



# "MAJOR SWINE DISEASE AND CURRENT DIAGNOSTIC METHODS IN MONGOLIA"

**ODBILEG Raadan**

**Institute of Veterinary Medicine, Mongolia**

**Regional Workshop on Swine Disease Diagnosis**

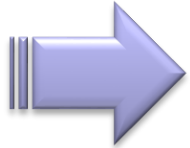
**Beijing, P. R. China, 30 – 31 Oct 2019**



**WORLD ORGANISATION FOR ANIMAL HEALTH**

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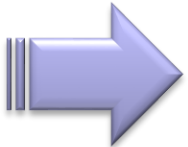
# ***Outline of presentation***



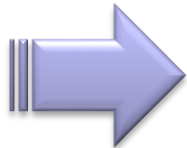
**National lab system**



**Brief background of pig population**



**Updates on disease situation**



**Swine diseases diagnosis**



**Challenges and possible solution**

# Veterinary Laboratory System

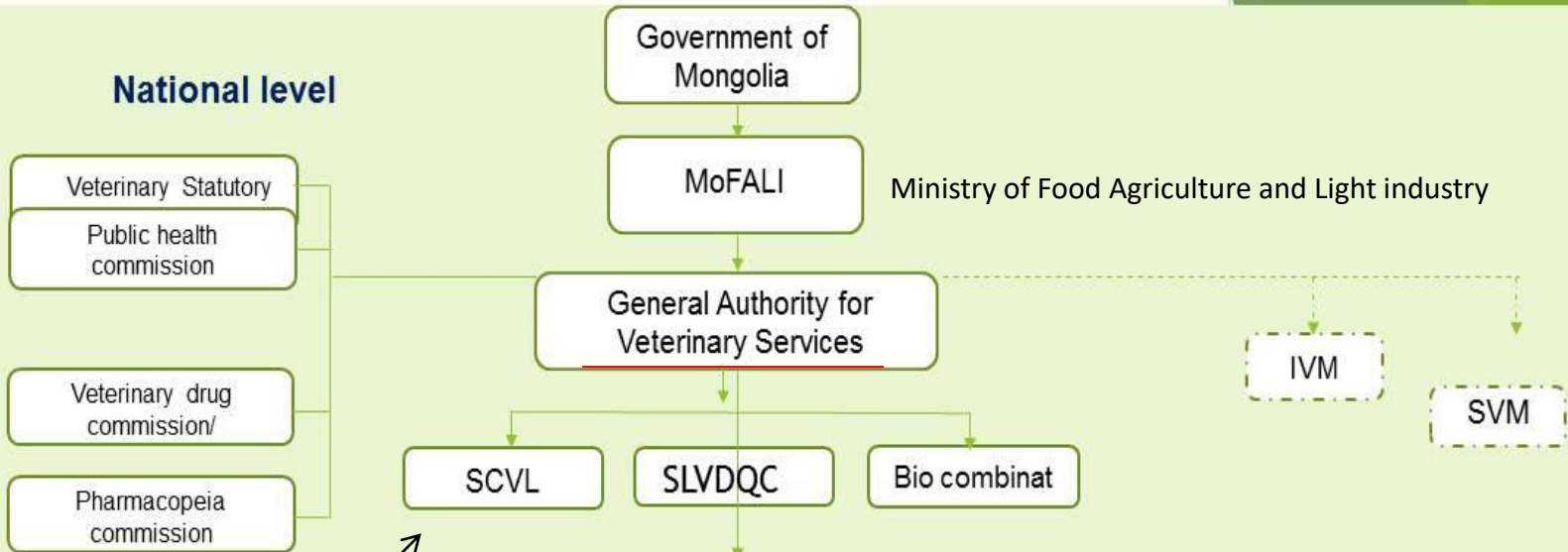


## GENERAL AUTHORITY FOR VETERINARY SERVICES (GAVS)



GAVS

### National level

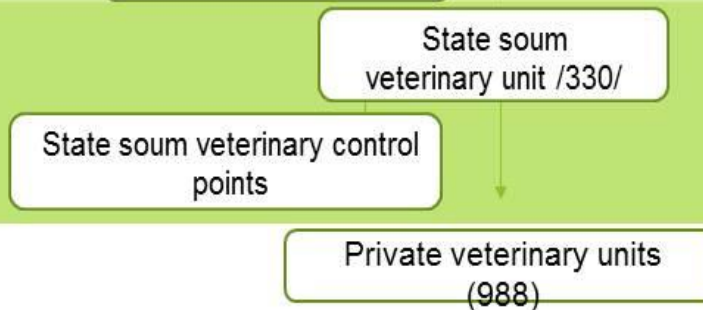


State central veterinary Laboratory

### Provincial level



### Primary level (330 soums)





# **THE STATE CENTRAL VETERINARY LABORATORY**

## **THE MAIN TASKS**

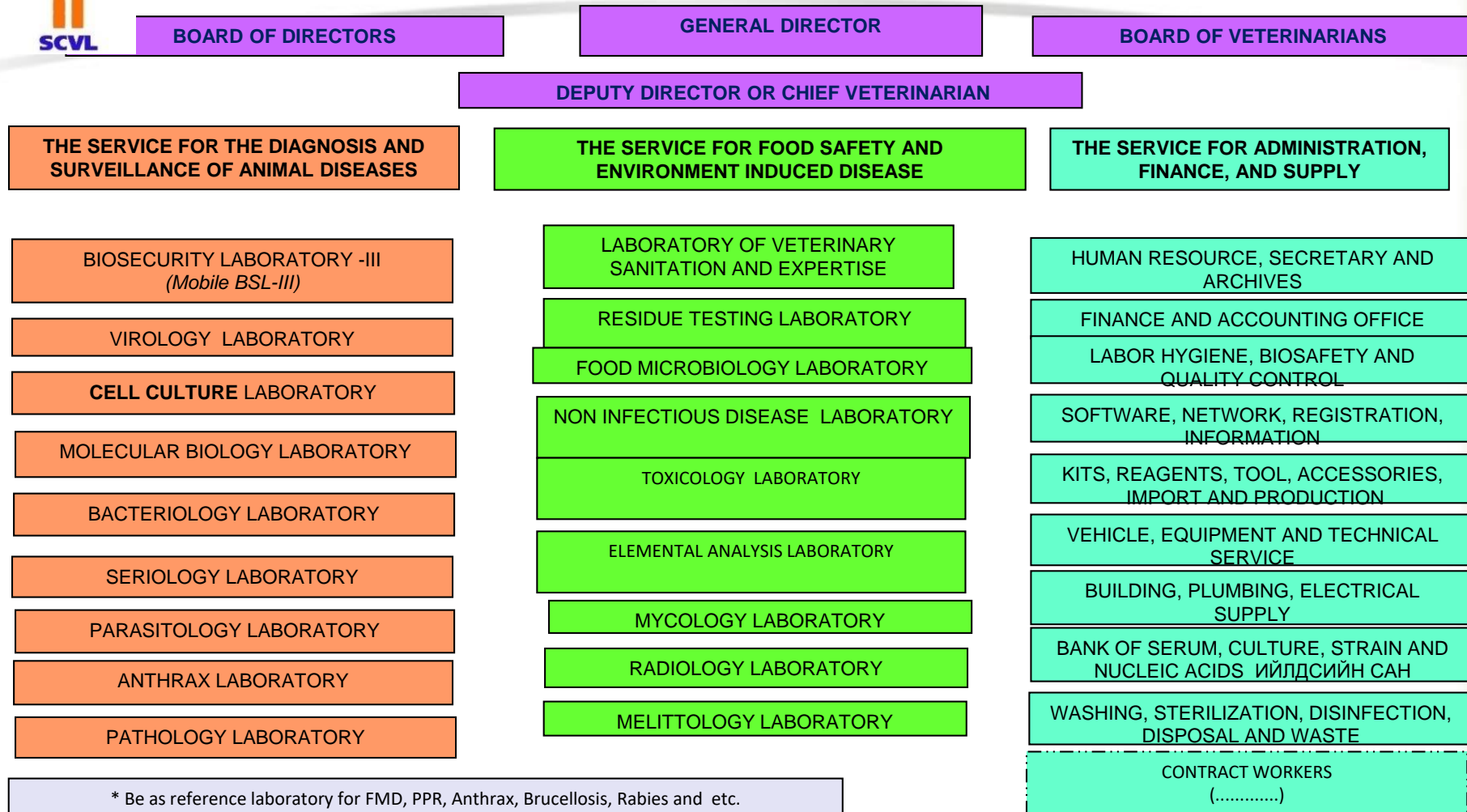
- ✓ **ANIMAL DISEASE DIAGNOSIS AND IMPLEMENTATION OF CONTROL MEASURES (SCREENING, SURVEILLANCE, CONFIRMATION)**
- ✓ **VETERINARY SANITARY EXPERTISE IN EXPORTING AND IMPORTING FOODS AND RAW MATERIALS OF ANIMAL ORIGIN**
- ✓ **TRAINING OF LABORATORY STAFF OF LOCAL VETERINARY NETWORK LABORATORIES AND DISTRIBUTION OF TRAINING MATERIALS**



