OUTLINE

1. Overview of ASF in China
2. Recent epidemiology and surveillance
3. Research of diagnostic technology for ASF control
4. Control measures and experience
1. Overview of pig industry in China

- The largest pork producing country worldwide
- Pork production about 125 millions tons in 2022, among which, 55.41 million tons were produced in China, as a proportion of 44.47%

In the year of 2022 in China:
- Number of breeding sows: 43.90 million
- Quantity of slaughtering pigs: 699 million (increased 4.27% YOY)

Data from national bureau of statistics
1. Overview of pig industry in China:

- **Huge genome, complex structure**
- **WOAH notifiable disease**
- **Class 1 disease in China**
- **Hemorrhage, high mortality up to 100%**
- **No vaccine or therapeutics currently**
On 3rd 2018, the first outbreak of ASF, caused by genotype II ASFV was reported in a pig farm in Shenyang, China: 47 pigs out of 383 showed clinical syndroms and died.

Although the vet authorities of China took control actions promptly, the disease spread to many provinces/regions of China.
1. Overview of pig industry in China: Threats to Chinese pig industry

- Although China is the biggest country in pig breeding and pork consumption in the world, the scale of pig breeding varies largely, given that a big proportion of 99% farms are small-scale ones with number of pigs less than 500. It should not be ignored that the biosafety level and ability of animal disease control of those kinds of pigs farms are relatively low, compared to large-scale farms.

- Thus, ASFV transmitted rapidly to most provinces/regions of China right after the first outbreak, leading to a large number pigs dead or being culled, and resulting in huge effect to the pig industry of China.
1. Overview of pig industry in China:

The characteristic of current ASF situation in China:
- Challenging situation of epidemic, with high risk of transboundary transmission.
- ASFV is still circulating;
- The positive rate of farm and pig individual is descending remarkably over the years.
The first ASFV transmitted into China belonged to genotype II, which has as high as 99.95% of homology in genomic sequence with strains isolated in Georgia, Russia, and Poland.

Results of studies indicated that there were 4 possible transmission routes for ASFV to China:

- International trade and smuggling in pig and pig products
- Pork and products carried by international passengers.
- Swill in international vehicles
- Boar movement
Three possible transmission routes:

- Pig and pig products movement among provinces
- Swilling feeding
- Mechanical dissemination by contaminated personnel and/or vehicle
1. Overview of pig industry in China: route and risk factors of transmission in China

- Live pig movement
- Swill feeding
- Vehicle
- Personnel
- Contaminated feed
- Tick biting
- Low level biosafety
- International trade
- Inappropriate disposal
- Direct contact

E.g. in 2018, a total of 68 ASF epidemics were investigated, the result showed that 13 (19%) epidemics were caused by pig movement; 23 (34%) epidemics were caused by swill feeding; 31 (46%) epidemics were caused by contaminated personnel and vehicle.
Illegal pig movement is one of the key factors causing ASFV transmission in China.

E.g., in 2019, a total of 32 ASF-related criminal cases were investigated by the Ministry of Public Security, in which 15 thousands pigs and 140 tons of pork and pork product were investigated.
Influenced by the value chain, ASFV spreads in the important places, such as breeding farms, slaughtering house, market, etc, leading to a more difficult situation in control, if biosafety measures are ineffective.
2. Current epidemiology and surveillance: regulations released after June 2020

- Notice of the Bureau of Animal Husbandry and Veterinary Services, MARA, on Adjusting the Surveillance of African Swine Fever in Some Provinces
- Notice of the Bureau of Animal Husbandry and Veterinary Services, MARA, on Adjusting the Assignment of Sampling and Testing Tasks for African Swine Fever in Pig Farms and Other Places (No. 670 in the year 2020)
- Notice of the Bureau of Animal Husbandry and Veterinary Services, MARA, on Continuing to Conduct Sampling and Detection of African Swine Fever in Large-Scale Pig Farms and Other Places (No. 14, in the year 2021)
- Notice of Bureau of Animal Husbandry and Veterinary Services, MARA, on the National Plan of Animal Disease Surveillance and Epidemiology (No. 11, in the year 2021)
- ... ...
Current overall situation of ASF in China is steady. ASF is now well controlled, and the number of epidemics decreased significantly compared to previous years.

In 2022, only one outbreak was reported in Xijing of China, in which a total of 16 pigs dead and 134 pigs culled.
the natural variants of genotype II and genotype I viruses have lower pathogenicity, but still have significant residual virulence compared to typical virulent strains;

- Longer incubation period
- Able to cause persistent infection and chronic disease progression;
- Having ability of horizontal transmission;
- Different clinical syndroms and morbility between pigs

The clinical manifestations of mutant strains and low-virulence strains are hard to be identified, making early diagnosis more difficult, posing a new challenge for the prevention and control of ASF in China!

Early rapid and reliable diagnosis is very important, as no vaccine against ASF at the present time!
3. Research of diagnostic technology for ASF control

- Virus isolation
- Direct IFC
- PCR
- Real-time PCR
- Sandwich ELISA
- Test strip
- Indirect ELISA
- Blocking ELISA
- IB
- Immunofluorescence
- Immunoperoxidase
- Test strip
The molecular biology diagnostic technology is the main methods for ASF diagnosis, in which PCR and real-time PCR was recommended by WOAH and FAO.

- In situ hybridization (ISH)
- PCR
- Real-time PCR
- Digital PCR
- LAMP
- Sequencing, genotyping
- Colloidal gold test strip

Real-time PCR kit developed by CADC for ASFV detection: the first registrated Veterinary New Drug Certicate
In November 2018 and June 2019, the MARA organized evaluation of two batches of ASF rapid detection kits for recommendation to use. A total of 43 (1st batch) and 93 (2nd batch) kits were evaluated, and 11 and 34 kits were recommended, including:

1st batch
- 8 Real-time PCR kits
- 1 LAMP kit
- 2 test strips

2nd batch
- 26 real-time PCR kits
- 6 LAMP kits

In November 2018, June 2019, and March 2021, the MARA performed evaluations on on-site rapid detection kits and antibody detection kits for ASF. A total of 36 nucleic acid detection kits and 33 antibody detection kits were recommended by MARA, and those kits played an important role in ASF diagnosis!
3. Research of diagnostic technology for ASF control

The reference materials (RM), “Reference Material for African Swine Fever Virus B646L Gene Plasmid” and the “Reference Material for African Swine Fever Virus (ASF Type II) Genomic DNA” have been developed by CADC and CAHEC respectively for the first time, providing standards and basis for the quality control of African Swine Fever laboratory testing. These RMs have been used for comparison and evaluation of capacity of veterinary laboratory testing.
1) **Strict biosafety management**

- Encourage large-scale breeding style and reduce small-scale breeding style, giving that number of ASF outbreak large-scale farm is much less than small-scale farms.
- Strict disinfection and hygiene, and apply acaricide to eliminate ticks.
- Strengthen pig breeding and movement management, considering pig movement, especially long-distance movement, is a significant factor causing ASFV transmission.
- Prohibit swill feeding.
- Enhance capability of protection against rodents, mosquitoes, and birds.
4. Control measures and experience

Four-word policy: early, rapid, strict, minimal

2) Surveillance and monitoring system for early diagnosis

Only kits recommended by MARA or those validated by CADC can be used for ASF diagnosis.

The National Animal Disease Surveillance and Epidemiology Survey Plan (2021-2025)
4. Control measures and experience

3) Strict movement management

- **Cross region movement**: approval of quarantine be authorized.
- **Marketing**: pig or port is prohibited to be sold without approval of quarantine.
- **Vehicle**: vehicles for live pig or pig product transportation should meet national standards in terms of hygiene and epidemic control.
- **Slaughtering house**: registrations and managements are required for moved-in pig, slaughtering, quarantine and disposal of diseased/dead animals.
The emergency implementation plan were revised the disposal measures were optimized for **four times**.

Accurate culling and strict blocking management once epidemic occurred.

Strict disposal management, deep burial or incineration for dead pigs.

Encourage farms to report epidemic case, avoiding wider spread of disease.

4. Control measures and experience

4) Implement of timely, effective and accurate emergency response
4. Control measures and experience

“Five doing”
- Reduce personnel and vehicle entering into farm;
- Thoroughly disinfect personnel and vehicles before entering the site;
- All-in and all-out management;
- Isolation of new pigs introduced;
- Quarantine application based on rules.

