某PED双阴GP场转阳后采用部分清群净化的案例研究

A Case Study on Implementing Partial Depopulation After Conversion to Positive in a PEDV-negative GP Farm

吴硕文
Shuowen WU

一、背景介绍Background

- 大型PS场为维持**PED阳性稳定**生产，执行后备猪入群前返饲和灭活苗免疫已是相对成熟的技术路线之一

  Feedback combined with inactivated vaccine immunization for replacement gilts before herd introduction is a relatively mature technical approach for large-scale PS farms to maintain stable PEDV-positive production.

- 上游GGP/GP群体持续稳定的提供PED双阴后备猪，有利于下游PS场后备猪入群前返饲操作

  Maintaining PEDV-negative stable production in GGP/GP breeding herds is conducive to feedback practices before replacement gilts enter PS farms.

- 自2020年起，体系内已建立了多个PED双阴GGP/GP群体，并得到良好维持未发生过自然感染，其中一个1100头规模的非空滤传统核心场已维持PED双阴生产近70个月。

  Since 2020, our system has established multiple PEDV-negative GGP/GP breeding herds—all of which have been well-maintained and remain free from natural infection, a conventional farms of 1100-head has maintained PEDV-negative production for nearly 70 months

- 若GGP/GP场发生PED转阳，将面临大量猪只在保育育成期排毒及影响外售种猪溢价，同时增加了下游PS场防控压力

  If a PEDV-negative GGP/GP herd turns positive, it will result in significant virus shedding in nursery/growing pigs and potential losses in breeding stock value, meanwhile increase the PED prevention and control pressure on downstream PS farms.

- 对于一点式生产的GGP/GP猪群，返饲会导致病毒持续循环而且影响种猪的育种测定，因此这些群体要维持PED双阴

  For GGP/GP herds under single-site production systems, feedback feeding can result in persistent viral circulation and disrupt the breeding performance testing of breeding stock. Thus, these populations must maintain dual negativity for PED.