# National lab system/ network



## THE STATE CENTRAL VETERINARY LABORATORY



VETERINARY LABORATORY NETWORK OF PROVINCES AND METROPOLIS

VETERINARY LABORATORY OF SOUMS, DISTRICTS AND PRIVATE ENTITY



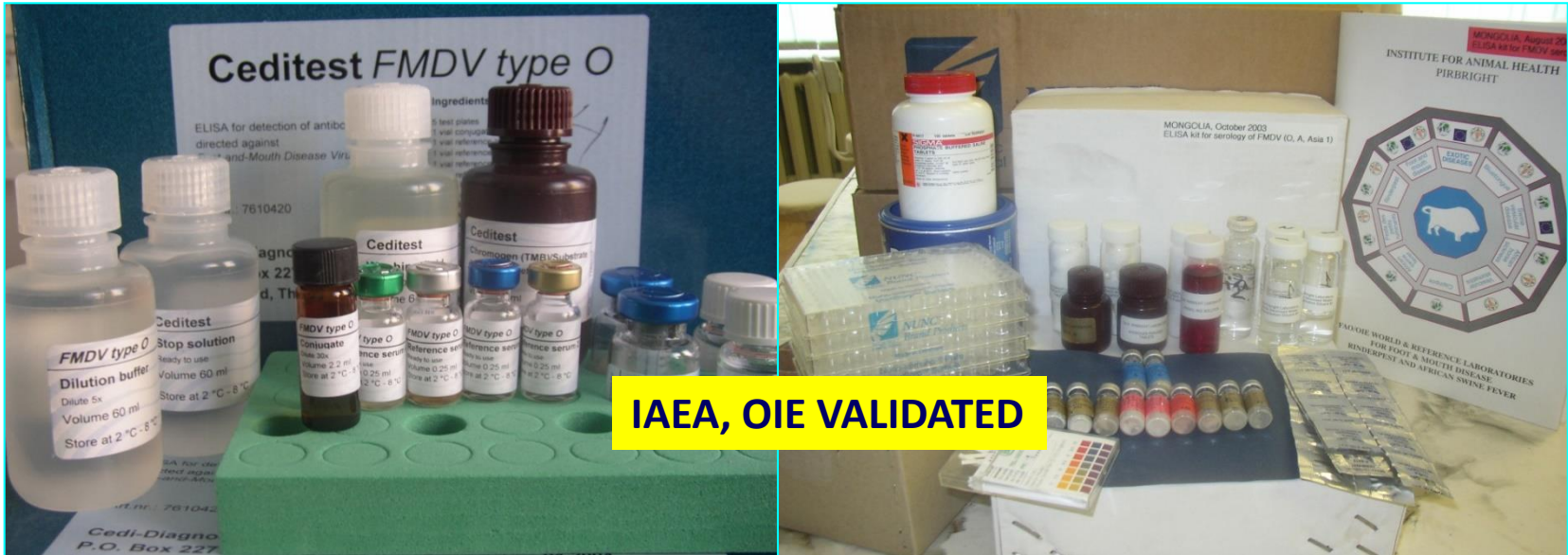
# BSL III TAD DIAGNOSIS AND SURVEILLANCE



2008-03-06



# DIAGNOSTIC REAGENTS

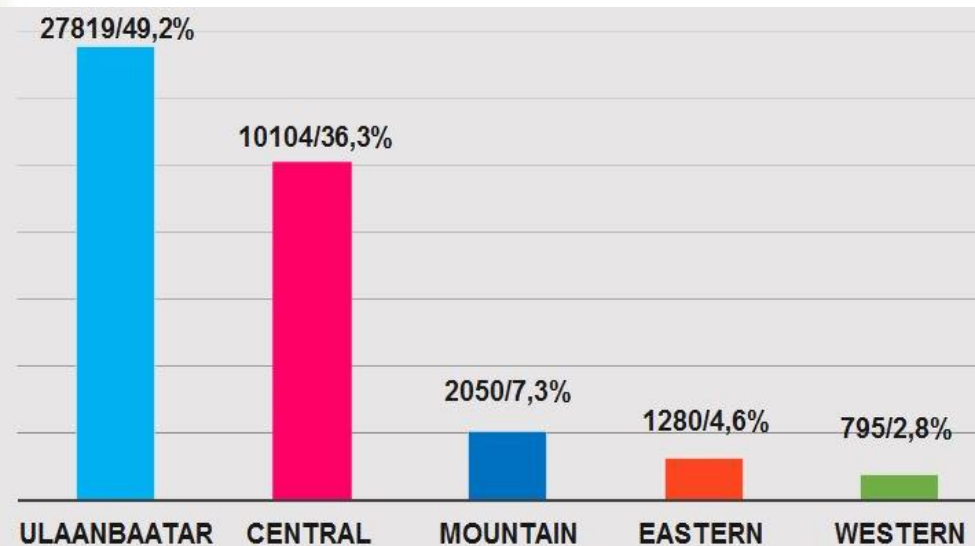


**DOMESTIC:** Biokombinat 10 diagnostic reagents, VRI- Bovine leucosis AGID  
**IMPORTED:**  
VMRD, SYNBIOTICS, IDEXX, INVITROGEN (USA), PRIONICS- CEDI (HOLLAND),  
PRIBRIGHT (UK), ROBOSCREEN, QIAGEN, SIGMA (GERMANY), POURQUIER, IDVET  
(FRANCE), HVRI (CHINA), CITM (BELGIUM), ARIAH (RUSSIA), JENOBIOTECH,  
ANIGEN, BIONER (KOREA), TAKARA (JAPAN), TESTLINE (CZECH), INGENASA (SPAIN)

