

Implementing internal and external biosecurity practices to reduce outbreaks and work toward elimination of virus from breeding herds

Leman China Conference

October 20-22, 2023
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Porcine Reproductive and Respiratory Syndrome (PRRS)

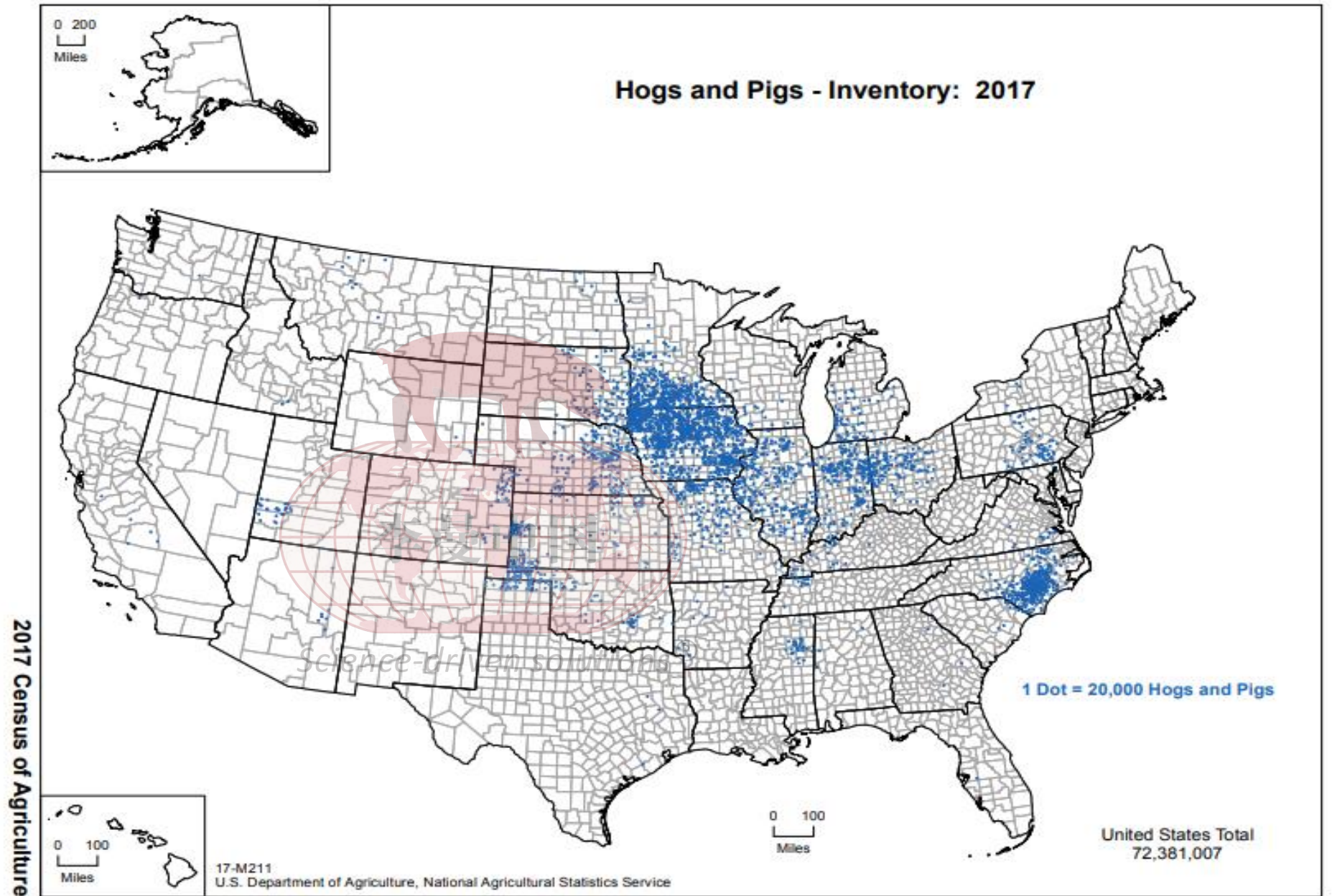
- PRRSv
 - Isolated in early 1990s
 - European (PRRSv-1) and North American (PRRSv-2)
 - Enveloped, single-stranded positive sense RNA virus^{1, 2}
 - Cost of PRRSv
 - \$664 million annual cost to U.S. pork producers³
 - Reproductive and respiratory disease
 - Significant Knowledge Gaps Remain
 - Modes of Transmission
 - Risk factors



1. Adams MJ, Lefkowitz EJ, King AMQ, Harrach B, Harrison RL, Knowles NJ, et al. Ratification vote on taxonomic proposals to the international committee on taxonomy of viruses. *Arch Virol.* (2016) 161:2921–49. doi: 10.1007/s00705-016-2977-6
- 2.. Sanjuán R, Domingo-Calap P. Mechanisms of viral mutation. *Cell Mol Life Sci.* 2016 Dec;73(23):4433-4448. doi: 10.1007/s00018-016-2299-6. Epub 2016 Jul 8. PMID: 27392606; PMCID: PMC5075021.
3. Holtkamp, et al. Assessment of the economic impact of porcine reproductive and respiratory syndrome virus on U.S. pork producers March 2013 *Journal of Swine Health and Production* 21(2):72-84



United States
pig production-
2017 U.S.
Department of
Agriculture,
Census of
Agriculture

