

The Russian ASF experience: epidemiology, prevention and strategies for disease control

**俄罗斯非洲猪瘟的主要病原特点、
防控策略及防控效果分析**

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09th of April 2019, Beijing, PRC

ASF distribution overview

ASF病毒分布概览



Fig. 2: Distribution of first reported cases of ASF in Georgia (source: OIE)

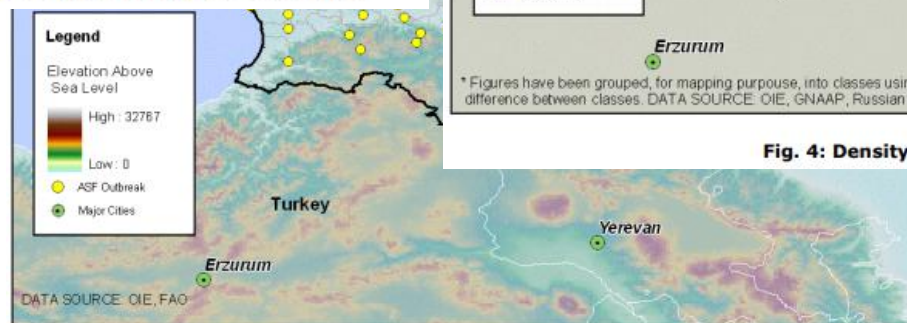


Fig. 3: Location of outbreaks in Georgia.

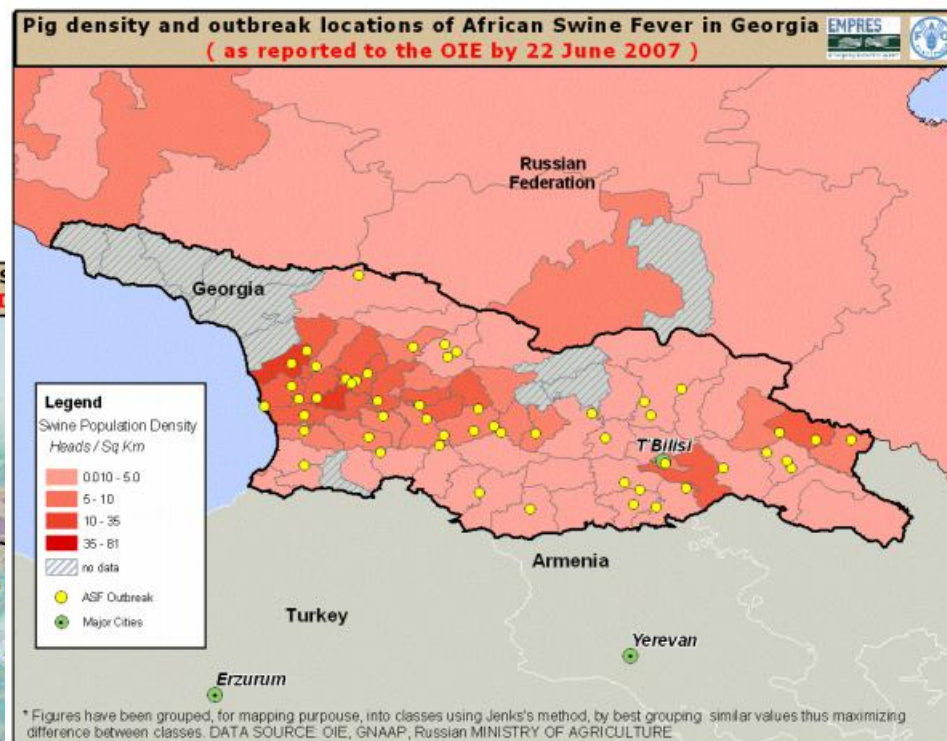
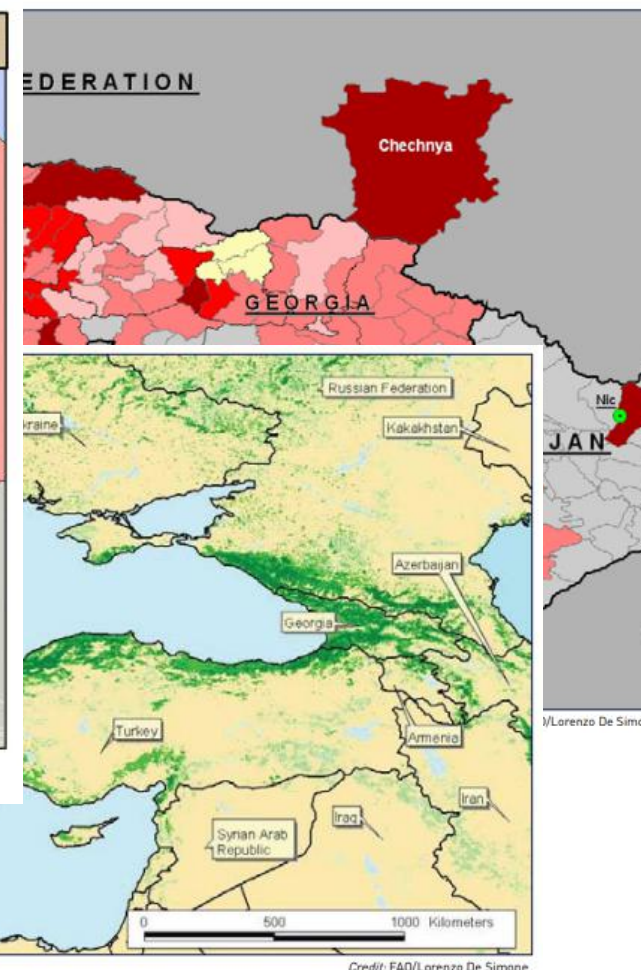
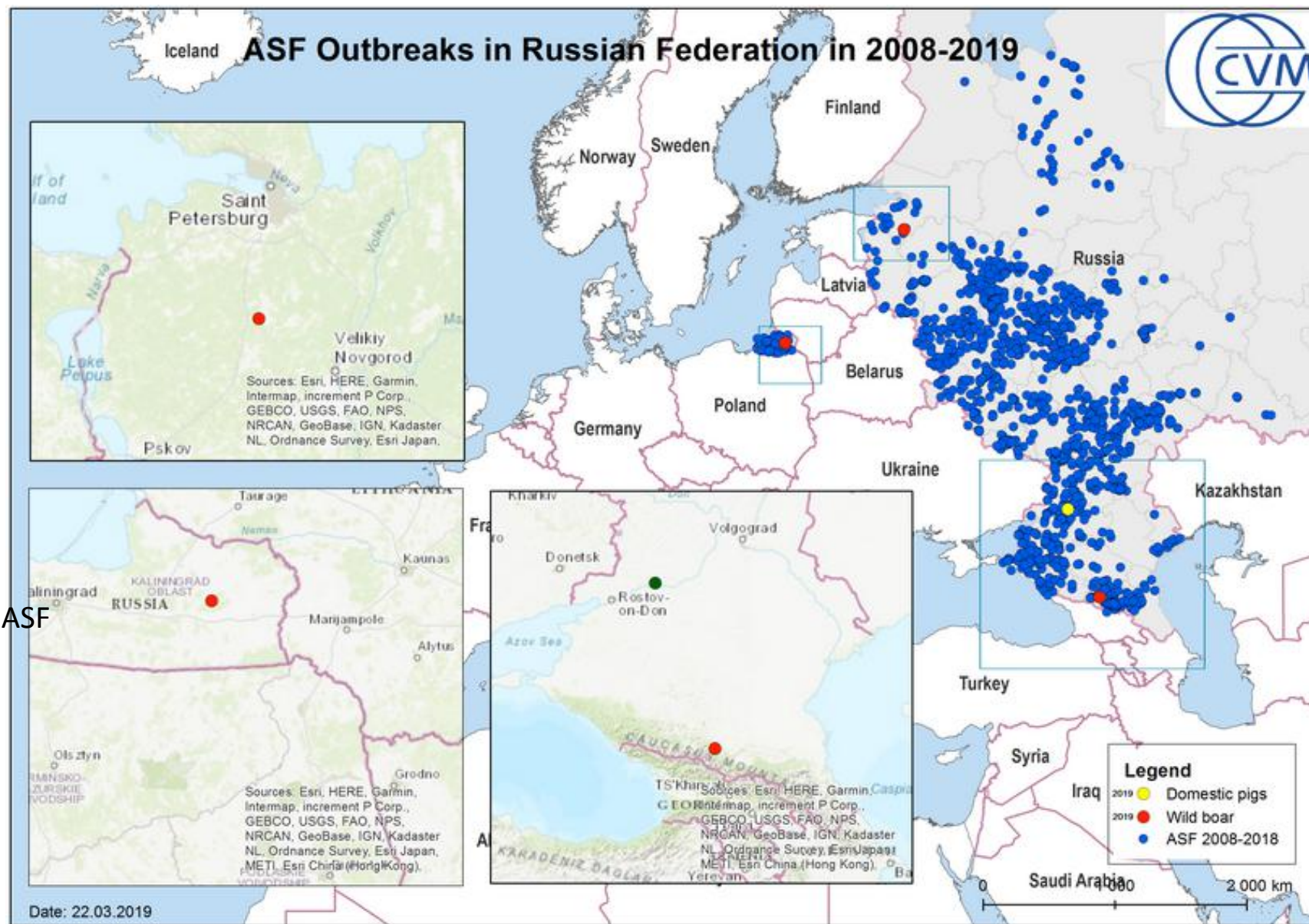


