Vaccination Strategies to Control PCV2 and PCV3

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October 2023

PCV2 and PCV3

PCV2

- Multi-systemic disease
- Clinical expression
  - Wasting
  - Reproductive
  - PDNS
- Clearly defined impact (kind of)
- Several commercially available vaccines

PCV3

- Multi-systemic disease
- Clinical expression
  - Reproductive
  - Neurologic
  - Performance
- Still a great deal of debate
- Two prescription platform vaccines

PCV2 and PCV3

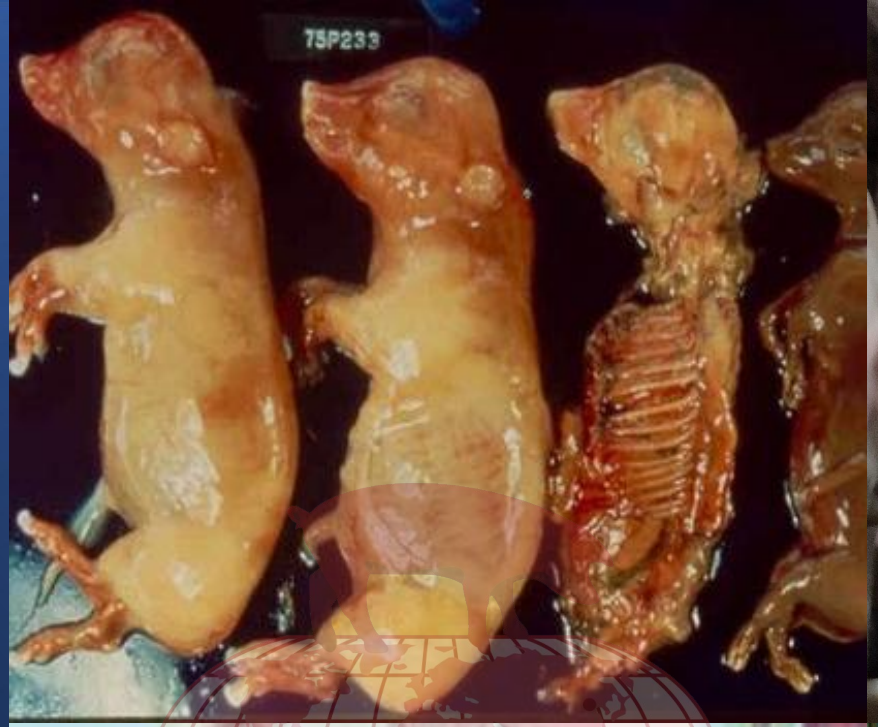
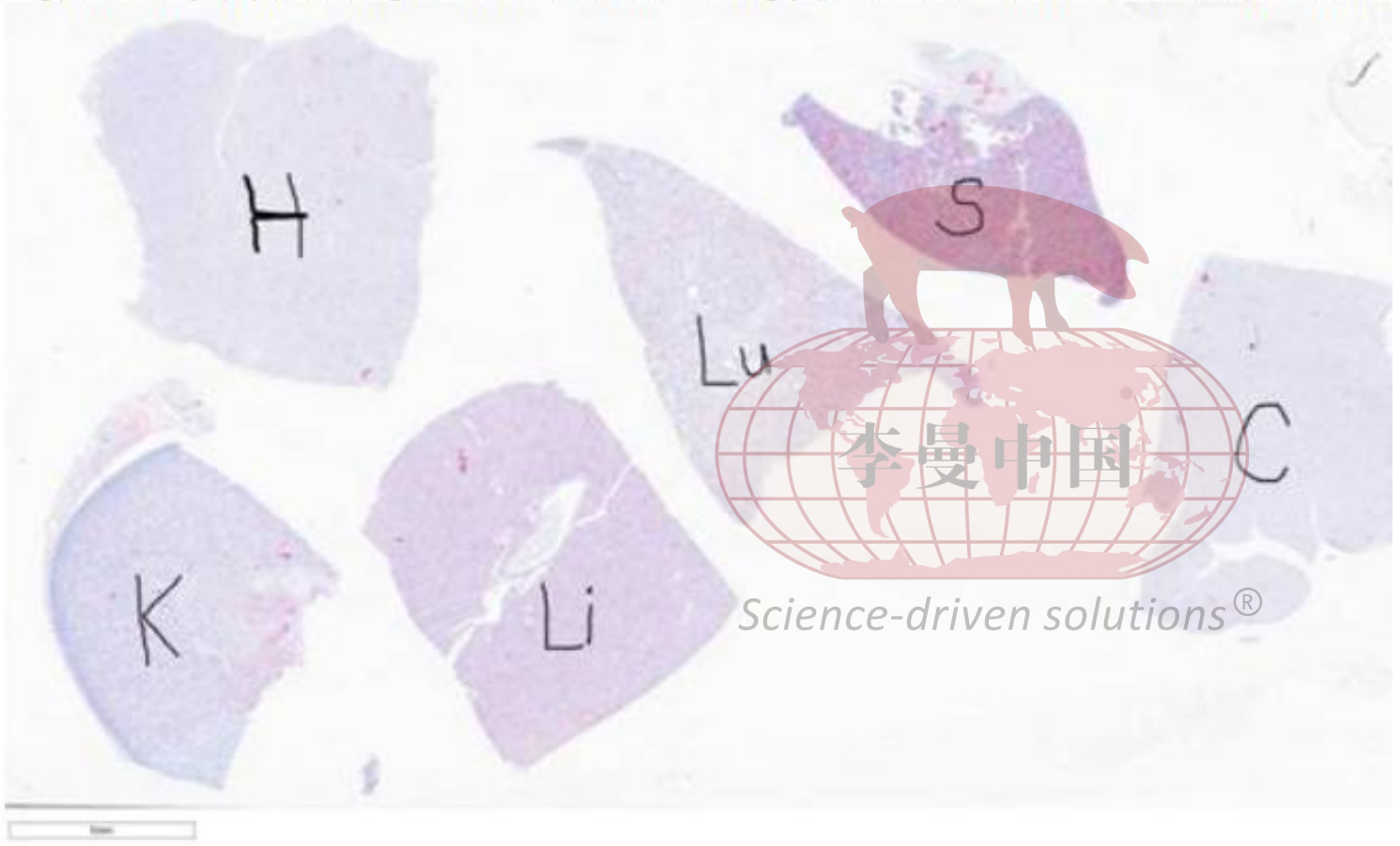


