Activities in the OIE twinning project on foot-and-mouth disease and other transboundary animal diseases between Mongolia and Japan (January 2016 to December 2018)

Parent laboratory: Exotic Disease Research Station (EDRS), National Institute of Animal Health, National Agriculture and Food Research Organization, Japan
Candidate laboratory: State Central Veterinary Laboratory (SCVL), Mongolia

First year (January 2016 to December 2016)

A. Dispatch of experts from the parent laboratory to the candidate laboratory

1. Experts for dispatch: Dr. Tatsuya Nishi, Dr. Katsuhiko Fukai and Dr. Kazuo Yoshida
2. Dispatch destination: SCVL, Ulaanbaatar, Mongolia
3. Dispatch period: from April 17 to April 23, 2016
4. Purpose of dispatch
   a. To develop a work plan for the project
   b. To inspect and evaluate the quality of equipment and human resources at the SCVL at start of the project
   c. To make suggestions and to improve diagnostic systems used by the SCVL
   d. To demonstrate and train diagnostic techniques for foot-and-mouth disease (FMD) and other transboundary animal diseases (TADs)
   e. To obtain several cell lines such as the IB-RS-2, BHK-21, ZZ-R 127 and LFBK-$\alpha v\beta 6$, which are generally used for diagnostic work of FMD
5. Schedule of the dispatch

Date	Activities	Hotel
April 17 (Sun)	Narita (OZ107) – Incheon (KE5865) – Ulaanbaatar	Bayangol
April 18 (Mon)	- Met Dr. Gerelmaa Ulziibat (Virologist of the SCVL), Dr. Batchuluun Damdiinjav (Director of the SCVL and Dr. Dambadarjaa Battsengel (Director General of the Department of	Bayangol

	Veterinary and Breeding Service, Implementing Agency of the Government of Mongolia) - Held a kickoff meeting with staff of the SCVL and Mongolian Government - Inspected and evaluated quality of equipment and human resources in the SCVL	
April 19 (Tue)	- Held classroom learning of techniques for cell culture, virus isolation, virus titration and neutralization test - Demonstrate techniques for cell culture - Train staff to improve their techniques for cell culture	Bayangol
April 20 (Wed)	- Trained staff to improve their techniques for cell culture - Demonstrated techniques for virus isolation from clinical samples	Bayangol
April 21 (Thu)	- Observed results of the virus isolation - Demonstrated techniques for virus titration of an FMDV and neutralization test	Bayangol
April 22 (Fri)	- Observed results of the virus isolation, virus titration and neutralization test - Visited a typical nomadic farm in a suburb of Ulaanbaatar	Bayangol
April 23 (Sat)	Ulaanbaatar (KE5866) – Incheon (OZ106) – Narita	

6. The work plan for the project

The work plan for the project (Table 1) was made by staff of the candidate and parent laboratories. It was introduced to staff of the SCVL and Mongolian Government.

Table 1. The work plan for the project over 3 years

Items	2016	2017	2018
1. Training of Mongolian specialists for improvement of diagnostic capabilities on FMD in the SCVL 2. Training of Mongolian specialists for selection of an adequate vaccine strain in future possible outbreaks in Mongolia 3. Training of Mongolian specialists for appropriate implementation of emergency vaccination in Mongolia			

1) Cell culture	<---------->		
2) Virus isolation	<---------->		
3) Virus titration	<---------->		
4) Neutralization test	<---------->		
5) Virus detection by an indirect fluorescent antibody test	<---------->		
6) Virus detection by an ELISA	<---------->		
7) Virus detection by a lateral flow device		<---------->	
8) Viral gene detection by an RT-PCR assay	<---------->		
9) Viral gene detection by a real-time RT-PCR assay	<---------->		
10) Sequencing	<---------->		
11) Next generation sequencing	<---------->		
12) Experimental infection	<---------->		
13) Training in Japan (2 persons each year)	<---------->		
4. Organization of workshops on "Early detection of FMD and other TADs" at regions where the diseases frequently occur in Mongolia 5. Organization of workshops on "Suitable harvesting and transportation methods of materials for early diagnosis of FMD and TADs" at regions where the diseases frequently occur in Mongolia 6. Organization of workshops on "Construction of transportation systems by considering transportation methods of diagnostic materials and vaccines" at the SCVL			
1) Workshops on "Early detection of FMD and other TADs"		<----->	
2) Workshops on "Suitable harvesting and transportation methods of materials for early diagnosis of FMD and TADs"			<----->
3) Workshops on "Construction of transportation systems by considering transportation methods of diagnostic materials and vaccines"	<----->		
7. Organization of training on "Pathology and anatomy in domestic animals" at the SCVL 8. Organization of workshops on "Clinical and pathological investigations of TADs" at the SCVL			
1) Training on "Pathology and anatomy in domestic animals"	<---------->		

2) Workshops on "Clinical and pathological investigations of TADs"	<---------->	

7. Results of inspection and evaluation at the SCVL

Quality of equipment and human resources at the SCVL was inspected and evaluated by Dr. Nishi, Dr. Fukai and Dr. Yoshida. Results are shown in Table 2.