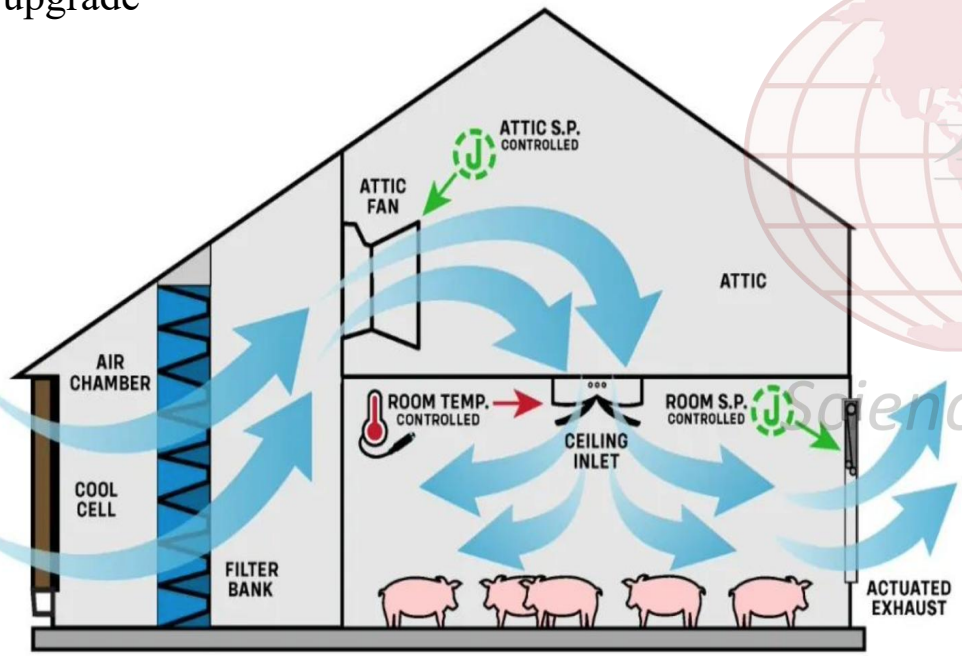
一、背景介绍Background

- 非瘟之后，猪场流行**“正压空气过滤+小间化/应急门”**设计，为内部生物安全升级提供了硬件基础

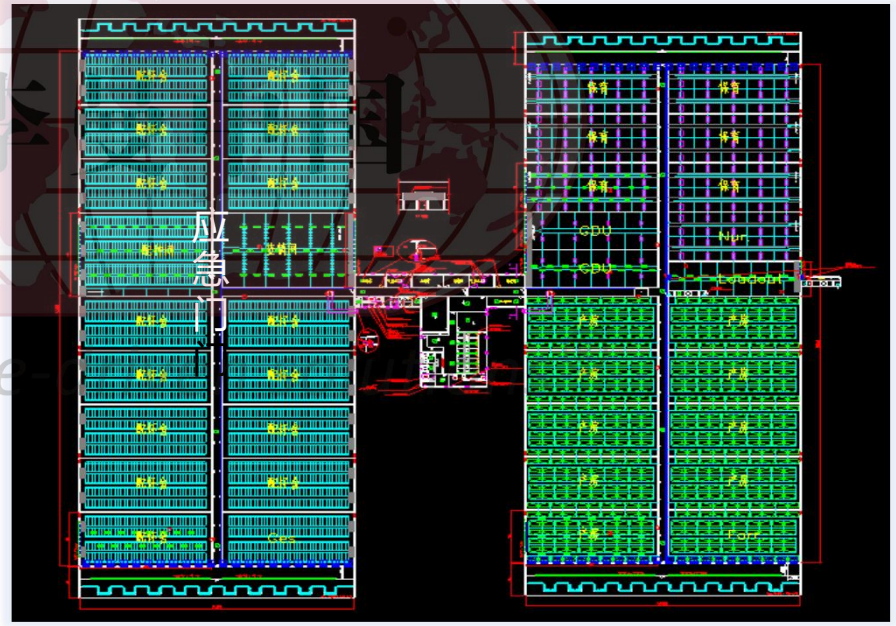
The "positive-pressure air filtration + compartmentalized barn and emergency exits design" model has gained prevalence among pig farms , providing a hardware foundation for the internal biosafety upgrade

- 体系内已积累了双阴群在**ASF、PRRS、Mhy**转阳后通过**部分清群**实现疾病快速净化的处置经验

There is accumulated practical experience in cases in our system where double-negative herds after converting to positive for ASF, PRRS or Mhy—achieve disease elimination through implementing partial depopulation



