

WOAH Reference Laboratory Reports Activities 2024

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LABORATORY INFORMATION

*Name of disease (or topic) for which you are a designated WOAH Reference Laboratory:	Swine streptococcosis
*Address of laboratory:	No. 1 Weigang, College of Veterinary Medicine, Nanjing Agricultural University, Nanjing
*Tel:	+86-18651836283
*E-mail address:	wuzongfu@njau.edu.cn
Website:	
*Name (including Title) of Head of Laboratory (Responsible Official):	Prof. Huochuan Yao
*Name (including Title and Position) of WOAH Reference Expert:	Prof. Chengping Lu
*Which of the following defines your laboratory? Check all that apply:	Academic institution

TOR1: DIAGNOSTIC METHODS

1. Did your laboratory perform diagnostic tests for the specified disease/topic for purposes such as disease diagnosis, screening of animals for export, surveillance, etc.? (Not for quality control, proficiency testing or staff training)

Yes

Diagnostic Test	Indicated in WOAH Manual (Yes/No)	Total number of test performed last year	
Indirect diagnostic tests		Nationally	Internationally
No	No		
Direct diagnostic tests		Nationally	Internationally
PCR assay for Streptococcus suis	Yes	2100	0
PCR assay for Streptococcus pasteurianus	No	420	80

TOR2: REFERENCE MATERIAL

2. Did your laboratory produce or supply imported standard reference reagents officially recognised by WOA?

No

3. Did your laboratory supply standard reference reagents (nonWOAH-approved) and/or other diagnostic reagents to WOA Members?

Yes

Type of reagent available	Related diagnostic test	Produced/ provide	Amount supplied nationally (ml, mg)	Amount supplied internationally (ml, mg)	No. of recipient WOA Member Countries	Country of recipients
DNA of Streptococcus suis reference strains	PCR	Provide	2 mL	0	1	CHINA (PEOPLE'S REP. OF),

4. Did your laboratory produce vaccines?

No

5. Did your laboratory supply vaccines to WOA Members?

No

TOR3: NEW PROCEDURES

6. Did your laboratory develop new diagnostic methods for the designated pathogen or disease?

Yes

Name of the new test or diagnostic method developed	Description and References (Publication, website, etc.)
Quantitative PCR assay for Streptococcus suis; Multiplex PCR assay for Streptococcus suis different pathogenic serotypes; Quantitative PCR assay for Streptococcus equi subsp. zooepidemicus	WOAH Reference Lab for Swine Streptococcosis, College of Veterinary Medicine, Nanjing Agricultural University, No. 1 Weigang, Nanjing 210014, China; These methods have been described in "Diagnostic techniques for swine streptococcosis" applied for National Standard of the People's Republic of China.

7. Did your laboratory validate diagnostic methods according to WOA Standards for the designated pathogen or disease?

No

8. Did your laboratory develop new vaccines for the designated pathogen or disease?

Yes

Name of the new vaccine developed	Description and References (Publication, website, etc.)
Bacterin against Streptococcus suis serotype 2; Multi-Epitope Vaccine Candidate against Streptococcus suis several serotypes	WOAH Reference Lab for Swine Streptococcosis, College of Veterinary Medicine, Nanjing Agricultural University, No. 1 Weigang, Nanjing 210014, China; Liang S, Zhang S, Bao Y, Zhang Y, Liu X, Yao H, Liu G. Combined Immunoinformatics to Design and Evaluate a Multi-Epitope Vaccine Candidate against Streptococcus suis Infection. Vaccines 2024, 12, 137. Liu J, Zhang Z, Pu W, Pan X, Li P, Bai Q, Liang S, Li C, Yu Y, Yao H, Ma J. A multi-epitope subunit vaccine providing broad cross-protection against diverse serotypes of Streptococcus suis. NPJ Vaccines 2024, 9(1):216

9. Did your laboratory validate vaccines according to WOAHP Standards for the designated pathogen or disease?

No

TOR4: DIAGNOSTIC TESTING FACILITIES

10. Did your laboratory carry out diagnostic testing for other WOAHP Members?

No

11. Did your laboratory provide expert advice in technical consultancies on the request of an WOAHP Member?

No

TOR5: COLLABORATIVE SCIENTIFIC AND TECHNICAL STUDIES

12. Did your laboratory participate in international scientific studies in collaboration with WOAHP Members other than the own?

Yes

Title of the study	Duration	Purpose of the study	Partners (Institutions)	WOAHP Member Countries involved other than your country
Research on the prevention and control of swine streptococcosis	July 22, 2024 (Online)	explore the feasibility of novel anti-streptococcal infection strategies to provide new perspectives on the prevention and control of swine streptococcosis.	National Institute of Animal Health	JAPAN
Research on the prevention and control of swine streptococcosis	November 1-5, 2024	explore the feasibility of novel anti-streptococcal infection strategies to provide new perspectives on the prevention and control of swine streptococcosis.	Faculty of Public Health,Kasetsart University	THAILAND

13. In exercising your activities, have you identified any regulatory research needs* relevant for WOAHP?

Yes

Research need : 1

Please type the Research need: The identification of swine streptococcosis pathogens including *Streptococcus suis*, *Streptococcus equi* subsp. *zooepidemicus*, and *Streptococcus pasteurianus* is not in the Terrestrial and Aquatic Manuals. This should be included in Terrestrial and Aquatic Manuals.