Table 2. Evaluation of the quality of the equipment and human resources at the SCVL in April, 2016

Year	Items	Equipment	Human resources	Training in Japan
2016	Cell culture	Good	Good	Yes
	Virus isolation	Good	Good	Yes
	Virus titration	Good	Not prepared	Yes
	Neutralization test	Good	Not prepared	Yes
	Virus detection	Good	Not prepared	Yes
	Viral gene detection	Good	Good	Yes
	Sequencing	Good	Good	Yes
2017		(expected)		
	Cell culture	Intermediate	Intermediate	Yes
	Virus isolation	Intermediate	Intermediate	Yes
	Virus titration	Intermediate	Good	Yes
	Neutralization test	Intermediate	Good	Yes
	Virus detection	Intermediate	Good	Yes
	Viral gene detection	Intermediate	Intermediate	Yes
	Sequencing	Intermediate	Intermediate	Yes
2018		(expected)		
	Cell culture	Excellent	Excellent	No
	Virus isolation	Excellent	Excellent	No
	Virus titration	Excellent	Intermediate	No
	Neutralization test	Excellent	Intermediate	No
	Virus detection	Excellent	Intermediate	No
	Viral gene detection	Excellent	Excellent	No
	Sequencing	Excellent	Excellent	No

8. Suggestions on diagnostic systems performed by the SCVL

The following procedures were recommended for further improvement of diagnostic systems performed by the SCVL.

1) Thaw frozen cells rapidly in a 37°C water bath.
2) Autoclave used pipettes for cell culture
3) Prepare an electric burner and an aspirator with an HEPA filter in a BSL3 facility

9. Demonstration and training of diagnostic techniques of FMD and other TADs

We performed initial classroom training in the techniques to staff of the SCVL. Next, we demonstrated techniques for cell culture, virus isolation, virus titration and neutralization testing to the staff. Finally, we trained the staff to improve their techniques for cell culture, virus isolation, virus titration and neutralization testing.

Group photo from pre-training of the OIE twinning project held in the SCVL in April 2016

B. Training for staff of the SCVL in Japan

1. Trainees: Dr. Odonchimeg Myagmasuren and Dr. Buyantogtokh Khanui
2. Place of training: EDRS, National Institute of Animal Health, National Agriculture and Food Research Organization
3. Training period: from June 13 to July 23, 2016
4. Contents of training (Table 3)

