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China Animal Disease Control Center

Epidemiology and Control of PRRS in China

Zhi Zhou

China Animal Disease Control Center, WOAH PRRS Reference Laboratory



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Control in Asia and the Pacific
Beijing, People's Republic of China
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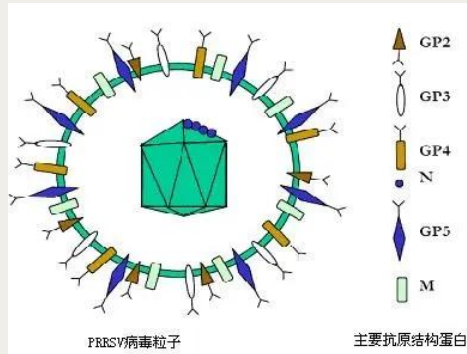
- ◆ **Basic information for PRRSV**
- ◆ **Situation of PRRS in China**
- ◆ **PRRS control measures**



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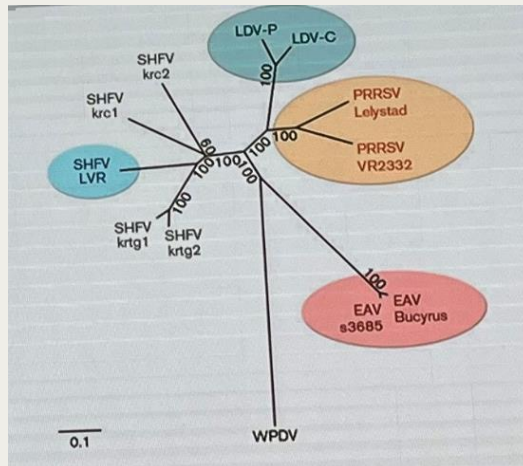
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PRRSV, which is a small enveloped virus with a single-strand, positive-sense RNA genome of approximately 15 kb and nine overlapping open reading frames (ORFs): ORF1a, ORF1b and ORFs2-7.

According to the International Committee on Taxonomy of Viruses in 2016, PRRSV belongs to the genus Betaarterivirus, family Arteriviridae, and order Nidovirales, which is currently classified into two distinct species: Betaarterivirus suid 1 (PRRSV-1) and Betaarterivirus suid 2 (PRRSV-2) .

Changes to taxonomy and the International Code of Virus Classification and Nomenclature ratified by the International Committee on Taxonomy of Viruses (2017), Michael J. Adams, Arch Virol DOI 10.1007/s00705-017-3358-5



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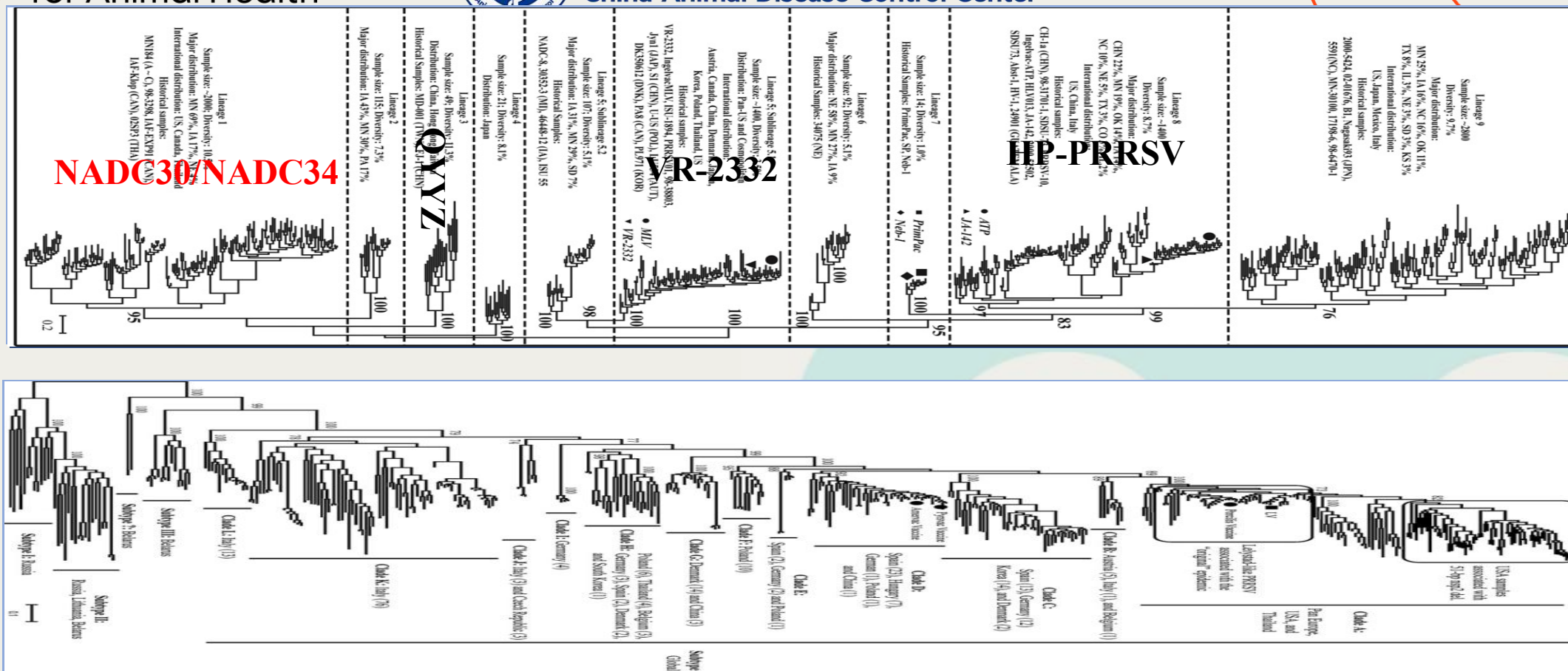
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PRRSV-2