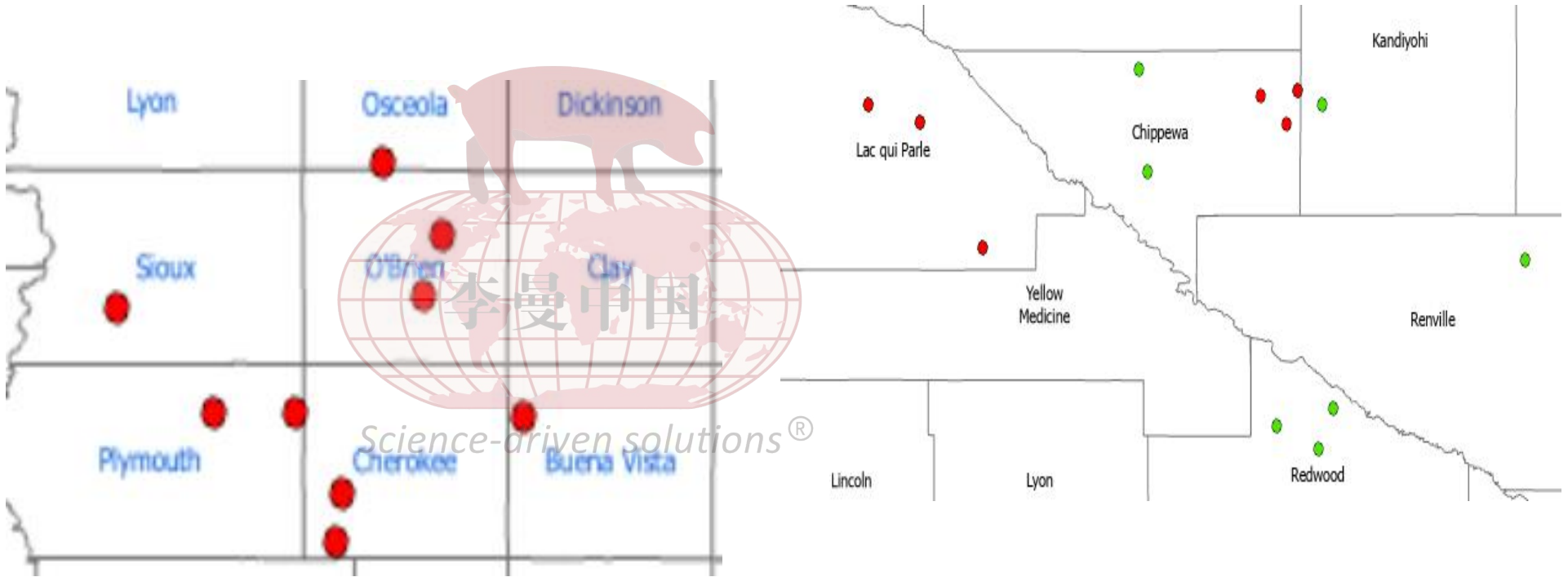


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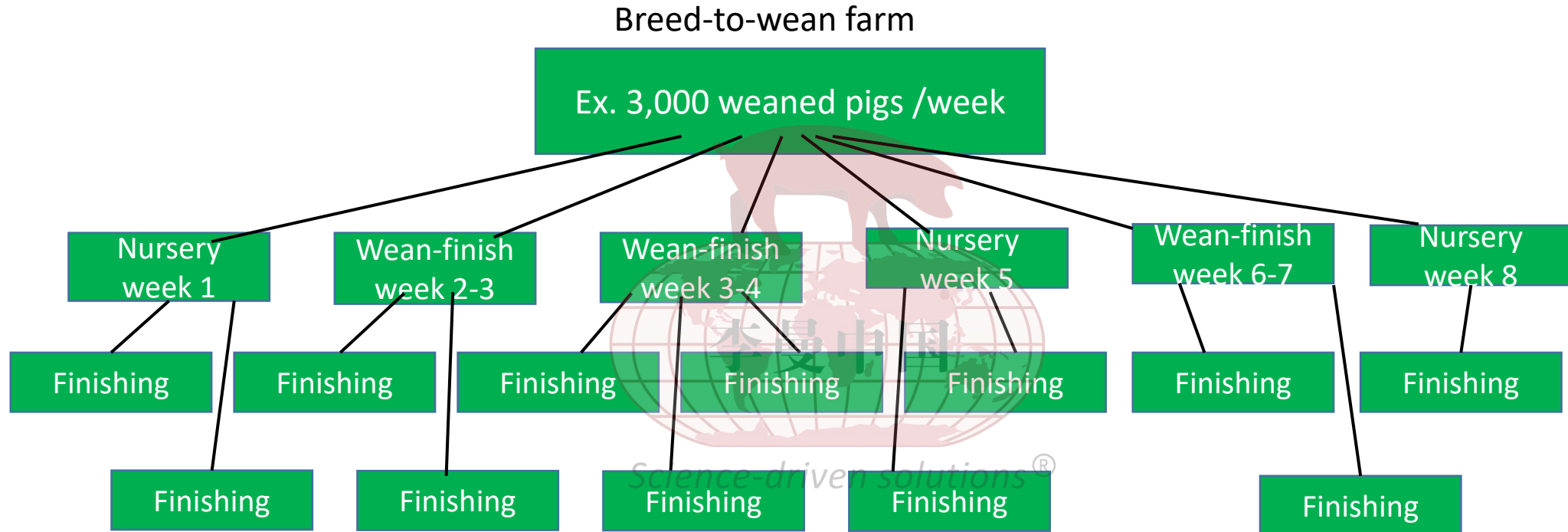
Protecting pig sites from PRRSV infection in regions with high pig density

Tobler's First Law of Geography

Everything is related to everything else. But near things are more related than distant things.
-Waldo Tobler



Multi-Site Production Model

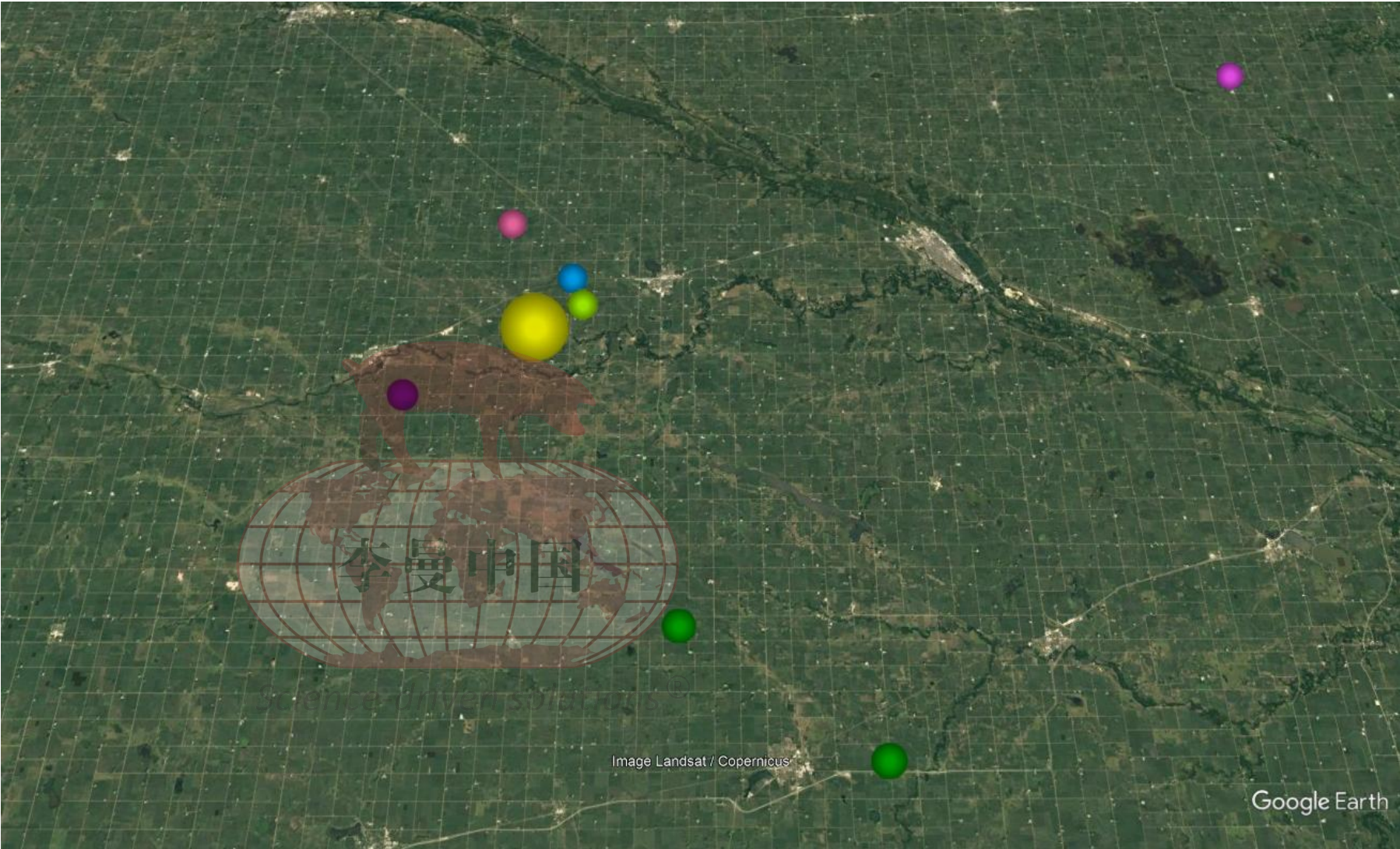


Features:

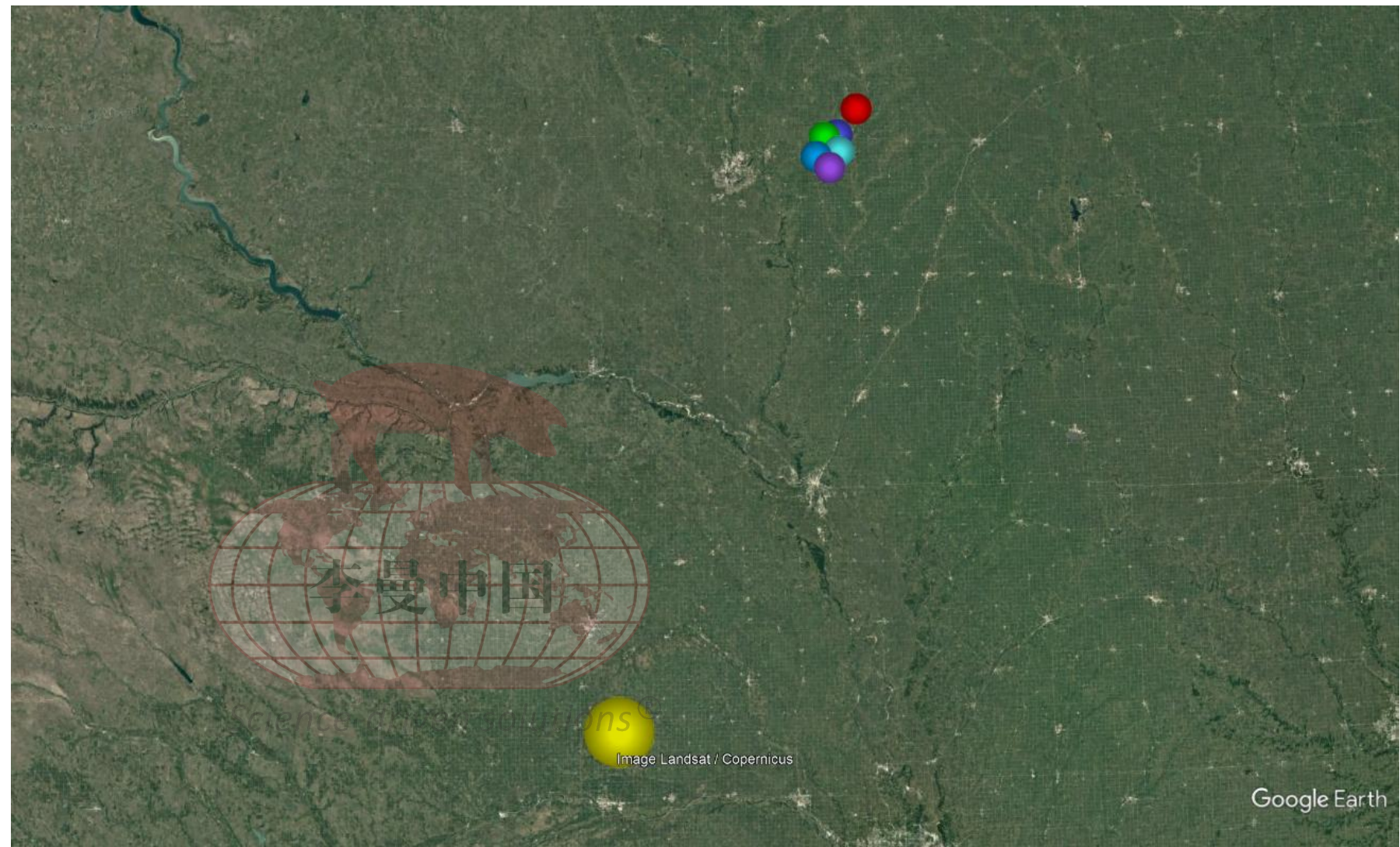
1. Weekly transport from breed-to-wean farm to nursery/wean-finish barns
2. Transport from nursery/wean-finish to finish
3. System-dependent nursery/wean-finish site capacity (2,400-8,000)
4. 12 to 20 nursery/wean-finish/finish sites for each breed-to-wean farm