正压空气过滤通风模式
Positive-pressure air filtration

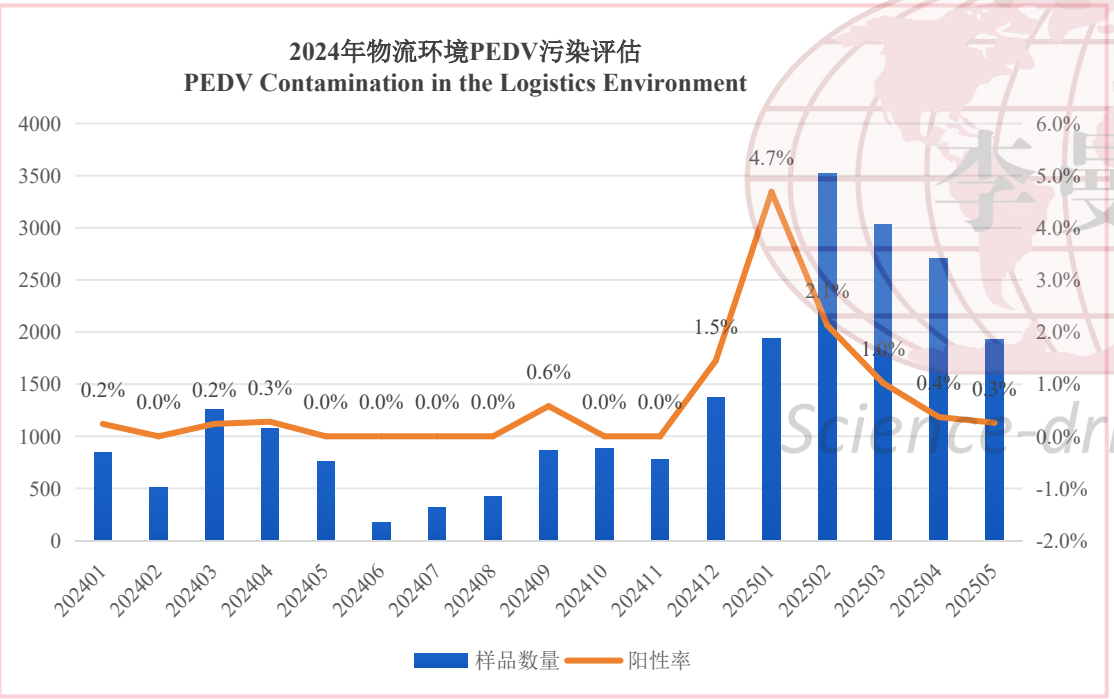


小间化+应急门设计
Compartmentalized barn and emergency exits design

一、背景介绍Background

- 2024年冬季在山东地区出现流行趋势。靠场人、车、物等靠场环境样品PEDV检出率高达4.7%，饲料厂环境也存在 PEDV 污染

During the winter of 2024, an epidemic trend has emerged in certain regions of Shandong Province.The detection rate of PEDV in on-site environmental samples related to personnel, vehicles, and goods reached as high as 4.7%, while environmental contamination with PEDV was also detected in local feed mills.



2025.01~03月份饲料厂环境PEDV污染
PEDV contamination in feed mill environment

工厂 Feed mill	室外环境 Outdoors		室内环境 Indoors		空滤墙外 Air Filtration Wall	制粒冷缺室 Cooling chamber
	01.24	02.17	01.24	02.17	02.17	02.17
A	-	+	+	+	-	-
B	+	-	-	-	-	-
C	+	-	-	-	+	-
E	+	-	-	-	-	-
F	-	+	-	-	+	-
G	-	-	-	-	-	-

“+”：阳性（Positive） “−”：阴性（Negative）

二、研究目的Objective

- 通过分析猪场猪流行性腹泻（PED）双阴维持策略和转阳后采用部分清群技术实现快速净化的成功经验，为PED双阴场转阳后的处置提供除返饲、疫苗免疫等常规方案之外的参考依据，提高我国猪场PED处置与防控能力。
- By analyzing the PEDV-negative maintenance strategies of this farm and the successful practices of applying partial depopulation techniques to achieve rapid eliminition after herd seroconversion to positive, this study provides reference guidelines for managing PEDV-positive conversions in PEDV-negative farms beyond conventional protocols such as feedback and vaccine immunization, thereby enhancing the disposal and prevention capabilities of PED in Chinese pig farms.

三、材料和方法Methods

- PED双阴维持策略：自2022年进行**生物安全体系迭代**，如：饲料厂制粒冷却室空滤改造，简化物流中转环节，猪场生物安全设备设施升级

Review of PEDV-Negative Maintenance Strategies in Farm: Since 2022, the biosafety system has been undergoing iterative upgrades, including air filtration system upgrade for pelleting cooling chamber , streamline logistics transshipment processes, biosecurity infrastructure upgrade for farms

- 将**“正压空气过滤+栋舍小间化/应急门”**设计与内部生物安全结合，实行风险小单元管理，降低疾病内部扩散风险

Integrate the 'positive pressure air filtration + compartmentalized barn and emergency exits' design with internal biosafety management to reduce the rate of disease spread

- 尝试采用**部分清群**对PED双阴场转阳后进行快速处置

Attempt to imlement partial depopulationt for rapid treatment after the PEDV-negative turns positive

三、材料和方法Methods

外部生物安全 External biosafety

1.员工经隔离站返回猪场，上下班需淋浴
Human being from the quarantine station and must shower when go to work.

2.车辆经洗消站洗消后靠场
Truck washing and drying

3.经物流采样消毒后中转,场内静置14天，采用浸泡或烘干消毒
Sampling and disinfection via the logistics warehouse. Standing for 14 days and using immersion or drying methods.

4.末端关卡加装监控录像
Final Checkpoints: Implement RVA

5.食材从源头采购
Food sourced directly from the origin.

6.饮水采用超滤设备消毒
Water undergoes ultrafiltration disinfection

7.饲料厂制粒冷却间空滤改造，饲料场内静置7天
Retrofitting of the air filtration system in the pelleting and cooling chamber of the feed mill. Feed is required to rest at the pig farm for 7 days

8.正压空气过滤系统升级
Positive Pressure Air Filtration System Upgrade

三、材料和方法Methods

1.进、出房间洗手、换鞋，跨“风险小单元”时需返回浴室换衣
Washing hands and changing shoes upon entering or exiting rooms, and be required to have a shower and change workwear when working across small units.

2.每周1次领取房间内所需物资
Collect the room’s necessary supplies once a week.

3.异常猪采样，主任每天随机抽检采样记录
Abnormal pigs are required to sampled, and the director conducts daily spot checks on the records.

4.房间内垃圾、胎衣、死猪在当日样品检测出结果前禁止出房间
Waste, afterbirth, and dead pigs in the room are prohibited from being removed from the room before the same-day sample test results are available.

