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Cross-sectional study comparing different sampling materials for monitoring or surveillance of swine Influenza A virus in enzootic infected pig herds

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Study design

- 25 German sow farms: attached nursery history of swIAV
- Individual samples
 - Nasal swabs (NS)
 - Blood samples (BS)
 - Tracheobronchial swabs (TBS)
- Group samples
 - Oral fluids (OF)
 - Surface wipes (SW1: dust, SW2: toys, feeders etc.)
 - Udder skin wipes (USW)
- RT-qPCR, positive samples with ct-value ≤ 32 subtyping RT-qPCR
- Blood samples: Hemagglutination inhibition test
- Clinical score



Study design

| Sows | Individual samples | Group samples |
|---|--------------------|---------------|
| Farrowing | 10 NS, 10 BS | 2 SW |
| Breeding | 10 NS, 10 BS | 2 SW |
| Gestation | 10 NS, 10 BS | 2 SW |
| → in each production group: 4 gilts, 3 sows parity 2nd-4th, 3 sows > 4th parity | | |
| Suckling piglets | | |
| 2. – 3. Week of age | 10 NS | 2 SW, 10 USW |
| → one piglet per litter from each sow in the farrowing unit | | |
| Nursery | | |
| Beginning (4.-6. w.o.a) | 10 NS, 5 TBS | 2 SW, 4 OF |
| Mid (7.-8. w.o.a) | 10 NS, 5 TBS | 2 SW, 4 OF |
| End (9.-10. w.o.a) | 10 NS, 5 TBS | 2 SW, 4 OF |

| No of samples per farm |
|------------------------|
| 70 NS (18 Pools) |
| 30 BS |
| 10 USW (3 Pools) |
| 12 SW |
| 15 TBS (3 Pools) |
| 12 OF |

Results

- 20/25 farms RT-qPCR-positive
 - 24.8 % (n= 233/938) of samples RT-qPCR positive
 - 45.5 % (n=106/233) of samples Ct-values <32
- 5/25 farms RT-qPCR-negative
 - suspicious for enzootic swIAV due to the results of HI and pre-screening



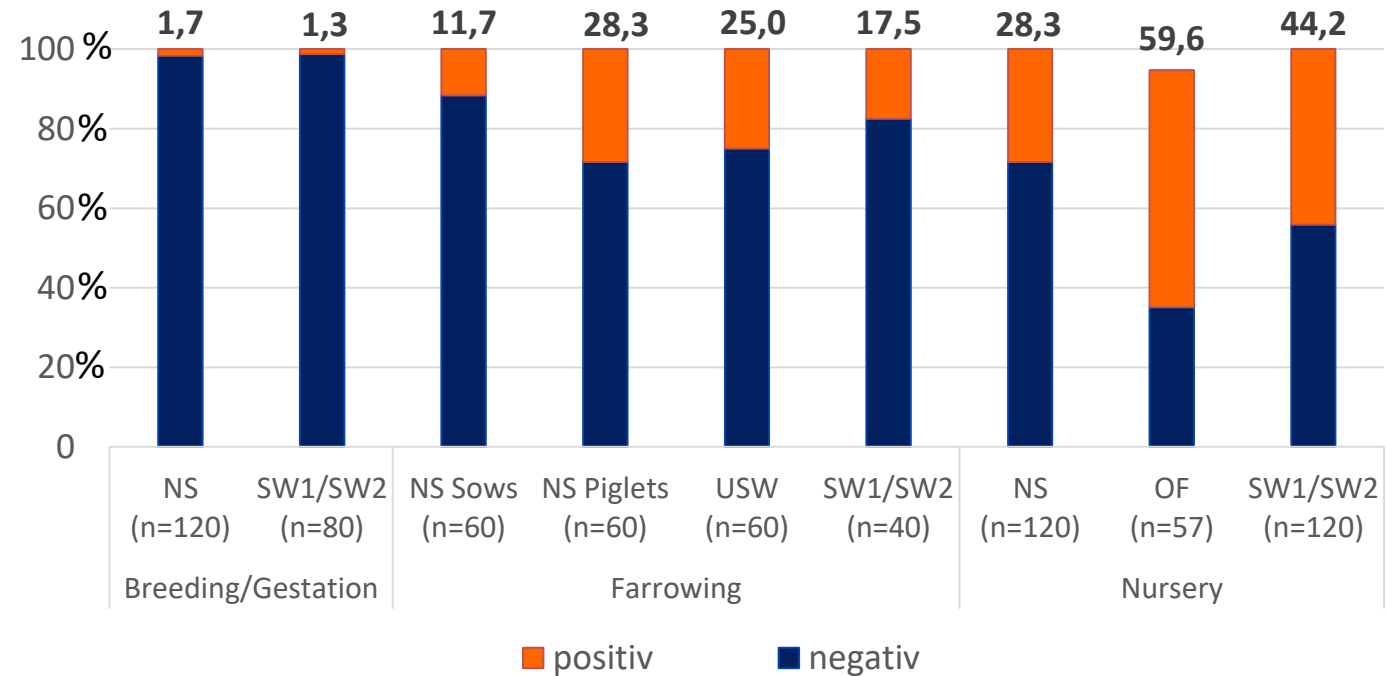
Results

Detection of swIAV in the different sampling materials

Farm level:

NS: 85 % (17/20)
 SW1: 50 % (15/20)
 SW2: 70 % (19/20)
 USW: 30 % (6/20)
 OF: 85 % (17/20)
 TBS: 45 % (9/20)

Sample level:



Results

Subtyping rate in different sampling materials (ct-value >32 an <32)

ct-value <32 in different sampling materials and age groups:

Total: NS: 65 % (n=39/60)

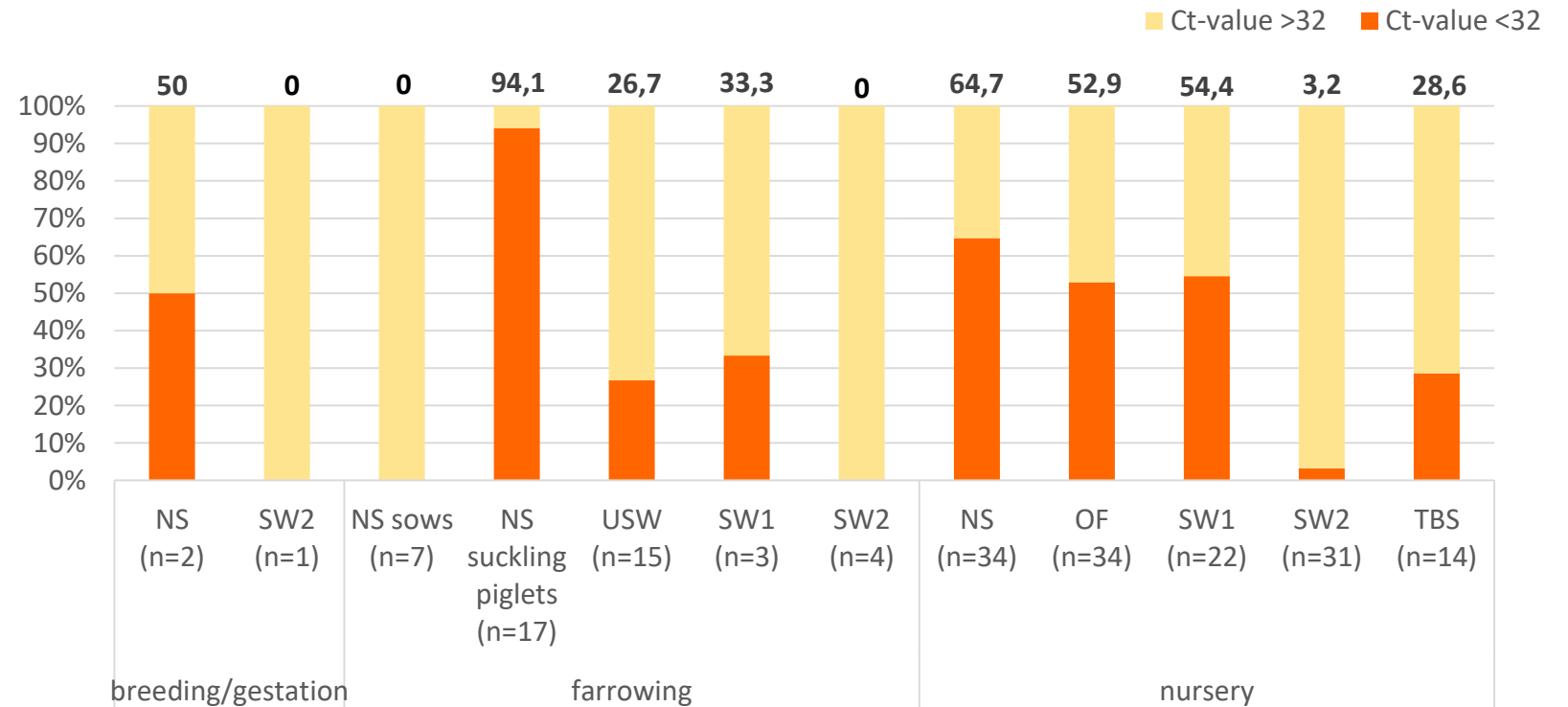
SW1: 52 % (n=13/25)

SW2: 2.8 % (n=1/36)