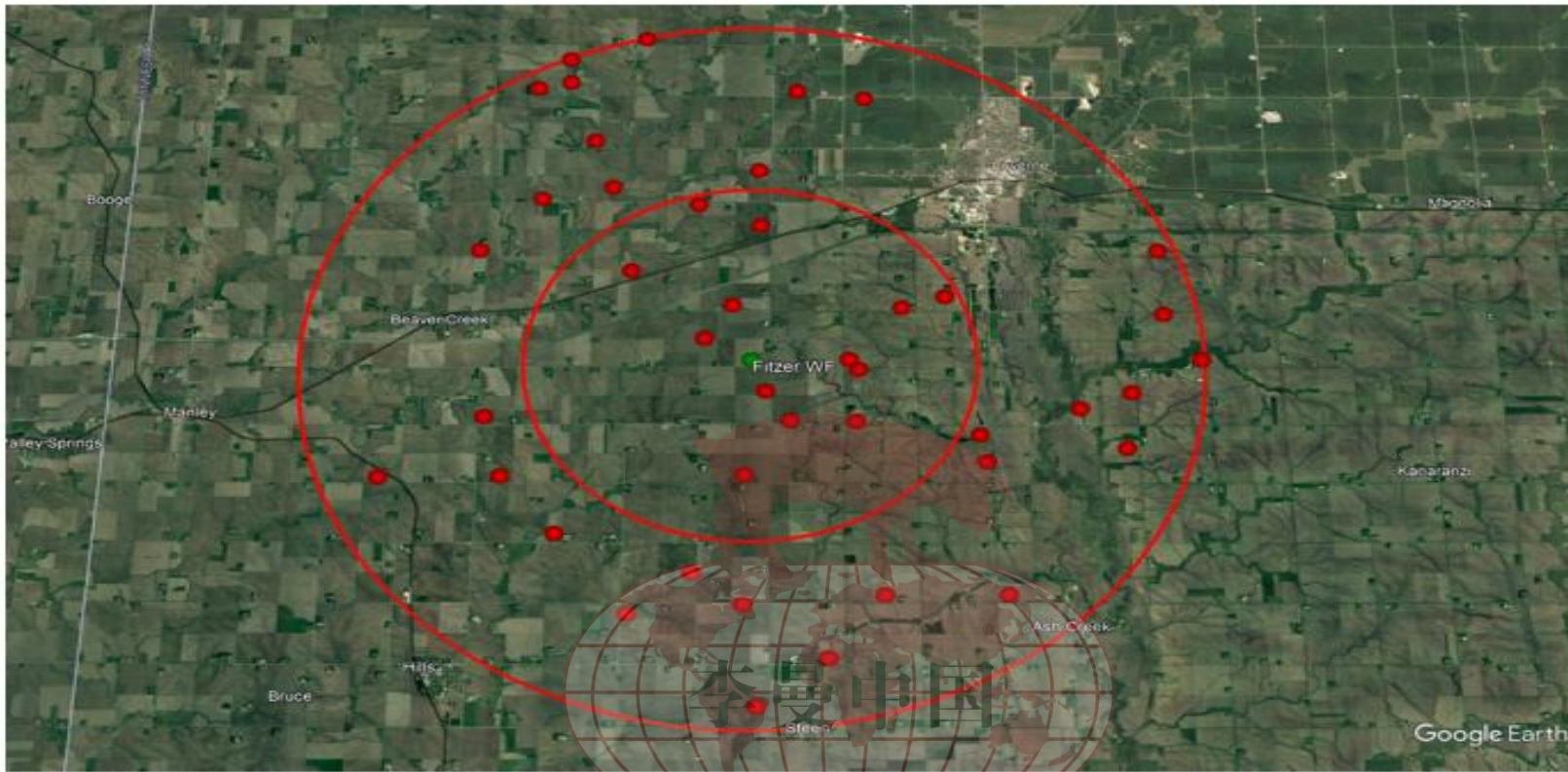
Multi-site
production:
weaned pigs
transported
to wean-finish
5-30 km



Multi-site
production:
weaned pigs
transported
250 km



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Site 2: 13 sites \leq 5 km (3.1 m) radius

Ave. distance from Site 2: 2.80 km (1.74 m)

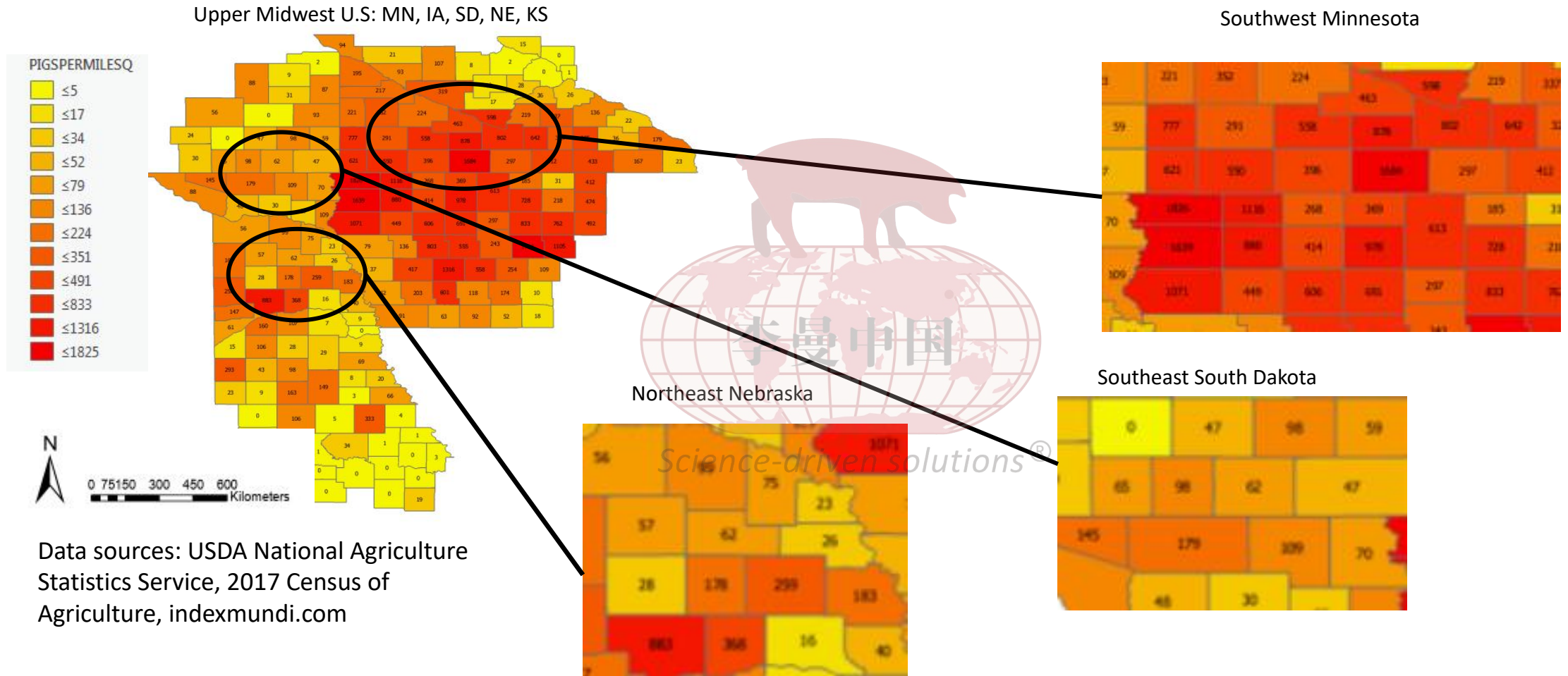
31 additional sites \geq 5 km and \leq 10 km

PRRSV surveillance results:

March 22, 2023: PCR NEGATIVE, 38 days in nursery phase



Pig Density Per Square Mile, Selected Midwest U.S. Counties

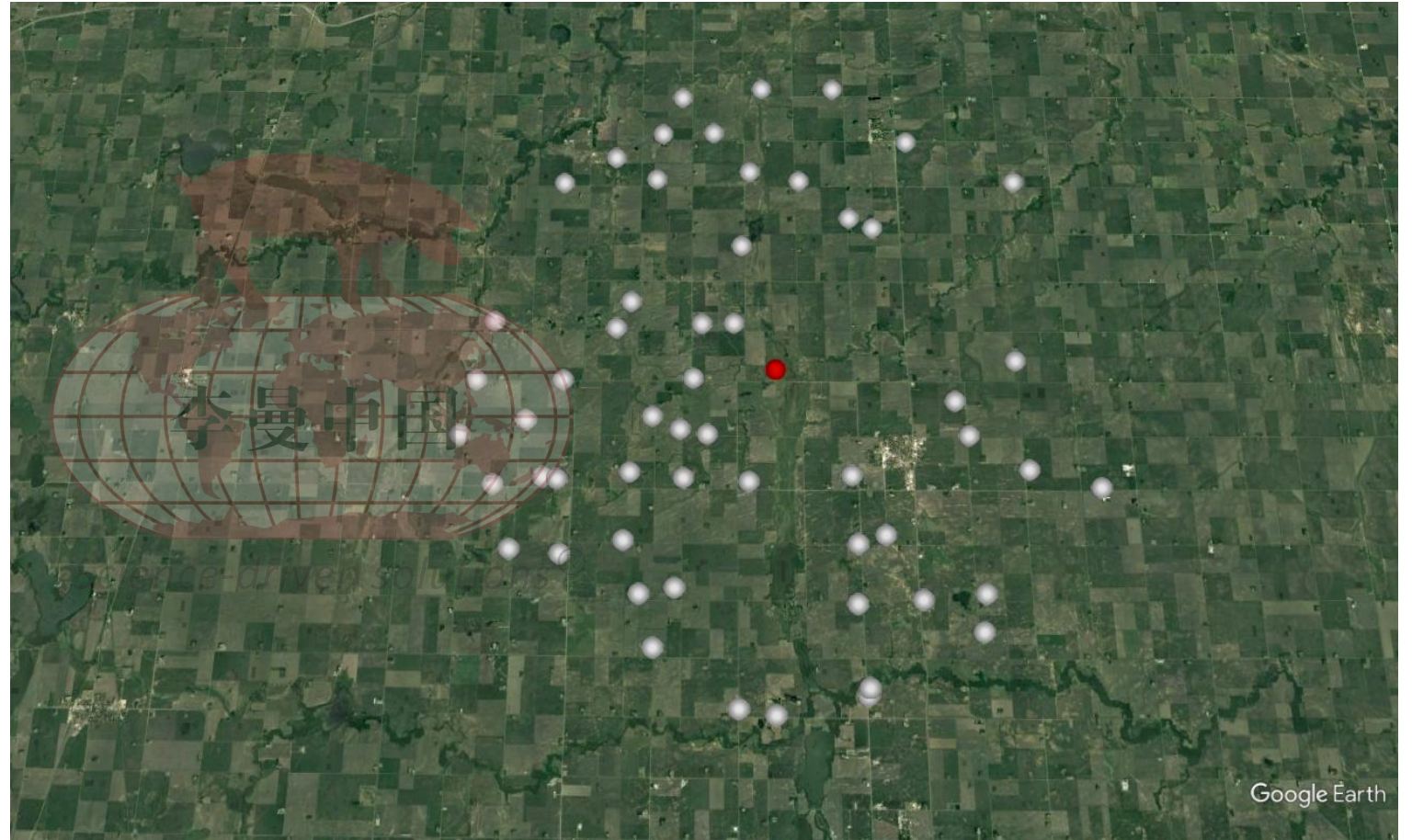


Data sources: USDA National Agriculture Statistics Service, 2017 Census of Agriculture, indexmundi.com



- Breeding herd
- Neighboring pig sites ≤ 10 km

55 pig sites ≤ 10 km
from the breeding
herd



Dutch entry system:
maintaining a
line of
separation



Supplies and equipment enter the farm through the ultraviolet light chamber



Transport vehicle sanitation



Wash

Disinfect

High
temperature
(71° C) drying



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Prevention



Shower in-
shower out
strictly
enforced

Limit visitors
to essential
visitors only

Strict
quarantine of
all bulk
supplies



Internal biosecurity: cleaning between farrowing groups



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Attention
to detail



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Air filtration of breeding herds



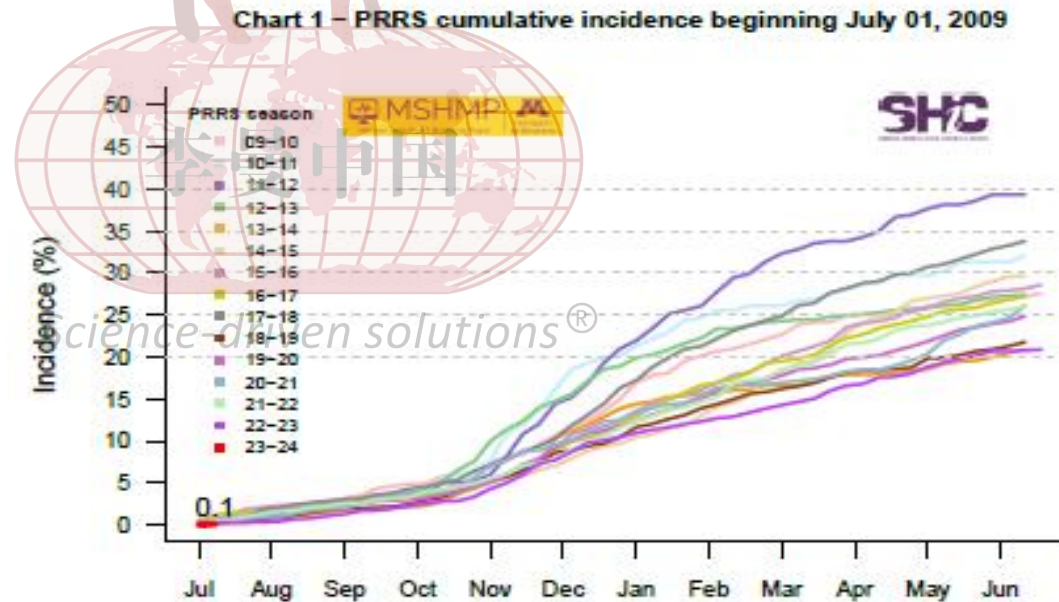
Specific management strategies to minimize PRRSV outbreaks in pig populations

- Locate pig production sites in low pig-dense areas
- Semen and replacement gilts confirmed PRRSV PCR negative before use or entry
- Dedicated inter-farm transport vehicles
- Washing, disinfection and controlled heating of all pig transport vehicles in contact with swine collection points, slaughter plants or other pig farms
- Minimal movement of people among farms, and only after down-time from any PRRSV site
- Equipment and supplies quarantined under controlled temperature (32°C) for 10 days before entry into a farm



When a sow farm has a PRRSV outbreak

- The goal is to return the breeding herd to PRRSV-negative status
- Expose all sows and gilts to the virus
- Stop gilt entry
- 300-360 days closure
 - Sometimes longer



Determination of PRRS Status of Pig Flows

- Sow farm surveillance
 - Processing Fluids
 - Serum
- Nursery, wean-finish surveillance
 - Oral Fluids
 - Serum