aa homologous

50-60%

PRRSV-1



PRRSV strains within both species are further classified into multiple genetic lineages; all strains are prone to sequence diversification through the accumulation of point mutations and by recombination of homologous genomic fragments.



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Shi M, et al. Virus Res. 2010, 134(1-2): 7-17.

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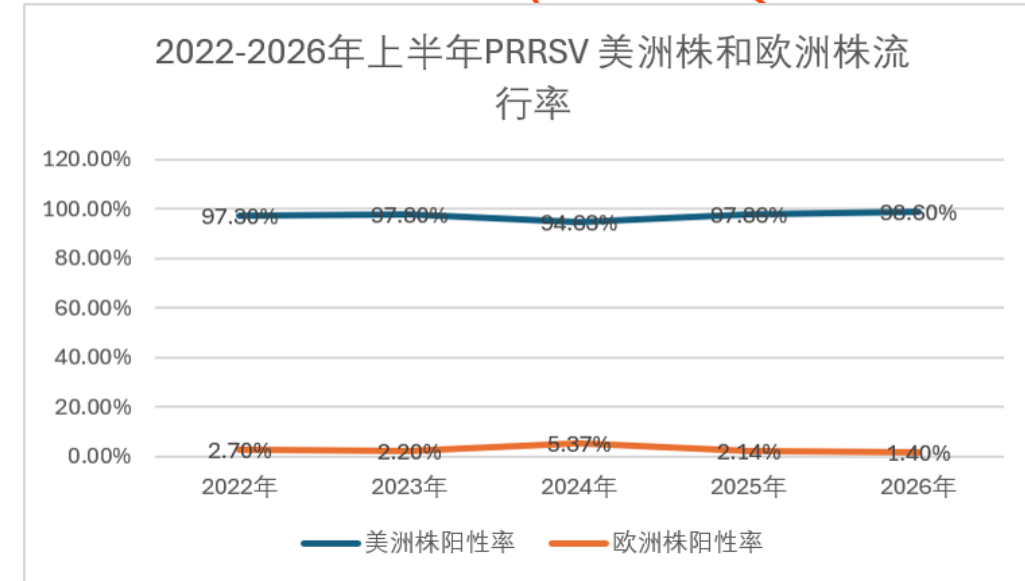
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Situation of PRRSV



A total of 60,312 clinical samples were subjected to PRRSV pathogen detection from 2022 to 2026. A total of 5,470 positive samples were detected, with an individual positive rate of 9.07%. Through annual monitoring and analysis from 2022 to 2026, the results showed that the infection rate decreased from 2022 to 2024. The infection rate in 2022 was 22.72%, and in 2024 it was 9.62%. However, the infection rate gradually increased from 2025 to 2026, reaching as high as 28.1% in 2026. PRRSV is widely present in pig populations in China, and the prevention and control still face considerable pressure.



A total of 5,470 positive samples were tested for the American strain and the European strain. The results showed that the number of positive samples for the PRRSV-2 was 5,302 with a positive rate as high as 96.93%, and the number of positive samples for the PRRSV-1 was 168, with a positive rate of 3.07%. This indicates that the PRRSV infection in China's pig herd is still dominated by the American strain. However, the detection rate of the European strain in clinical pig herds has also increased in recent years, which requires our high attention.



