Bilateral cooperation between a laboratory in Korea and laboratories in other countries:
the basis for a future extended network

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Bilateral cooperation between Korea and Mongolia

NVRQS, Korea and SCVL, Mongolia

- Foot and Mouth Disease
1st visit to Mongolia for cooperation

- Visitor: Yi-Seok Joo, Kwang-Nyeong Lee
- Period: 25 March ~ 1 April 2002 (SCVL)

- Investigation of the status of FMD outbreak in Mongolia

- Serological survey with NVRQS-developed diagnostic kits for the samples obtained in the Mongolian field.
Dispatch of Veterinarian Expert to Mongolia

Kang-Seok Choi (11 Aug ~ 17 Nov 2003, SCVL)

- Theory of PCR and RT-PCR
- RT-PCR for FMDV and equine infectious anemia virus
- Cell culture technique
- Workshop for FMD diagnosis
Meeting Promoting Agricultural Cooperation between Two countries

- Period: 27 Oct 2003
- Place: Ministry of Agriculture and Forestry, Korea

- Agreement to hold the Agricultural Joint Committee every two years.
1st Meeting of the Agricultural Joint Committee

- MOFA requested to help in introducing the HACCP system into the processing plants of animal products in Mongolia.

- MAF, Korea, suggested cooperation projects related to introduction of HACCP system in Mongolia in Jan, 2006.
1st KOICA Project

Improvement of Testing Capability of Veterinary Hygiene Laboratory

- **Equipments.** Apparatuses and reagents (0.26 million USD)
- **Expert Dispatch.** 5 Korean experts over two years
- **Training.** 4 Mongolian staffs for three months
Supply of Equipments to Mongolia

(Dec 2004 – Feb 2005)
Expert Dispatch (Senior Adviser)

(31 Aug – 21 Sep, 2004)

Consult for strategy improving livestock development
Expert Dispatch (Researcher)

(14 Feb – 15 March 2005)
Training in Korea (Four Mongolian)
(16 May – 12 Aug 2005)
Expert Dispatch (Analysis)
(3 – 16 Sep 2005)
Certificate of Appreciation Presented by Minister, Terbishdagva (15 Sep 2005)
Agreement to Collaborate Between NVRQS and SCVL (21 – 24 Dec 2005)
2nd Meeting of the Agricultural Joint Committee

- Discussion of cooperation activities between two ministries during ’04-’05 & future plans
Summit Meeting Between Korea and Mongolia

Period: 7 ~ 13 May 2006 (Mongolia)

Several agenda were discussed including:

- Supply of diagnostic kits for FMD and Avian Influenza
- Establishment of viral animal disease diagnostic center at SCVL
Donation of Diagnostic Kits to Mongolia

(July ~ Aug 2006)

FMDV NSP ELISA kit: 4,000 tests
Avian Influenza Ag kit: 800 tests
Donation of FMD Vaccine to Mongolia

- **Period**: 29 ~ 31 Aug 2006
- **Vaccine**: Trivalent(O,A,Asia1), 300,000 doses
Agreement to Collaborate for FMD and AI
(30 Sep – 4 Oct 2006)
**FMD**

Development and application to the field of multi-diagnostic methods for vesicular diseases
(RT-PCR for FMD, C-ELISA for VS)

**Avian Influenza**

Study on the characteristics and distribution of avian Influenza viruses in wild birds of North-Eastern Asian region
2nd KOICA Project

Establishment of Viral Animal Disease Diagnostic Center at SCVL (2007 ~ 2009)

**Building** : Building up BSL III lab

**Equipments** : Apparatuses and reagents (133 Kinds)

**Expert Dispatch** : 17 Korean experts over two years

- Senior Adviser (7 ~ 22 Sep 2007)
- Two NVRQS Experts & Four Equipment Experts (2 weeks, 2007)
- 10 NVRQS Experts (2 ~ 4 weeks, 2007-2009)

**Training** : 11 Mongolian staffs for three months

- Maintenance of Biosafety Laboratory : 2 Mongolian (2 weeks, 2007)
2nd KOICA Project