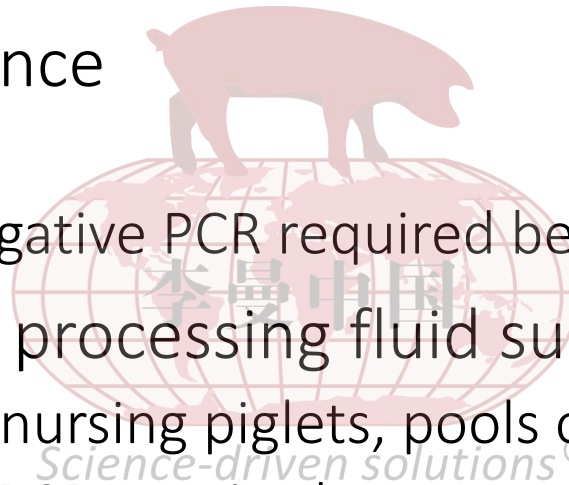


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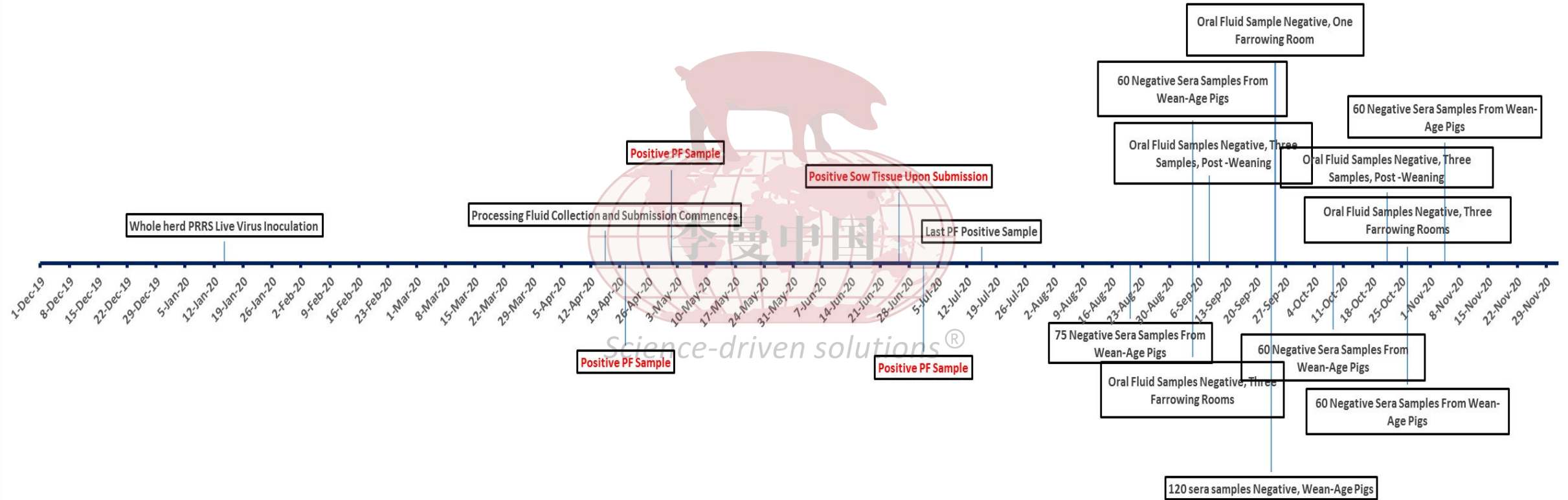
Determination of PRRSv Negative Status of the Breeding Herd

- Whole-herd virus exposure
- Processing fluid surveillance
 - One sample per room
 - One complete turn of negative PCR required before serum collection
- Semi- weekly serum and processing fluid surveillance
 - 60 sera sample negative-nursing piglets, pools of 5
 - 6- semi-weekly negative PCR required
- Upon any positive PF or serum at any point
 - The clock starts over

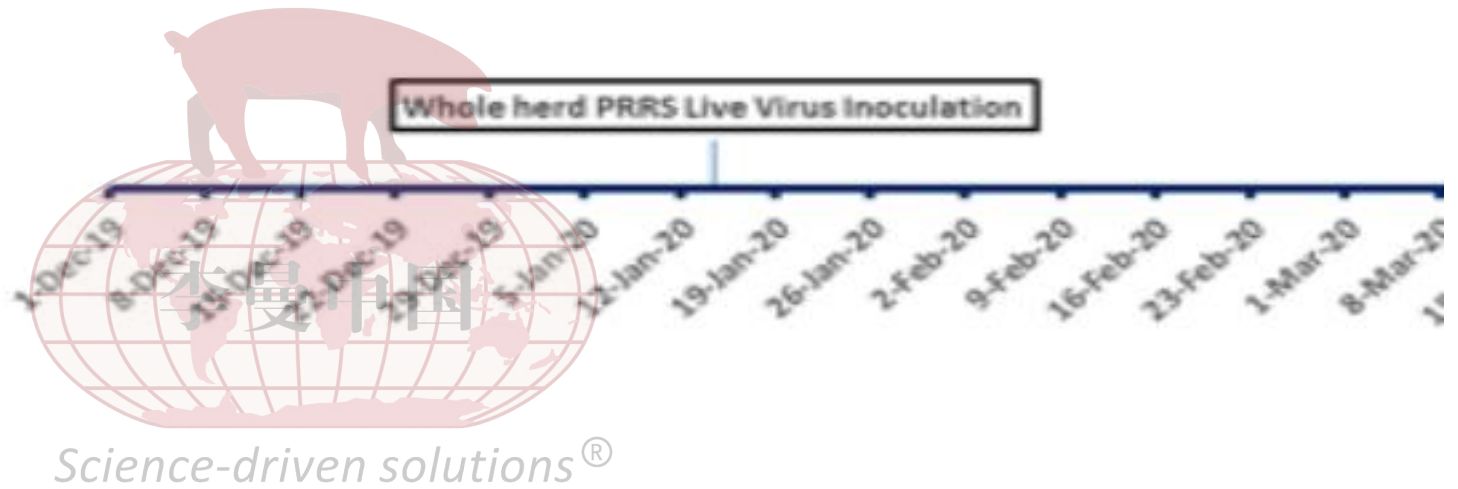


PRRS Closure/Elimination Timeline: Farm A

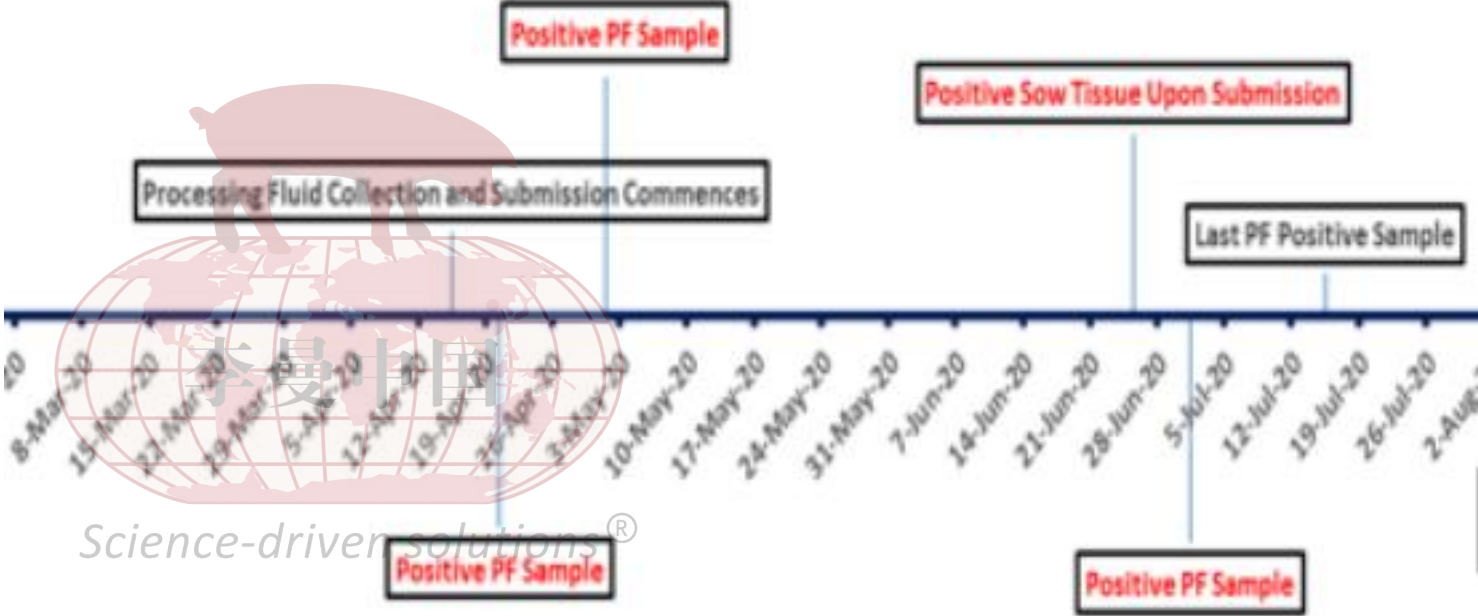
Farm A PRRSU Closure/Elimination Surveillance and Results



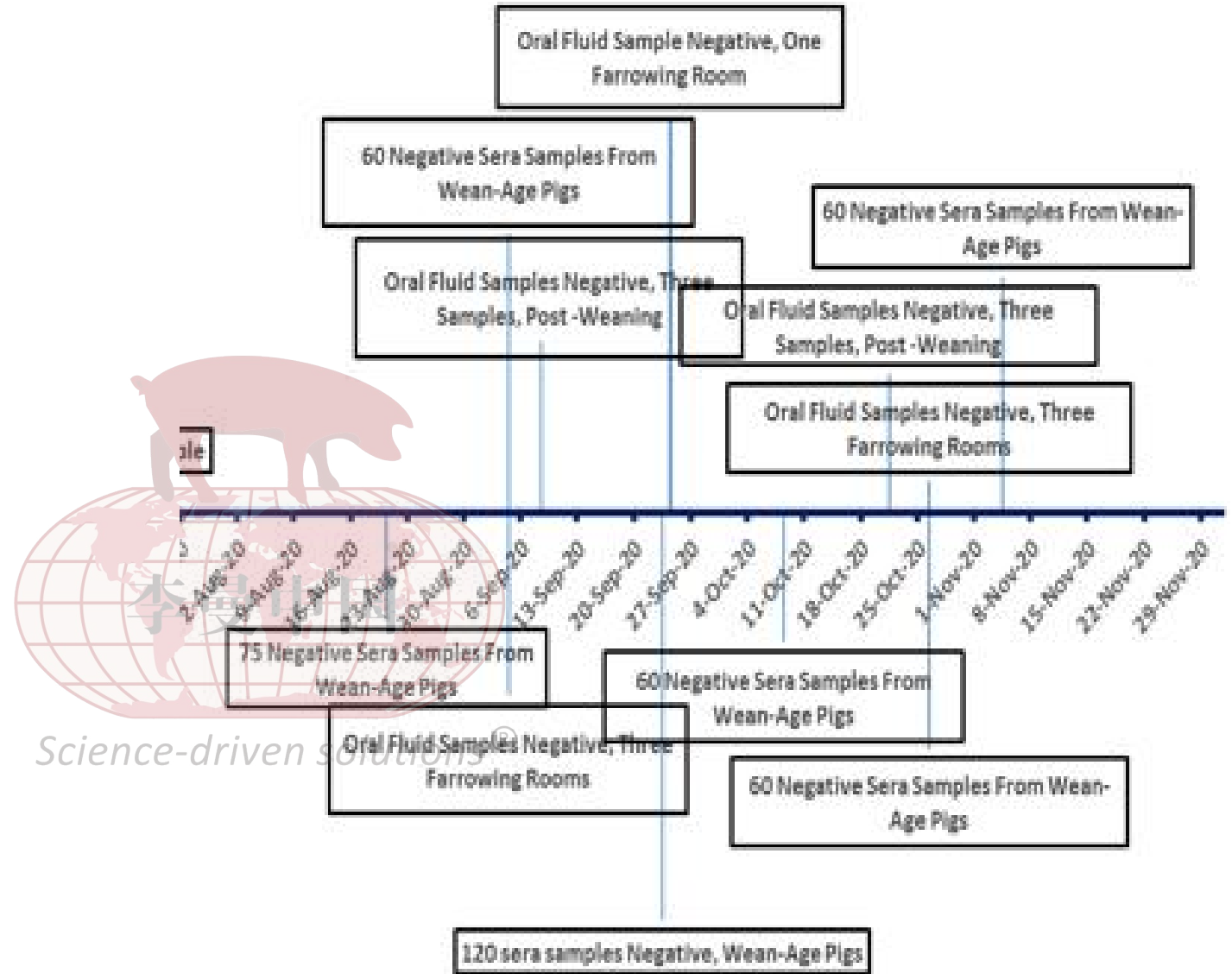
Farm A PRRSV closure: initiation



Farm A PRRSV elimination surveillance

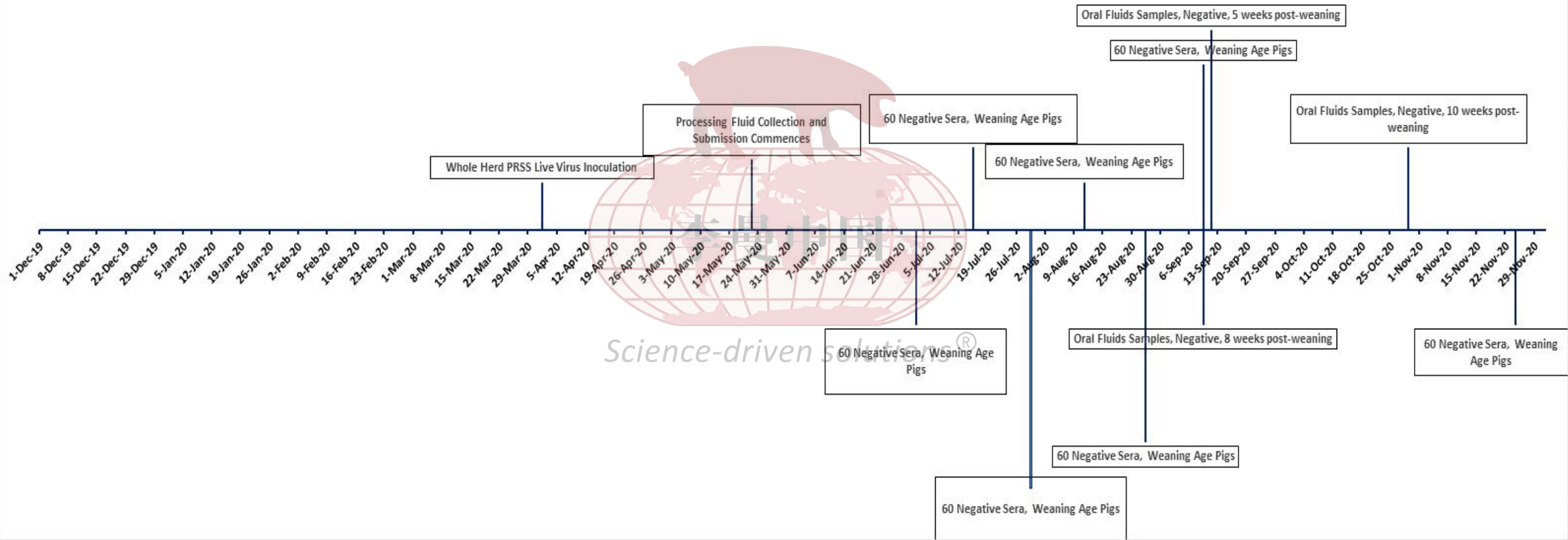


Farm A PRRSV elimination surveillance



PRRS Closure/Elimination Timeline: Farm B

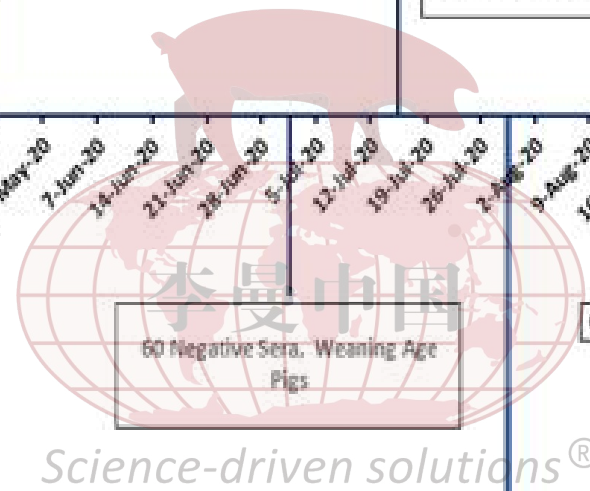
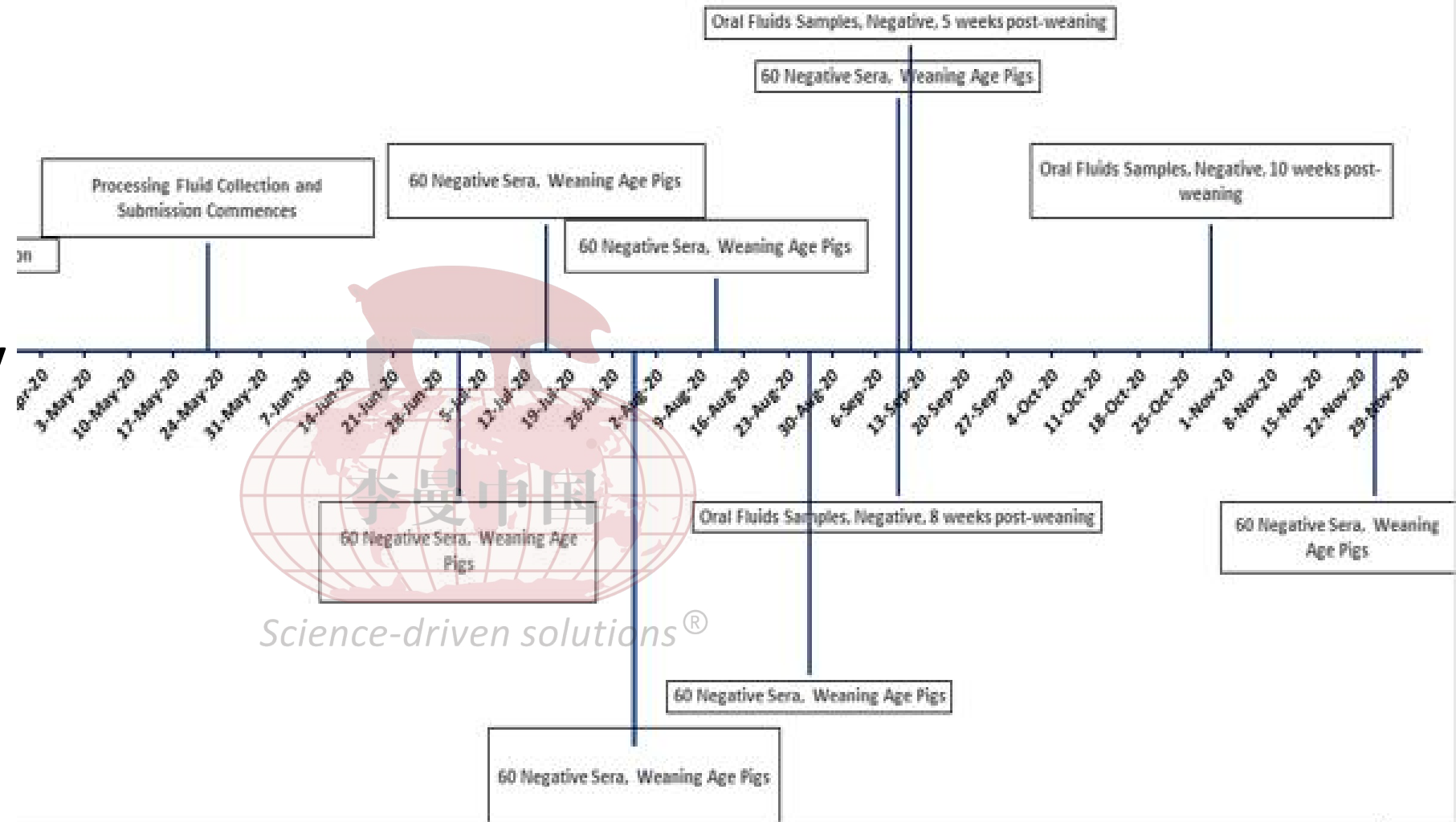
Farm B PRRS Closure/Elimination Surveillance/Results