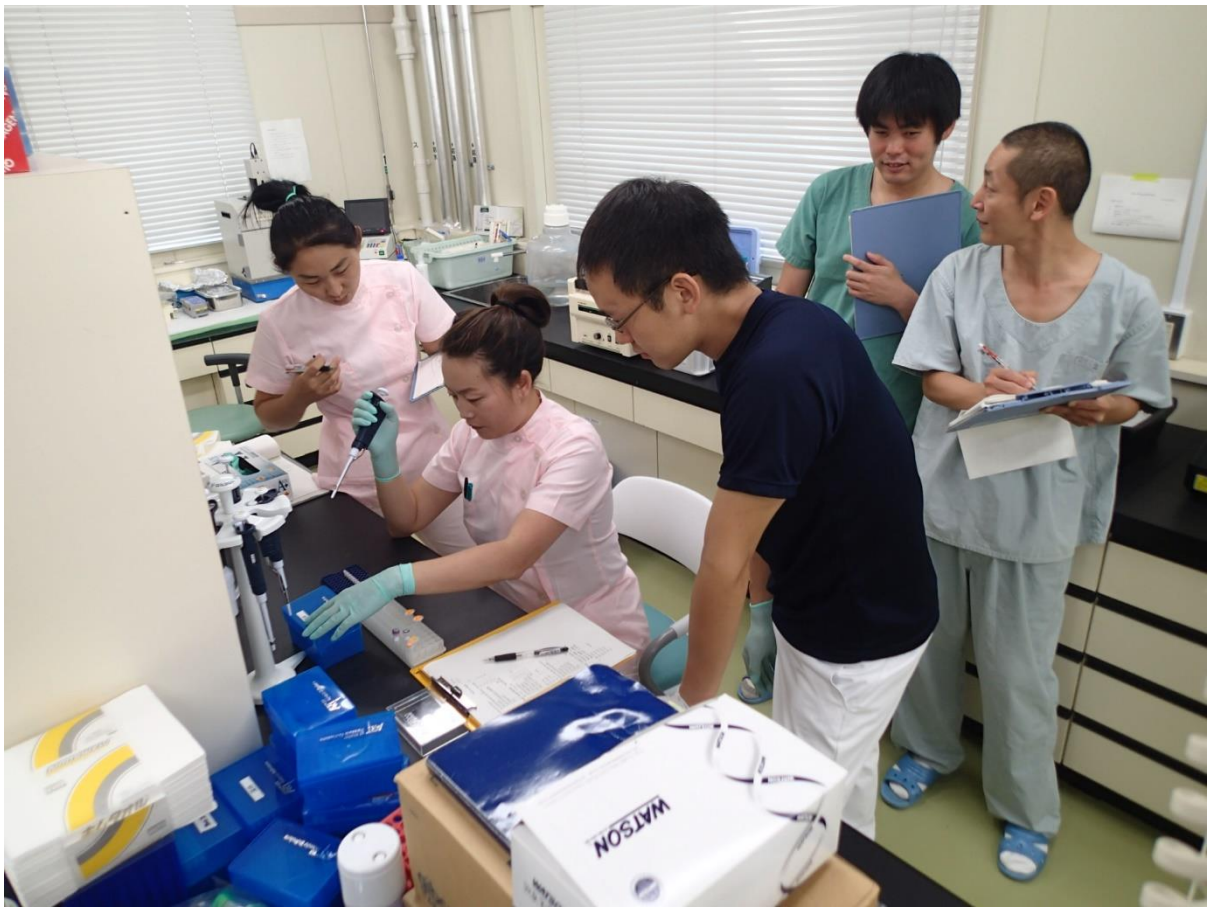
1) Virus isolation (lecture by Dr. Fukai)
   a) Preparation of clinical samples
   b) Observation of cytopathic effect
2) Virus titration (lecture by Dr. Fukai)
   a) Identification of 50% tissue culture infectious dose ($TCID_{50}$)
   b) Identification of plaque forming unit (PFU)
3) Neutralization test (lecture by Dr. Fukai)
   a) Judgement of antibody titers
   b) Calculation of r_1 values
4) Virus detection (lecture by Dr. Fukai)
   a) Detection of viruses by an indirect fluorescent antibody (IFA) assay
   b) Detection of viruses by monoclonal antibody-based sandwich direct ELISA (MSD-ELISA)
5) Viral gene detection (lecture by Dr. Fukai)
   a) RNA extraction
   b) Detection of viral genes by an RT-PCR assay
   c) Quantification of viral gene loads by a real-time RT-PCR assay
6) Sequencing (lecture by Dr. Nishi and Dr. Fukai)
   a) Purification of RT-PCR products
   b) Identification of nucleotide sequences by Sanger sequencing
   c) Identification of nucleotide sequences by next-generation sequencing
   d) Genetic analysis of nucleotide sequences
7) Experimental infection (lecture by Dr. Yamada, Dr. Yoshida and Dr. Fukai)
   a) Training for a high-containment facility
   b) Observation of clinical symptoms
   c) Collection of clinical samples
   d) Postmortem examination

Table 3. Main activities for Dr. Odonchimeg Myagmasuren and Dr. Buyantogtokh Khanui during training in Japan

Date	Main activities
June 13 (Mon.)	Arrival at Japan (13:40, OM0501)
June 14 (Tue.)	Orientation Training for a high-containment facility
June 15 (Wed.)	RNA extraction RT-PCR (for 3D region) Neutralization test
June 16 (Thu.)	Electrophoresis and purification of RT-PCR products Neutralization test
June 17 (Fri.)	Sequencing of the purified RT-PCR products Neutralization test
June 18 (Sat.)	Holiday
June 19 (Sun.)	Holiday
June 20 (Mon.)	Judgement of neutralization tests and calculation of r_1 values Titration ($TCID_{50}$) of viruses
June 21 (Tue.)	RT-PCR (for VP1 region) Electrophoresis and purification of RT-PCR products Inoculation of viruses (for PFU)
June 22 (Wed.)	Sequencing of the purified RT-PCR products Inoculation of viruses (for IFA)
June 23 (Thu.)	IFA assay Judgement of virus titration ($TCID_{50}$ and PFU)
June 24 (Fri.)	Real-time RT-PCR
June 25 (Sat.)	Holiday
June 26 (Sun.)	Holiday
June 27 (Mon.)	MSD-ELISA for antigen detection
June 28 (Tue.)	Experimental infection using inoculated pigs and contact cows was started. Preparation of clinical samples RNA extraction
June 29 (Wed.)	Preparation of clinical samples RNA extraction Virus isolation
June 30 (Thu.)	Preparation of clinical samples

