

Improving transport biosecurity and reducing risk of disease spread with biosecurity management software

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Introduction

Research confirms that people and vehicle movements play a significant role in the spread of swine diseases like porcine epidemic diarrhea (PEDV) and porcine reproductive and respiratory syndrome (PRRSV). Dr Derald Holtkamp and a team of researchers at Iowa State University reviewed infections of PRRSV, PEDV and porcine deltacoronavirus (PDCoV) at growing-pig sites to investigate biosecurity gaps. They followed 75 groups of pigs from nursery to finish, all of which were negative for PRRSV at placement. Of these, only two stayed negative after being placed. The researchers identified one pattern that stood out from the data. It was how closely the frequency of events (such as movements, deliveries, maintenance, etc) corresponds to infection of PRRSV, PEDV, and PDCoV, in both the nursery and finishing phases.¹

Additionally, farm connections such as shared personnel and animal movements have been confirmed by the USDA in the spread of highly pathogenic avian influenza (HPAI) among dairy herds.²

Pillen Family Farms is a 3rd generation, family owned and operated swine farm based out of Nebraska. The company piloted Farm Health Guardian biosecurity management software to test its ability to improve their transport biosecurity program and reduce the risk of disease spread between farm properties.

Methods

The pilot project involved 184 Pillen farm properties, 197 vehicles, and 71 users of the app from February – May 2024. Vehicles were linked to the software through GPS link, or by installing a GPS device to record visits to geo-fenced properties. Of the 197 vehicles, 25 were installed with a GPS taillight device, with the balance connected to the software through GPS link to existing navigation system. Vehicle types included feed trucks, market livestock trucks, nursery livestock trucks, sales livestock trucks, and trailers. Farm properties were geofenced in the Farm Health Guardian software system, and included farrow to wean barns, finishing barns, gilt development units, gene centres, nucleus farms, nurseries, and nursery finishers. Planned visits to the properties were to be validated by the Farm Health Guardian software system. Following the initial pilot project period, the software use continued, and three transport biosecurity protocols were configured for ongoing compliance monitoring between April and October 2024.

Results

A total of 22,744 property visits were recorded by the software during this period, with 17,789 (78%) of those visits being trucks/vehicles recorded through GPS link or devices. The balance were people visits recorded by the app. The software was configured to send breach alerts for trucks if they violated any one of three biosecurity rules for visits between farm properties. For example, visits to two distinct truck washes (a high-speed wash and then an audited truck wash) were required for livestock trailers travelling

from any production site with a health status of 4 or higher, before going back to a DNA site. A second rule was for dedicated trailers for a specific flow of sow to finishing barns, which includes its own truck wash. A third rule was feed truck visit order, which was to go from high health to lower health status properties for feed deliveries during the course of the week.

Biosecurity rules for people movements between farms were verified by configuring 18 health statuses for downtime requirements. The lower the number the higher the health status, with DNA sites having the highest health status and Finisher PEDV+ having the lowest health status. For example, going from a finisher (levels 9 & 10) to a DNA genetics site (level 0), requires three nights downtime. When the sites and their corresponding health statuses were configured in the Farm Health Guardian software, a notification was sent to health staff if a user attempted to visit a site without meeting the required downtime (Figure 1).

For most of the weeks (16 out of 25), there were no recorded transport breaches (Figure 2). A minimal number of breaches (three or fewer per week) occurred in 9 of the 25-week period. The ability to visualize the breach data and receive real-time notifications helped ensure a very low number of breaches were maintained by personnel. This demonstrates the impact of real-time feedback and visualizing data to increase awareness and influence biosecurity implementation.

Figure 1: Example of a breach notification alert sent through the Farm Health Guardian software when a user attempts to visit a site without meeting the required downtime.