USW: 20 % (n=3/15)

OF: 51.8 % (n= 43/83)

TBS: 38.9 % (n=7/14)



Results

Detection of swIAV in the different age groups

RT-qPCR positive age groups per farm

- In 55 % (11/20) of RT-qPCR positive farms only 1 age group positive (in all farms nursery)
- In 25 % (5/20) of RT-qPCR positive farms 2 age groups positive
- In 20 % (4/20) of RT-qPCR positive farms all 3 age groups positive

Subtypeable age groups per farm

- In 22% (2/9) of the farms all positive age groups subtypeable

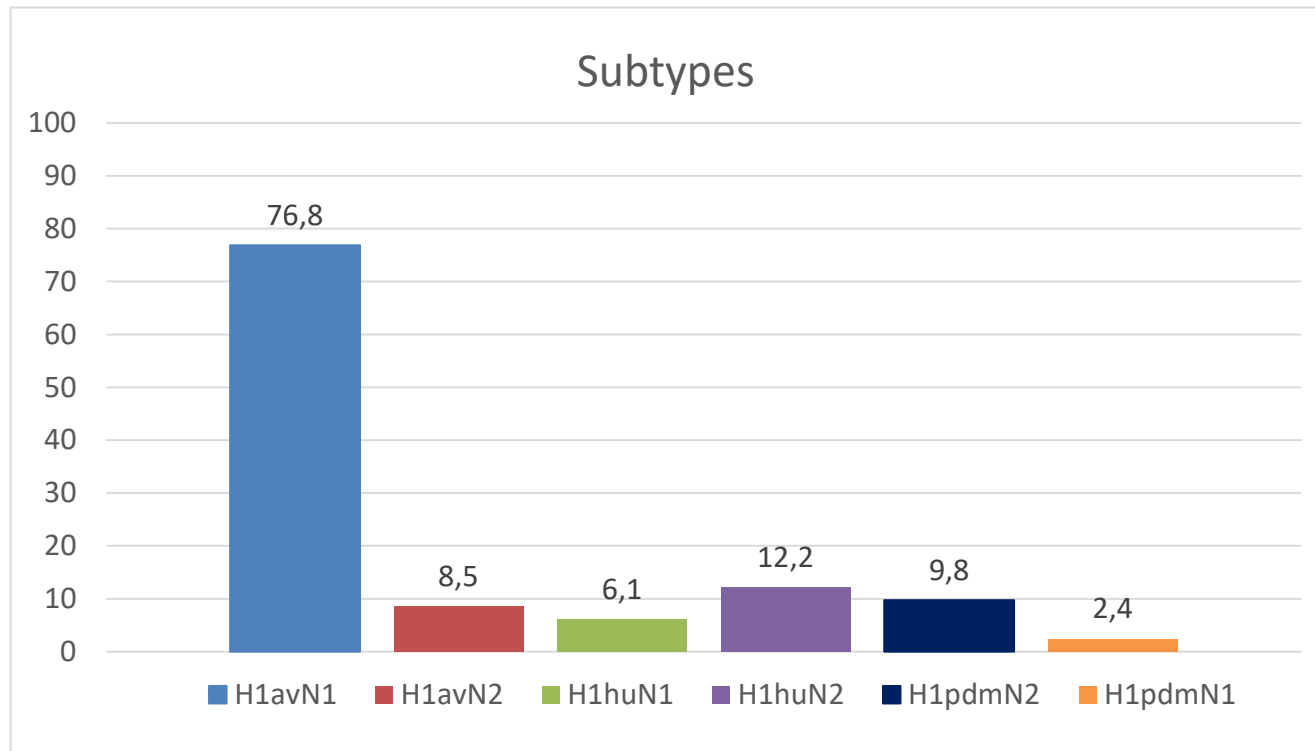
→ **Sampling of different age groups required**

| Farm | Sows | Suckling piglets | Nursery |
|------|------|------------------|---------|
| 1 | 1 ○ | 1 ● | 0 |
| 2 | 0 | 1 ● | 1 ● |
| 3 | 0 | 0 | 1 ● |
| 4 | 0 | 0 | 1 ● |
| 5 | 1 ○ | 1 ● | 0 |
| 7 | 0 | 0 | 1 ● |
| 8 | 1 ● | 1 ● | 1 ○ |
| 9 | 0 | 0 | 1 ● |
| 10 | 0 | 0 | 1 ● |
| 12 | 0 | 0 | 1 ● |
| 13 | 0 | 0 | 1 ● |
| 14 | 0 | 1 ● | 1 ● |
| 15 | 0 | 0 | 1 ● |
| 16 | 0 | 0 | 1 ● |
| 18 | 1 ○ | 0 | 1 ● |
| 19 | 1 ● | 1 ○ | 1 ○ |
| 22 | 0 | 0 | 1 ● |
| 23 | 1 ● | 1 ● | 1 ○ |
| 24 | 1 ○ | 1 ○ | 1 ● |
| 25 | 0 | 0 | 1 ● |