	RNA extraction
July 1 (Fri.)	Collection of clinical samples Preparation of clinical samples RNA extraction Virus isolation
July 2 (Sat.)	Holiday
July 3 (Sun.)	Holiday
July 4 (Mon.)	Preparation of clinical samples RNA extraction Virus isolation
July 5 (Tue.)	Preparation of clinical samples RNA extraction Virus isolation
July 6 (Wed.)	Collection of clinical samples Preparation of clinical samples RNA extraction Virus isolation
July 7 (Thu.)	Preparation of clinical samples RNA extraction Virus isolation
July 8 (Fri.)	Preparation of clinical samples RNA extraction Virus isolation
July 9 (Sat.)	Holiday
July 10 (Sun.)	Holiday
July 11 (Mon.)	Experimental infection using inoculated pigs and contact cows was finished. Postmortem examination Virus isolation
July 12 (Tue.)	MSD-ELISA for antigen detection Classroom learning of techniques for next generation sequencing
July 13 (Wed.)	Next generation sequencing
July 14 (Thu.)	Next generation sequencing
July 15 (Fri.)	Next generation sequencing
July 16 (Sat.)	Holiday
July 17 (Sun.)	Holiday

July 18 (Mon.)	Holiday (Marine day)
July 19 (Tue.)	Next generation sequencing
July 20 (Wed.)	Next generation sequencing
July 21 (Thu.)	Genetic analysis of nucleotide sequences
July 22 (Fri.)	Completion ceremony
July 23 (Sat.)	Departure from Japan (20:30, OM0504)



Dr. Odonchimeg and Dr. Buyantogtokh performing next generation sequencing with Dr. Nishi and Japanese trainees.

C. Dispatch of experts from the parent laboratory to the candidate laboratory and a veterinary laboratory

1. Experts for dispatch: Dr. Tatsuya Nishi, Dr. Manabu Yamada and Dr. Kazuo Yoshida (Travel cost and daily allowance for Dr. Nishi was paid out of our own budget)
2. Dispatch destination: SCVL, Ulaanbaatar and Veterinary Laboratory (VL), Dornod, Mongolia

3. Dispatch period: from September 11 to September 24, 2016
4. Purposes of dispatch
   a. To organize training on "Pathology and anatomy in domestic animals" and workshops on "Clinical and pathological investigations of TADs" at the SCVL and VL (Meeting 1)
   b. To organize workshops on "Construction of transportation systems by considering transportation methods of diagnostic materials and vaccines" at the SCVL and VL (Meeting 2)
5. Schedule of the dispatch

Date	Activities	Hotel
September 11 (Sun)	Narita (OM502) – Ulaanbaatar	Bayangol
September 12 (Mon)	Opening ceremony Laboratory tour at the SCVL Lectures on "Introduction for autopsy and necropsy" and "General pathology" (organized by Dr. Yamada) Lecture on general virology and FMD, and discussion on animal health in Bayan-Olgii and Khovd provinces (organized by Dr. Nishi and Dr. Yoshida)	Bayangol
September 13 (Tue)	Lecture on "Pathology of infectious bovine diseases" and training on autopsy using a cow (organized by Dr. Yamada) Lecture on appropriate transportation methods of clinical materials and diagnostic methods for FMD (organized by Dr. Nishi and Dr. Yoshida)	Bayangol
September 14 (Wed)	Lecture on "Pathology of infections equine diseases" and training on sample preparation for pathological investigations and autopsy using a horse (organized by Dr. Yamada) Lecture on diagnostic methods for FMD and discussion on animal health in provinces where trainees work (organized by Dr. Nishi and Dr. Yoshida)	Bayangol
September 15 (Thu)	Lecture on "Pathology of infectious ovine and caprine diseases and training on autopsy	Bayangol

