmental |

ToR 1: To use, promote and disseminate diagnostic methods validated according to OIE Standards

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 OIE Manual (Yes/No) | Total number of test performed last year | |
|---------------------------|----------------------------------|--|-----------------|
| | | Nationally | Internationally |
| Indirect diagnostic tests | | Nationally | Internationally |
| ELISA (SP Antibody) | Yes | 2804 | 0 |
| ELISA (NSP Antibody) | Yes | 1752 | 0 |
| Direct diagnostic tests | | Nationally | Internationally |
| Virus isolation | Yes | 0 | 0 |
| Antigen ELISA | Yes | 0 | 0 |
| Realtime RT-PCR | Yes | 208 | 0 |
| VP1 gene sequencing | Yes | 0 | 0 |

ToR 2: To develop reference material in accordance with OIE requirements, and implement and promote the application of OIE Standards. To store and distribute to national laboratories biological reference products and any other reagents used in the diagnosis and control of the designated pathogens or disease.

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

No

3. Did your laboratory supply standard reference reagents (non OIE-approved) and/or other diagnostic reagents to OIE Member Countries?

Yes

| Type of reagent available | Related diagnostic test | Produced/ provide | Amount supplied nationally (ml, mg) | Amount supplied internationally (ml, mg) | No. of recipient OIE Member Countries | Region of recipients |
|--|----------------------------|--------------------------------|-------------------------------------|--|---------------------------------------|--|
| VDRD FMDV 3Diff/PAN Rapid kit | FMDV Rapid test | Median Diagnositcs/APQA | 550tests | 0 | 1 | <input type="checkbox"/> Africa <input type="checkbox"/> Americ as <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East |
| VDx FMDV O qRT- PCR | rRT-PCR(serotype O) | Median Diagnostics/APQA | 0 | 288tests | 3 | <input type="checkbox"/> Africa <input type="checkbox"/> Americ as <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East |
| VDx FMDV A qRT-PCR | rRT-PCR(serotype A) | Median Diagnositcs/APQA | 0 | 288tests | 3 | <input type="checkbox"/> Africa <input type="checkbox"/> Americ as <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East |
| VDx FMDV Asia1 qRT- PCR | rRT-PCR(serotype Asia1) | Median Diagnositcs/APQA | 0 | 288tests | 3 | <input type="checkbox"/> Africa <input type="checkbox"/> Americ as <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East |
| VDpro FMDV NSP-3AB ELISA | FMD Ab test (NSP) | Median Diagnositcs /APQA | 0 | 480tests | 1 | <input type="checkbox"/> Africa <input type="checkbox"/> Americ as <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East |

| | | | | | | |
|---------------------------------------|--------------------------------|----------------------|---|----------|---|--|
| BIONOTE FMDV NSP-3ABC ELISA | FMD Ab test (NSP) | Bionote/APQA | 0 | 480tests | 1 | <input type="checkbox"/> Africa <input type="checkbox"/> Americ as <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East |
| PrioCHECK NS kit | FMDV Ab test (NSP) | Prionics AG /APQA | 0 | 480tests | 1 | <input type="checkbox"/> Africa <input type="checkbox"/> Americ as <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East |
| VDpro FMDV Type-O Ab b-ELISA | FMD Ab test (SP Ab type O) | Median Diagnosis | 0 | 480tests | 1 | <input type="checkbox"/> Africa <input type="checkbox"/> Americ as <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East |
| PrioCHECK FMDV Type O | FMDV Ab test (SP Ab type O) | Prionics AG /APQA | 0 | 480tests | 1 | <input type="checkbox"/> Africa <input type="checkbox"/> Americ as <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East |

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to OIE Member Countries?

No

ToR 3: To develop, standardise and validate, according to OIE Standards, new procedures for diagnosis and control of the designated pathogens or diseases

6. Did your laboratory develop new diagnostic methods validated according to OIE Standards for the designated pathogen or disease?