5.跨房间转猪需检测7天内的异常猪
Transferring pigs across rooms requires testing for abnormal pigs within 7 days.

6.单一性处置预案和疫情演练
Single-type epidemic response plan and epidemic drill

风险小单元管控
Management and Control of Small Risk Units

四、结果与分析Results and Analysis

投入与回报 Investment and Return

- 当前GGP/GP约20000头猪持续保持PED双阴生产，年提供种猪近**20万**头
- GGP/GP herds with approximately 20,000 pigs consistently maintain PEDV-negative production status for PED , supplying nearly 200,000 breeding pigs annually.

繁殖群PED防控结果

Results of PED prevention and control in the breeding population

年度 Date	在途空滤场线 On-the-way air filter field line	转阳场线 Positive line	转阳率 Positive rate
2022	7	0	0.00%
2023	10	0	0.00%
2024	10	0	0.00%
2025-	10	0*	0.00%

生物安全防控投入（元）

Investment in biosecurity prevention and control

日期 Date	饲料厂升级 Feed mill upgrade	物流环节 Logistics system	空滤基建折旧 Filtration Infrastructure	过滤器更换耗费 Filter consumption	猪场硬件升级 Upgrade of farm	合计 Total	出栏肥猪 fattened pigs for sale	头均成本 Average cost per head
2022年	6229684	13971716	5546982	1278785	3983349	31010516	1520958	20.39
2023年	3386106	11607502	5546982	4359432	6934007	31834027	1985180	16.04
2024年	2389330	11772535	5546982	10954097	10632542	41295486	2640902	15.64

四、结果与分析Results and Analysis

猪场特征 Herd description

- 2022年12月投产，正压空气过滤通风，采用栋舍小间化和应急门设计

  Build in December 2022, positive pressure air filtration with compartmentalization and emergency Exit.

- 基础母猪合计存栏10600头，配套保育舍和独立公猪站，3公里内建有2个配套的正压空滤种猪培育场

  Housing 10600 sows, equipped with nursery house and an independent boar station; Within a 3-kilometer radius, the herd have two GDUs equipped with positive-pressure air filtration systems.

- PRRS、PED、*M.hyo*、APP维持双阴，CSF、PR、FMD等采用疫苗免疫

  Negative for PRRSV, PEDV, M.hyo, APP; adopt vaccine immunization for CSF, PR, FMD.

- 四周节律，两点式生产，为体系内提供种猪和精液

  4-week batch, 2-site production system, primarily supplying breeding pigs and boar semen .

- 自有饲料厂供料，使用饮水超滤设备

  Feed provided by the company owned feed mill, equipped with drinking water ultrafiltration equipment.

- 截止2025年10月，已维持PED双阴生产近34个月

  As of January 2025, the negative status for PEDV has been maintained for nearly 34 months since the establishment.