	using a goat and sheep (organized by Dr. Yamada) Lecture on disinfectants and discussion on outbreaks of peste des petits ruminants (PPR) in Mongolia (organized by Dr. Nishi and Dr. Yoshida)	
September 16 (Fri)	Lecture on "Pathology of infectious swine diseases" and training on autopsy using a pig (organized by Dr. Yamada) Lecture on disinfectants and discussion on animal health in Tov and Dornogovi provinces (organized by Dr. Nishi and Dr. Yoshida) Closing ceremony	Bayangol
September 17 (Sat)	Moved to Khentii province	Ezent guren
September 18 (Sun)	Laboratory tour at a VL in Khentii province Move to Dornod province	Bolor Tuv
September 19 (Mon)	Opening ceremony Lecture on "Pathology of infectious swine diseases" and training on autopsy using a pig (organized by Dr. Yamada) Lecture on general virology and FMD, and discussion on animal health in Dornod province (organized by Dr. Nishi and Dr. Yoshida)	Bolor Tuv
September 20 (Tue)	Lecture on "Pathology of infectious equine diseases" and training on autopsy using a horse (organized by Dr. Yamada) Lecture on FMD and disinfectants, and discussion on animal health in Khentii and Sukhbaatar provinces (organized by Dr. Nishi and Dr. Yoshida)	Bolor Tuv
September 21 (Wed)	Lecture on "Pathology of FMD" and training on autopsy using a goat and sheep (organized by Dr. Yamada) Inspection of the Khavirga quarantine station	Bolor Tuv

	and a nomadic farm (organized by Dr. Nishi and Dr. Yoshida)	
September 22 (Thu)	Training on autopsy using a cow (organized by Dr. Yamada) Lecture on vaccines for TADs and discussion on border control between countries (organized by Dr. Nishi and Dr. Yoshida) Closing ceremony Inspection of a nomadic farm and wild animals	Bolor Tuv
September 23 (Fri)	Moved to Ulaanbaatar	Bayangol
September 24 (Sat)	Laboratory tour at the SCVL Ulaanbaatar (OM501) – Narita	

Group photo from the training and workshop in the SCVL in September 2016

Second year (January 2017 to December 2017)

A. Training for staff of the SCVL in Japan

1. Trainees: Dr. Gerelmaa Ulziibat and Dr. Enkhbaatar Tsogzol
2. Place of training: EDRS, National Institute of Animal Health, National Agriculture and Food Research Organization
3. Training period: from June 2 to June 30, 2017
4. Contents of training (Table 1)

1) Cell culture (lectured by Dr. Fukai)
   a) Preparation of LFBK-$\alpha_v\beta_6$ cells for virus isolation
2) Virus isolation (lecture by Dr. Fukai)
   a) Preparation of clinical samples
   b) Observation of cytopathic effect
3) Virus titration (lecture by Dr. Fukai)
   a) Identification of 50% tissue culture infectious dose ($TCID_{50}$)
4) Neutralization test (lecture by Dr. Fukai)
   a) Judgement of antibody titers
   b) Calculation of r_1 values
5) Viral gene detection (lecture by Dr. Fukai)
   a) RNA extraction
   b) Detection of viral genes by an RT-PCR assay
6) Sequencing (lecture by Dr. Nishi)
   a) Purification of RT-PCR products
   b) Identification of nucleotide sequences by next-generation sequencing
   c) Genetic analysis of nucleotide sequences
7) Experimental infection (lecture by Dr. Yamada, Dr. Fukai and Dr. Shimazaki)
   a) Training for a high-containment facility
   b) Observation of clinical symptoms
   c) Collection of clinical samples
   d) Postmortem examination

Table 4. Main activities for Dr. Gerelmaa Ulziibat and Dr. Enkhbaatar Tsogzol during training in Japan

Date	Main activities
June 2 (Fri.)	Arrival at Japan (13:40, OM0501) Orientation

June 3 (Sat.)	Holiday
June 4 (Sun.)	Holiday
June 5 (Mon.)	Training for a high-containment facility
June 6 (Tue.)	Experimental infection using inoculated and contact cows was started. Preparation of clinical samples RNA extraction Virus isolation Titration ($TCID_{50}$) of an FMDV
June 7 (Wed.)	Preparation of clinical samples RNA extraction Virus isolation
June 8 (Thu.)	Preparation of clinical samples RNA extraction Virus isolation
June 9 (Fri.)	Preparation of clinical samples RNA extraction Virus isolation Judgement of virus titration ($TCID_{50}$) Neutralization test
June 10 (Sat.)	Holiday
June 11 (Sun.)	Holiday
June 12 (Mon.)	Collection of clinical samples Preparation of clinical samples RNA extraction Virus isolation Judgement of neutralization tests and calculation of r_1 values
June 13 (Tue.)	Preparation of clinical samples RNA extraction Virus isolation RT-PCR (for 3D region)
June 14 (Wed.)	Preparation of clinical samples RNA extraction Virus isolation Preparation of cells Electrophoresis of RT-PCR products