Yes

7. Did your laboratory develop new vaccines according to OIE Standards for the designated pathogen or disease?

No

| Name of the new test or diagnostic method or vaccine developed | Description and References (Publication, website, etc.) |
|--|--|
| VDpro FMDV Type-O Ab b-ELISA | Blocking ELISA kit for detection of antibodies against FMDV Type-O structural protein using recombinant FMDV rP13C protein immobilized on ELISA plates with trapping antibody and peroxidase labeled monoclonal antibodies. Website : www.mediandiagnosics.com/eng |
| BIONOTE FMDV Type-O Ab ELISA | Competitive ELISA for the qualitative detection of antibody to FMDV Type-O structural protein using recombinant VP4231 protein of FMDV O/JC/SKR 2014 (O/SEA/Mya-98) Website : www.bionote.co.kr/eng |

ToR 4: To provide diagnostic testing facilities, and, where appropriate, scientific and technical advice on disease control measures to OIE Member Countries

8. Did your laboratory carry out diagnostic testing for other OIE Member Countries?

No

9. Did your laboratory provide expert advice in technical consultancies on the request of an OIE Member Country?

No

ToR 5: To carry out and/or coordinate scientific and technical studies in collaboration with other laboratories, centres or organisations

10. Did your laboratory participate in international scientific studies in collaboration with OIE Member Countries other than the own?

Yes

| Title of the study | Duration | Purpose of the study | Partners (Institutions) | OIE Member Countries involved other than your country |
|--|---------------------|---|--|---|
| Comparative studies for avian influenza virus and FMD virus between Korea and Vietnam | 10 years(2014-2024) | Studies on genetic characterization of foot and mouth disease viruses and avian influenza virus in Vietnam | NCVD (National Center for Veterinary Diagnosis, Department of Animal health, Hanoi, Vietnam) | VIETNAM |
| Comparative studies for avian influenza virus and FMD virus between Korea and Cambodia | 5 years(2018-2022) | Studies on genetic characterization of foot and mouth disease viruses and avian influenza virus in Cambodia | NAHPRI (National Animal Health and Production Research Institute, Phnom Penh, Cambodia) | CAMBODIA |
| Comparative studies for avian influenza virus and FMD virus between Korea and LAO PDR | 5 years(2018-2022) | Studies on genetic characterization of foot and mouth disease viruses and avian influenza virus in LAO PDR | NAHL (National Animal Health Laboratory, Vientiane, LAO PDR) | LAOS |
| Collaborative validation studies of solid phase competitive enzyme-linked immunosorbent assay and rapid detection kits for antibodies to NSPs for FMDV | 3 years(2019-2021) | Validation studies of solid phase competitive enzyme-linked immunosorbent assay and rapid detection kits for antibodies to NSPs for FMDV | NCFAD, Canada (FAO FMD Lab.) | CANADA |
| Comparative studies for FMD virus between Korea and Bangladesh | 5 years(2020-2024) | Studies on genetic characterization of foot and mouth disease viruses and avian influenza virus in Bangladesh | CDIL(Central Disease Investigation Laboratory), | BANGLADESH |
| Establishing technology of identifying FMD genes to use molecular epidemiology and building NGS | 2years(2020-2021) | For establishing the leading analytical technology of viral genomic epidemiology that can scientifically support epidemiological studies in response to FMD outbreaks and building NGS platform for rapid pan genome analysis | The Pirbright Institute | UNITED KINGDOM |

ToR 6: To collect, process, analyse, publish and disseminate epizootiological data relevant to the designated pathogens or diseases

11. Did your Laboratory collect epizootiological data relevant to international disease control?

Yes

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

Epizootiological data relating to the samples received for scientific research (see ToR5) was collected

12. Did your laboratory disseminate epizootiological data that had been processed and analysed?

No

If the answer is no, please provide a brief explanation of the situation:

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

a) Articles published in peer-reviewed journals: 12

1. Da-Rae Lim, Hye-Ryung Kim, Ha-Gyeong Chae, Bok-Kyung Ku, Jin-Ju Nah, Soyeon Ryoo, Sung-Hwan Wee, Changhee Lee, Young S. Lyoo, Choi-Kyu Park. Probe-based real-time reverse transcription loop-mediated isothermal amplification (RRT-LAMP) assay for rapid and specific detection of foot-and-mouth disease virus
2. Kim J, Kim T, Hong JK, Lee HS, Lee KN, Jo HJ, Choi J, Choi J, Lee SH, Lee MH, Kim B, Park JH. The interference effect of maternally-derived antibodies on the serological performance of pigs immunized with a foot-and-mouth disease oil emulsion vaccine. *Vaccine*. 2020, 38(7):1723-29.
3. Sun Young Park, Jung-Min Lee, Ah-Young Kim, Sang Hyun Park, Sim-In Lee, Hyejin Kim, Jae-Seok Kim, Jong-Hyeon Park, Young-Joon Ko, Choi-Kyu Park. Efficient removal of non-structural protein using chloroform for foot-and-mouth disease vaccine production. *Vaccines(Basel)*, 2020, 8(3), 483
4. Sun Young Park, Jung-Min Lee, Ah-Young Kim, Sang Hyun Park, Jae-Seok Kim, Hyejin Kim, Jung-Won Park, Jong-Hyeon Park, Young-Joon Ko, Choi-Kyu Park. Application of heparin affinity chromatography to produce a differential vaccine without eliciting antibodies against the nonstructural proteins of the serotype O foot-and-mouth disease viruses. *Viruses*, 2020, 12(12), E1405
5. Lee G, Hwang JH, Kim A, Park JH, Lee MJ, Kim B, Kim SM. Analysis of Amino Acid Mutations of the Foot-and-Mouth Disease Virus Serotype O Using both Heparan Sulfate and JMJD6 Receptors, *Viruses*. 2020 Sep; 12(9):1012
6. Lee G, Hwang JH, Park JH, Lee MJ, Kim B, Kim SM. Vaccine strain of O/ME-SA/Ind-2001e of foot-and-mouth disease virus provides high immunogenicity and broad antigenic coverage, *Antiviral Res.*2020 Oct; 182:104920
7. Su-Mi Kim, Se-Kyung Kim, Kwang-Nyeong Lee, Jong-Hyeon Park, Byoungan Kim. Stable Expression of Bovine Integrin Beta-6 Increases Susceptibility of Goat Kidney Cell Line to Foot-and-mouth Disease Virus, *JOURNAL OF BACTERIOLOGY AND VIROLOGY* 50(1), 2020.3, 35-43
8. Jo HE, Choi JH, You SH, Shin SH, Jo H, Lee MJ, Kim SM, Kim B, Park JH. Improved foot-and-mouth disease vaccine with O PanAsia-2 strain protect pigs against O/Jincheon/SKR/2014 originated from South Korea. *Vaccine*. 2020 Jan 29;38(5):1120-1128.
9. Lee MJ, Jo H, Park SH, Ko MK, Kim SM, Kim B, Park JH. Advanced Foot-And-Mouth Disease Vaccine Platform for Stimulation of Simultaneous Cellular and Humoral Immune Responses. *Vaccines (Basel)*. 2020 May 28;8(2):254.
10. Shin SH, Jo H, Ko MK, Choi JH, You SH, Jo HE, Lee MJ, Kim SM, Kim B, Park JH. Antigenic properties of a novel vaccine strain for type Asia1 foot-and-mouth disease in pigs. *Vet Microbiol*. 2020 Sep;248:108802.
11. Choi JH, You SH, Ko MK, Jo HE, Shin SH, Jo H, Lee MJ, Kim SM, Kim B, Lee JS, Park JH. Improved immune responses and safety of foot-and-mouth disease vaccine containing immunostimulating components in pigs, *J Vet Sci*. 2020 Sep;21(5):e74.
12. Ekanayaka P, Lee SY, Herath TUB, Kim JH, Kim TH, Lee H, Chaturanga K, Chaturanga WAG, Park JH, Lee JS.

Foot-and-mouth disease virus VP1 target the MAVS to inhibit type-I interferon signaling and VP1 E83K mutation results in virus attenuation, *PLoS Pathog.* 2020 Nov 24;16(11):e1009057.