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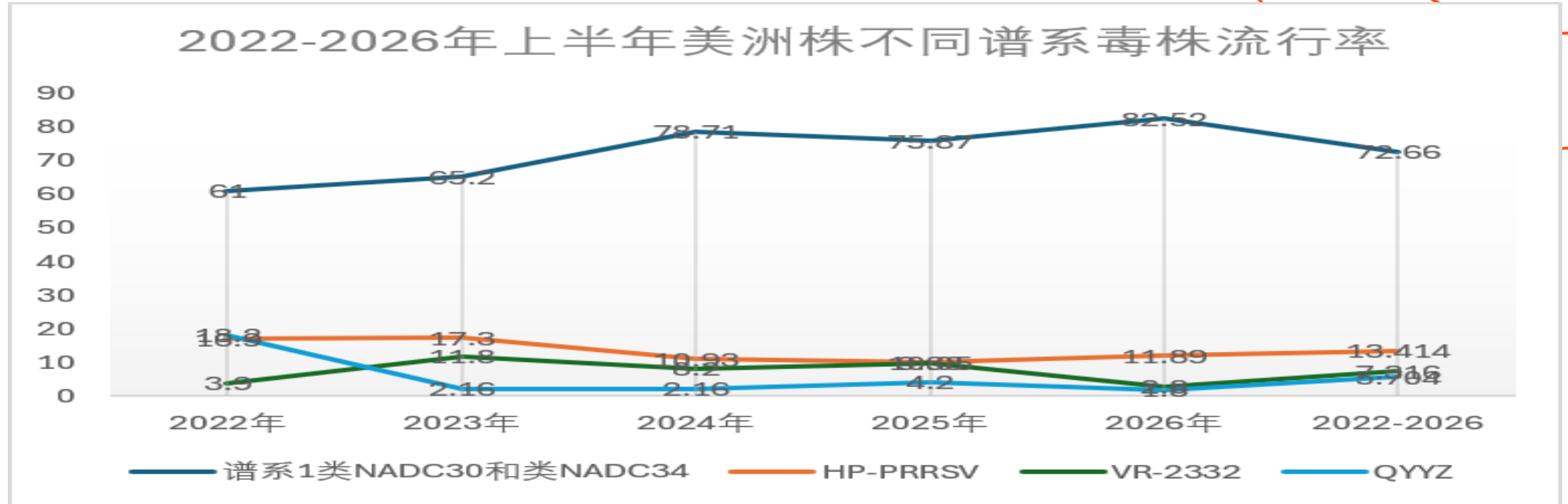


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Situation of PRRSV



Linage 1 PRRSV-2 is the most important viral stains in swine herds, the prevalence rate of Linage 1 PRRSV-2 is over 70%.



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Situation of NADC30-Like PRRSV



Henan province 2012



The major epidemic strain in 2026



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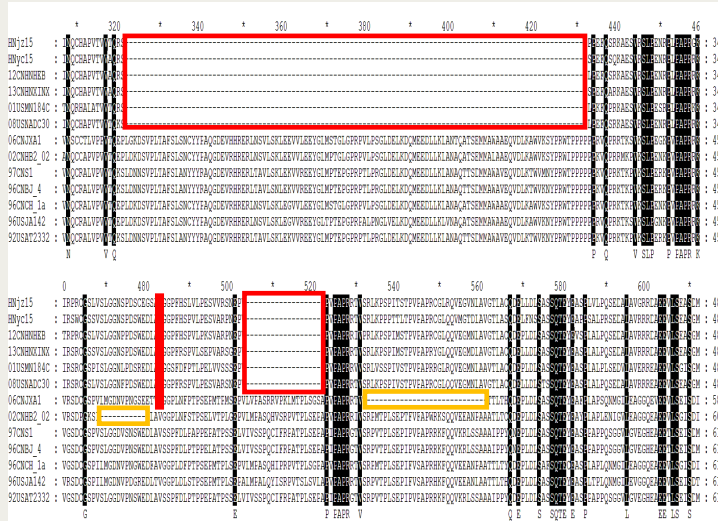


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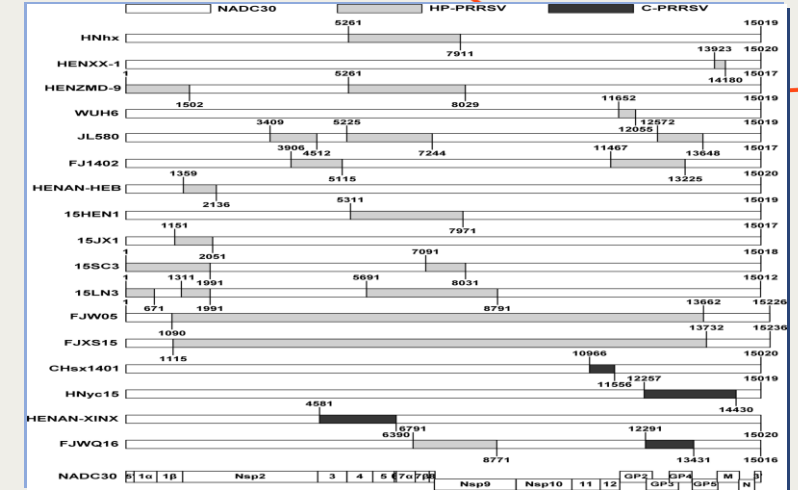