Fig. 4: Density of pigs in Georgia



俄罗斯ASF病毒爆发点图示（2008至2019年）

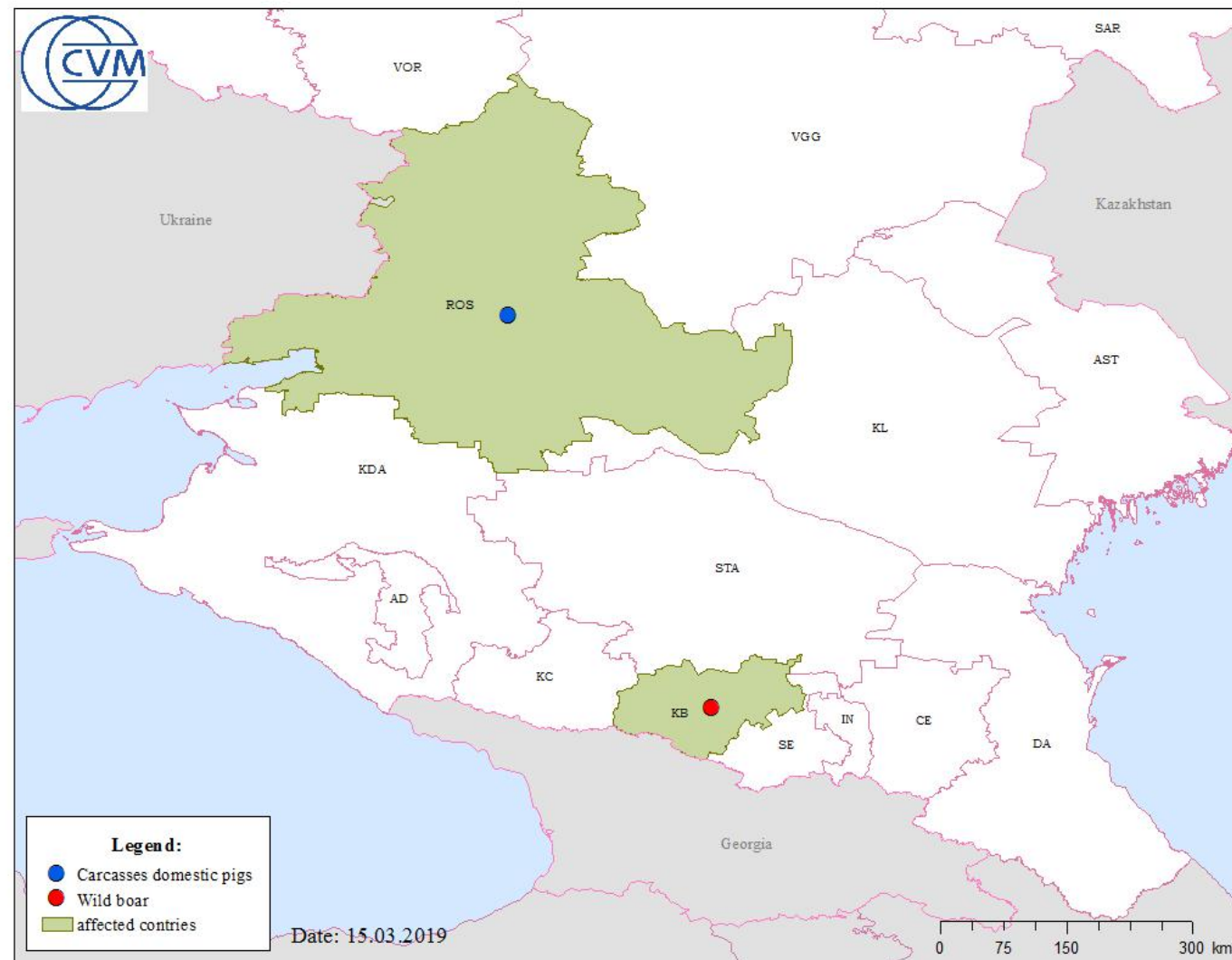


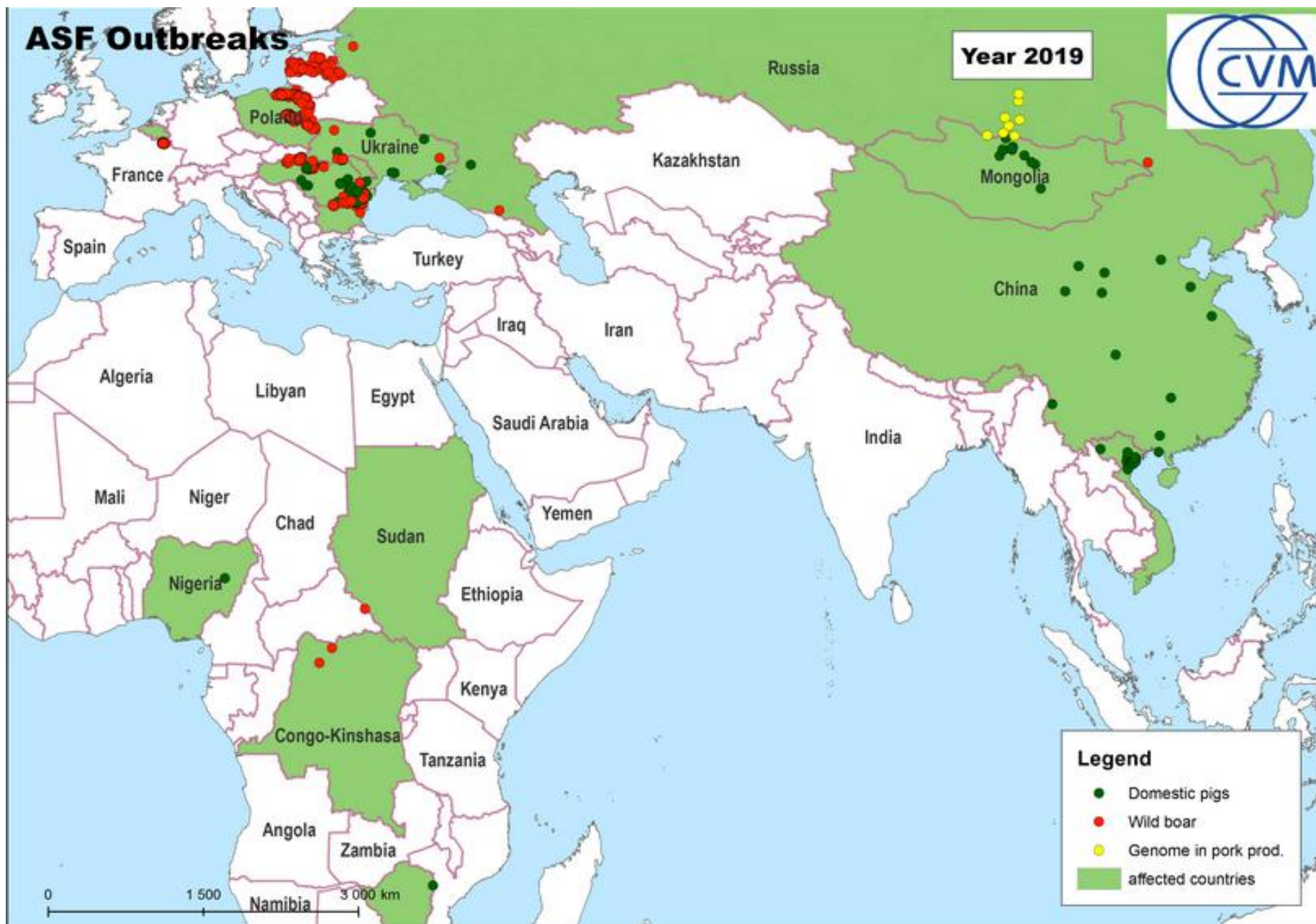
● 家猪 ● 野猪 ● 2008-2018 ASF

ASF in Russia March 2019

俄罗斯地区ASF病毒情况（2019年3月）

● 家猪 ● 野猪 ■ 受感染区域





2019年图示

- 家猪 ● 野猪 ● 猪肉生产基因组
- 受感染国家

No clear definition of case/outbreak

病毒爆发后没有明确定义的方面

- ✓ Infected animal or carcass
受感染的动物或动物尸体
- ✓ Backyard 散养猪