b) International conferences: 34

1. BooMi La, Hyun-ji Lee, Da-Rae Lim, Sumelee Lee, Semin Jung, Jeongwon Lee, Dongsook Lee, Hye-jin Park, Jinju Nah, Kang-seok Choi, Bok Kyung Ku, Tho Dang Nguyen, Thanh Long To, Bounlom Douangngeun, Watthana Theppangna, Seng Bunnary, Sothyra Tum, Sang-Ho Cha, Soyoony Ryoo, Genetic characterization of Foot-and-Mouth Disease Viruses in South East Asia: Vietnam, Laos and Cambodia. IUMS2020
2. Jeong-won Lee, Soyoony Ryoo, BooMi La, Da-Rae Lim, Dongsook Lee, Hyunji Lee, Hey-jin Park, Nguyen Dang Tho, Thanh Long To, Bounlom Douangngeun, Watthana Theppangna, Seng Bunnary, Sothyra Tum, Hey-jin Park, Sung-hwan Wee, Bok Kyung Ku, Jae-Myung Kim, Sang-Ho Cha, Improvement of diagnostic performance in POOL 1 region using APQA ELISA kit. IUMS2020
3. Hyunji Lee, Soyoony Ryoo, Da-Rae Lim, BooMi La, Jeong-Won Lee, Dongsook Lee, Hye-Jin Park, SomGyeol Jung, Bok Kyung Ku, Jae-Myung Kim, Sang-Ho Cha. Development of FMDVA/ASIA/Sea-97 genotype lineage -specific real-time RT-PCR. IUMS2020
4. Hyun Mi Pyo, Heeyeon Kim, Youjin Han, Rokeya Pervin, Mi-Young Park, Eun-Jin Choi, Jaemyung Kim. Comparison of Foot-and-mouth disease NSP antibody ELISAs using caprine sera. IUMS2020
5. Heeyeon Kim, Youjin Han, Jihyun Lee, Rokeya Pervin, Mi-Young Park, Hyun Mi Pyo, Eun-Jin Choi. Foot-and-mouth disease virus Asia1/MOG/05, field isolate challenge study in vaccinated pigs. IUMS2020
6. Mi-Young Park, Jihyun Lee, Hyun Mi Pyo, Wonseok Shin, Doheon Kwon, Jaemyung Kim, Eun-Jin Choi. Evaluation of Non-Structural Proteins assay system for Foot and Mouth Disease Surveillance to support the control and prevention program in Korea. IUMS2020
7. Youjin Han, Jaemyung Kim, Eun-Jin Choi, Hyun Mi Pyo, Rokeya Pervin, Jihyun Lee, Heeyeon Kim, Wonseok Shin, Doheon Kwon, Mi-Young Park
The Effect of booster administration of Foot and Mouth disease vaccines on the immune response in piglets with maternally-derived antibody. IUMS2020
8. Mi-Young Park, Jihyun Lee, Hyun Mi Pyo, Wonseok Shin, Doheon Kwon, Jaemyung Kim, Eun-Jin Choi, Novel sero-diagnostic tool for detection of antibodies to non-structural protein of Foot and Mouth Disease Virus in Korea. IUMS2020
9. Wonseok Shin, Jihyun Lee, Hyun Mi Pyo, Eun-Jin Choi, Doheon Kwon, Jaemyung Kim, Mi-Young Park, Post-Vaccination Monitoring (PVM) to assess population immunity at individual animal group in Korea. IUMS2020
10. Doheon Kwon, Changyeop Lee, Jihyun Lee, Youjin Han, Hyun Mi Pyo, Eun-Jin Choi, Wonseok Shin, Jaemyung Kim, Mi-Young Park, Comparison of the Specificity in Three Commercial ELISA kits for the Detection of Antibodies against Non-Structure Proteins (NSP) of Foot-and-Mouth Disease Virus (FMDV) in Wild Boars in Korea. IUMS2020
11. Jihyun Lee, Youjin Han, Hyun Mi Pyo, Eun-Jin Choi, Wonseok Shin, Doheon Kwon, Jaemyung Kim, Mi-Young Park, Analysis of immune response for detection of antibodies to non-structural proteins by a multiplexed immunoblotting assay in single pig following infection of Foot and Mouth Disease Virus. IUMS2020
12. Hyunji Lee, BooMi La, Jeong-won Lee, Dongsook Lee, Jae-Myung Kim, Tho Dang Nguyen, Bounlom Douangngeun, Seng Bunnary, Sang-Ho Cha, Da-Rae Lim. Genetic characterization of serotype and genetic relatedness of foot-and-mouth disease viruses in South East Asia. EuFMDOS2020
13. BooMi La, Jeong-won Lee, Soyoony Ryoo, Da-Rae Lim, Dongsook Lee, Hyunji Lee, Hey-jin Park, Tho Dang Nguyen, Thanh Long To, Bounlom Douangngeun, Watthana Theppangna, Seng Bunnary, Sothyra Tum, Jae-Myung Kim, Sang-Ho Cha, Enhanced diagnosis efficacy of a newly developed ELISA kit for FMDV in pool 1 region. EuFMDOS2020
14. Jeong-won Lee, Hyunji Lee, Soyoony Ryoo, Da-Rae Lim, BooMi La, SomGyeol Jung, Dongsook Lee, Hye-Jin Park, Bok-Kyung Ku, Jae-Myung Kim, Sang-Ho Cha, Development of lineage-specific real time RT-PCR for the recent ASIA/SEA097 in South Korea. EuFMDOS2020
15. Eun-Jin Choi, Youjin Han, Jihyun Lee, Hyun Mi Pyo, Wonseok Shin, Doheon Kwon, Jaemyung Kim, Mi-Young Park
Validation of recombinant protein-based ELISA for detection of antibodies to foot-and-mouth disease virus type-o. EuFMDOS2020
16. Mi-Young Park, Youjin Han, Jihyun Lee, Hyun Mi Pyo, Eun-Jin Choi, Wonseok Shin, Doheon Kwon, Jaemyung Kim. Duration of immunity in cattle and pigs under national vaccination programme against foot-and-mouth disease virus. EuFMDOS2020
17. Mi-Young Park, Youjin Han, Jihyun Lee, Hyun Mi Pyo, Eun-Jin Choi, Wonseok Shin, Doheon Kwon, Jaemyung Kim. Comparison of diagnostic performances of three commercial ELISA kits for detection of antibodies to foot-and-mouth disease virus type-o. EuFMDOS2020
18. Mi-Young Park, Youjin Han, Hyun Mi Pyo, Wonseok Shin, Doheon Kwon, Jaemyung Kim, Eun-Jin Choi, Development of Solid-phase competition ELISA for detection of type-A Foot and Mouth Disease Virus antibodies. EuFMDOS2020
19. Hyejin Kim, Ah-Young Kim, Sun Young Park, Sang Hyun Park, Jae-Seok Kim, Sim-In Lee, Jong-Hyeon Park, Young-Joon Ko. Suggestion of easy-to-use serum-free medium for the large-scale production of FMD vaccine. International Union of Microbiological Societies 2020.