“Four not doing”
- No swill feeding of pigs
- Do not breed in a scattered manner to avoid contact with wild pigs;
- Do not introduce pigs from epidemic region
- Do not stop reporting of suspicious cases.
4. Control measures and experience

6) Cooperating prevention and control mechanism

- Bureau of Animal Husbandry and Vet Services, MARA
- Provincial Agricultural and Animal Husbandry and Veterinary Department/Bureau
- China Animal Disease Control Center
- China Animal Animal Health and Epidemiology Center
- China Institute of Vet Drug Control
- Provincial/city/county animal disease control center
- Porvincial/city/county animal health inspection institution
- University & institute
- National ASF Ref Lab
- Professional ASF Lab
- Food and Drug Administration Departments
  - at different levels
- Forestry and grassland bureaus at different levels
- Security units
- Traffic units

...
Initiation

China has a vast territory and significant regional differences. Implementing zoning management and strengthening classification guidance can effectively prevent and control animal epidemics, which has been repeatedly proven by prevention and control practices over the past years, and is also a mature international experience and common practice.

The MARA attached great importance to the pilot work of zoning control. Since the launch of the pilot work in the Central South District in March 2019, the former ministerial leaders have conducted multiple thematic studies and deployments, conducted on-site investigation and guided the district prevention and control work, and dispatched a guidance team from the Central South District to Guangzhou to guide the work.

What is zoning control?
A risk management model that effectively prevents and controls major animal epidemics such as ASF, comprehensively considers factors such as administrative divisions, the layout of the breeding and slaughtering industry, and risk assessment, divides provinces (cities, districts) within the mainland of China into several regions, establishes and improves a joint meeting mechanism for regional prevention and control, and plans for regional animal epidemic prevention and control, pig transportation supervision, and production and marketing linkage.

- In 2021, the No. 1 document of the MARA clearly stated that the prevention and control of major animal epidemics such as ASF should be comprehensively promoted.
4. Control measures and experience

1. Cooperation agreement signed
2. The guidance group stationed in the region
3. Joint meeting on work cooperation
4. Regional joint meeting
5. Expert committee established
6. Unified and standardized regional environmental risk monitoring
7. Designated inspection stations
8. Pig and pig product whole process inspection system
9. Production and sales docking

7) exploring zoning control strategy
4. Control measures and experience

7) exploring zoning control strategy

01
Regional coordination mechanism has played a role

02
Regional joint control measures effective

03
Regional inspection on live pig and pig products enhanced significantly

04
Regional industrialization measures implemented into practice

05
Regional live pig supply changed

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4. Control measures and experience

Construction and evaluation work on ASF-free compartment in accordance with laws and regulations

8) ASF-free compartment

Laws/rule/regulation

Standards

Experts

Application 申请
Evaluation 评估
Announcement 公布
Supervision management 监督管理

General rule
Standard of ASF-free compartment
Risk analysis rule
Biosafety rule
Biosafety specification in farm
Biosafety specification in slaughtering house
Surveillance standard
Disinfection specification in farm
Animal health inspection specification
National evaluation expert group
Candidate experts
4. Control measures and experience

✓ A total of 216 ASF-free zones have so far been established.
✓ The construction was mainly based on breeding pig farms, including multiple sites and links such as breeding pigs, commercial pigs, feed, washing and disinfection, etc.
✓ Infrastructure upgraded, building multiple barrier systems such as physical barriers, personnel isolation, and multi-level decontamination.
✓ Strengthen measures such as feed maturation, multi-level washing and decontamination, vehicle specific use. A scientific biosafety management system established
✓ Standardized the official and effective supervision of "process supervision, risk control, and traceability management".

8) ASF-free compartment

Pictures of ASF-free compartment established
4. Control measures and experience

SUMMARY in ASF control

✓ Strengthen the biosafety management of livestock farms/households, improving the hygiene and biosafety level of pig farms to reduce the spread of viruses;
✓ Enhance the implementation of territorial management responsibilities, aquaculture and business entity responsibilities;
✓ Strengthen epidemiological surveillance and screening, and early monitoring and warning;
✓ Effectively implement the culling and subsidy policy;
✓ Strict disposal treatment of dead pigs;
✓ Pig movement management;
✓ Standardize transportation and slaughtering procedures, and effectively wash and disinfect vehicles;
✓ Prohibit the import of live pigs from high-risk areas, and strictly quarantine pork products;
✓ Implement zoning control strategy and ASF-free community construction, and strengthen regional management;
✓ Enhance joint cooperation for ASF control;
✓ Illegal vaccine producing, selling and using are prohibited;
✓ Strengthen support for basic research on ASF, explore the molecular mechanisms of infection, pathogenesis, and immunity, and steadily work on the development of ASF vaccine through multiple technical routes.
Thank you

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