# Brief background of pig population



Number of pigs (2018)



Livestock population (2018)



3 940 092



4 380 879



459 702

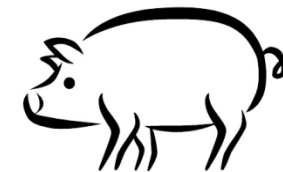


30 554 804



27 124 703

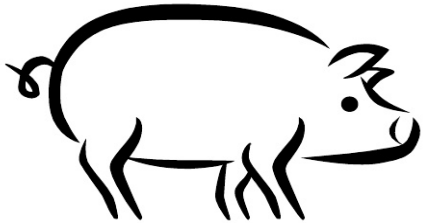
The total number of livestock is estimated at 66 460 180 thousand by 2018.



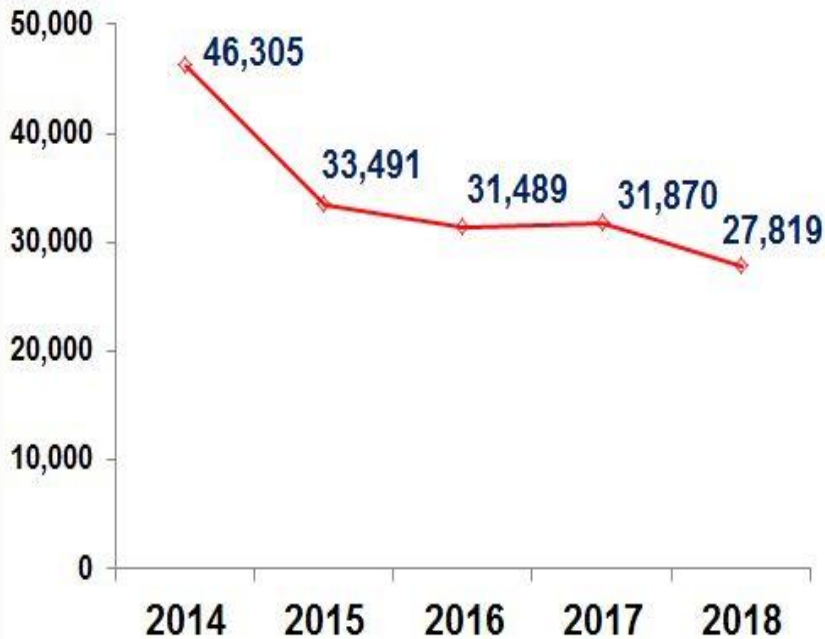
27 819



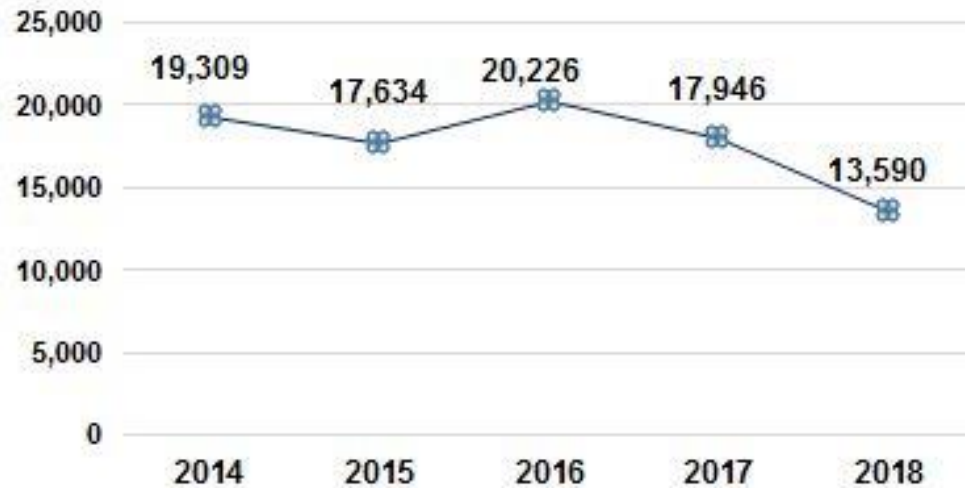
- Brief background of pig population**



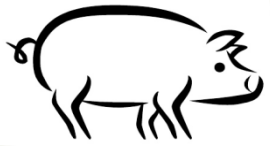
**Number of pigs (2014-2018)**



**Ulaanbaatar city  
Number of pigs (2014-2018)**



**Pig population (by years)**



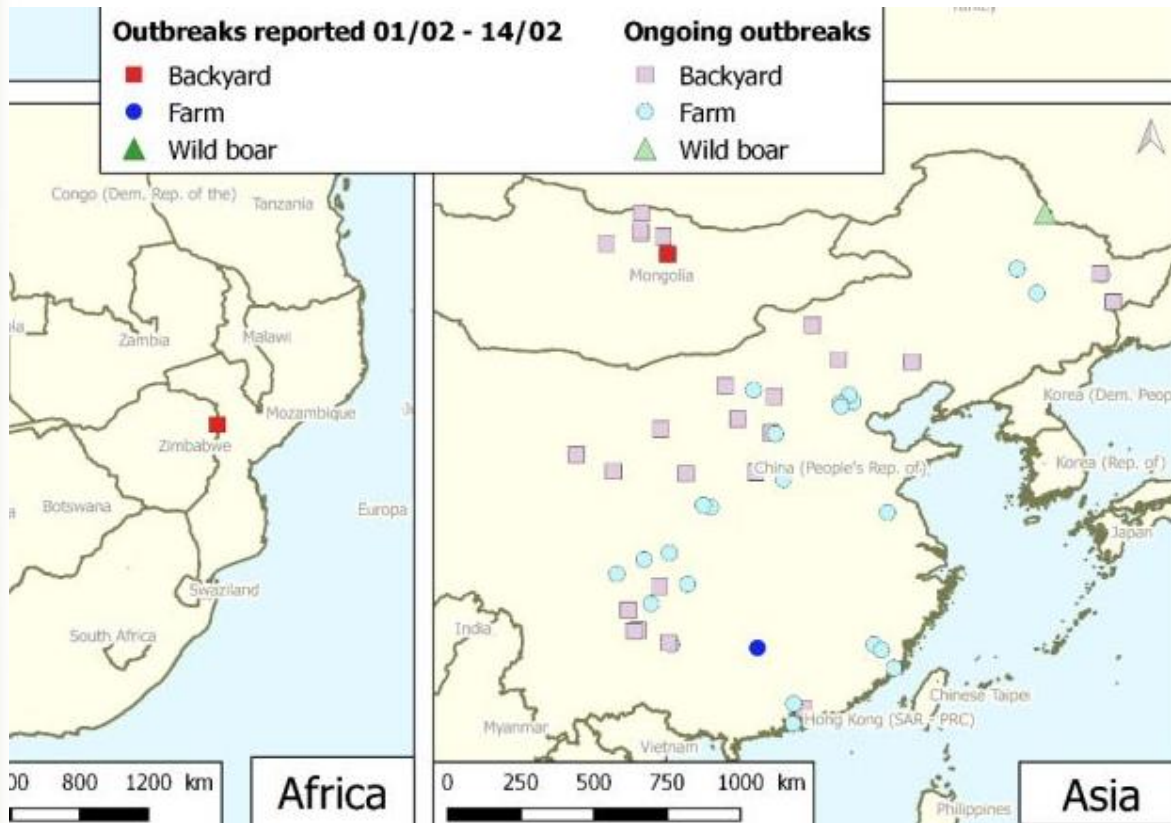
# Brief background of pig population



# Updates on disease situation

## African swine fever virus (ASF)

ASF is a fatal animal disease affecting pigs and wild boars with up to 100% case fatality rate.