Image 3, below: Subgross PCV3 RNAscope including lung (Lu) and heart (H) from Pig1, Pig 2, kidney (K) from Pig 3. All tissues are strongly positive. Positive control (C) is on the



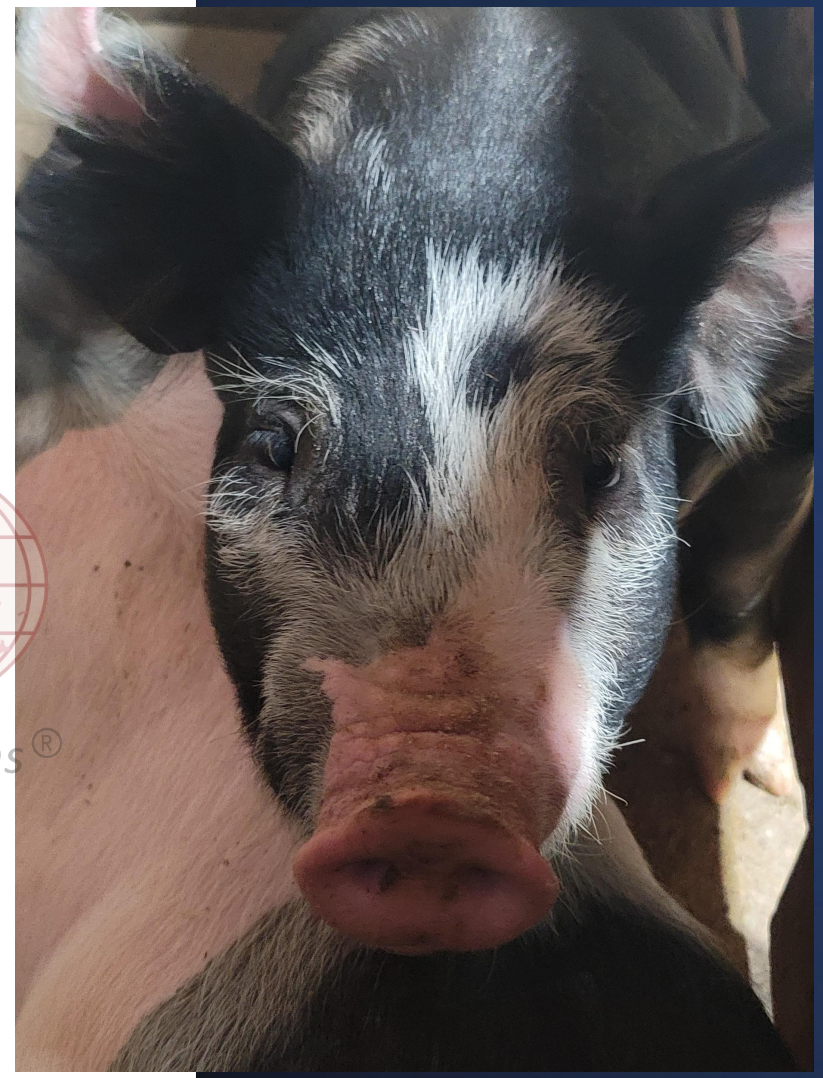
PCV2 and PCV3

Viral Evolution

- Porcine circoviruses are “lazy” and “simple” when it comes to viral replication
- Porcine circoviruses are dependent on blastogenesis in order to replicate at high levels
- Therefore, co-infections and immune stimulations, favor the replication of porcine circoviruses.

Impact on Vaccination Strategies