- ✓ Settlement 解决方案

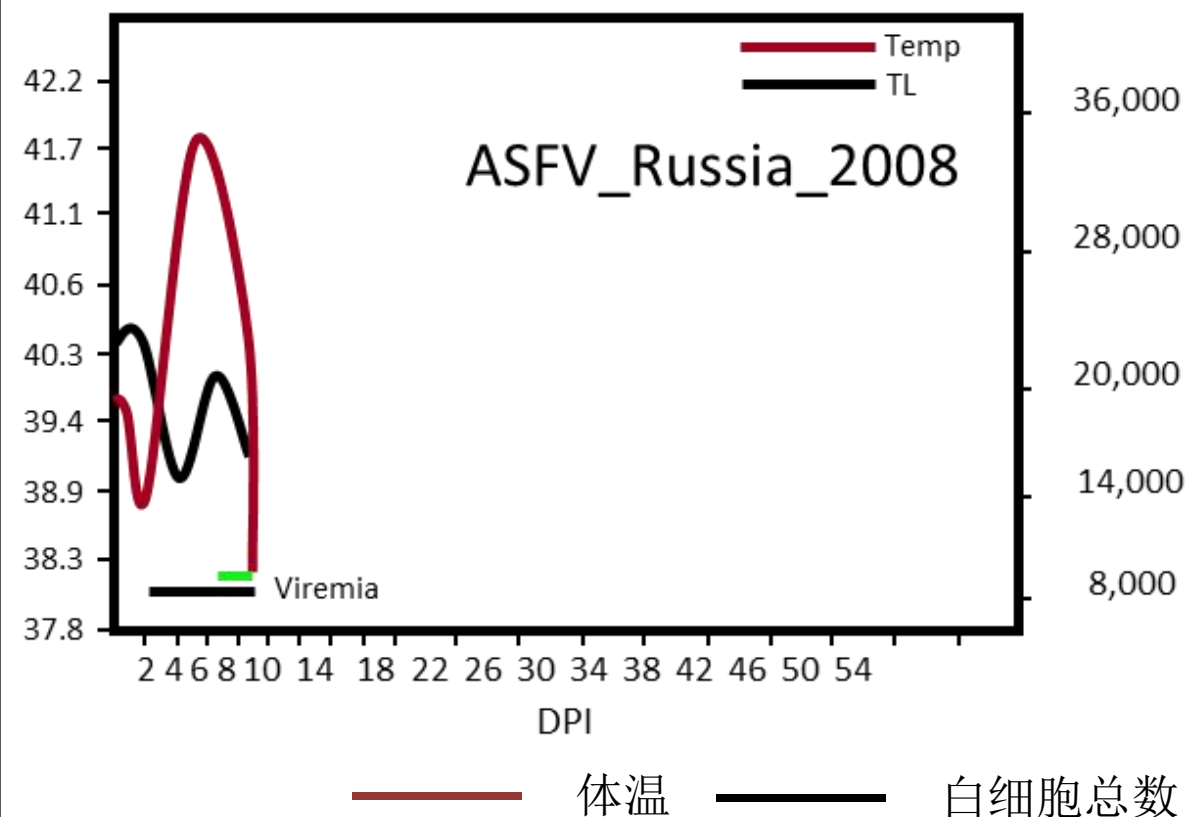
STABILITY OF VIRUS

病毒的稳定性

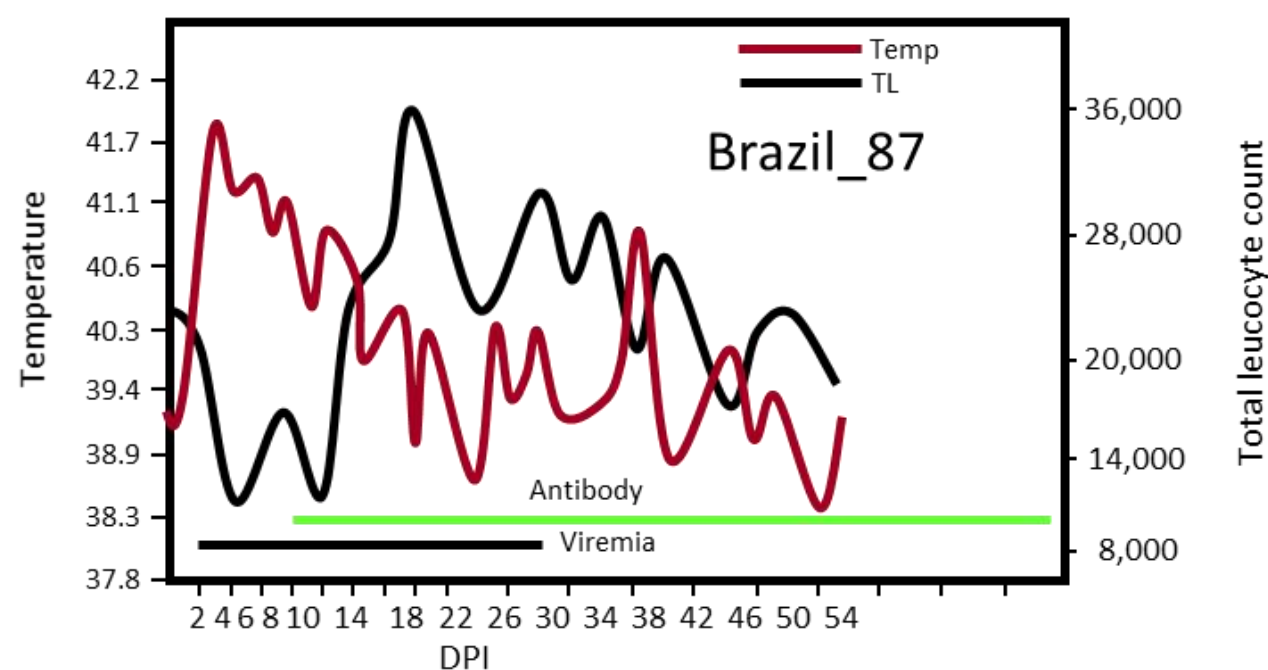
Clinical forms of ASF

ASF病毒的临床表现

Acute 强毒



Mild 弱毒



ASFV Strains 2017

ASFV 2017系列病毒毒株

- ASFV_VLADIMIR_2017_WB
- ASFV_KUBAN_2017_DP
- ASFV_SARATOV_2017_DP
- ASFV_IRKUTSK_2017_DP
- ASFV_OMSK_2017_DP

Bioassay

猪只遇到的挑战

- 3 pigs in every group were infected with 10^3 HAU IM.