20. Hyejin Kim, Ah-Young Kim, Sun Young Park, Sang Hyun Park, Jae-Seok Kim, Sim-In Lee, Jong-Hyeon Park, Young-Joon Ko. Improvement of the structural stability for FMD vaccine antigens by combinational use of the optimized buffer and excipients. International Union of Microbiological Societies 2020.
21. Sun Young Park, Ah-Young Kim, Sang Hyun Park, Hyejin Kim, Jae-Seok Kim, Jong-Hyeon Park, Sim-In Lee, Young-Joon Ko. The effect of removing nonstructural proteins by chloroform to improve the purity of foot-and-mouth disease vaccine antigen. International Union of Microbiological Societies 2020.
22. Sim-In Lee, Sun Young Park, Jung-Min Lee, Ah-Young Kim, Sang Hyun Park, Jae-Seok Kim, Hyejin Kim, Jong-Hyeon Park, Young-Joon Ko. Development of chromatographic method for foot-and-mouth disease vaccine production. International Union of Microbiological Societies 2020.
23. Jae-Seok Kim, Sang Hyun Park, Hyejin Kim, Ah-Young Kim, Sun Young Park, Sim-In Lee, Na Young Kang, Jong-Hyeon Park, Young-Joon Ko. Development of foot and moth disease vaccine antigen production process using a pilot-scale equipment. International Union of Microbiological Societies 2020.
24. Jae-Seok Kim, Sang Hyun Park, Hyejin Kim, Sim-In Lee, Ah-Young Kim, Sun Young Park, Na Young Kang, Jong-Hyeon Park, Young-Joon Ko. Optimization of serotype O foot and mouth disease virus antigen production. International Union of Microbiological Societies 2020.
25. S Jung, J Choi, S Lee, H-H Kim, J-H park and J Kim. Experimental evaluation of foot-and-mouth disease O SKR Vaccine: Protective efficacy and serological performance in pigs. EUFMD open session 2020.
26. S Jung, J Choi, S Lee, H-H Kim, J-H park and J Kim. Correlation between serological titer and protection in pigs vaccinated with foot-and-mouth disease serotype A vaccine. EUFMD open session 2020.
27. J Choi, S Jung, S Lee, H-H Kim, J-H park and J Kim. Development of a liquid-phase blocking based foot-and-mouth disease virus A/Yeoncheon/2017 for post-vaccination sero-monitoring. EUFMD open session 2020.
28. S Jung, J Choi, S Lee, H-H Kim, J-H park and J Kim. Evaluation of the antigenic relatedness between foot-and-mouth disease vaccines and currently circulating viruses in Southern East Asia. EUFMD open session 2020.
29. J Choi, S Jung, S Lee, H-H Kim, J-H park and J Kim. The Change of serological cross-reactivity between homologous and heterologous booster foot-and-mouth disease vaccination in pigs. EUFMD open session 2020.
30. Dong-Wan Kim, Jong-Hyeon Park, Sung-han Park, Swine protection in the early stage with intradermal vaccine against type A foot-and-mouth disease virus isolated in Korea, 2018, EU-FMD, 2020
31. Dong-Wan Kim, Jong-Hyeon Park, Sung-han Park, Comparison of immune responses of intradermal and intramuscular foot-and-mouth disease vaccines, IUMS 2020
32. Dong-Wan Kim, Jong-Hyeon Park, Sung-han Park, Immuno-potentiated effect of the adjuvants used in intradermal foot-and-mouth disease vaccine, IUMS 2020
33. Dong-Wan Kim, Jong-Hyeon Park, Sung-han Park, Evolutionary phylodynamics of type O foot-and-mouth disease virus circulating in 2006-2019, IUMS 2020
34. Dong-Wan Kim, Jong-Hyeon Park and Sung-han Park, Evolutionary phylodynamics of type A foot-and-mouth disease virus circulating in 2006-2018, IUMS 2020