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NADC30-Like PRRSV genetic characterization



Strains	Amino acid sites																														
	39	196	219	242	243	289	290	297	298	324-433	455	472	474	481	483	492	504-522	533-561	569	587	617	749	763	767	827	834	906	949	1187		
VR-2332	K	S	P	N	K	D	V	A	A		A	G	V		P						E	A	K	S	E	B	G	A	S	H	I
CH-1a	K	P	R	N	K	N	V	A	A		A	D	V		P						E	A	N	S	E	B	G	V	S	H	I
IB-1(a)/2002	K	P	H	N	K	N	V	A	A		A	D	V		P						E	A	S	S	G	B	G	V	S	H	I
ZXA1	K	P	H	N	K	N	V	A	A		A	D	V		DEL	P			DEL		E	A	N	S	G	B	G	V	S	H	I
MN184A	K	P	P	N	K	D	V	X	A	DEL	A	G	L		DEL	L	DEL				E	A	R	S	Q	B	G	V	S	H	I
NADC30	K	S	S	N	K	D	V	V	A	DEL	A	G	F		DEL	L	DEL				E	A	R	S	R	K	G	V	T	H	I
HENAN-XINX	K	L	S	N	K	D	V	V	A	DEL	A	G	S		DEL	L	DEL				E	A	R	S	R	K	G	V	A	H	I
HENAN-HBB	K	P	H	N	K	D	V	V	A	DEL	A	G	P		DEL	L	DEL				E	A	R	S	R	K	G	V	T	H	I
JL580	K	S	S	N	K	D	V	V	A	DEL	A	G	F		DEL	L	DEL				E	A	R	S	G	B	G	V	S	H	I
CHa1401	K	S	S	N	K	D	V	V	A	DEL	A	G	F		DEL	L	DEL				G	A	R	S	Q	K	G	I	T	H	I
FY04	K	S	S	N	K	D	V	V	A	DEL	A	G	L		DEL	L	DEL				E	A	R	S	Q	K	G	V	T	H	I
FJ203	K	S	S	N	K	D	V	V	A	DEL	A	G	S		DEL	L	DEL				E	A	R	S	R	K	G	V	T	H	I
FJ1402	K	P	S	N	K	D	V	V	A	DEL	A	G	S		DEL	L	DEL				E	A	R	S	R	K	G	V	S	H	I
HENXC-4	E	A	P	N	K	D	V	V	A	DEL	A	G	F		DEL	L	DEL				E	A	R	S	R	K	G	V	T	H	I
HENXC-1	K	S	S	N	K	D	V	M	A	DEL	A	G	F		DEL	L	DEL				E	A	R	S	R	N	G	V	T	H	I
HENAM-9	K	S	S	N	K	D	V	A	A	DEL	A	G	F		DEL	L	DEL				E	A	R	S	R	K	D	V	T	H	I
HNj15	K	S	S	N	K	D	V	V	A	DEL	A	G	S		DEL	L	DEL				E	V	R	S	Q	K	G	V	T	H	I
HNyc15	K	S	S	N	K	D	V	V	A	DEL	A	G	S		DEL	L	DEL				E	A	R	S	R	K	G	V	T	H	I
WUH5	K	S	S	N	K	D	I	V	A	DEL	A	G	F		DEL	L	DEL				D	A	R	S	R	K	G	V	T	H	I
WUH6	K	S	S	N	K	D	V	V	A	DEL	A	G	P		DEL	L	DEL				E	A	R	S	R	K	G	V	T	H	I
HNn	G	T	L	D	R	G	F	M	V	DEL	T	S	I		DEL	Q	DEL				R	T	M	T	V	T	S	F	N	R	V



131AA discontinuous deletions were observed in Nsp2 of PRRSV, including an 111-aa deletion at position 322–432, 1-aa deletion at position 483, and 19-aa deletion at position 504–522, which are similar to NADC30 strains.

Highly susceptible mutation all these isolates shared 92.2%-97% homology with NADC30. And they shared 88.2%-95.6% homology with each other.