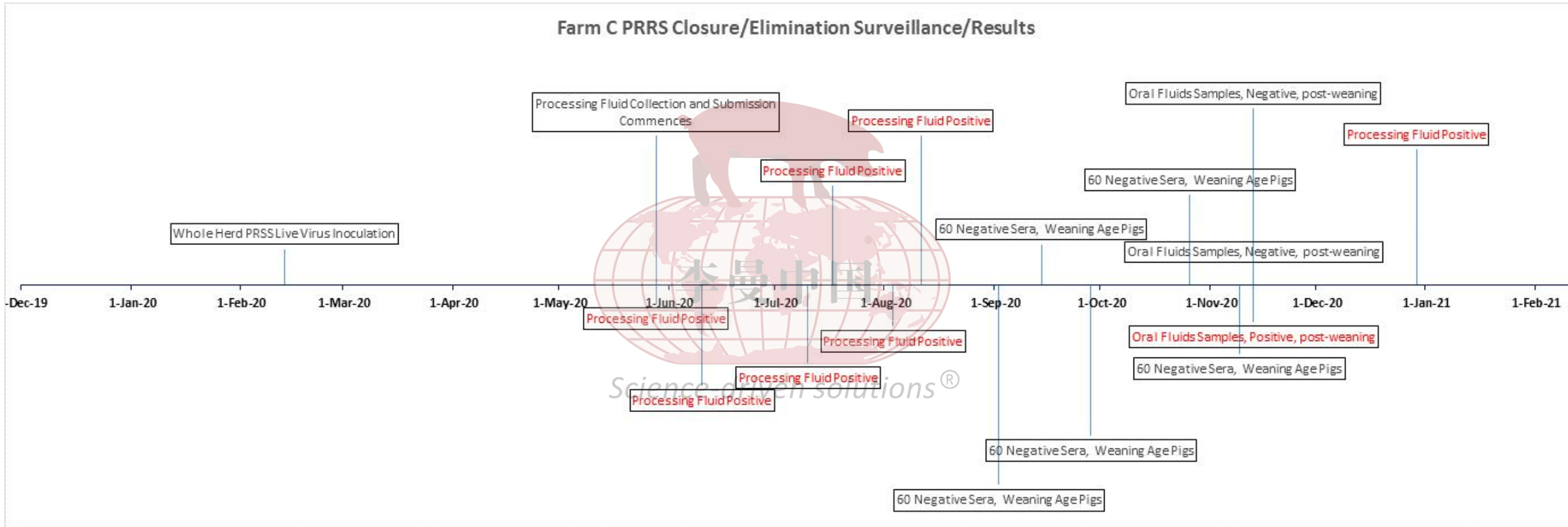
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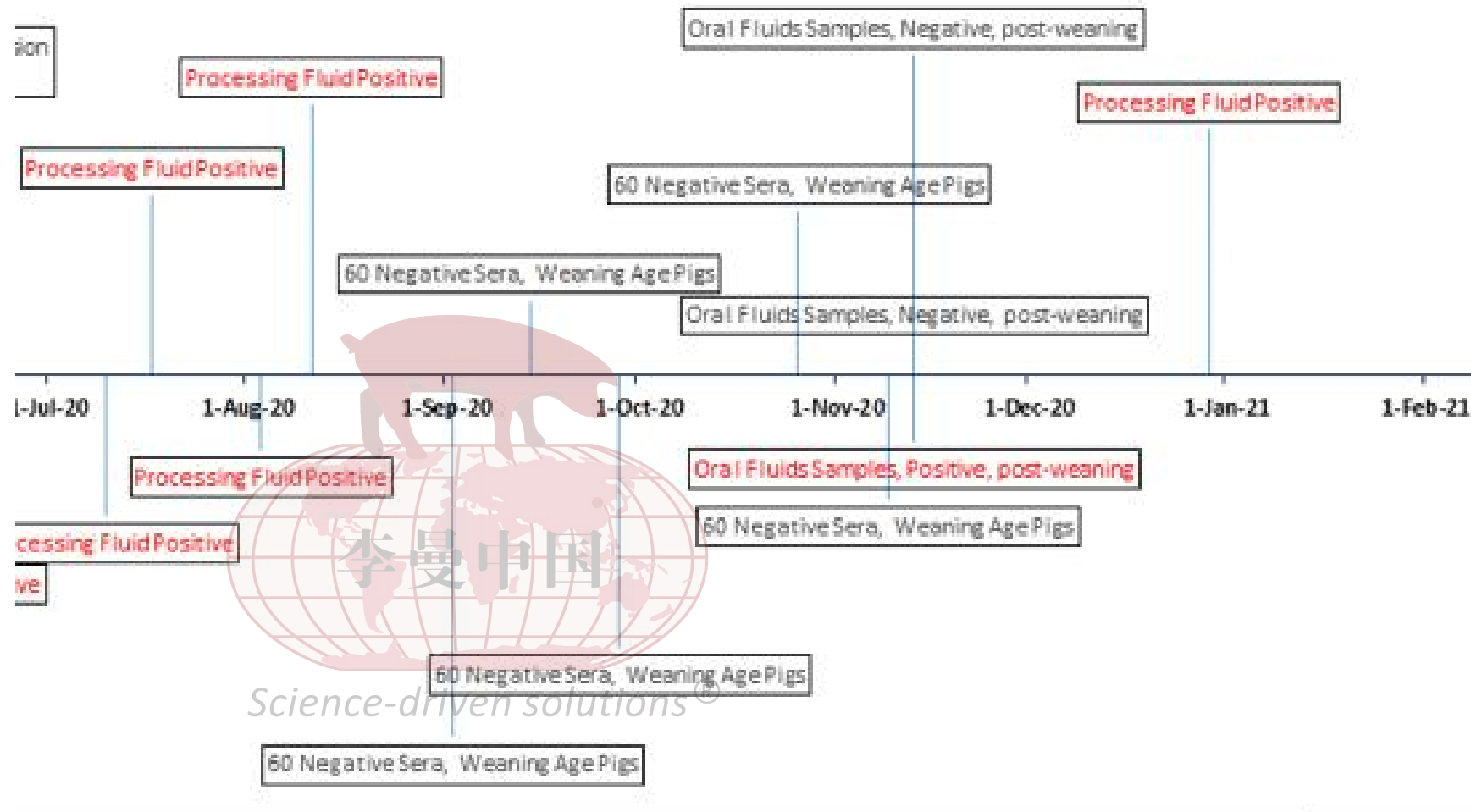
Farm B PRRSV elimination surveillance