- Consider not just circovirus vaccination, but also major and minor viruses of swine in order to prevent co-infections
- At the same time consider a target of minimal to no viral presence at birth as certainly controlling all co-infections is not feasible
- This is the basis of vaccination strategies that I employ on client farms



PCV2/PCV3 vaccination

Breeding herd

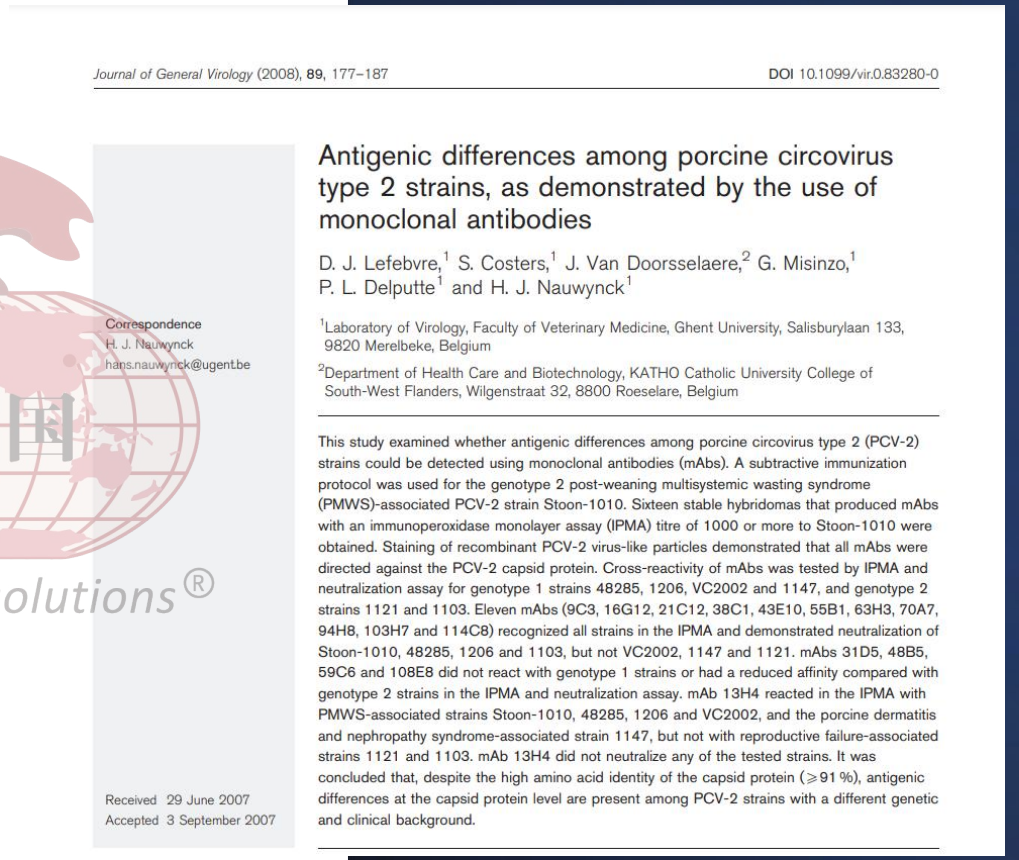
- Timing and Frequency
  - Replacement gilts at weaning, 2 doses 3 weeks apart
  - Gilts pre-breed – be thinking 9 weeks ahead
  - Sows – boost in the post-farrow to pre-breed period every parity
- To be continued…

Pigflow

- Timing and Frequency
  - 2-dose program with commercial PCV2 vaccine (no PCV3 currently)
  - Single dose is an option:
    - No PRRS or other recent disease break
    - PCV2 shedding is minimal
- DO NOT PARTIAL DOSE!!

Breeding herd continued…

- Homology
  - Cross-protection…is that good enough?
  - In a terminal setting…perhaps, for now
  - In a reproductive site…my bias is no considering what we know
  - Prescription platform vaccines allow for the ability to enhance homology and add multiple strains
  - Word of caution…don't let perfection get in the way of progress…can get caught chasing the uncatchable.



Journal of General Virology (2008), **89**, 177–187 DOI 10.1099/vir.0.83280-0

Antigenic differences among porcine circovirus type 2 strains, as demonstrated by the use of monoclonal antibodies

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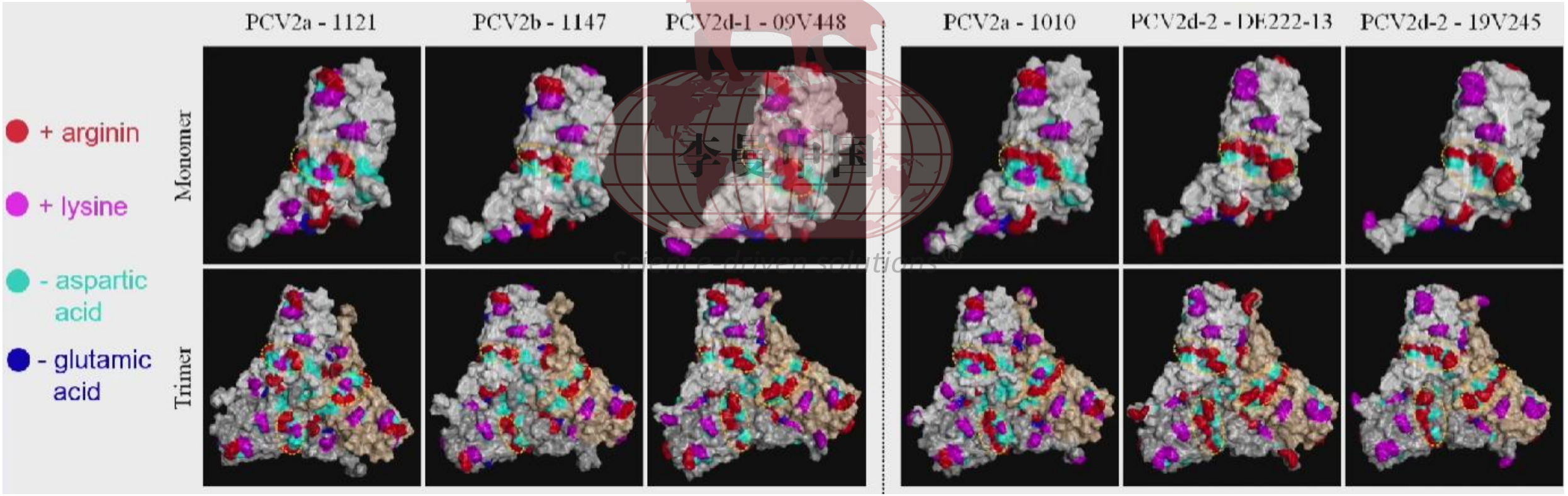
This study examined whether antigenic differences among porcine circovirus type 2 (PCV-2) strains could be detected using monoclonal antibodies (mAbs). A subtractive immunization protocol was used for the genotype 2 post-weaning multisystemic wasting syndrome (PMWS)-associated PCV-2 strain Stoon-1010. Sixteen stable hybridomas that produced mAbs with an immunoperoxidase monolayer assay (IPMA) titre of 1000 or more to Stoon-1010 were obtained. Staining of recombinant PCV-2 virus-like particles demonstrated that all mAbs were directed against the PCV-2 capsid protein. Cross-reactivity of mAbs was tested by IPMA and neutralization assay for genotype 1 strains 48285, 1206, VC2002 and 1147, and genotype 2 strains 1121 and 1103. Eleven mAbs (9C3, 16G12, 21C12, 38C1, 43E10, 55B1, 63H3, 70A7, 94H8, 103H7 and 114C8) recognized all strains in the IPMA and demonstrated neutralization of Stoon-1010, 48285, 1206 and 1103, but not VC2002, 1147 and 1121. mAbs 31D5, 48B5, 59C6 and 108E8 did not react with genotype 1 strains or had a reduced affinity compared with genotype 2 strains in the IPMA and neutralization assay. mAb 13H4 reacted in the IPMA with PMWS-associated strains Stoon-1010, 48285, 1206 and VC2002, and the porcine dermatitis and nephropathy syndrome-associated strain 1147, but not with reproductive failure-associated strains 1121 and 1103. mAb 13H4 did not neutralize any of the tested strains. It was concluded that, despite the high amino acid identity of the capsid protein (⩾91 %), antigenic differences at the capsid protein level are present among PCV-2 strains with a different genetic and clinical background.