每个群体有3头猪只感染了 10^3 HAU IM型ASF病毒;

- Clinical symptoms and temperature were registered daily.

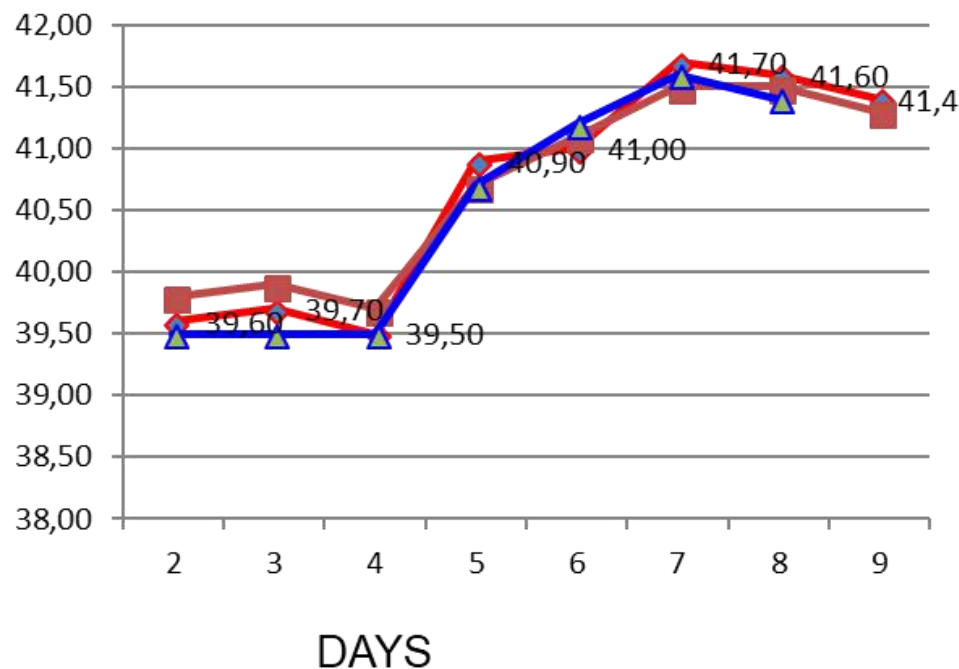
每天登记猪只的临床症状及体温情况。



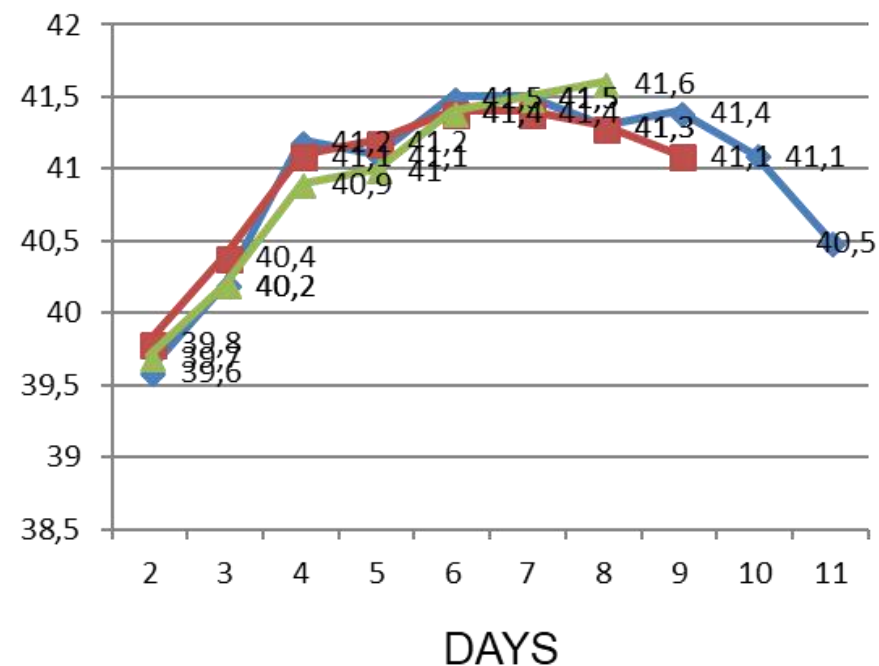
Temperature profiles

体温资料

ASFV_Saratov_2017_DP



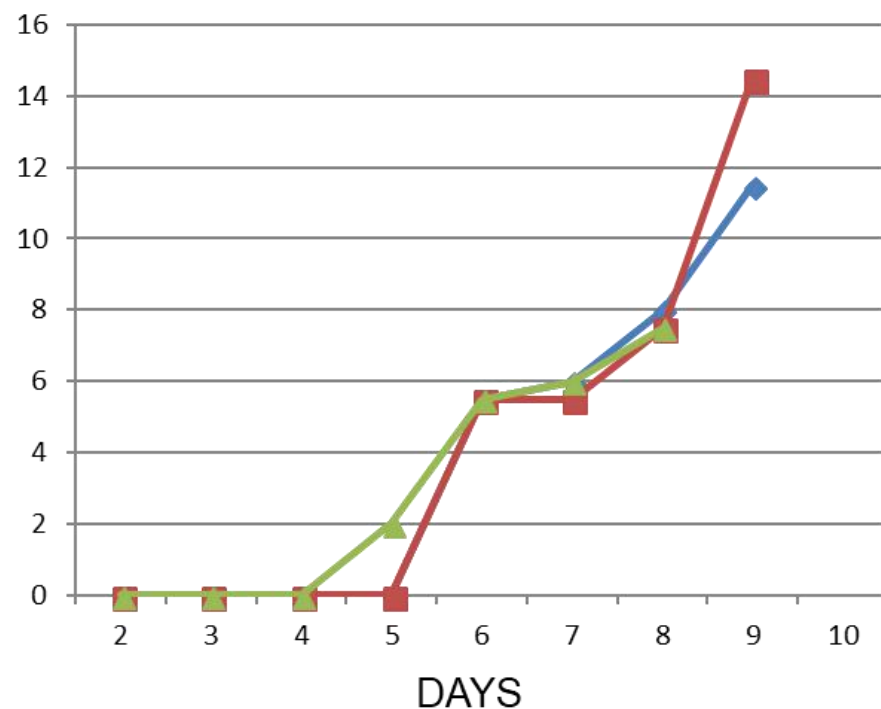
ASFV_Kuban_2017_DP



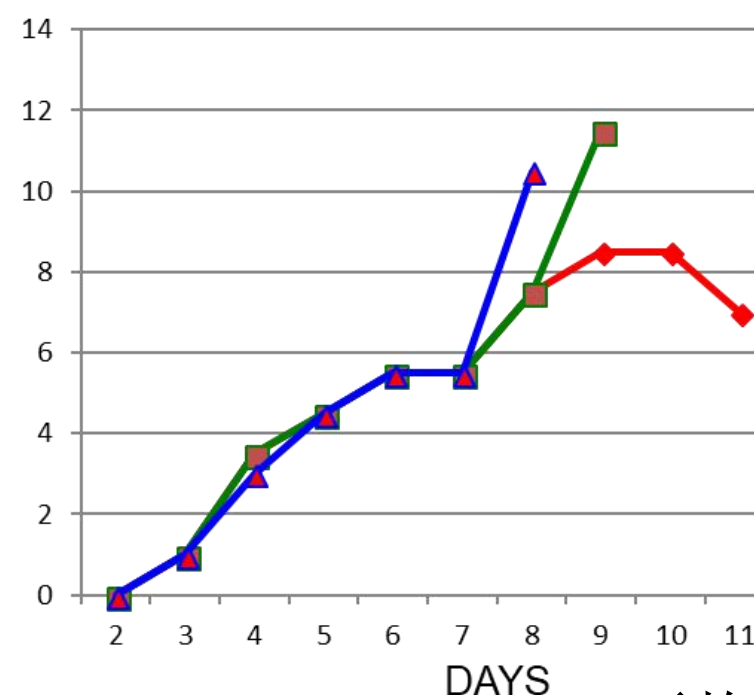
- Mean time to fever 平均发热时间 (TTF) – 3.5 dpi
- Mean time of fever 平均发热时间 – 5.7 days