Relevance for WOAHP Standard Setting,

Relevance for the Code or Manual Manual,

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Field Epidemiology and Surveillance, Diagnostics,

Animal Category Terrestrial,

Disease:

Swine streptococcosis

Kind of disease (Zoonosis, Transboundary diseases) Zoonosis,

If any, please specify relevance for Codes or Manual, chapter and title

(e.g. Terrestrial Manual Chapter 2.3.5 - Minimum requirements for aseptic production in vaccine manufacture)

Answer:

Notes:

Answer:

TOR6: EPIZOOLOGICAL DATA

14. Did your Laboratory collect epidemiological data relevant to international disease control?

Yes

If the answer is yes, please provide details of the data collected:

We collected epizootiological data of *Streptococcus suis* and *Streptococcus pasteurianus* isolated from healthy or diseased pigs.

15. Did your laboratory disseminate epidemiological data that had been processed and analysed?

Yes

If the answer is yes, please provide details of the data collected:

We provided the details of epidemiological data of *Streptococcus suis* in the following paper: Jinlu Zhu, Jianping Wang, Weiming Kang, Xiyan Zhang, Anusak Kerdsin, Huochun Yao, Han Zheng, Zongfu Wu. *Streptococcus suis* serotype 4: a population with the potential pathogenicity in humans and pigs. *Emerging Microbes & Infections*, 2024, 13(1): 2352435
Yang XU, Ruiguang WANG, Zeren PENG, Zongfu WU. The pathogenic and antimicrobial resistance characteristics of *Streptococcus suis* isolates from healthy pigs at slaughterhouses in Jiangsu Province, 2023. *Acta Microbiologica Sinica*, 2025, 65(1): 211-224.

16. What method of dissemination of information is most often used by your laboratory? (Indicate in the appropriate box the number by category and list the details in the box)

a) Articles published in peer-reviewed journals:

12

1. Xinchu Zhu, Zijiang Liang, Jiale Ma, Jinhu Huang, Liping Wang, Huochun Yao, Zongfu Wu. *The cadDX operon contributes to cadmium resistance, oxidative stress resistance, and virulence in zoonotic streptococci*. *Veterinary Research*, 2024, 55(1): 119

2. Jinlu Zhu, Zijiang Liang, Huochun Yao, Zongfu Wu. *Identifying Cell-Penetrating Peptides for Effectively Delivering Antimicrobial*

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Molecules into *Streptococcus suis*. *Antibiotics*, 2024, 13(8), 725.

3. Jinlu Zhu, Jianping Wang, Weiming Kang, Xiyan Zhang, Anusak Kerdsin, Huochun Yao, Han Zheng*, Zongfu Wu*. *Streptococcus suis* serotype 4: a population with the potential pathogenicity in humans and pigs. *Emerging Microbes & Infections*, 2024, 13(1): 2352435

4. Jiale Ma, Huizhen Wu, Zhe Ma, Zongfu Wu. Bacterial and host factors involved in zoonotic *Streptococcal* meningitis. *Microbes and Infection*, 2024, doi.org/10.1016/j.micinf.2024.105335

5. Zijiang Liang, Jiaxuan Lu, Yinli Bao, Xiang Chen, Huochun Yao, Zongfu Wu. Glycerol metabolic repressor GlpR contributes to *Streptococcus suis* oxidative stress resistance and virulence. *Microbes and Infection*. 2024, doi.org/10.1016/j.micinf.2024.105307

6. Qi Sheng, Qiuhua Xu, Zouran Lan, Zongfu Wu. Comparative Genome Analysis of Two *Streptococcus suis* Serotype 8 Strains Identifies Two New Virulence-Associated Genes. *Animals*, 2024, 14(4), 572

7. Yang XU, Ruiguang WANG, Zeren PENG, Zongfu WU. The pathogenic and antimicrobial resistance characteristics of *Streptococcus suis* isolates from healthy pigs at slaughterhouses in Jiangsu Province, 2023. *Acta Microbiologica Sinica*, 2025, 65(1): 211-224.

8. Jianan Liu, Zhen Zhang, Wanxia Pu, Xinming Pan, Pei Li, Qiankun Bai, Song Liang, Caiying Li, Yong Yu, Huochun Yao, Jiale Ma. A multi-epitope subunit vaccine providing broad cross-protection against diverse serotypes of *Streptococcus suis*. *NPJ Vaccines*. 2024; 9(1):216.

9. Jianan Liu, Jianzhong Wang, Zhen Zhang, Qiankun Bai, Xinming Pan, Rong Chen, Huochun Yao, Yong Yu, Jiale Ma. *Streptococcus suis* Deploys Multiple ATP-Dependent Proteases for Heat Stress Adaptation. *J Basic Microbiol*. 2024; 64(9):e2400030.

10. Song Liang; Shidan Zhang; Yinli Bao; Yumin Zhang; Xinyi Liu; Huochun Yao*; Guangjin Liu*. Combined Immunoinformatics to Design and Evaluate a Multi-Epitope Vaccine Candidate against *Streptococcus suis* Infection. *Vaccines*, 2024, 12, 137.

11. Qibing Gu ,Xiayu Zhu , Yong Yu, Tao Jiang , Zihao Pan , Jiale Ma, Huochun Yao . Type II and IV toxin-antitoxin systems coordinately stabilize the integrative and conjugative element of the ICESa2603 family conferring multiple drug resistance in *Streptococcus suis*. *PLoS Pathogens*. 2024 Apr 19;20(4):e1012169.

12. Qibing Gu, Peijuan He, Qiankun Bai, Xiaojun Zhong, Yue Zhang, Jiale Ma, Huochun Yao, Zihao Pan. Insight into the role of *Streptococcus suis* Zinc metalloprotease C from the new serotype causing meningitis in piglets. *BMC Veterinary Research*.2024, 20:337.

b) International conferences:

1

April 22 to 28, 2024, Paradigm Shifts for Global One Health symposium at Wageningen University, the Netherlands

c) National conferences:

4

1. December 20, 2024, Guangdong Haid Institute of Animal Husbandry & Veterinary, "Streptococcus suis and Streptococcal Diseases in Pigs"

2. July 26, 2024, Qinghai Haixi Animal Disease Prevention and Control Center, "Streptococcus suis: A 'One Health' Perspective"

3. July 19, 2024, Shandong Animal Disease Prevention and Control Center, "New Features of Streptococcus suis and Small RNAs"

4. June 24, 2024, Zhejiang Academy of Agricultural Sciences, "Diversity of Streptococcus suis: Serotypes, Pathogenicity, and Antimicrobial Resistance Characteristics"

d) Other (Provide website address or link to appropriate information):

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

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17. Did your laboratory provide scientific and technical training to laboratory personnel from other WOA H Members?

Yes

a) Technical visit : 0

b) Seminars : 1

c) Hands-on training courses: 1

d) Internships (> 1 month) 0

Type of technical training provided (a, b, c or d)	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
B	CHINA (PEOPLE'S REP. OF)	15
C	CHINA (PEOPLE'S REP. OF)	15

TOR8: QUALITY ASSURANCE

18. Does your laboratory have a Quality Management System?

Yes

Quality management system adopted	Certificate scan (PDF, JPG, PNG format)	
ISO 17025	ISO-IEC 17025 2017.JPG	ISO-IEC 17025 2017.JPG

19. Is your quality management system accredited?

Yes

Test for which your laboratory is accredited	Accreditation body
PCR detection for Streptococcus suis serotype 2	China National Accreditation Service for Conformity Assessment (CNAS)
qPCR detection for Streptococcus suis serotype 2	China National Accreditation Service for Conformity Assessment (CNAS)

20. Does your laboratory maintain a "biorisk management system" for the pathogen and the disease concerned?

Yes

The laboratory activities are carried out according to Biosecurity Law of the People's Republic of China.

TOR9: SCIENTIFIC MEETINGS

21. Did your laboratory organise scientific meetings related to the pathogen in question on behalf of WOA H?

No

22. Did your laboratory participate in scientific meetings related to the pathogen in question on behalf of WOA H?

No

TOR10: NETWORK WITH WOA H REFERENCE LABORATORIES

23. Did your laboratory exchange information with other WOA H Reference Laboratories designated for the same pathogen or disease?

Not applicable (only WOA H Reference Laboratory designated for the disease)

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24. Do you network (collaborate or share information) with other WOA Reference Laboratories designated for the same pathogen?

Not applicable (only WOA Reference Laboratory designated for the disease)

25. Did you organise or participate in inter-laboratory proficiency tests with WOA Reference Laboratories designated for the same pathogen during the past 2 years?

Not applicable (Only WOA Reference Laboratory designated for the disease)

Not applicable

26. Did your laboratory collaborate with other WOA Reference Laboratories for the same disease on scientific research projects for the diagnosis or control of the pathogen of interest?

Not applicable (only WOA Reference Laboratory designated for the disease)

TOR11: OTHER INTERLABORATORY PROFICIENCY TESTING

27. Did your laboratory organise or participate in inter-laboratory proficiency tests with laboratories other than WOA Reference Laboratories for the same pathogen during the past 2 years?

Yes

Purpose for inter-laboratory test comparisons ¹	Role of your reference laboratory (organizer/participant)	No. participating laboratories	Name of the test	WOAH Member Countries
Checking the laboratory capability to conduct diagnostic tests	participant	2	qPCR detection for <i>Streptococcus suis</i> serotype 2	CHINA (PEOPLE'S REP. OF),

TOR12: EXPERT CONSULTANTS

28. Did your laboratory place expert consultants at the disposal of WOA?

No

29. Additional comments regarding your report:

No