**Equipments:** Apparatuses and reagents (133 Kinds)

(4) Real time PCR  DNA calculator  Freeze microtome
2nd KOICA Project

Expert Dispatch: 17 Korean experts over two years

- Senior Adviser (7 ~ 22 Sep 2007)
- Two NVRQS Experts & Four Equipment Experts (2 weeks, 2007)
2nd KOICA Project

**Training**: 11 Mongolian staffs for three months

- Maintenance of Biosafety Laboratory: 2 Mongolian (2 weeks, 2007)
- Training on diagnostic methods of animal diseases (2 months, ’07-08)
Korea-Mongolia

- Collaborative research project on FMD
  - Development and application to the field of multi-diagnostic methods for vesicular diseases (2006-2008)
    - Multiplex PCR detection for 7 serotype FMDV
    - Development of ELISA for vesicular stomatitis NJ type
Multiplex PCR detection on FMDV

O/SKR/2002  Asia1 MOG/05  A22 Iraq 24/64  C3 Resende

SAT 1 BOT 1/68  SAT 2 ZIM 5/81  SAT 3 ZIM 4/81
Short communication

Evidence of recombination in a new isolate of foot-and-mouth disease virus serotype Asia 1

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ABSTRACT

Phylogenetic analysis of the nucleotide sequence of VP1 revealed that a new isolate of foot-and-mouth disease virus (FMDV) serotype Asia 1 identified in Mongolia in 2005 was related to Chinese and Russian strains isolated during the same year. In this study, these strains were defined as East Asian strains having a common geographical origin, and the complete genomic sequence of the Mongolian strain (As1/MOG/05) was determined and compared to other strains of serotype Asia 1. As1/MOG/05 showed 100% identity with an East Asian strain from China (As1/Qinghai/CHA/05) in terms of its VP1 nucleotide sequence. However, the Mongolian strain has a four-amino acid extension in 3D that is missing from all other strains of serotype Asia 1, and which is not due to an insertion. A full genomic scan revealed that the Mongolian strain is closer to the East Asian strain As1/JS/CHA/05 than to all other strains of serotype Asia 1 in nearly all genomic regions. Within the narrow region of low similarity between the two sequences, As1/JS/CHA/05 was found to have a mosaic structure with a partial 2C fragment supposedly transferred from Hong Kong strain As1/HNK/CHA/05. The genomic mosaicism and extension detected in non-structural protein-coding regions in this study may be used to trace the origins and evolution of problematic strains of serotype Asia 1 that have arisen in East Asia since 2005.

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Development of ELISA for vesicular stomatitis NJ type

Development of Mab in VSVNJ 1G11

ELISA Development for VS NJ strain
Collaborative Research for Avian Influenza
Collaborative Research for Avian Influenza

Korea / Mongolia
Nov 2006 – Oct 2009 (Three Years)

- **Purpose**
  - *International research cooperation* for the studies on characteristics and distribution of avian influenza viruses in wild birds of North-Eastern Asian region

- **Strategies**
  - **NVRQS**: Analysis of AIVs, advising in establishment of the laboratory and the system for AIV research
  - **SCVL**: Collection of specimen, establishment of the laboratory and the system for AIV research in SCVL
Collaborative Research for Avian Influenza

Korea / Mongolia
Nov 2006 – Oct 2009 (Three Years)

Sample Collection
: The researchers of NVRQS visited every year for sample collection of wild birds in Mongolia

- **2007**
  - 1st: Bulgan region, 200 samples, 26 Aug~2 Sep
  - 2nd: Sukhbaatar region, 240 samples, 27 Sep~5 Oct

- **2008**
  - 1st: Bulgan, Arhangay region, 398 samples, 25~31 May
  - 2nd: Bulgan etc. region, 402 samples, 10~20 Aug

- **2009**
  - Arhangay region, 8~14 June
Visiting for Sample Collection

Khunt lake, 2007

Gangga lake, 2007

Khunt lake, 2008

SCVL, 2008
Collaborative Research for Avian Influenza

Korea / Mongolia
Nov 2006 – Oct 2009 (Three Years)