c) National conferences: 21

1. BooMi La, Jeong-won Lee, Hyunji Lee, HyeonWoo Hwang, SomGyeol Jung, DongSook Lee, Da-Rae Lim, JaeMyung Kim, SangHo Cha, Seng Bunnary, Sothyra Tum, Soyoon Ryoo. Genetic characterization and Phylogenetic analysis of Foot-and-Mouth Disease Viruses detected in Cambodia in 2019. (National conference for the Korean Society of Veterinary Science, Nov 2020)
2. Dong Sook Lee, Hey-jin Park, Hyun-ji Lee, Jung-won Lee, BooMi La, Som-Gyeol Jung, Hyeon-Woo Hwang, Soyoon Ryoo, Da-rea Lim, Jea-Myung Kim, Sang-Ho Cha. Genetic evolution of FMDV isolated from Korean domestic farms during 145 days between 2010 and 2011. (National conference for the Korean Society of Veterinary Science, Nov 2020)
3. Jeong-won Lee , BooMi La, Hyunji Lee , DongSook Lee, Thanh Long To, Jae-Myung Kim, Hyeon Woo Hwang , SomGyeol Jeong, Da-Rae Lim, Soyoon Ryoo, Sang-Ho Cha. Genetic characterization of Foot-and-Mouth Disease viruses isolated from Vietnam during 2019-2020. (National conference for the Korean Society of Veterinary Science, Nov 2020)
4. Hyunji Lee, Soyoon Ryoo, Da-Rae Lim, BooMi La, Jeong-won Lee, SomGyeol Jung, DongSook Lee, HyeonWoo Hwang, Bok-Kyung Ku, Jae-Myung Kim, Sang-Ho Cha. Chronological analysis of Foot-and-Mouth Disease Virus in Vietnam from 2014 to 2020, (National conference for the Korean Society of Veterinary Science, Nov 2020)
5. Dong Sook Lee, Hey-jin Park, Hyun-ji Lee, Jung-won Lee, BooMi La, Hyeon-Woo Hwang, Som-Gyeol Jung, Soyoon Ryoo, Kang-sok Choi, Bok Kyung Ku, Genetic characterization of Korean foot-and-mouth disease virus serotype O isolates collected during the period 2010. 16TH KOGO
6. Dong Sook Lee, Hey-jin Park, Hyun-ji Lee, Jung-won Lee, BooMi La, Hyeon-Woo Hwang, Tho Dang Nguyen, Thanh Long To, Bounlom Douangngeun, Watthana Theppangna, Kang-sok Choi, Bok Kyung Ku, Soyoon Ryoo, Comparative genetic analysis of recent foot-and-mouth disease virus of serotype O lineage Ind-2001e isolated in LAO, Myanmar and South Korea, 16TH KOGO
7. Jae-Seok Kim, Sang Hyun Park, Hyejin Kim, Ah-Young Kim, Sun Young Park, Na Young Kang, Jong-Hyeon Park, Young-Joon Ko. Optimization of the serotype A foot and mouth disease inactivation vaccine antigen production using pilot-scale equipment (National conference of the Korean Society for biochemistry and molecular biology,

Sep. 2020)