### Mongolia

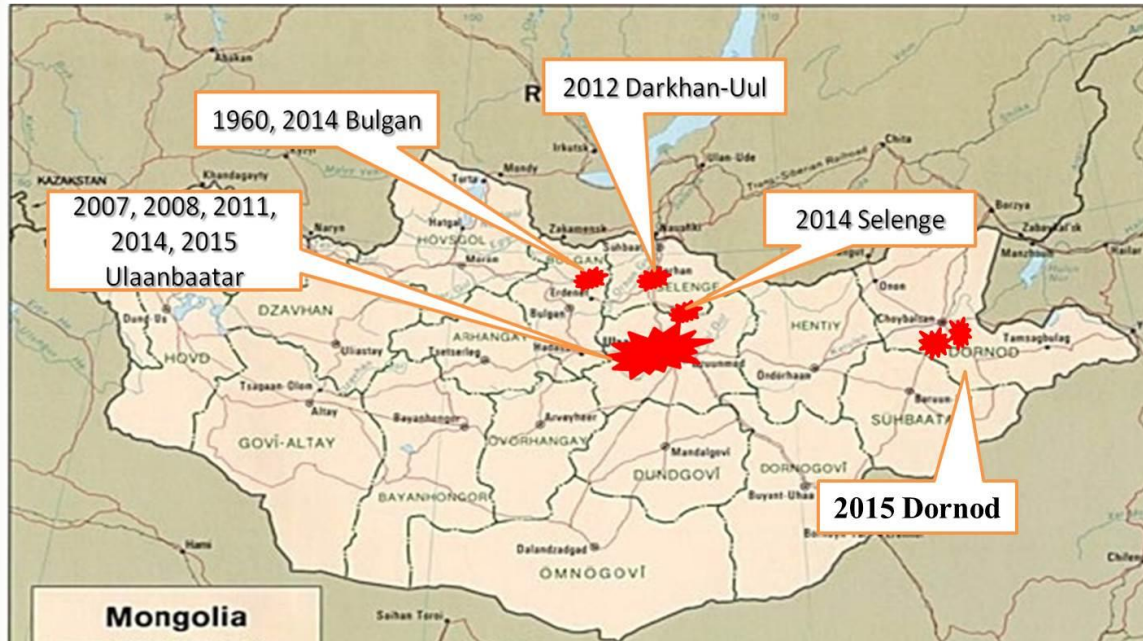
Since its first report on 15 January 2019, 11 outbreaks in 6 provinces and in Ulaanbaatar have been reported, involving 105 farms/households. More than 3,115 pigs, more than 10 percent of the total pig population in Mongolia, have died/been destroyed due to the ASF outbreaks.

Figure 2. Losses\* due to ASF outbreaks notified through WAHIS within the period (Feb 1-14, 2019)

Source: [https://www.oie.int/fileadmin/Home/eng/Animal\\_Health\\_in\\_the\\_World/docs/pdf/Disease\\_cards/ASF/Report10\\_Current\\_situation\\_of ASF.pdf](https://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/ASF/Report10_Current_situation_of ASF.pdf)

# Updates on disease situation

## Classical swine fever outbreak in Mongolia (1960-2015)



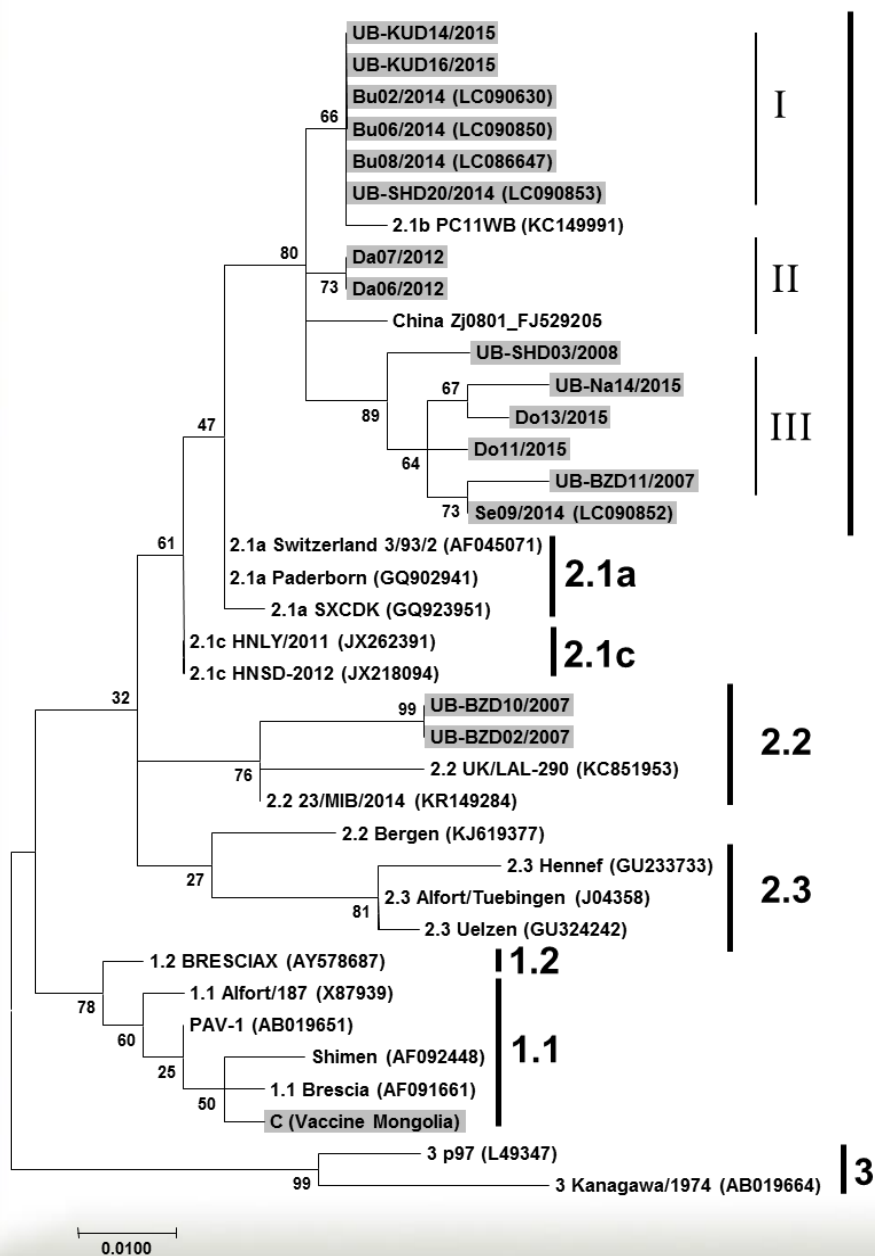
Live attenuated vaccine  
against CSF

Strain: C (Chinese)