- Training for AIV diagnosis and research technique
  - 1st training course
    - 2007.10. 28 ~ 11. 10 (14 days)
    - Dr. Batchuluun of SCVL
    - Virus isolation and identification technique: egg inoculation, HA, HI, NI test, RT-PCR, AGID etc.
Collaborative Research for Avian Influenza

Korea / Mongolia
Nov 2006 – Oct 2009 (Three Years)

- Training for AIV diagnosis and research technique
  - 2nd training course
    - 2008.10.6 ~ 10.17 (12 days)
    - Dr. Erdene-Ochir of SCVL
    - Virus isolation technique, genetic analysis, speciation
    - Visiting for wild bird habitats
Collaborative Research for Avian Influenza

Korea / Mongolia
Nov 2006 – Oct 2009 (Three Years)

\[ \text{Result} \]
- Establishment of the ability for AIV diagnosis & research in Mongolia
- Understanding between two countries for avian influenza research
- Obtaining of useful resources (Avian influenza viruses)
Bilateral cooperation between Korea and UK
• MOU between NVRQS, Korea and Institute for Animal Health, UK (May, 2003)

  - Characterization and serodiagnosis on FMDV on domestic animals
  - Application of advanced molecular biotechnology for improvement of animal welfare
  - Exchange of science/technology information and the mutual visits of scientists and experts
Collaborative project

- The infection-interference strategy for mucosal defense against foot-and-mouth disease virus infection (2003-2006)
  - Development of anti-FMDV agent as adenoviruses with siRNA, IFN and antibody gene
  - Differentiation with vaccinated and infected animals by CMI response

- Inhibiting FMDV infection and defining viral pathogenicity determinants (2007-2010)
  - Analysis of persistent factor using DNA chips
  - Recombinant Sendai virus expressing protective antigen
Bilateral cooperation between Korea and China
Collaborative Research between Korea and China

Contracting MOU between NVRQS and Agricultural college of Yanbian University in China (’00.12.20)
Collaboration Research

- Examine on *Theileria* vaccine therapy and development of slow releasing anti-protozoal drugs for the treatment of Theileriosis in cattle (’02.2-’04.12)
- Development of *Neospora caninum* tachyzoite vaccine (’05.3-’08.3)
- Development of Alternative Therapies against Bacterial Diseases using Chinese herbal medicine in Animals (’05.7-’08.6)
- Survey and Control on Zoonosis in the Northeast Asia Animals (’08.10-’10.9)
  - Brucellosis, Tuberculosis, Toxoplasmosis
Collaborative Research for Neospora
Brucellosis Workshop in China

- Brucellosis serological diagnosis
- Brucella isolation methods
- Brucella genetic identification
- Brucellosis epidemiology
- Brucellosis consultants
Bilateral cooperation between Korea and Vietnam
Korea-Vietnam

- MOU between NVRQS, Korea and Department of animal health, Ministry of agriculture and rural development, Vietnam
  - March 2008
  - Developing research cooperation in surveillance, diagnosis and control of animal diseases
  - to control and minimize the outbreaks of FMD, rabies and important bacterial diseases and to standardize diagnostic methods from this year. Korea will continually play a role in effective diagnosing of animal diseases in Asia
• Collaborative research project (2009-2010)
  – Molecular epidemiology on the persistent infection of FMD in epidemic area
    • Virus detection and molecular epidemiological analysis in clinical samples of endemic region
    • Antigenic analysis and serological assay in persistent infection

Mouth swab for virus detection related to persistent infection (2009)
Future extended network

• Laboratory Twining Projects
  – Brucellosis: Mongolia with NVRQS, Korea
    (New approval Bovine brucellosis OIE reference laboratory)

• Laboratory cooperation
  – Rabies and FMD: Vietnam with NVRQS, Korea

• Expert training (Every year, 2 weeks)
  – Asean 10 country for AI and FMD
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