8. Sun Young Park, Jung-min Lee, Ah-Young Kim, Sang Hyun Park, Jae-Seok Kim, Hyejin Kim, Jong-Hyeon Park, Young-Joon Ko. Efficient chromatographic method for non-structural protein removal in the process of foot-and-mouth disease vaccine production (National conference of the Korean Society for biochemistry and molecular biology, Sep. 2020)

9. Jae-Seok Kim, Sang Hyun Park, Hyejin Kim, Ah-Young Kim, Sun Young Park, Sim-In Lee, Na Young Kang, Jong-Hyeon Park, Young-Joon Ko. Optimization of conditions for serotype O and A divalent foot-and-mouth disease vaccine production in pilot-scale (National conference for the Korean Society of veterinary science, Nov. 2020)

10. Jae-Seok Kim, Sang Hyun Park, Hyejin Kim, Ah-Young Kim, Sun Young Park, Sim-In Lee, Na Young Kang, Jong-Hyeon Park, Young-Joon Ko. Inactivation kinetics of foot-and-mouth disease virus with binary ethyleneimine treatment (National conference for the Korean Society of veterinary science, Nov. 2020)

11. Hyejin Kim, Ah-Young Kim, Sun Young Park, Sang Hyun Park, Jae-Seok Kim, Sim-In Lee, Jong-Hyeon Park, Young-Joon Ko. Investigation of the optimal medium for suspension cell culture-based FMD vaccine antigen production (National conference for the Korean Society of veterinary science, Nov. 2020)

12. Sim-In Lee, Sun Young Park, Jung-Min Lee, Ah-Young Kim, Sang Hyun Park, Jae-Seok Kim, Hyejin Kim, Jong-Hyeon Park, Young-Joon Ko. Purification of foot-and-mouth disease (FMD) virus by affinity chromatography to produce FMD vaccine with improved purity (National conference for the Korean Society of veterinary science, Nov. 2020)

13. Sim-In Lee, Sun Young Park, Ah-Young Kim, Sang Hyun Park, Hyejin Kim, Jae-Seok Kim, Jong-Hyeon Park, Young-Joon Ko. A novel method of removing non-structural proteins to produce the foot-and-mouth disease vaccine antigen using chloroform (National conference for the Korean Society of veterinary science, Nov. 2020)

14. Sim-In Lee, Hyang-Sim Lee, Sun Young Park, Ah-Young Kim, Sang-Oh Lee, Jae-Seok Kim, Hyejin Kim, Hee-Jeong Youn, Young-Joon Ko. Development of novel foot-and-mouth disease vaccine using vesicular stomatitis virus glycoprotein (National conference for the Korean Society of veterinary science, Nov. 2020)

15. Sung-han Park, Development of FMD Serotype O and A Inactivated Vaccine for Intradermal Inoculation, MSK2020, 2020

16.1. J Choi, S Jung, S Lee, H-H Kim, J-H park and J Kim. Development of a liquid-phase blocking based foot-and-mouth disease virus A/Asia/Sea-97 lineage for post-vaccination sero-monitoring. 2020 National conference for the Korean Society of Veterinary Science.

17. J Choi, S Jung, S Lee, H-H Kim, J-H park and J Kim. Potency assessment of foot-and-mouth disease O SKR vaccine in pigs by means of in vivo vaccination-challenge test and serological assay. 2020 National conference for the Korean Society of Veterinary Science.

18. S Jung, J Choi, S Lee, H-H Kim, J-H park and J Kim. Use of statistical model for evaluating the level of neutralizing antibody titer as a correlate of protection against foot-and-mouth disease type A. 2020 National conference for the Korean Society of Veterinary Science.

19. S Jung, J Choi, S Lee, H-H Kim, J-H park and J Kim. Use of antigenic cartography to investigate the cross-reactivity among foot-and-mouth disease virus serotype A: Validate the possibility as an alternative to in vitro vaccine matching. 2020 National conference for the Korean Society of Veterinary Science.

20. J Choi, S Jung, S Lee, H-H Kim, J-H park and J Kim. Clinical dynamics of the serotype O, A, and Asia 1 foot-and-mouth viruses in pigs using intradermal lingual inoculation. 2020 National conference for the Korean Society of Veterinary Science.