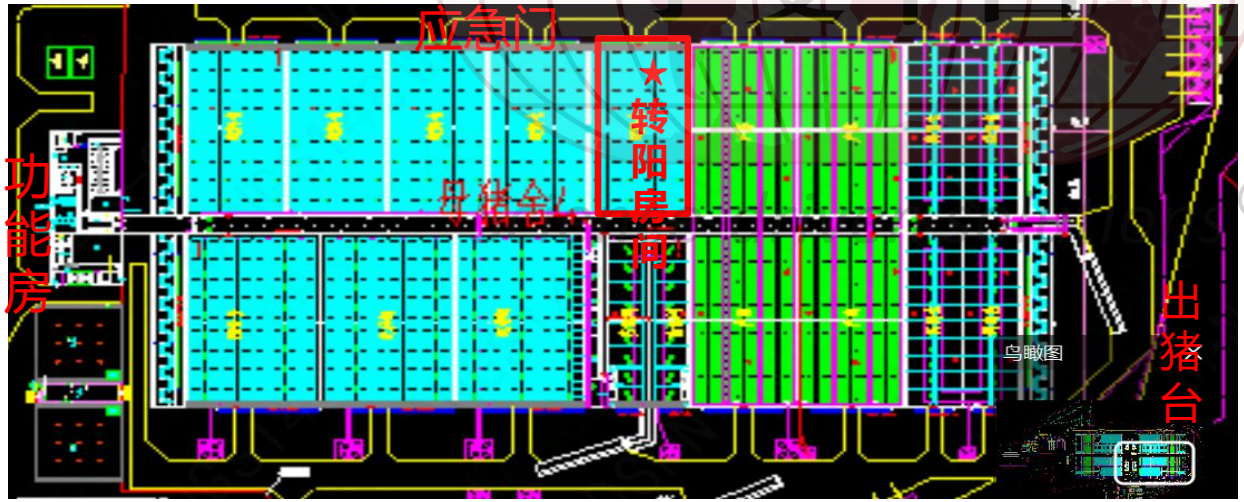
四、结果与分析Results and Analysis

病例描述 Case Description

- 时间：2025年1月22日
  Date: January 22, 2025
- 位置：四线 配怀R5车间R5-1-52
  Site: 4-processing-line, R5-1-52
- 实验室检测结果：**PEDV 阳性 CT=16.2**
  Testing result:PEDV-positive CT=16.2

- 临床症状：妊娠71天，之前无不食、少食等异常情况，22日上午饲喂后巡栏发现腹泻情况，采肛拭子检测PEDV、*胞内劳森菌*;

  Clinical information：During feeding and pen inspection on the morning , cases of diarrhea were observed. Anal swabs were collected and submitted for PEDV and *L.intracellularis* testing by qPCR.