In Mongolia, pigs are vaccinated with **lapinized CSF** and effectiveness of such vaccine is an important need for successful control of disease in the country.

In Mongolia has been reported 14 outbreaks in 2007, 2008, 2011, 2012, 2014, and 2015 ([Genetic and virulence characterization of classical swine fever viruses isolated in Mongolia from 2007 to 2015](#). Enkhbold B, et al., Virus Genes. 2017 Jun;53 (3):418-425).

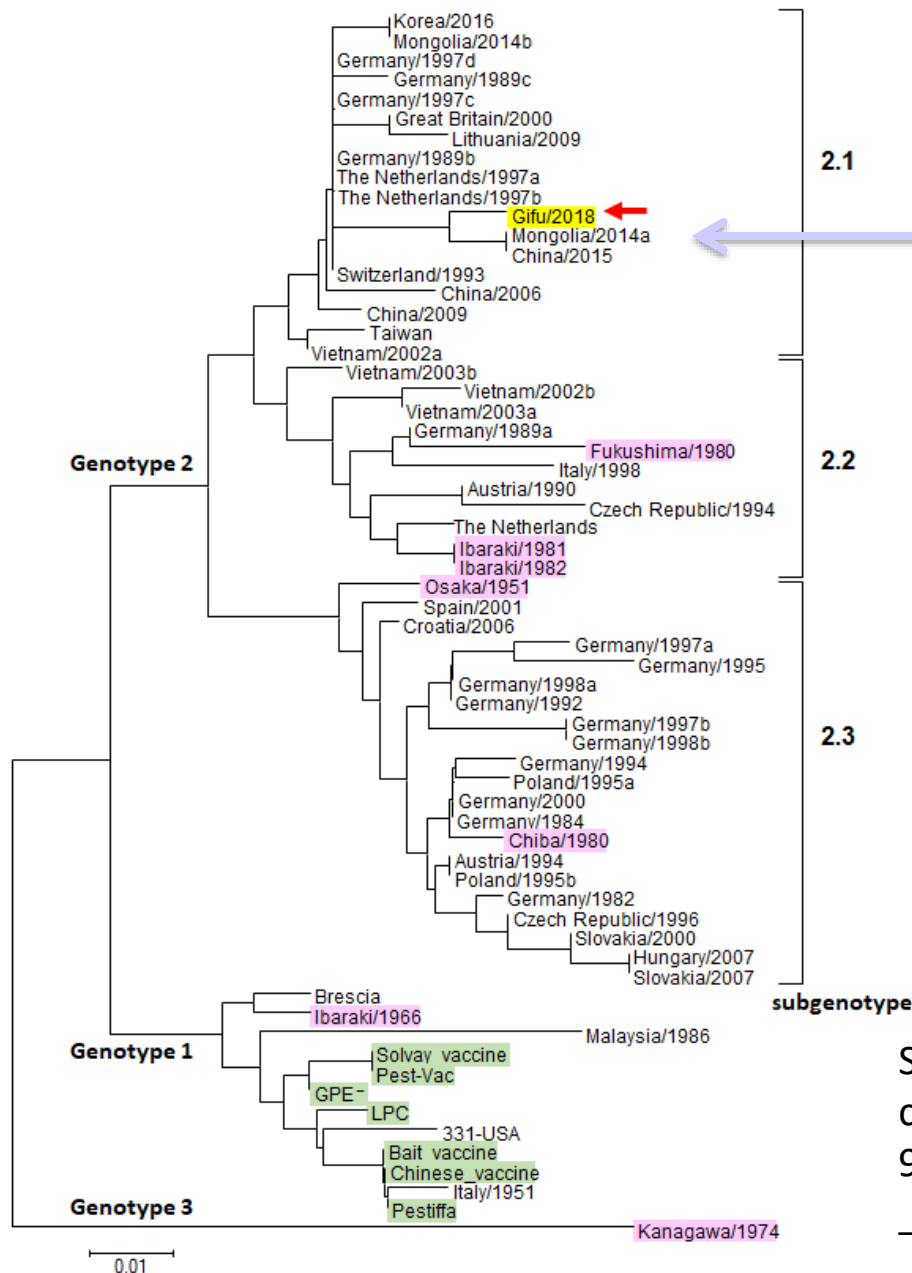
# Molecular characterization of CSFV in Mongolia



Sequences of the 14 CSFV Mongolian isolates (2007–2015) and vaccine C-strain are indicated with gray highlights. The 13 sub-genotype 2.1b isolates were further classified into three clusters (I–III) followed by bootstrap values of phylogenetic analysis. Country name of each Mongolian CSFV isolate was omitted from strain name

Figure 1. Enkhbold et al., Virus genes, 2017

# Analysis of classical swine fever virus isolated in Gifu Prefecture.



CSFV/Mongolia/2014

Source: [http://www.naro.affrc.go.jp/english/niah/topics/hog/index.html?fbclid=IwAR3yGgpGSf9zv-9ikNX3R1AaHA2AQUgJe0YZmbQ2A\\_XzUbcpkGD37P\\_9nsk](http://www.naro.affrc.go.jp/english/niah/topics/hog/index.html?fbclid=IwAR3yGgpGSf9zv-9ikNX3R1AaHA2AQUgJe0YZmbQ2A_XzUbcpkGD37P_9nsk)