Highly susceptible recombination
>80% isolates recombination
Multiple recombination modes:
Recombination of **different lineages strains**

Recombination of **different gene region**
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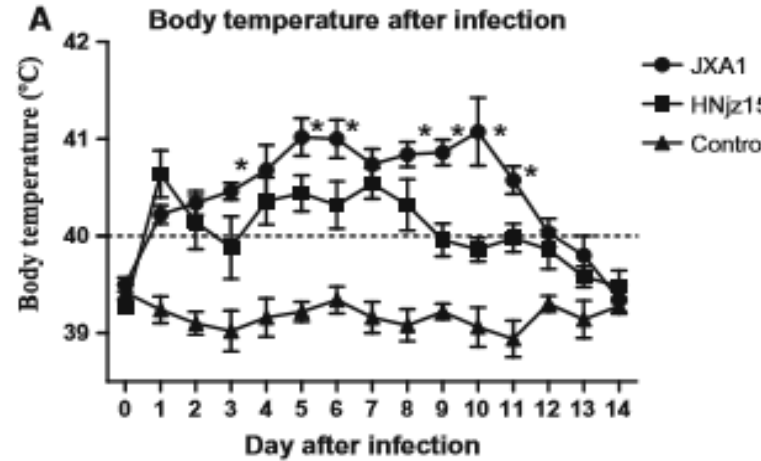


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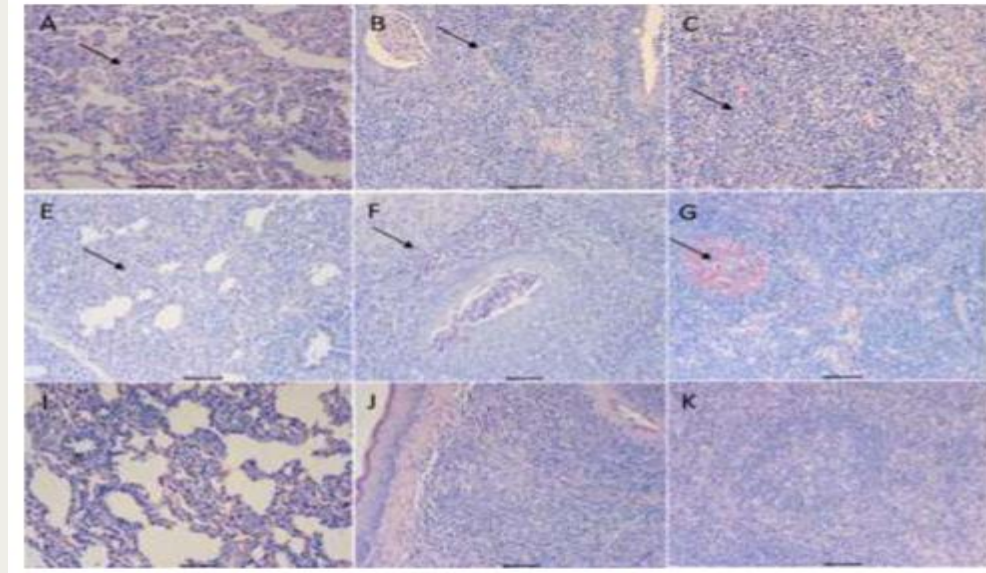
Pathogenic analysis of NADC30-Like isolations



Respiratory distress



Fever



Histopathological lesions including

Interstitial, pneumonia with infiltration of mononuclear cells in lung.

Necrosis in tonsil.

Lymphocyte depletion and infiltration of neutrophils in lymph nodes.

Compared with HP-PRRSV, the NADC30-Like strains were **milder pathogenicity**, **lower mortality**

sun et al. [Pathogenicity comparison between highly pathogenic and NADC30-Like porcine reproductive and respiratory syndrome virus.](#)



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Whether pigs immunized with commercial vaccines can protected from NADC30-Like or NADC34-like challenge

X. Bai et al., Vaccine xxx (2016) xxx-xxx

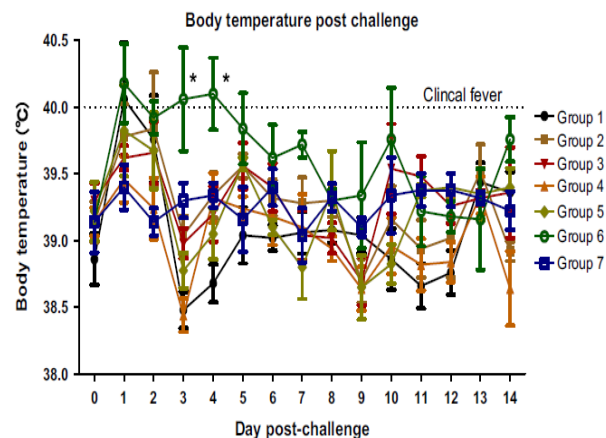


Fig. 1. Dynamics of pig body temperature after viral challenge. Clinical fever was set at 40 °C. * indicates statistically significant difference ($p < 0.05$).

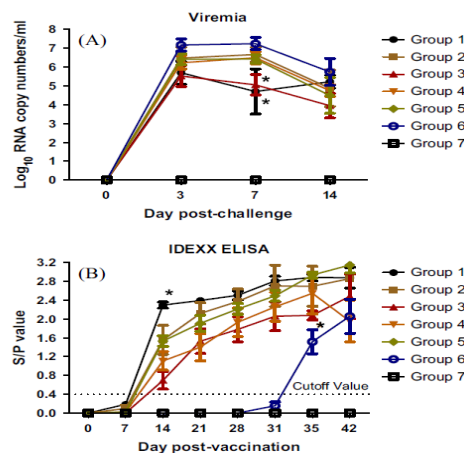
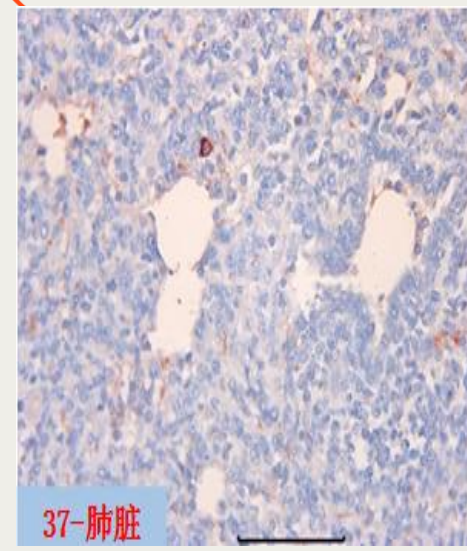


Fig. 5. Viremia (A) and PRRSV-specific antibodies (B) per group after vaccination and/or HNjz15 PRRSV challenge. The threshold for seroconversion was set at sample-to-positive (s/p) ratio of 0.4 according to the manufacturer's instruction. Each bar represents the average for five pigs $\pm$ SEM. *, $p < 0.05$.



VR-2332 (Boehringer-Ingelheim)

JXA1-R (HP-PRRSV MLV)

HuN4-F112 (HP-PRRSV MLV)

GDr180 (HP-PRRSV MLV)

TJ-F92 (HP-PRRSV MLV)

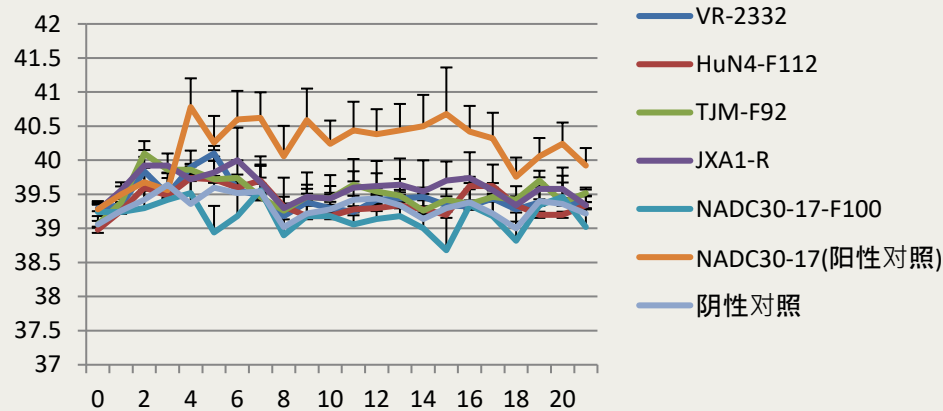
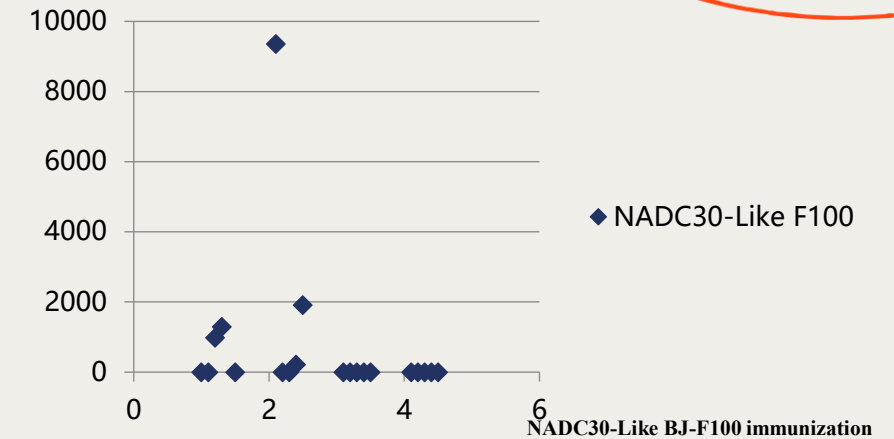
Five commercial MLV vaccines were used to evaluate their efficacy to block NADC30-like/ NADC34-like infection. The results showed that all attenuated vaccines could shorten the period of fever and reduce viral loads in sera, but were not able to reduce the clinical signs and lung lesions, indicating that the commercial vaccines **provide limited cross-protection** against the NADC30-like or NADC34-like challenge.

Commercial attenuated vaccines can not provide complete protection for NADC30/NADC34-like PRRSV infection

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Homology vaccines can provide complete protection for NADC30-like PRRSV infection



Zero serum viremia in challenged 21days

- 100 successive passages of NADC30 strains(NADC30-Like BJ-F100) were used to evaluate their efficacy to block NADC30-like infection. Our results showed that this vaccine block the virus infection, no the clinical signs and lung lesions, the viral loads in sera was zero in 11 days after challenge, indicating that the **homology vaccine provide complete protection against the NADC30-like challenge.**

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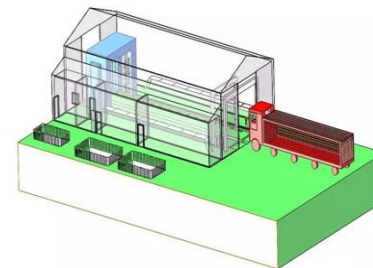
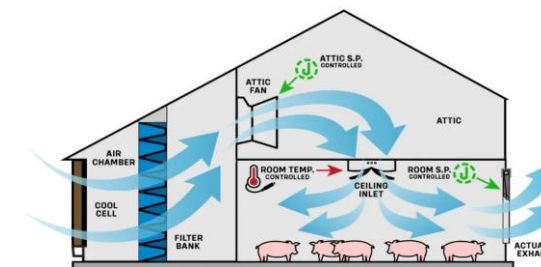
What We Can Do to Control PRRS: Use All of the Tools

PRRS is a globally spread disease affecting the swine industry. Disease control and prevention is based on vaccination; however, the high genetic diversity of the PRRSV, poses a constant challenge to the successful implementation of disease control and eradication programs.

1. Enhance biosafety measures are the primary measures to control PRRS

Enhance **external biosafety** measures block importing new strains, including

- ✓ Pigs—isolation monitoring—avoid inducing PRRSV positive pigs
- ✓ Staff—isolation, shower, changing cloth and shoes
- ✓ Vehicles, craft and equipment——clean and disinfection
- ✓ Reduce the movement of live pigs and introduce surveillance for breeding pigs and semen.
- Enhance **internal biosafety** measures reduce the spread of the virus within farms
- ✓ Multi-site, All in-All out, production, air filter system.
- ✓ Good veterinary practice.
- ✓ Good animal management.
- ✓ Good diagnostics. Good recordkeeping and financial data.



What We Can Do to Control PRRS: Use All of the Tools

2. Strategies for different kinds of farms

PRRSV negative farm(breeding farm)---Do NOT use MLV

- **Positive / stable farm----** No need for whole herd vaccination
- **Positive / unstable farm----** Use MLV or killed vaccine
 - ✓ the vaccine was used scientifically and rationally according to the monitoring results in farm, especially choosing a vaccine that matches the genotype of PRRSV in farms.
- **PRRSV outbreak farm ---Use MLV**
 - ✓ Design reasonable program,
 - ✓ Choosing homology vaccine for PRRSV in farms
 - ✓ Control secondary bacterial infection
 - ✓ Antibiotic and traditional Chinese medicine utilization for prevention and health improvement in PRRSV outbreak herd

What We Can Do to Control PRRS: Use All of the Tools

3. Strengthen regional surveillance, eliminating positive animals, constructing negative PRRSV breeding herds, to stop the spread of PRRSV from breeding farms to other farms.

The Chinese government is actively promoting the eradication of animal diseases and has introduced a series of measures to guide the eradication of animal diseases:

- ✓ **Opinions of the Ministry of Agriculture and Rural Affairs on Promoting the Eradication of Animal Diseases including PRRSV.**
- ✓ **Guidelines for Evaluation and Management of Animal Disease Eradication in Farms.**
- ✓ **Technical Rules for Evaluation of Animal Disease Eradication in Farms---including PRV, PRRSV, CSFV, ASFV and FMDV.**

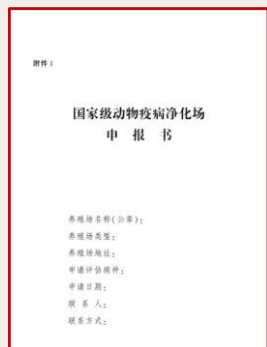
Farms meet the PRRS eradication level, and the farmer voluntarily applies for PRRS eradication evaluation, the Bureau of Animal Husbandry and Veterinary Medicine of the Ministry of Agriculture and Rural Affairs give evaluation.



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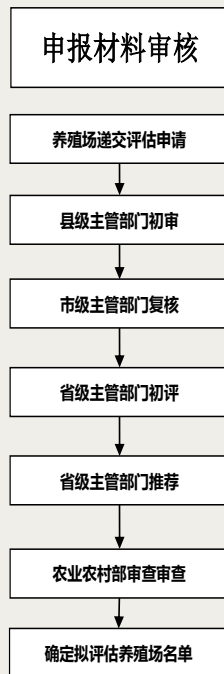
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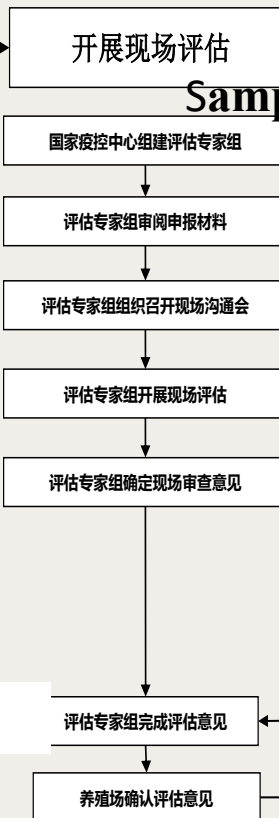
Breeding farmer
voluntarily applies
for PRRS eradication
PRRSV

Total score is no less than 90 points

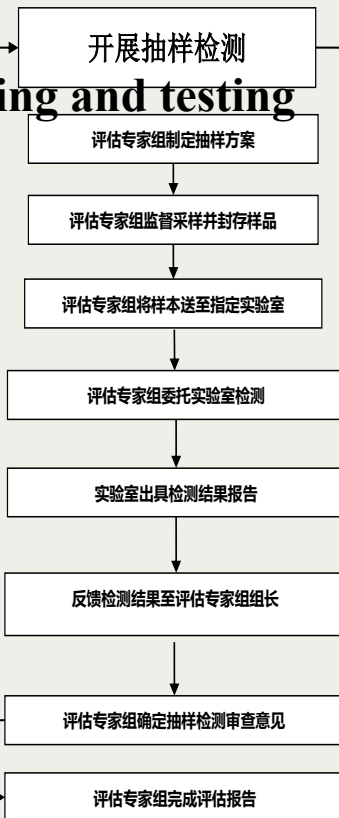
Review materials



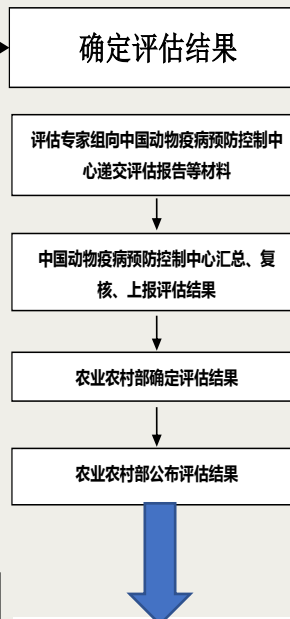
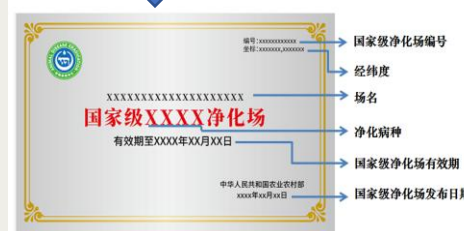
On-site evaluation



Sampling and testing



Evaluation confirm



必备条件 Essential conditions	Score
人员管理 Staff management	5
结构布局 Multi-site setting	7
栏舍设置 Pigsty welfare	4
卫生环保 Sanitation and environment	7
无害化处理 Harmless treatment	8
消毒管理 Disinfection management	9
生产管理 recordkeeping	8
防疫管理 Vaccine management	10
种源/调运管理 Introduction management	10
监测净化分 Monitoring Plan	12
场群健康 herds health	9
特定项 others	11

Flowchart of PRRS eradication evaluation in China

The ultimate goal for PRRSV prevention and control is virus eradication (eradication/clearance from the herd), combined with sustained maintenance afterward — not just short-term control.

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Thank you!

Contact information

ZHOU ZHI

National/WOAH Porcine Reproductive and Respiratory Syndrome Laboratory, Animal Disease Control Center, Beijing, China

Tel: +86 13552858938

[E-mail: zhouzhi1@126.com](mailto:zhouzhi1@126.com)

Adrees: No. 17, Tiangui Street, Biomedical Base, Daxing District, Beijing.