21. Hyun-ji Lee, BooMi La, Dongsook Lee, Jeong-Won Lee, Tho Dang Nguyen, Thanh Long To, Bounlom Douangneun, Watthana Theppangna, Seng Bunnary, Sothyra Tum, Som-Gyeol Jung, Hye-Jin Park, Hyeon-Woo Hwang, Kang-Seok Choi, Bok-Kyung Ku, Soyoon Ryoo, Genetic comparison of Foot-and-Mouth disease virus serotype A in South Korea, Vietnam, Laos and Cambodia. 16TH KOGO

d) Other:

(Provide website address or link to appropriate information) 1

Monthly National sero-surveillance results for overall population immunity and prevalence of infection surveillance (in Korean, www.data.go.kr)

ToR 7: To provide scientific and technical training for personnel from OIE Member Countries

To recommend the prescribed and alternative tests or vaccines as OIE Standards

14. Did your laboratory provide scientific and technical training to laboratory personnel from other OIE Member Countries?

No

ToR 8: To maintain a system of quality assurance, biosafety and biosecurity relevant for the pathogen and the disease concerned

15. Does your laboratory have a Quality Management System?

Yes

| Quality management system adopted | Certificate scan (PDF, JPG, PNG format) |
|-----------------------------------|---|
| KS Q ISO/IEC 17025 | CERTIFICATE(2020).jpg |

16. Is your quality management system accredited?

Yes

| Test for which your laboratory is accredited | Accreditation body |
|---|---------------------------------------|
| Antigen detection(Realtime RT-PCR, RT-PCR, Antigen) | KOLAS(Korean Laboratory Accrediation) |
| Antibody detection(SP ELISA, NSP ELISA) | KOLAS(Korean Laboratory Accrediation) |

17. Does your laboratory maintain a “biorisk management system” for the pathogen and the disease concerned?

Yes

(See *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, Chapter 1.1.4*)

ToR 9: To organise and participate in scientific meetings on behalf of the OIE

18. Did your laboratory organise scientific meetings on behalf of the OIE?

No

19. Did your laboratory participate in scientific meetings on behalf of the OIE?

Yes

| Title of event | Date (mm/yy) | Location | Role (speaker, presenting poster, short communications) | Title of the work presented |
|---|--------------|----------|---|--|
| OIE/FAO Reference Laboratory Network Annual Meeting | 12/2020 | on-line | speaker | FMD-related activities in 2020 of Animal and Plant Quarantine Agency |

ToR 10: To establish and maintain a network with other OIE Reference Laboratories designated for the same pathogen or disease and organise regular inter-laboratory proficiency testing to ensure comparability of results

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

No

21. Was your laboratory involved in maintaining a network with OIE Reference Laboratories designated for the same pathogen or disease by organising or participating in proficiency tests?

Yes

| Purpose of the proficiency tests: ¹ | Role of your Reference Laboratory (organiser/ participant) | No. participants | Participating OIE Ref. Labs/ organising OIE Ref. Lab. |
|--|--|------------------|---|
| FMD Proficiency Testing | Participant | 4 | The Pirbright Insitutue, UK |

¹ validation of a diagnostic protocol: specify the test; quality control of vaccines: specify the vaccine type, etc.

22. Did your laboratory collaborate with other OIE 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 OIE Reference Laboratories |
|---|---|--|
| Establishing technology of identifying FMD genes to use molecular epidemiology and building NGS | To carry out a collaborative research project on Molecular epidemiology and NGS platform studies on foot and mouth disease virus (FMDV) between APQA, Korea and WRLFMD, United Kingdom, for establishing the leading analytical technology of viral genomic epidemiology that can scientifically support epidemiological studies in response to FMD outbreaks and building NGS platform for rapid pan genome analysis | The Pirbright Institute, UK |

ToR 11: To organise inter-laboratory proficiency testing with laboratories other than OIE Reference Laboratories for the same pathogens and diseases to ensure equivalence of results

23. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than OIE Reference Laboratories for the same disease?

Yes

Note: See Interlaboratory test comparisons in: Laboratory Proficiency Testing at: <http://www.oie.int/en/our-scientific-expertise/reference-laboratories/proficiency-testing> see point 1.3

| Purpose for inter-laboratory test comparisons ¹ | No. participating laboratories | Region(s) of participating OIE Member Countries |
|--|--------------------------------|---|
| National Proficiency test for Diagnosis of FMD(Organiser) | 46 | <input type="checkbox"/> Africa <input type="checkbox"/> Americas <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East |

ToR 12: To place expert consultants at the disposal of the OIE

24. Did your laboratory place expert consultants at the disposal of the OIE?

No

25. Additional comments regarding your report: