

Serological evaluation of Influenza A virus antibody in breeding age swine in the United States

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Introduction

- Influenza A Virus (IAV) is endemic in US swine herds.
- IAV causes significant economic losses due to reduced weight gain and increased treatment costs.
- IAV has become increasingly diverse both genetically and antigenically. This diversity has made prevention efforts, such as vaccination, more difficult.
- Serologic status of replacement gilts is important for vaccination timing and content of antigens in the vaccine.

Objectives

1. Evaluate serological status against IAV of new replacement gilts entering isolation on breeding/gestation farms.
2. Evaluate serological evidence of exposure to six IAV antigens representing major lineages currently circulating in US swine.

Materials and Methods

- 504 serum samples collected from new replacement gilts in Regions 1, 2, 3, 4 of USDA Regional Map (Figure 1).
- Two serological assays evaluated the antibody response
- Nucleoprotein Enzyme Linked Immunosorbent Assay (NP ELISA)
 - Broadly cross-reactive assay detects antibody to NP.
 - Each serum sample was tested once using a commercial kit from IDEXX.
 - Exposure, whole virus vaccine, and maternal antibody can be detected by NP ELISA
- Hemagglutination Inhibition Assay (HI)
 - Highly specific assay. Each serum sample was tested 6 times, once for each virus.
 - Six viruses selected from the USDA IAV repository
 - H1- γ , H1- δ 1 and H1- δ 2 IAV
 - H3 red cluster, H3 green cluster, H3-human like IAV



Figure 1. USDA IAV-S Surveillance Map

Results

- **NP ELISA (Table 1)**
 - Region 1 had few NP ELISA positive swine, suggesting limited natural exposure.
 - Region 2 had no NP ELISA positive swine, suggesting swine were IAV antibody naïve.
 - Region 3: >60% of swine were NP ELISA positive, suggesting natural exposure prior to herd entry or vaccination
 - Region 4: >80% of swine were NP ELISA positive, suggesting natural exposure prior to herd entry or vaccination
- **HI Assay (Table 2 and Fig 2)**
 - Region 1 & 2 were HI antibody negative to six IAV, suggesting no exposure to the antigens chosen
 - Region 3: >45% of swine were positive for one or more of the antigens, suggesting natural exposure prior to herd entry.
 - H1N2- δ 1 was most commonly detected in region 3.
 - Region 4: >35% of swine were positive for one or more antigens, suggesting natural exposure prior to herd entry.
 - H1N1- γ was most commonly detected in region 4.

Table 1. Summary of NP ELISA results by Region

NP ELISA			
Region	# of Swine (N)	# Pos	% Pos
1	131	10	7.6
2	123	0	0.0
3	130	83	63.9
4	120	100	83.3
Overall	504	193	38.3

Table 2. Summary of HI assay results by Region

HI Assay			
Region	# of Swine (N)	# Pos	% Pos
1	131	0	0
2	123	0	0
3	130	64	49.2
4	120	43	35.8
Overall	504	107	21.2

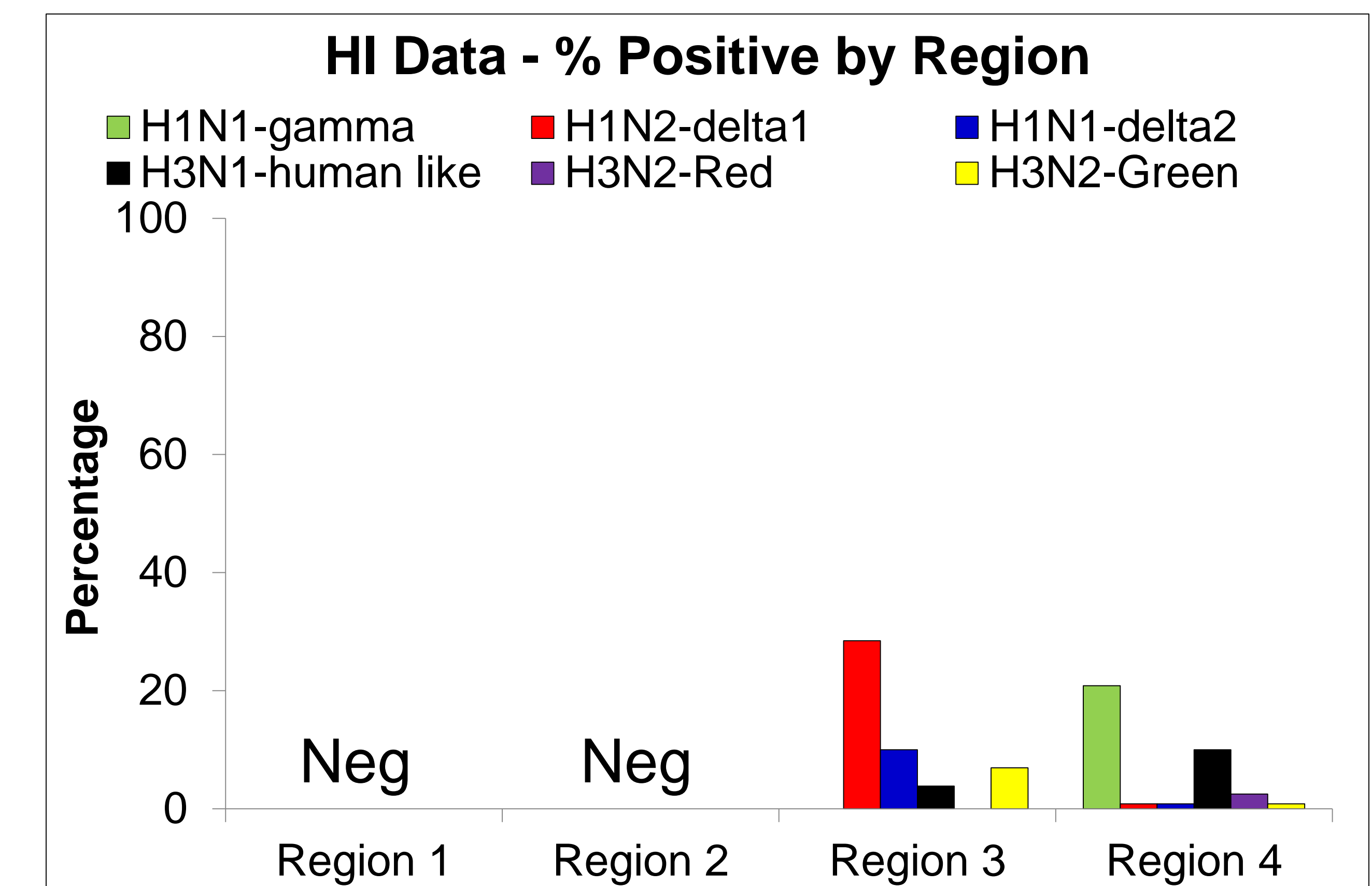


Fig 2. Percent HI antibody positive by region against 6 IAV

Conclusions

- A portion of replacement gilts appear to be antibody negative prior to herd entry and vaccination.
- This suggests limited exposure in this swine population. This naïve population could allow for the propagation of IAV within the production system.
- Exposure potential of gilts may be influenced by density of swine population at the site of origin.
- A portion of NP positive swine had undetectable HI antibodies suggesting that our six IAV did not capture all possible exposures within the samples tested or HI antibodies wane prior to ELISA antibodies.
- The diverse antigenic exposures highlights the difficulty in vaccine development and diagnostic testing.
- This suggests the HI assay is most appropriate for herd-specific evaluation with local viral isolates.
- The data suggests potential regional differences in IAV exposure histories.

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