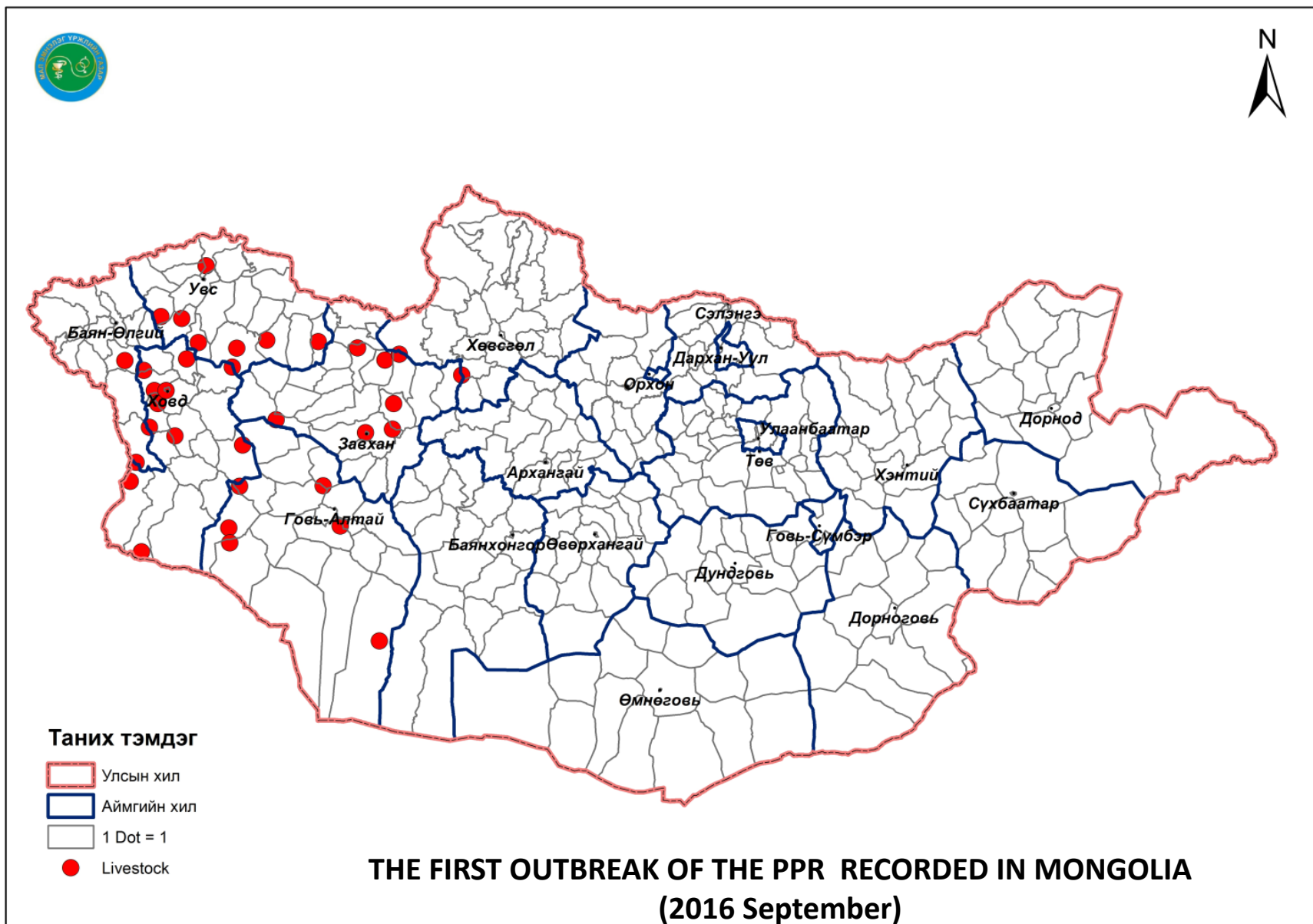
# Updates on disease situation



## OCCURRENCE OF DISEASE

<b>Disease name</b>	<b>Last case</b>	<b>Status</b>
<b>FMD (O type)</b>	<b>2018</b>	<b>infected</b>
<b>Sheep &amp; goat pox</b>	<b>2017</b>	<b>infected</b>
<b>PPR</b>	<b>2017</b>	<b>infected</b>
<b>Classical swine fever</b>	<b>2015</b>	<b>infected</b>
<b>PRRS</b>	<b>2014</b>	<b>infected</b>
<b>Avian Influenza</b>	<b>2005, 2006, 2009, 2010</b>	<b>Cases in wild bird, but not in domestic</b>

# THE OUTBREAKS OF THE PESTE DES PETITS RUMINANTS (PPR)





## PPR disease detected in Mongolia from wild animals.



**Saiga**



**Black-tailed gazelles**



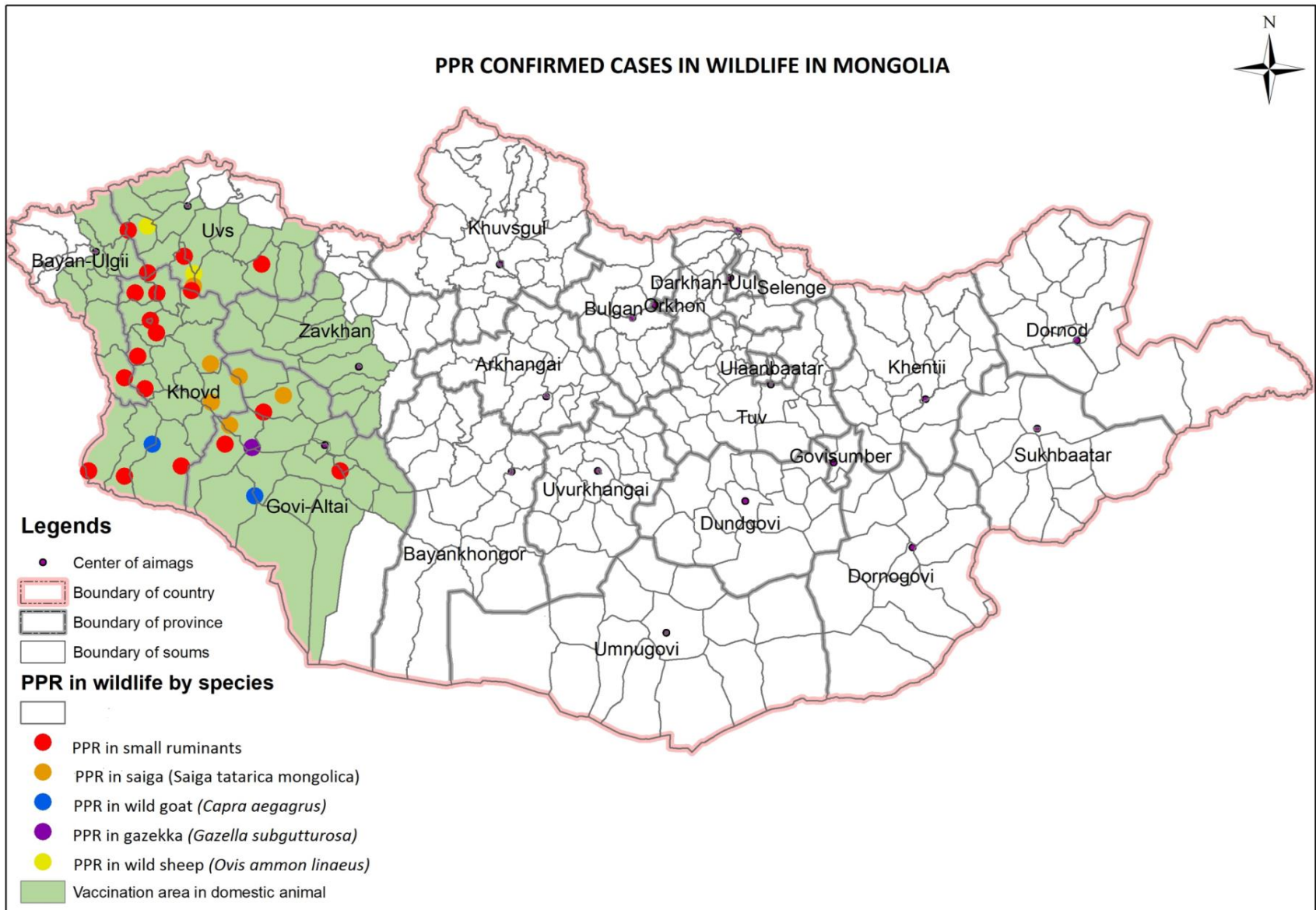
**Wild sheep**



**Ibex**

By June 2017 reported the death of saiga has been stopped, but the ibex died in mountains area (in Khovd province).

# PPR confirmed cases in wildlife in Mongolia (2017)



# Swine diseases diagnosis



## TESTS USED FOR TAD DIAGNOSIS AND SURVEILLANCE IN SCVL

No	Disease name	Test name	Diagnostic kits
1	<b>Foot and mouth disease</b>	ELISA, RT - PCR	Ab & Ag LPB-ELISA, Pribright, UK O type & NSP ELISA, Cedi, the Netherlands ELISA & CFT-ARIAH, Russia NSP-ELISA, Jenobiotech, Korea Rapid test-Anigen, Korea
2	<b>Classical swine fever</b>	ELISA	Ab & Ag ELISA-IDEXX, USA Ab & Ag ELISA- Jenobiotech, Korea
3	<b>Highly pathogenic avian influenza</b>	AGID, HA, HI, RT – PCR, qRT_PCR Inoculation in embryonated eggs	Rapid test-Synbiotics, USA and Anigen, Korea HA-HVRI, China, IZP, Italy and NVSL, USA HI- NVSL, USA, Primer set-Invitrogen and Takara
4	<b>Sheep/goats pox</b>	PCR, ELISA	IAH, UK designed primers
5	<b>PPR</b>	RT-PCR, ELISA (Ab, Ag)	IDVET, France

# Swine diseases diagnosis



## TESTS USED FOR TAD DIAGNOSIS AND SURVEILLANCE IN SCVL

No	Disease name	Test name	Diagnostic kits
1	<b>African swine fever</b>	ELISA, PCR Real -time PCR Virus isolation	ID Screen ASF Competition ELISA, ID Screen ASF Indirect- Screening test- Indirect ELISA King`s Real-time PCR
2	<b>Classical swine fever</b>	ELISA	Ab & Ag ELISA-IDEXX, USA Ab & Ag ELISA- Jenobiotech, Korea

# Swine diseases diagnosis



- *Diagnostic capacity of your lab (such as cell culture, FAT, PCR.)*
- *Cell culture - Vero, MDBK, MDCK*
- *Virus isolation /HAD test/ ?*
- *FAT (Fluorescent antibody test) ?*

# Swine diseases diagnosis

## Diagnosis of ASF

### TESTS USED FOR TAD DIAGNOSIS AND SURVEILLANCE IN SCVL

Death pigs

#### 1. Sample preparation

Tissue, blood samples

#### 2. Prepare cell culture

Porcine alveolar macrophage (PAM)



Primary cell culture

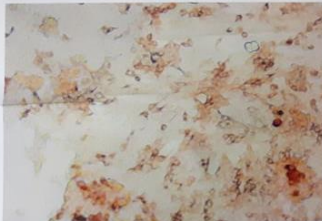
#### 3. Virus isolation

#### 4. PCR amplification

#### 5. Sequence analysis

#### 1. Virus isolation

When the virus replicates in these cultures, the majority of the ASFV strains produced the haemadsorption reaction (HAD) due to adsorption of pig red blood cells on ASFV infected porcine alveolar macrophages.

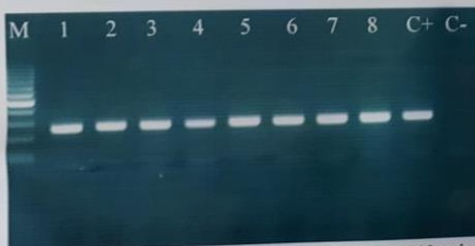


Picture 1. Positive sample /4 days post inoculation/

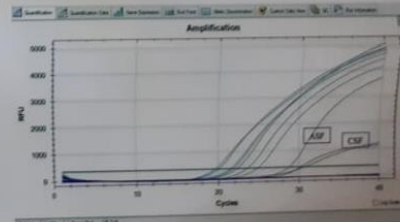


Picture 2. Negative sample /4 days post inoculation/

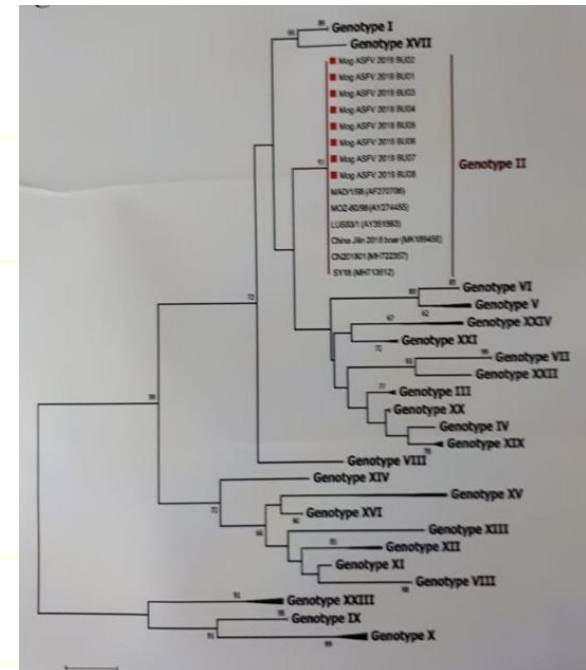
#### 2. Determination of P72 gene by PCR and qRT-PCR



Picture 1. M – Marker, Lane 1, 2-Kidney; Lane 3,4-Spleen; Lane 5,6-Lymph nodes; Lane 7,8- Lung; C+ - Positive control, C - Negative control



Picture 2. African Swine Fever - /ASF/ - FAM  
Classical Swine Fever - /CSF/ - Cy5



## Diagnosis of ASF

### TESTS USED FOR TAD DIAGNOSIS AND SURVEILLANCE IN SCVL

Death pigs

#### **1. Sample preparation**

Tissue, blood samples

#### **2. Prepare cell culture**

Porcine alveolar macrophage (PAM)

Primary cell culture

#### **3. Virus isolation**

4. PCR amplification

5. Sequence analysis

### Detection of the virus in cell culture

#### CONCLUSION

1. Mongolian strains of 2019 sequence shared 100% nucleotide identity across the 401 bp fragment of the 72 gene with China 2018, Zambia 1991, Madagascar 2003, Poland 2014 strains.
2. The PCR assay was used to amplify part of the p72 and p54 gene of African Swine Fever Virus in the sample tested positive using HAD test.
3. These results confirm that ASF viruses in Mongolian samples belong to ASFV genotype II.

Source: Ulaankhuu A, "Result of virus isolation for African swine fever disease  
Mongolian journal of infectious disease research 2019 No 5 (88) page 45

# ACCREDITATIONS- SCVL

1999, 2001, 2003, 2005, 2007, 2010, 2015, **2019**

## CONFIRMATION THE DIAGNOSIS OF ANIMAL DISEASES

### DIAGNOSTIC LABORATORIES:

- BACTERIOLOGY \*\*\*
- VIROLOGY8 CELL CULTURE \*\*\*
- MOLECULAR DIAGNOSIS\*\*\*
- PARASITOLOGY\*\*\*
- PATHOLOGY\*\*\*
- METABOLISM\*\*\*

### SEROLOGY LABORATORY

- ANTHRAX\*\*\*
- SEROLOGY\*\*\*
- EPIDEMIOLOGY



\*\*\*accredited

# ILAC/MRA

## VETERINARY SANITATION

- FOOD HYGIENE
- MICROBIOLOGY\*\*\*
- MEAT AND MILK\*\*\*
- RADIOLOGY \*\*\*
- MICOLOGY \*\*\*
- RESIDUE TESTING\*\*\*

### ENVIRONMENTAL ANALYSIS

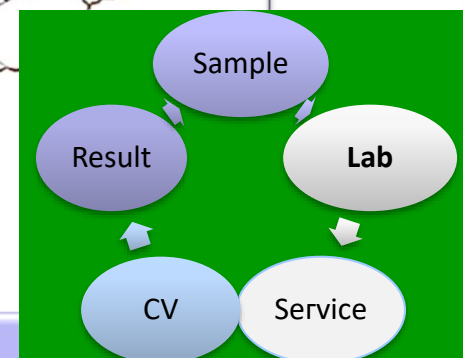
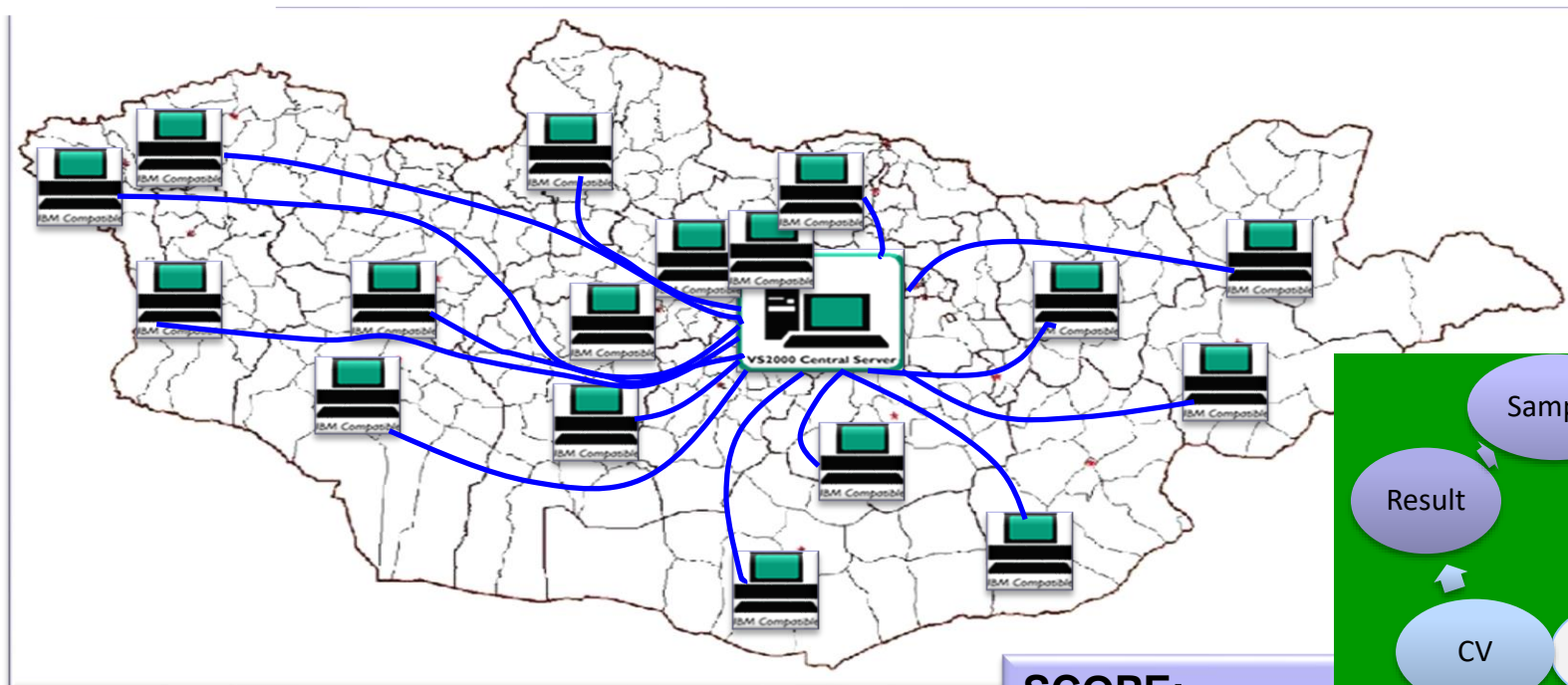
- BIOCHEMISTRY \*\*\*
- TOXIXOLOGY\*\*\*
- AAS, ICP-MS \*\*\*
- HEAVY METALS

- Used about 480 methods of nearly 342 parameters of 15 types of tests.
- Be accredited in 2019 for 8 times.
- Used the logo of ILAC MRA which acceptable for 70 countries of the world.
- It gives the potential positive effect for export and import



## Improvement and implementation

[www.scvl.gov.mn](http://www.scvl.gov.mn)



### IMPORTANCE:

- Diagnostic capacity /training, skills/
- Human capacity
- Tools and equipment
- Kits and reagents
- Order or enquire
- Expense or consumption

### SCOPE:

- SOP's
- Accreditation
- Internal monitoring
- Planning and activity
- Improvement Diagnostic capacity
- Epidemiological application (M-AIMS; Sajinmoyo app.)

# Challenges and possible solution



**Control Measures, conducted in Mongolia below as following:**

- **Outbreak investigation (questionnaire, tracing)**
- **Movement control inside the country**
- **Disinfection**
- **Surveillance outside containment and/or protection zone**
- **Emergency vaccination**
- **Vaccine monitoring**
- **No treatment of affected animals**

# Challenges and possible solution

## African swine fever virus



- *Wild boar ?*
- *Virus isolation /HAD test/ ?*
- *FAT (Fluorescent antibody test)*
- Virus isolation in porcine bone marrow cells (Chapter 3.8.1.)

# Acknowledgements



**Regional Workshop on Swine Disease Diagnosis  
Beijing, P. R. China, 30 – 31 Oct 2019**

**Hosts & Sponsor**



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*Protecting animals, preserving our future*

# Thank you for your attention



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