Clinical score 临床评分

ASFV_Saratov_2017_DP



ASFV_Kuban_2017_DP



- Mean time to death 平均死亡时间 (TTD) – 8.5 days

MOLECULAR CHARACTERIZATION OF ASFV STRAINS 2017

ASFV 2017病毒毒株的分子特性

- ASFV_VLADIMIR_2017_WB
- ASFV_IRKUTSK_2017_DP
- ASFV_SARATOV_2017_DP
- ASFV_KUBAN_2017_DP
- ASFV_OMSK_2017_DP

TAAATAACAAGTATATAGGAATATATAGGAATATATAGGAATAT
TAAATAACAAG-----TATATAGGAATATATAGGAATAT
TAAATAACAAGTATATAGGAATATATAGGAATATATAGGAATAT
TAAATAACAAGTATATAGGAATATATAGGAATATATAGGAATAT
TAAATAACAAGTATATAGGAATATATAGGAATATATAGGAATAT

ASFV IGR II>ASFV IGR I

Align fragments of IGR I73R/I329L OF ASFV STRAINS 2016-2017

ASFV 2016-2017病毒毒株IGRI73R/I329L的基因片段对比

	10	20	30	40	50	60	70	80	90	100	110	120
Isolate Abk07	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
Isolate Lt14/1490	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
Isolate Dagestan09	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 1.Saratov.18.02.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 2.Moscow.reg.05.04.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 2v.Volgograd.05.06.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 9.Saratov.02.02.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 16.Krasnodar.06.01.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 1.Krim.06.01.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 4.Saratov.20.01.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 5.Vladimir.30.01.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 1.Irkutsk.29.03.17	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 3.Samara.16.03.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 2.Moscow.04.04.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 32.Orel.20.02.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 33.Saratov.22.02.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 39.Vladimir.25.01.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 41.Vladimir.02.05.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 43.Volgograd.14.06.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 44.Vladimir.03.07.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 45.Ivanovo.04.07.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 46.Volgograd.05.07.17.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 48.Ryazan.15.06.16.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	
CAP 49.Voronezh.06.06.16.Ecol	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTCA	
CAP 50V.Novgorod.28.06.16.Eco	GGATAGTTTAA	GCA GTAAATGTA	GAA TAA CA	CAGTTAA	GCAATAAA	TAA CAG	-----	TAT	TAGGAATATATAGG	-----	AATATATAGAAATATATAGAAATAGCTAA	

- ✓ Some additional SNP's were identified in different ASFV genes regardless ASFV strains origin

不管**ASF**病毒的毒株来源，一些附加的**SNP**被证明处在不同的**ASF**病毒基因组；

- ✓ Despite the fact, that the number of nucleotide mismatches in currently circulating ASFV strains is dramatically increasing there is no clear evidence of virus attenuated phenotype in Russia

尽管事实如此,但核苷酸的数量与现存的**ASF**病毒毒株无法匹配，并呈显著增长的趋势。没有明显的证据表明俄罗斯区域的病毒呈减毒表型态。

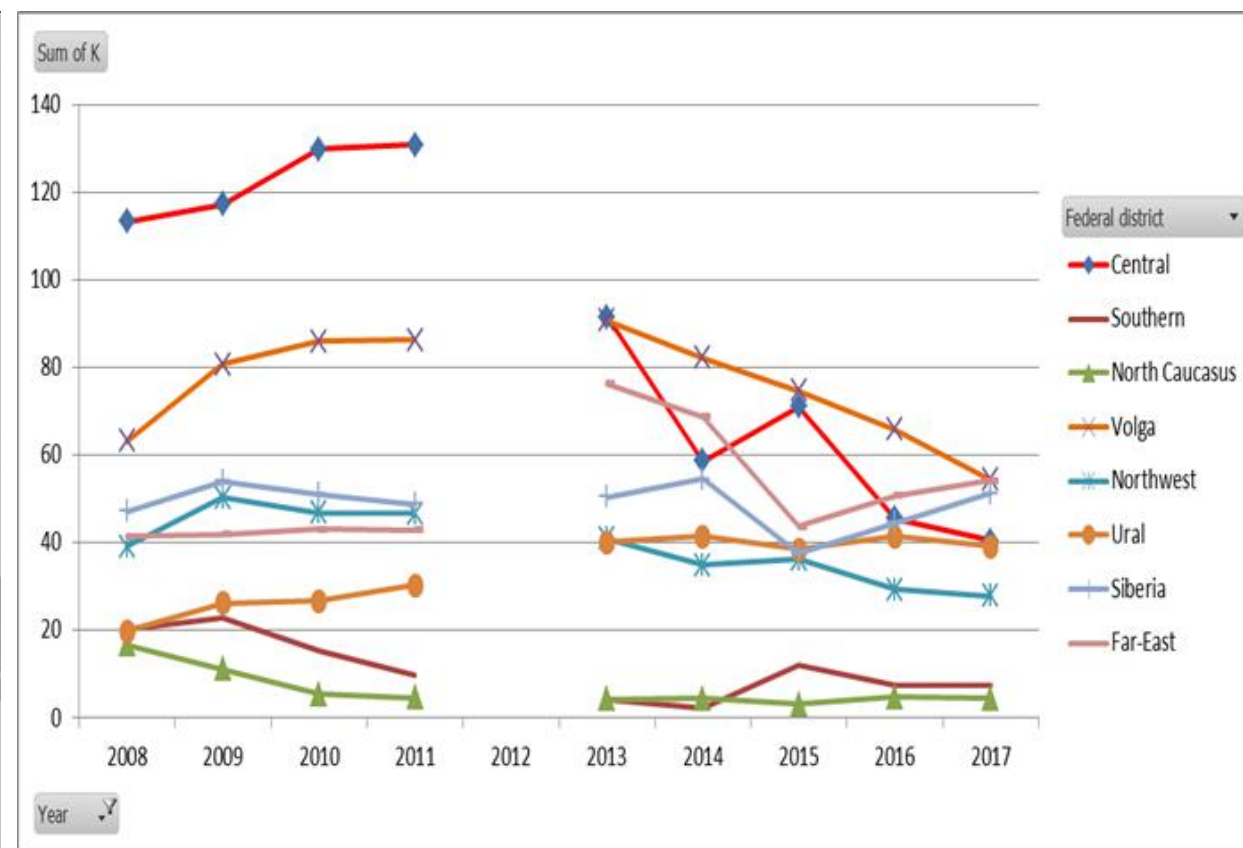
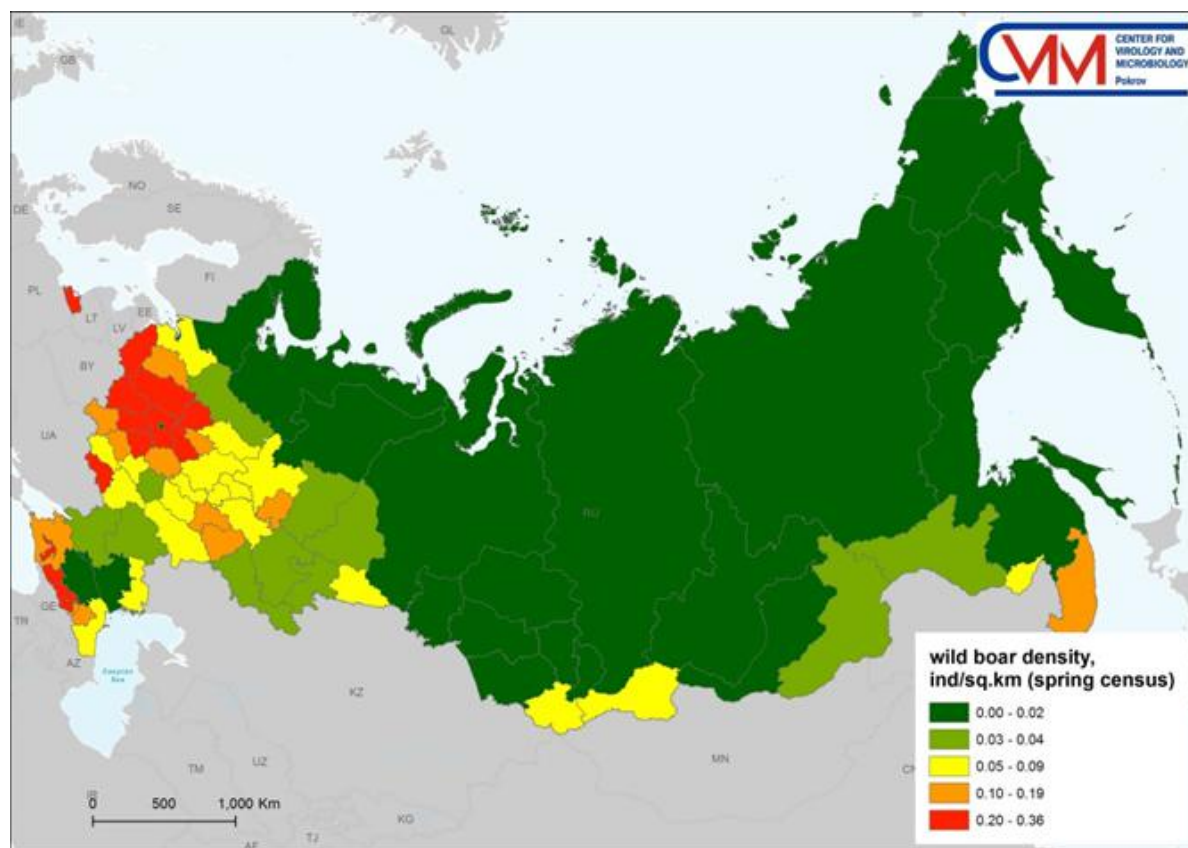
ASF in wild boars