Received 29 June 2007
Accepted 3 September 2007

Homology

Nauwynck, ESPHM 2023



Homology

Expected Results

PCR - Porcine Circovirus 2 and 3

Animal ID	Specimen	PCV2 ct/ Result	PCV3 ct / Result
GA [2 - 3]	Processing Fluid	>=37 / Negative	>=37 / Negative
GB [4 - 5]	Processing Fluid	>=37 / Negative	>=37 / Negative
GC [6 - 7]	Processing Fluid	>=37 / Negative	>=37 / Negative
982-54, Tube #1	Processing Fluid	>=37 / Negative	>=37 / Negative

Sample Type	Test	PCV2 ct	PCV2 Result	PCV3 ct	PCV3 Result
Oral fluids	PCV2_PCV3 PCR	no ct	No PCV2 detected	no ct	No PCV3 detected

Sample Type	Test	PCV2 ct	PCV2 Result	PCV3 ct	PCV3 Result
Processing Fluids	PCV2_PCV3 PCR	27.86	PCV2 detected	22.75	PCV3 detected
Processing Fluids	PCV2_PCV3 PCR	no ct	No PCV2 detected	35.35	PCV3 detected
Processing Fluids	PCV2_PCV3 PCR	29.54	PCV2 detected	20.62	PCV3 detected
Processing Fluids	PCV2_PCV3 PCR	36.86	PCV2 detected	21.97	PCV3 detected

Porcine circovirus 2,3 real-time PCR (duplex) - Oral Fluid

Porcine circovirus type 2 real-time PCR

1-PIG 1/15 WK POSITIVE 20.22 Ct40

Porcine circovirus type 3 real-time PCR

1-PIG 1/15 WK Neg

- Discussion has been given toward expectations for PCV2/PCV3 screening
  - This is where I diverge
  - Environmental contamination
  - Significance of only a positive PcR
- Repeated success with producing negative results on processing fluids and oral fluids
  - PCV2 very reliable since stabilizing the sow herds with current vaccination rigor
  - PCV3 occasionally high Ct positive PcR
  - Investigate and adjust if otherwise

Take Homes

- PCV2 and PCV3 cause multi-systemic disease in pigs
- Circovirus replication is dependent on blastogenesis and/or immune activation
- Circovirus evolution is real
- Goals should be to control co-infection and maintain a robust stable sow herd vaccination in order to get optimal benefit with pigflow vaccination
- Doing so will optimize performance, reduce replication and evolution of PCV's
- Surveillance and sequencing are needed in order to adapt vaccination strategies as needed.