PRRS Closure/Elimination Timeline: Farm C



Farm C PRRSV surveillance

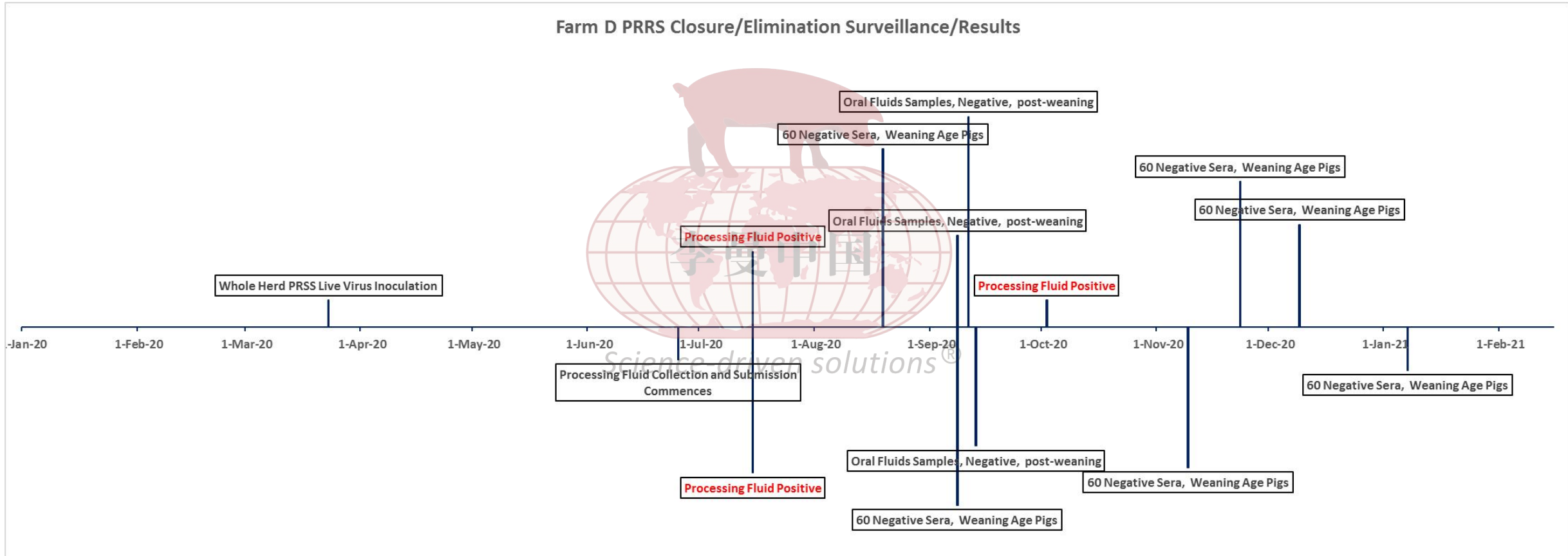


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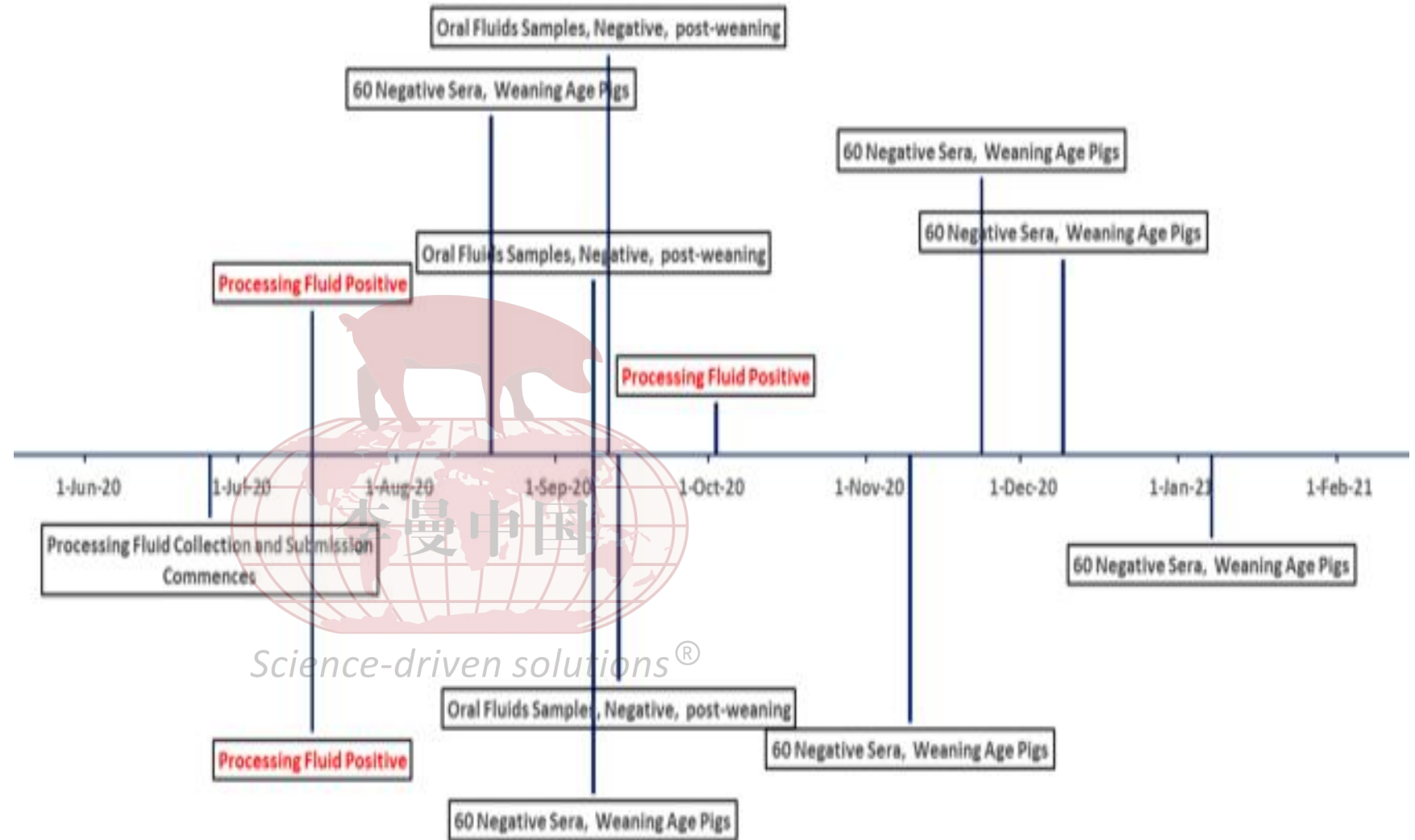


PRRS Closure/Elimination Timeline: Farm D

Farm D PRRS Closure/Elimination Surveillance/Results



Farm D PRRSV surveillance



Farm A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Processing Fluids						32.7			27.3							35.3				
Serum																				
Oral Fluids																				
Other																				

Farm A (cont.)	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Processing Fluids											35.6	34.3								
Serum																				
Oral Fluids									36.1											
Other (sow tissue)													33.0							

Farm A (cont.)	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Processing Fluids										34.8										
Serum																				
Oral Fluids																				
Other																				

Farm A (cont.)	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Processing Fluids																				
Serum																				
Oral Fluids																				
Other																				

Farm A (cont.)	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Processing Fluids																				
Serum																				
Oral Fluids																				
Other																				

Herd Closure Surveillance Timeline: Farm A



Farm A (cont.)	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	
Processing Fluids	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Serum	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Green	Grey	Grey	Green	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Oral Fluids	Green	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Green	Grey	Green	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Other	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Farm A (cont.)	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	
Processing Fluids	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Serum	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Oral Fluids	Grey	Grey	Grey	Grey	Green	Green	Green	Grey	Grey	Grey	Grey	Green	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Other	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Farm A (cont.)	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	
Processing Fluids	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Serum	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Oral Fluids	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Other	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey

Herd Closure
Surveillance
Timeline, Farm A

Processing Fluids: 160
rooms, 48 litters per room,
14 pigs per litter
PF from ~ 107,000 pigs

Serum: ~ 600 sera
samples, weaning
age pigs

Oral Fluids: 10 oral
fluids sampling
events, nursing and
post-weaning pigs

~320 days closure,
LVI to gilt entry



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Opening the breeding herd to gilt entry

- Declaring the herd PRRSV-negative
- Resumption of gilt entry
 - PRRSV-naïve
- Continue monthly PRRSV surveillance with processing fluids



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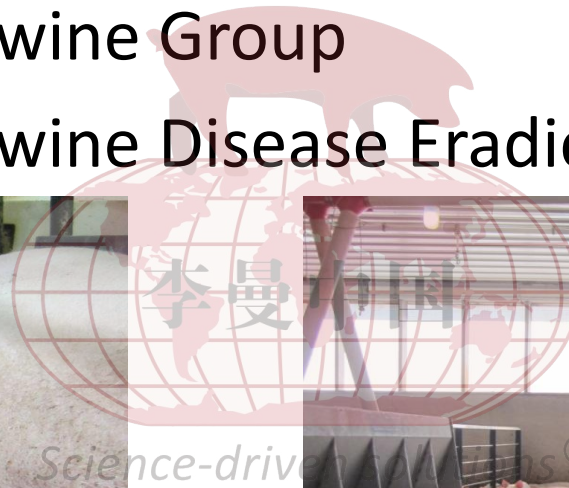


Thank you

My gratitude to:

University of Minnesota Swine Group

University of Minnesota Swine Disease Eradication Center



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