感染ASF病毒的野猪

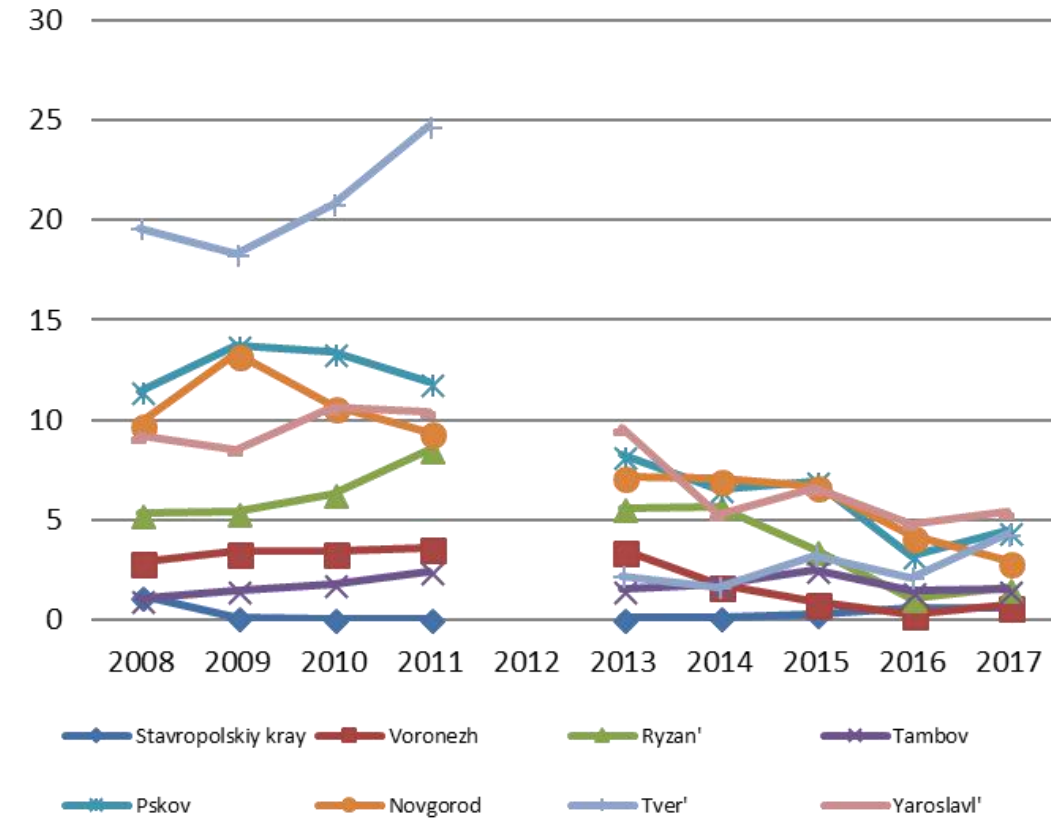
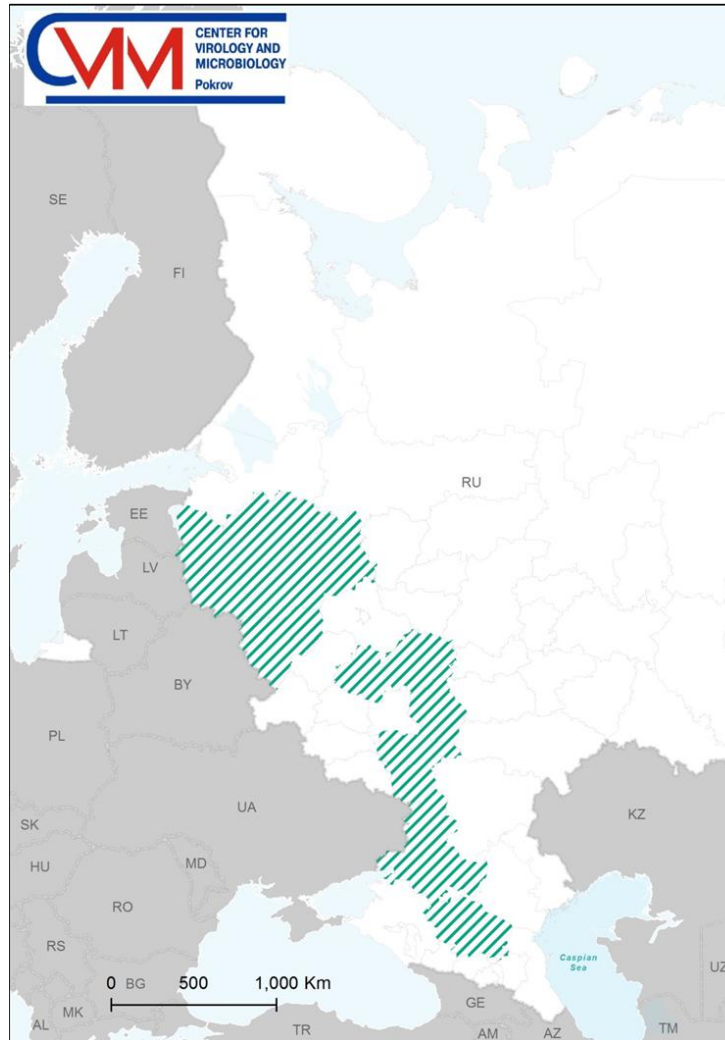