June 15 (Thu.)	Preparation of clinical samples RNA extraction Virus isolation
June 16 (Fri.)	Preparation of clinical samples RNA extraction Virus isolation Neutralization test
June 17 (Sat.)	Holiday
June 18 (Sun.)	Holiday
June 19 (Mon.)	Postmortem examination Collection of clinical samples Preparation of clinical samples RNA extraction Virus isolation Judgement of neutralization tests and calculation of r_1 values
June 20 (Tue.)	Experimental infection using inoculated and contact cows was finished. Preparation of clinical samples RNA extraction Virus isolation
June 21 (Wed.)	Next generation sequencing
June 22 (Thu.)	Next generation sequencing
June 23 (Fri.)	Next generation sequencing
June 24 (Sat.)	Holiday
June 25 (Sun.)	Holiday
June 26 (Mon.)	Next generation sequencing
June 27 (Tue.)	Next generation sequencing
June 28 (Wed.)	Genetic analysis of nucleotide sequences
June 29 (Thu.)	Completion ceremony
June 30 (Fri.)	Departure from Japan (14:40, OM0502)

5. Detailed information on training

Japan is an FMD-free country; therefore, we can investigate live FMDVs only in a high containment facility (BSL-3ag facility). The trainees received the training in a BSL-3ag facility at our institute.

We imported FMDVs isolated in Mongolia in 2017 before the training was started.

Two cows (6 months old, female, Holstein) were inoculated with $10^{7.5}$ $TCID_{50}$ of a Mongolian FMDV isolate and two cows (6 months old, female, Holstein) were housed together with the inoculated cows. Clinical samples such as sera and oral and nasal swabs were collected daily from the cows. Approximately 200 clinical samples were collected during the experimental period. The trainees performed virus isolation and titration, RNA extraction, RT-PCR and neutralization tests using the clinical samples according to the OIE manual.

Vesicular lesions were observed on the feet, inside lips and tongue from 1-3 days post-inoculation in the inoculated cows and from 4-10 days post-contact in the contact cows. Viruses and viral genes were obtained in the inoculated cows from 1 day post-infection and in the cohabitated cows from 1-2 days post-contact. The cows were euthanized after approximately 2 weeks and postmortem examinations were performed to examine condition of tissues and organs of their bodies.

The trainees understood well the contents of the training and performed the diagnostic methods in the experimental infection precisely; however, they should get more experience to improve their technique.

Dr. Gerelmaa and Dr. Enkhbaatar are performing next generation sequencing with Dr. Nishi

B. Dispatch of experts from the parent laboratory to the candidate laboratory and a veterinary laboratory

1. Experts for dispatch: Dr. Kazuo Yoshida, Dr. Manabu Yamada and Dr. Katsuhiko Fukai
2. Dispatch destination: SCVL, Ulaanbaatar and VL, Dornogovi province, Mongolia
3. Dispatch period: from September 18 to September 24, 2017 (Dr. Fukai); from September 18 to September 27, 2017 (Dr. Yoshida and Dr. Yamada);
4. Purposes of dispatch
    a. To organize training on "Pathology and anatomy in domestic animals" and workshops on "Clinical and pathological investigations of TADs" at the SCVL and VL (Meeting 1)
    b. To organize workshops on "Early detection of FMD and other TADs" at the SCVL and VL (Meeting 2)
5. Outcomes of the dispatch
    a. Participants acquired effective necropsy procedures for domestic animals including cows, pigs, sheep and goats, and procedures of sample collection from appropriate organs/tissues for diagnosis at necropsy by training in actual necropsy procedures for domestic animals using cows, pigs, sheep and goats. Participants learnt about important clinical and pathological findings for rapid and differential diagnosis of TADs, including FMD, classical swine fever (CSF), African swine fever (ASF), capripox and PPR. Participants acquired effective histopathological diagnostic procedures for infectious diseases in domestic animals using a microscope by hands-on training in the observation of histological findings in hematoxylin-and-eosin stained sections of tissue samples collected from domestic animals by microscopy (Meeting 1). A brochure, which contained clear photos of such TADs as FMD, CSF, ASF, capripox and PPR, was also prepared in the workshop in order to facilitate early detection of TADs. Meeting 1 was helpful in improving diagnostic procedures from the field to a veterinary diagnostic laboratory for an effective and rapid response to outbreaks of diseases that have a high economic impact.
    b. In Meeting 2, participants learned about general virology, characteristics of FMD and appropriate transportation methods for FMD. One of the most important things for precise diagnostic work of FMD is to transport clinical samples collected from affected animals from the place where the FMD case is detected to a central laboratory where the diagnostic work of FMD is performed. If precise diagnostic work is performed, control measures to the

FMD case can start rapidly. As a result, the FMD case can be eradicated rapidly. Meeting 2 was useful in improving the skills and knowledge of the SCVL and VL staff, who performed sample collection in an FMD case and transported the samples to the central laboratory.

6. Schedule of dispatch

Date	Activities
September 18 (Mon.)	Narita (OM502) – Ulaanbaatar (Dr. Yoshida and Dr. Yamada) Narita (KE0704) – Inchon (KE0867) – Ulaanbaatar (Dr. Fukai)
September 19 (Tue.)	Opening ceremony Lectures on "Characteristic histological findings" (organized by Dr. Yamada) Lecture on general virology and FMD (organized by Dr. Yoshida and Dr. Fukai)
September 20 (Wed.)	Training on microscopical examination of tissue samples collected from cases of FMD, CSF, ASF, PPR and botulism (organized by Dr. Yamada) Lecture on appropriate transportation methods of clinical materials and diagnostic methods for FMD (organized by Dr. Yoshida and Dr. Fukai) Closing ceremony
September 21 (Thu.)	Ceremony to mark the 70th anniversary of the establishment of the SCVL Move to Dornogovi province
September 22 (Fri.)	Opening ceremony Lecture on "Pathology of FMD and training on autopsy using a cow and a sheep (organized by Dr. Yamada) Lecture on general virology and FMD (organized by Dr. Yoshida and Dr. Fukai) Moved to Ulaanbaatar (Dr. Fukai)
September 23 (Sat.)	Lecture on "Pathology of infectious swine diseases (CSF and ASF" and infectious small ruminant diseases (PPR and capripox), and training on autopsy using a pig and a goat (organized by Dr. Yamada) Lecture on appropriate transportation methods of

	clinical materials and diagnostic methods for FMD (organized by Dr. Yoshida) Ulaanbaatar (KE0868) – Inchon (KE0703) – Narita (Dr. Fukai)
September 24 (Sun.)	Training on autopsy using a goat and a sheep (organized by trainees) Inspection of the Zamyn-Uud quarantine station (organized by Dr. Yoshida and Dr. Yamada)
September 25 (Mon.)	Discussion on animal health (organized by Dr. Yoshida and Dr. Yamada) Closing ceremony Moved to Ulaanbaatar
September 26 (Tue.)	Holiday
September 27 (Wed.)	Ulaanbaatar (OM501) – Narita

Group photo from the training and workshop in the SCVL in September 2017

Third year (January 2018 to December 2018)

A. Dispatch of experts from the parent laboratory to veterinary laboratories

1. Experts for dispatch: Dr. Kazuo Yoshida and Dr. Katsuhiko Fukai
2. Dispatch destination: Tov and Selenge provinces, Mongolia
3. Dispatch period: from June 21 to June 28, 2018
4. Purpose of dispatch

To organize workshops on "Suitable harvesting and transportation methods of materials for early diagnosis of FMD and TADs" at the VL

5. Outcomes of the dispatch

In the workshop, participants learned general virology, characteristics of FMD and TADs, and appropriate transportation methods for FMD and TADs. One of the most important things for precise diagnostic work of FMD and TADs is to transport clinical samples collected from affected animals from the place where an FMD and TADs case is detected to a central laboratory where diagnostic work of FMD and TADs is performed. If the diagnostic work is performed precisely, control measures to the FMD and TADs case can start rapidly. As a result, the FMD and TADs case can be eradicated rapidly. The workshop was useful in improving the skills and knowledge of the VL staff, who performed sample collection in an FMD and TADs case and transported the samples to the central laboratory.

6. Schedule of the dispatch

Date	Activities
June 21 (Thu.)	Narita (OZ107) – Inchon (OM306) – Ulaanbaatar
June 22 (Fri.)	Moved to Tov province Opening ceremony Lecture on general virology and FMD and TADs
June 23 (Sat.)	Lectured on appropriate transportation methods of clinical materials and diagnostic methods for FMD and TADs
June 24 (Sun.)	Discussion on animal health in Mongolia and Japan Closing ceremony
June 25 (Mon.)	Moved to Selenge province
June 26 (Tue.)	Visited a boarder control and a VL
June 27 (Wed.)	Moved to Ulaanbaatar
June 28 (Thu.)	Ulaanbaatar (OM305) – Inchon (OZ106) – Narita

Workshop on “Suitable harvesting and transportation methods of materials for early diagnosis of FMD and TADs” at Tov province

B. Dispatch of experts from the parent laboratory to Mongolia

1. Experts for dispatch: Dr. Kazuo Yoshida, Dr. Manabu Yamada, Dr. Katsuhiko Fukai and Dr. Tatsuya Nishi
2. Dispatch destination: The Corporate Hotel & Convention Centre
3. Dispatch period: from August 20 to August 24, 2018
4. Purposes of dispatch

To organize a joint closing meeting of two OIE twinning projects between Mongolia and Japan and participate in Regional Workshop for Transboundary Animal Diseases Control

5. Outcomes of the dispatch

In the meeting, we had a presentation on activities in the twinning project for three years. Dr. Yoshida, Dr. Fukai and Dr. Nishi in the Parent Laboratory gave a presentation entitled "The OIE twinning project on FMD and other TADs between

Mongolia and Japan", "Activities in the OIE twinning program on FMD and other TADs between Japan and Mongolia in the NIAH" and "Activities in the OIE twinning program on clinical and pathological investigations of TADs", respectively. Dr. Gerelmaa in the Candidate Laboratory also gave a presentation entitled "Activities in the OIE twinning program on FMDV isolation from Mongolian Bactrian camel". We discussed the activities and future necessary plans. Finally, we concluded that the activities in the twinning project for three years improved not only the skills of staff in the Candidate Laboratory regarding diagnostic work for FMD and TADs but also the relationship between the Parent and Candidate Laboratories.

6. Schedule of the dispatch

Date	Activities
August 20 (Mon.)	Narita (OM502) – Ulaanbaatar
August 21 (Tue.)	Joint closing meeting of two OIE twinning projects between Mongolia and Japan
August 22 (Wed.)	Regional Workshop for Transboundary Animal Diseases Control Narita (OM502) – Ulaanbaatar (Dr. Yamada)
August 23 (Thu.)	Regional Workshop for Transboundary Animal Diseases Control
August 24 (Fri.)	Ulaanbaatar (OM501) – Narita (Dr. Yoshida, Dr. Yamada and Dr. Nishi) Ulaanbaatar (OM301) – Inchon (OZ9610) – Narita (Dr. Fukai)

Conclusion

The objectives of the twinning project are (1) to improve diagnostic capabilities on FMD, (2) to acquire methods on the selection of an adequate vaccine strain of FMD, (3) to construct transport systems and acquire methods for the collection of materials for laboratory diagnosis, and (4) to acquire pathology and anatomy procedures for TADs. For these objectives, the following activities were performed: (1) Training of Mongolian specialists in virus isolation, virus titration, VNT, virus detection, viral gene detection, sequencing and experimental infection of FMDV for improvement of diagnostic capabilities on FMD in the SCVL; (2) Training of Mongolian specialists on the r_1 value measurement test and evaluation of the measured r_1 value for selection of an adequate vaccine strain of FMD in future possible outbreaks in Mongolia; (3) Training of Mongolian specialists on evaluation of the effectiveness of FMD vaccines

preserved for emergency vaccination in Japan and Mongolia; (4) Organization of workshops on "Early detection of FMD and other TADs" in regions where the diseases frequently occur in Mongolia; (5) Organization of workshops on "Suitable harvesting and transportation methods of materials for early diagnosis of FMD and other TADs" in regions where the diseases frequently occur in Mongolia; (6) Organization of workshops on "Construction of transport systems by considering transportation methods of diagnostic materials and vaccines" at the SCVL; (7) Organization of training on "Pathology and anatomy in domestic animals" at the SCVL; and (8) Organization of workshops on "Clinical and pathological investigations of TADs" at the SCVL.

Through activities (1) to (3), Mongolian specialists were trained to improve their knowledge and skills on several tests for diagnostic work on FMD. The specialists gained knowledge on the selection of an adequate vaccine strain of FMD and effectiveness of FMD vaccines. Through activities (4) to (6), a rapid detection system of FMD and TADs in the field was constructed, and adequate sampling methods and transportation systems of diagnostic materials were acquired. Through activities (7) and (8), Mongolian specialists were trained in pathological and anatomical procedures in the field and veterinary diagnostic laboratories for effective and adequate responses in outbreaks of diseases that cause high economic impact.

Group photo from the joint closing meeting in Ulaanbaatar in August 2018