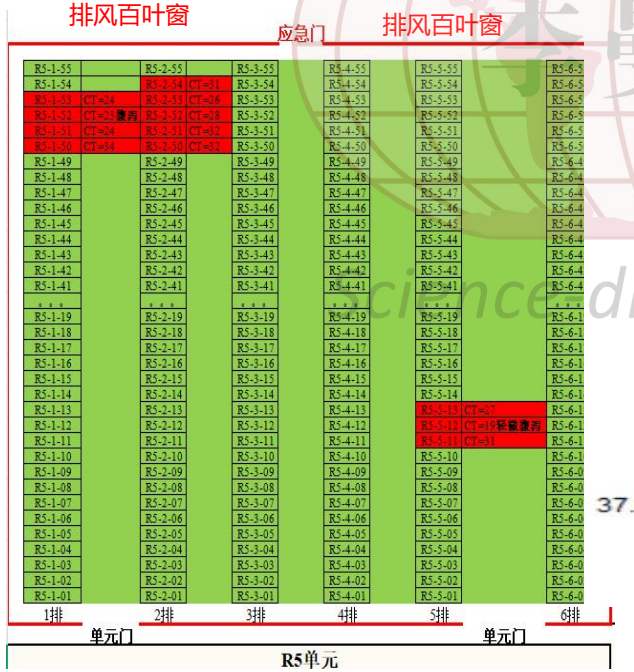
四、结果与分析Results and Analysis

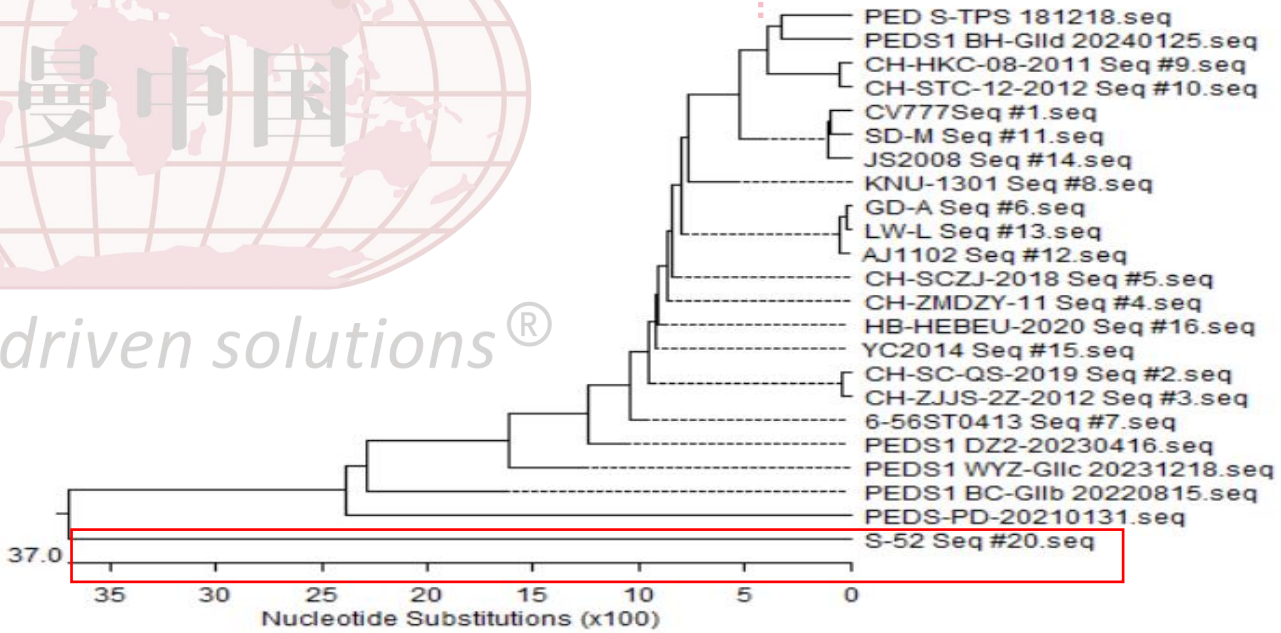
临床诊断 Clinical Diagnosis

- 1月22日下午再次摸排采样，R5-1-52均阳性：CT18.5（A试剂盒）、CT21.0（B试剂盒），其他点位摸查见下图
- On January 22, the second sampling conducted in the afternoon tested positive for PED. CT18.5(kit A),CT21.0(kit B)

- 环境污染：浴室门把手CT37.9、排风百叶窗灰尘CT30.7、房间内地面CT29.0
- Environmental Pollution Assessment:Bathroom environment CT37.9、Exhaust louver dust CT30.7、the floor sample inside the room CT29.0

- S蛋白测序：G1b型
- PEDV S protein sequencing：G1b genotype





四、结果与分析Results and Analysis

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处置过程 Handling Process

- 减少房间内通风量，压强降至10-15pa，停止跨间操作

  Reduce the ventilation rate in this room, lower the internal pressure to 10-15 Pa, and suspend cross-room operations.

- 对浴室和中央连廊环境使用1:200卫可喷雾消毒，员工工装1:200卫可浸泡消毒，兽医负责将阳性猪只安乐死

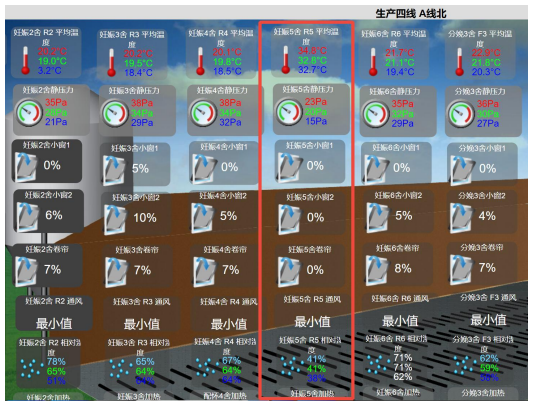
  For the bathroom and central corridor areas, apply spray disinfection using 0.5% Virkon solution; staff uniforms are disinfected through soaking in 0.5% Virkon solution，and euthanize the PEDV-positive pig.

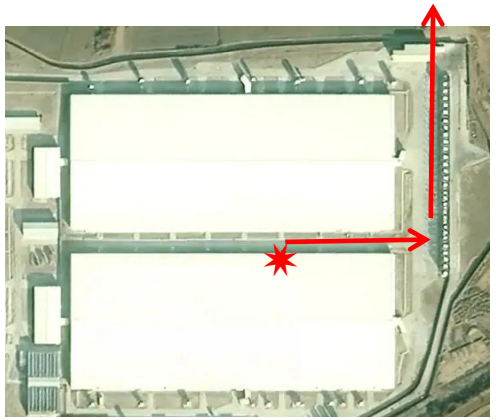
- 人员由应急门进入R5，使用空滤车将整间322头妊娠猪剔除至方舱场，房间消毒封存

  Personnel entered the room through the emergency excite, utilized many air-filtered trucks to relocate all 322 pregnant sows from the room to a containerized isolation facility, and subsequently disinfected and sealed the room

- 审计内部交叉风险，房间R4、R6、B1、B3划为高风险，连续2天全群采样检测，在第5、10天转为单元抽检+异常猪监测

  Considering internal-biosecurity, R4, R6, B1 and B3 are designated as high-risk rooms. Full-population sampling and testing will be carried out for two days. On days 5 and 10, the protocol will shift to unit-based sampling inspection combined with monitoring of abnormal pigs.



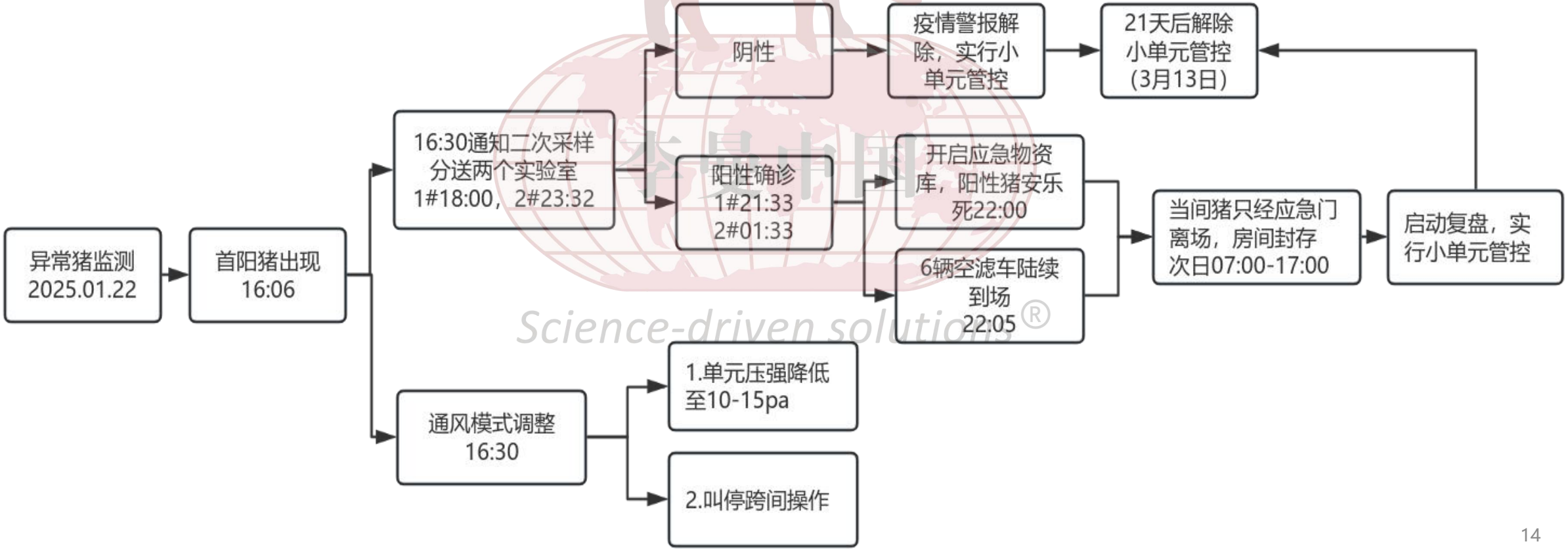


四、结果与分析Results and Analysis

处置过程 Handling Process

- 整个处置全程耗时约24小时，其中自实验室通报至一线反应用时24分钟。

The time from the first positive notification by the laboratory to the frontline response was noly 24 minutes, approximately 24 hours for the entire process of epidemic response.



四、结果与分析Results and Analysis

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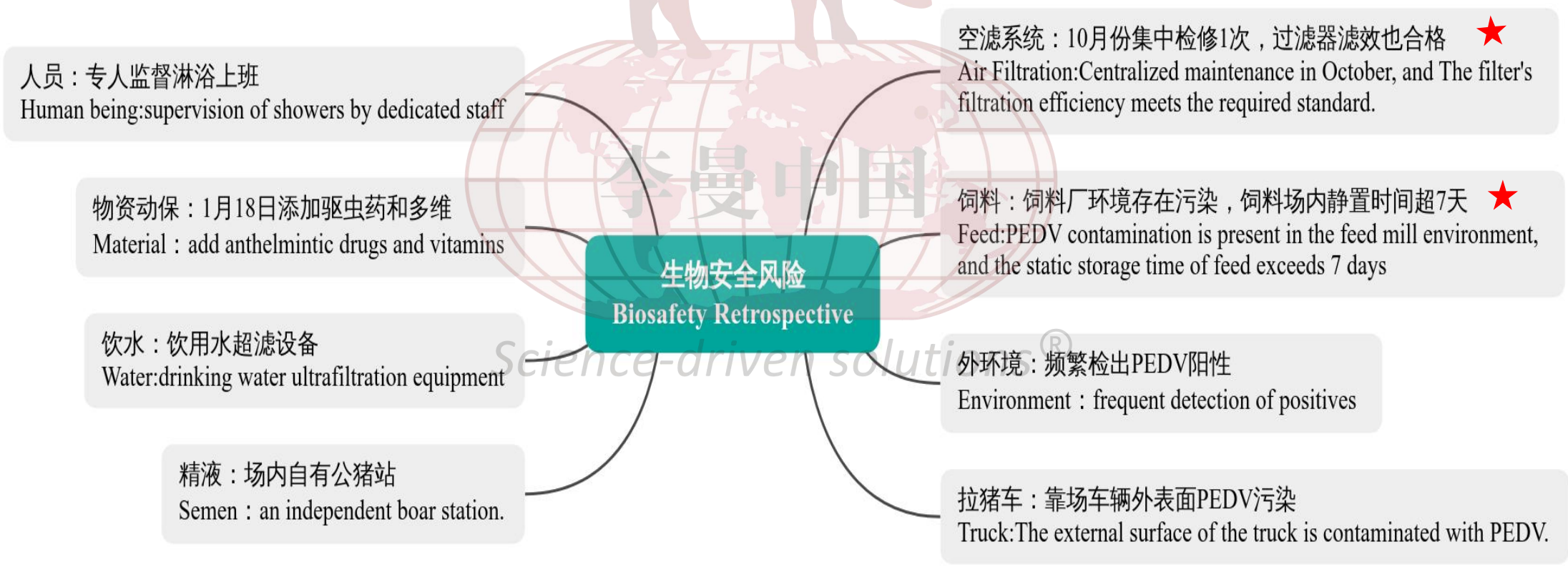
生物安全复盘Biosafety Retrospective

- 2月份在空滤三防网、场内环境样品中均检测到PEDV阳性
  In February, both the air filtration three-defense net and on-site environmental samples tested positive for PEDV



四、结果与分析Results and Analysis

经济损失分析Economic Loss Analysis

不同处置方案对比 Comparison of Different Epidemic Disposal Plans			
处置方案Disposal concept	**优势 Advantages**	**劣势 Disadvantage**	**经济损失Economic loss**
1.局部清群 Partial Depopulation	1.内部生物安全小单元风险管控期 Risk Control and Management Period for Small Internal Biosafety Units 2.只有1头猪明显腹泻，环境载毒量少 Only one pig has diarrhea, with a low environmental viral load 3.短时间内恢复生产双阴仔猪 Successful culling enables the continued production of double-negative piglets.	1.病毒被带出房间，造成交叉感染 The virus was carried out of the room, leading to cross-infection. 2.剔除322头妊娠母猪 Before culling, new diarrhea cases in pigs may emerge	猪只损失率Loss Rate of Population 322/10600*100%=3.0% 种猪间接损失Indirect Losses of Breeding pigs 3.5*322*（1900-1300）=676,200
2.全群返饲 Whole herd feedback	1.不损失妊娠母猪 No loss of pregnant sows	1.环境载毒量剧增，极可能攻克其他生产线 The environmental viral load has surged, and it is highly likely to breach other production lines. 2.猪场健康度降级，下游PS场返饲毒株被迫更换 The farm's biosecurity level has been downgraded, forcing the downstream PS farm to replace the feedback virus strain. 3.外销种猪失去竞争力 Loss of competitiveness in external breeding stock supply	仔猪直接损失: Direct loss of weaned pig： 120*3*12.6*（0.6*450+0.4*650）*4=9,616,320 返饲和免疫投入: Feedback and Vaccine Immunization (2750/50*450 +2750*8)*4=187,000 合计：9,803,320

五、结论与讨论 Conclusion and Application

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1

1.非洲猪瘟后随着行业整体生物安全体系的升级，在高密度地区维持大群体长时间的PED双阴是可以实现的

Following the ASF outbreak, with the enhancement of the overall biosafety system across the industry, it has become achievable to maintain a large-scale and PEDV-negative in pig herds in high-density regions.

2

2.PED的R0值高达5.39，相对其他疾病，群体内传播快，本案例中依靠完善的内部生物安全，通过早发现、早处置实现了PED转阳后采用部分清群技术快速净化。

With R0 up to 5.39, PED spreads more rapidly within pig herds than other diseases. In this case, leveraging a robust internal biosafety system—through early detection and swift response—the farm implemented partial depopulation after identifying PEDv-positive animals, achieving rapid virus elimination.

3

执行单一性应急预案和日常演练，可缩短应急反应时间，提高处置成功率。

Implementing specific emergency response plans and daily drills can shorten emergency response time and improve the success rate of disease outbreak response

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