Wild boar spring census 2008-2017 (by Federal Districts)

2008-2017年俄罗斯联邦野猪春季普查情况



ASF and wild boar population ASF及野猪猪群

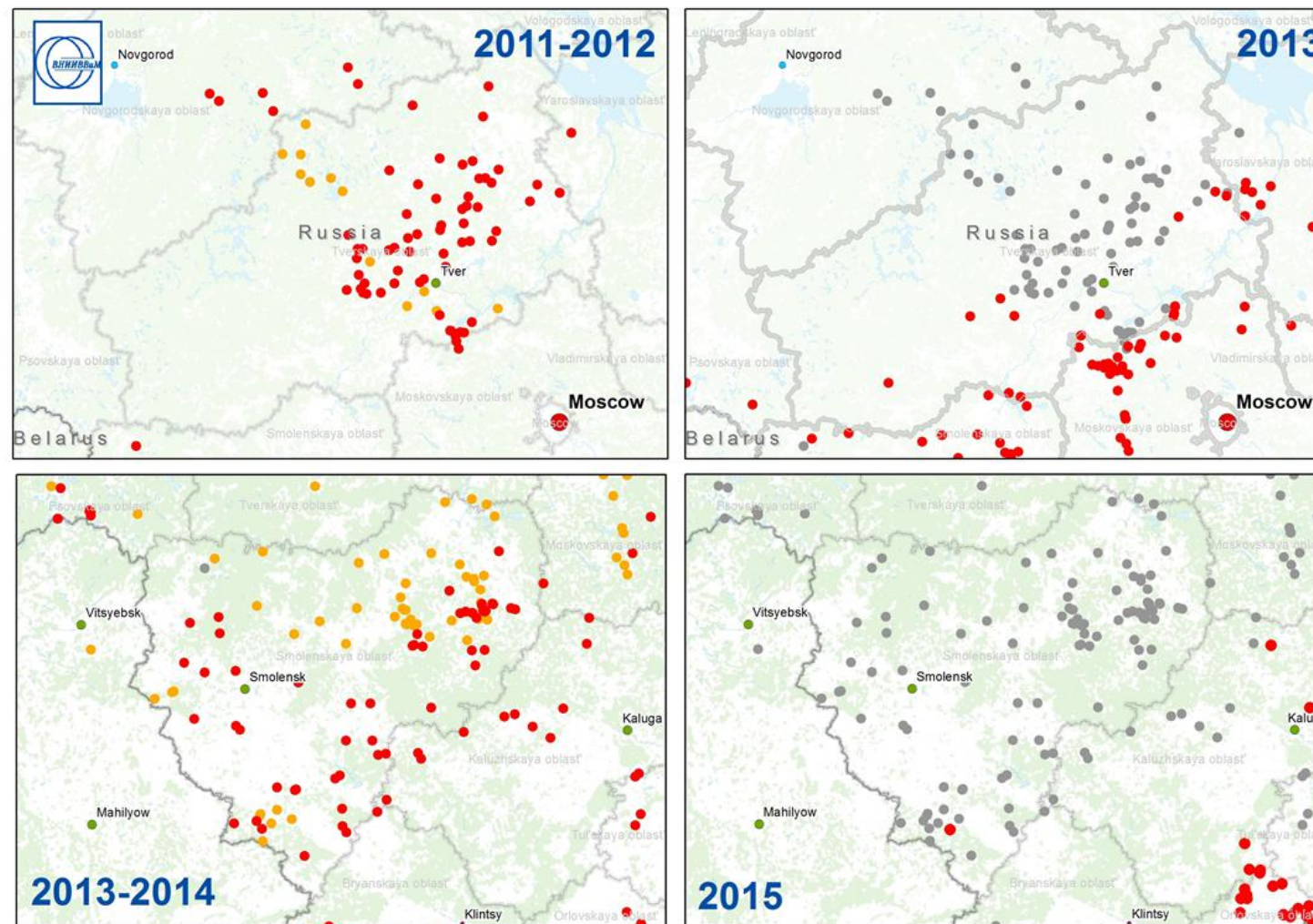


Regions where ASF was registered in wild boar earlier and currently is not notified (for at least 2 years)

俄联邦各区域早期即登记野猪感染ASF病毒情况，但最近两年未有报导。

Comparison the number of ASF cases in WB in 3 years period

三年期间感染ASF病毒的野猪数量对比图

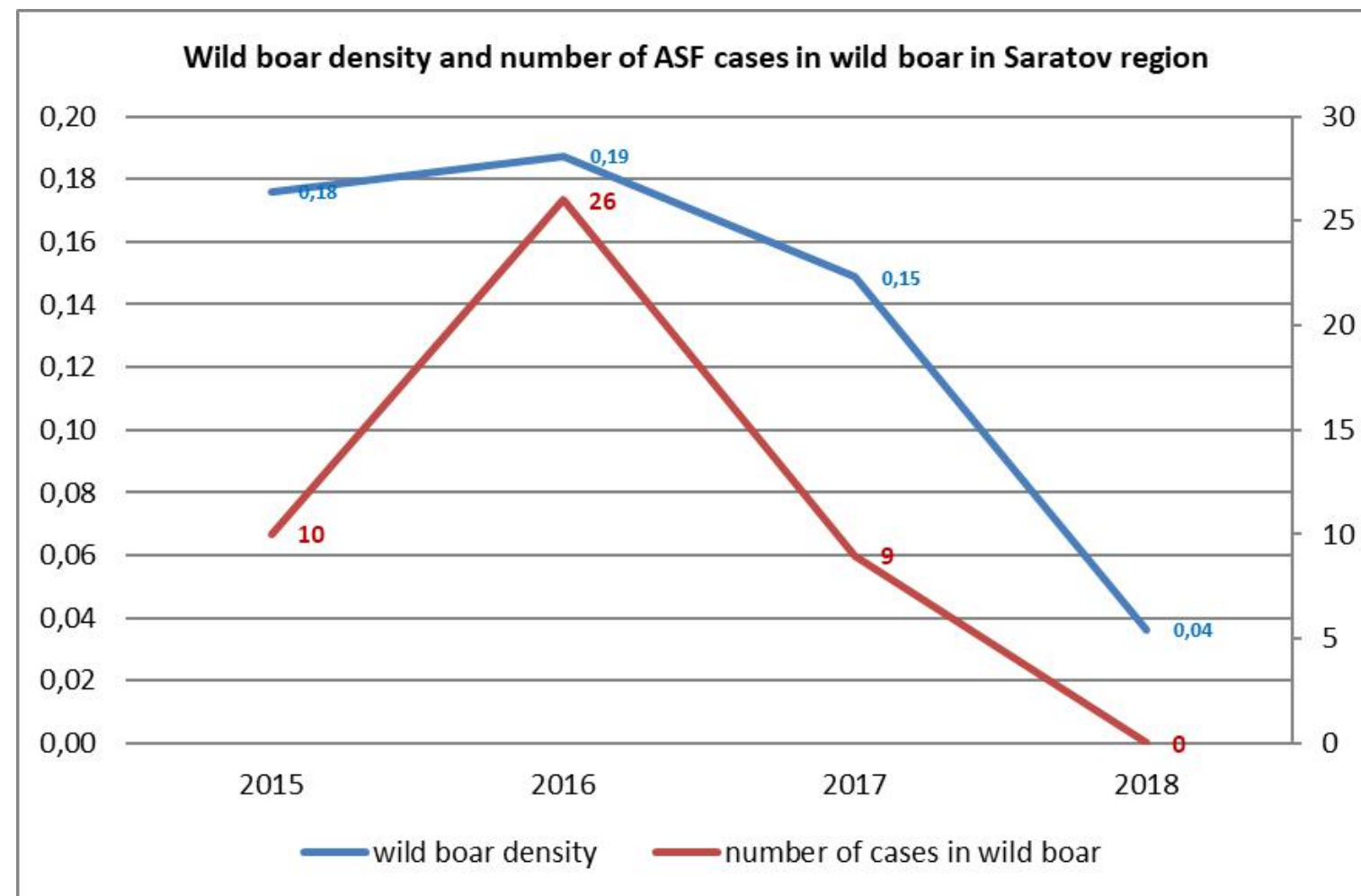


Correlation between WB density and number of ASF cases

野猪密度及感染ASF病毒野猪数量相关性比较图

—— 野猪密度

—— 感染ASF的野猪数量



ASF Diagnosis

ASF病毒诊断



ASF looks very different

ASF 病毒死亡特征各有不同



Diagnostics

诊断

- ✓ No chance to diagnose by clinical signs/people in most number of cases do not see classical clinical picture from the Textbook

在大多数病例中无法通过临床表征或医生来进行诊断，教科书中也无法找到典型临床表现图片。

- ✓ Only laboratory tests can help 仅可通过实验室测试
- ✓ PCR feet to purpose + confirmation method (DIF) or challenge test

PCR 测试结合DIF确认法或攻毒试验

- ✓ Understanding mechanism of ASF virus of infection is key to disease control and eradication

了解**ASF**病毒的感染机制是控制及根除该病毒的关键。

- ✓ Infected animals and infected pork are responsible for transmission of ASF virus

ASF病毒是人为的通过受感染的动物和猪肉进行传播。该病毒总是与红细胞相关。

- ✓ The main route of infection in 99 percent of cases is oral

99%的感染途径为口对口传播。

- ✓ The second route – local spreading of ASF virus within and between herds with contaminated needles during animal treatment or vaccination

排名第二的传播途径----**ASF**病毒在局部扩散，并在动物治疗或疫苗接种时通过针管在猪群间传播。

- ✓ Only one kind of pork should be allowed on the market – pork from ASF free farms

仅能允许一种猪肉在市场上流通--- 猪肉来源于无**ASF**病毒的猪场，且猪肉本身未检测出**ASF**病毒。

- ✓ Impossible to test each carcass or pig. Laboratory tests can only confirm the disease

永远没有机会可以对每头猪只或胴体进行测试。实验室测试仅能用于确认疾病。

- ✓ Need to use ASF free status of the farm to prove that pork is ASF free

需要使用无**ASF**病毒的猪场，用于证明猪肉是没有病毒的。

- ✓ Selling and transportation is not allowed without veterinary certificate

没有动物检疫证书，不允许进行销售及运输。

- ✓ No certificate can be issue after ASF is suspect (before it confirmed)

有疑似**ASF**病毒（未确诊）出现，则不允许颁发任何证书。

- ✓ No pigs and pork movements after suspicion of ASF

有疑似**ASF**病毒出现，不允许猪只及猪肉的流通。

- ✓ Pig farms closing for six months after the stamping-out of last pig and final disinfection

在最后一头猪只被捕杀及最终消毒程序完成后，猪场必须要停业**6**个月。

- ✓ No pork allow on the farm canteen
猪场餐厅中不允许有猪肉。
- ✓ Provide free meals without pork to workers – otherwise they will bring pork with them from outside
提供不带猪肉的免费工作餐给工人---避免工人从外面自带猪肉进场。
- ✓ Cloth and shoes change every time (include lunchtime, office visiting)
每次必须换衣换鞋（包括午餐时间及去往办公区）。
- ✓ Shower before entering the farm - not only after (Shower in – Shower out)
每次进猪舍前必须洗澡---而不是从猪舍出来后。
- ✓ Contractor organizations – electricity, gas, mechanics must follow the same rules
分包商 ---- 电、燃气、机械

- ✓ Transport companies which provide service for different companies is the main risk factor to infect pigs during transportation (No bumper to bumper contact with internal transport on the farm)

运输公司提供给不同公司服务，所以在运猪期间会带来巨大的风险。

- ✓ Quarantine 7 days, One-way pigs movement

7天隔离期，猪只单向流动。

Successful ASF control and eradication requires:

- ✓ Early reporting and fast, accurate ASF diagnostics together with effective stamping out policies and strict control measures for animal and pork movements

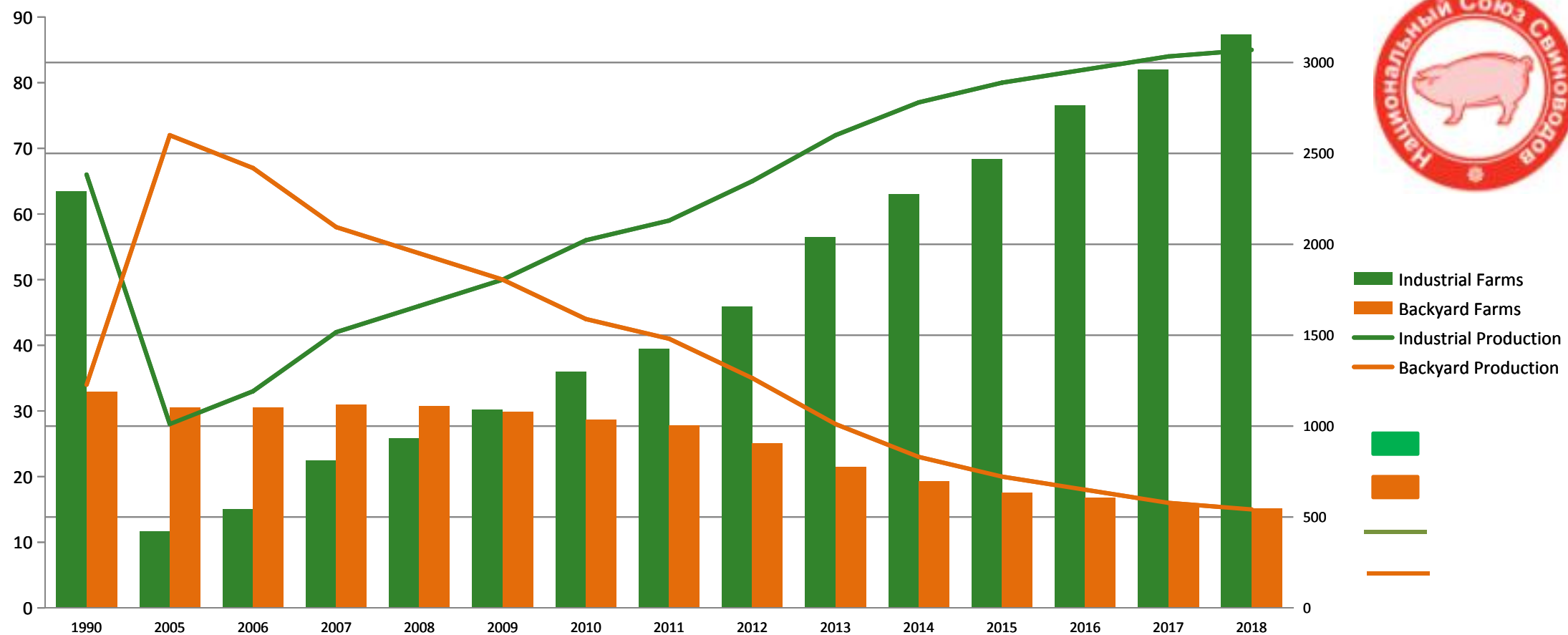
只有通过早期报告、病毒快速精确的诊断、政府捕杀和严控动物、猪肉的流转相结合，才可有助于根除病毒。

- ✓ Disease awareness by **all** players including not only the industrial producers but also small farmers and hunters

在ASF病毒的控制及根除上，需要知道所有的参与者不仅是规模化猪场，小农户及猎户也扮演了非常重要的角色。

Pork production in Russia in 2005-2018

俄罗斯猪肉生产图示（2005-2018）





Thank you

INFO@VNIIVVIM.RU

“African Swine Fever is a
man-made disease”

“非洲猪瘟是人为
带来的疾病”

<https://www.pigprogress.net/Health-Diseases/Outbreaks/2015/12/African-Swine-Fever-is-a-man-made-disease-2716712W/>