- Subtypeable sample
- Not subtypeable sample

Results

Subtypes: H1avN1, H1avN2, H1huN1, H1huN2, H1pdmN1, H1pdmN2

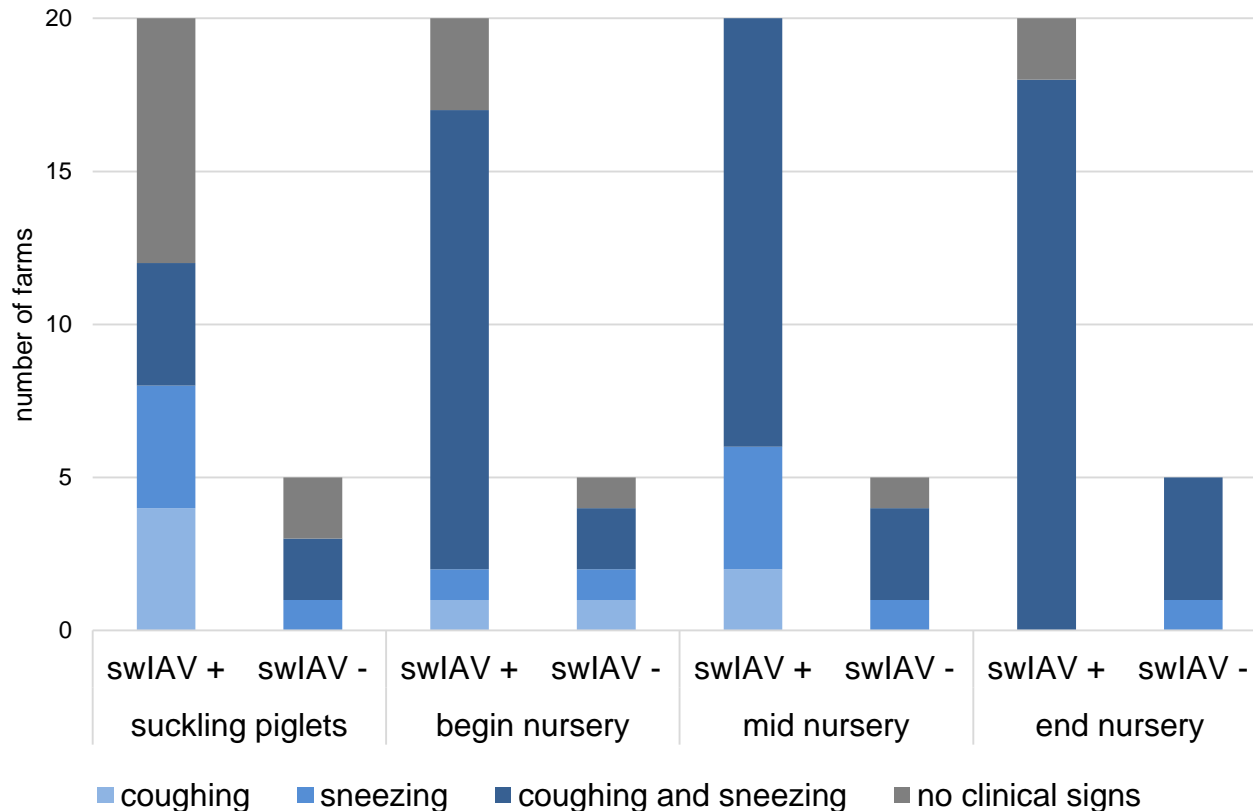


Number of subtypes found per farm
70% (n= 14/20) one subtype
15% (n=3/20) two subtypes
10% (n= 2/20) three subtypes
5% (n= 1/20) four subtypes

- In 4/6 farms with multiple subtypes, different subtypes found in different age groups
- Different subtypes found in different sampling materials

Results

Clinical signs in swIAV positive and negative pigs



- Nursery pigs 81 times more likely to show clinical signs compared to suckling piglets (CI:11.75; 560.32, $p < 0.001$)
- Piglets at beginning of the nursery more often positive in environmental wipes SW1 and SW2 if they show clinical signs
- No association between swIAV detection and clinical signs for other age groups

Discussion

- Population-based specimen highly effective for swIAV monitoring
- Nasal swabs still the preferable sampling material for swIAV surveillance
- Exclusive sampling of single age groups does not cover all circulating subtypes on farm
- Clinical signs do not necessarily correlate with swIAV detection
- Reliance on single specimen or single age groups will compromise swIAV detection