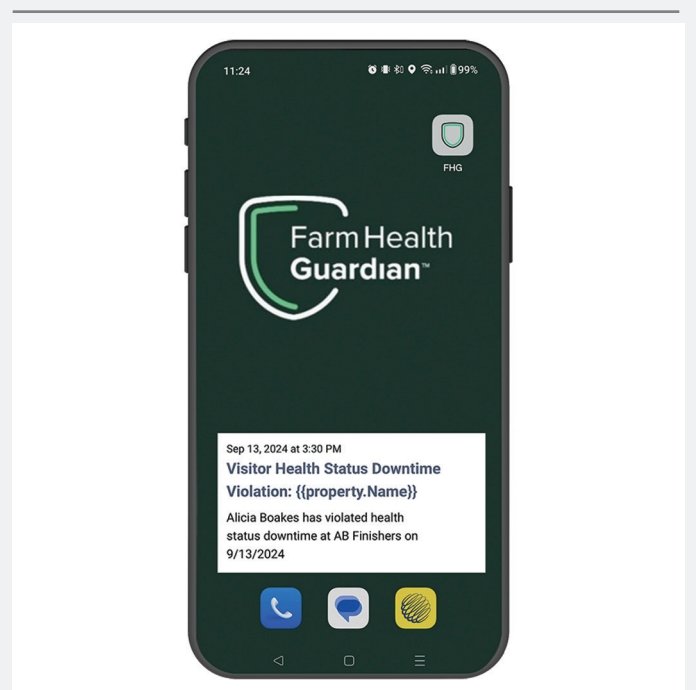


Figure 2: Breaches per week shown visually.

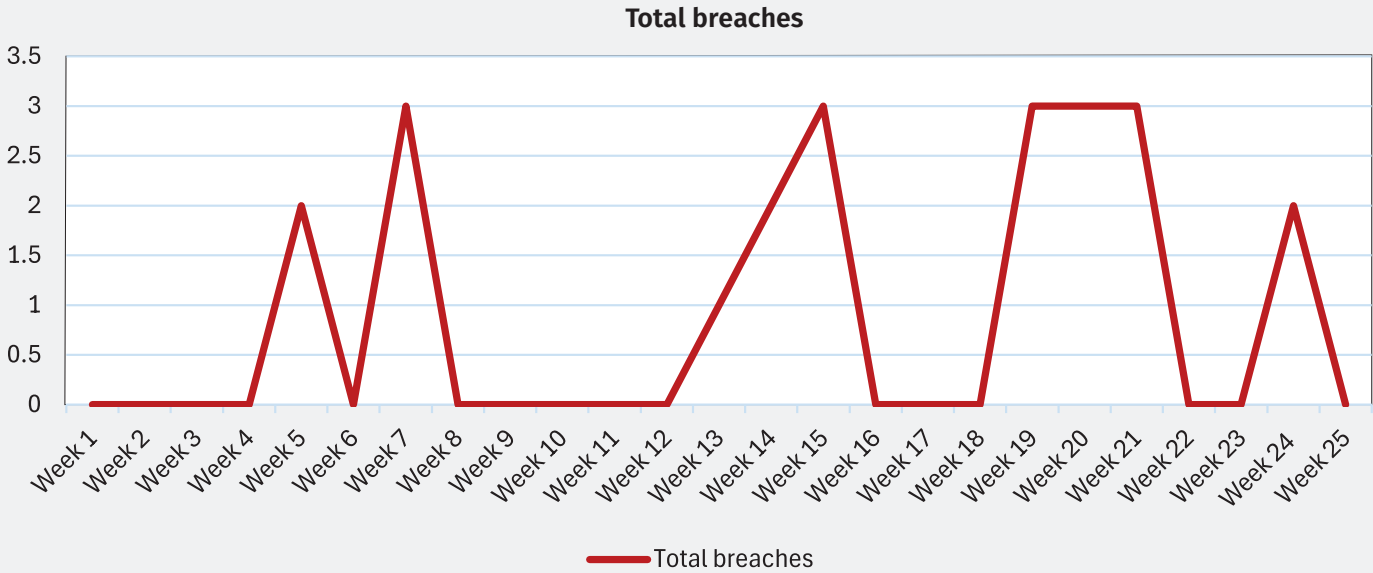
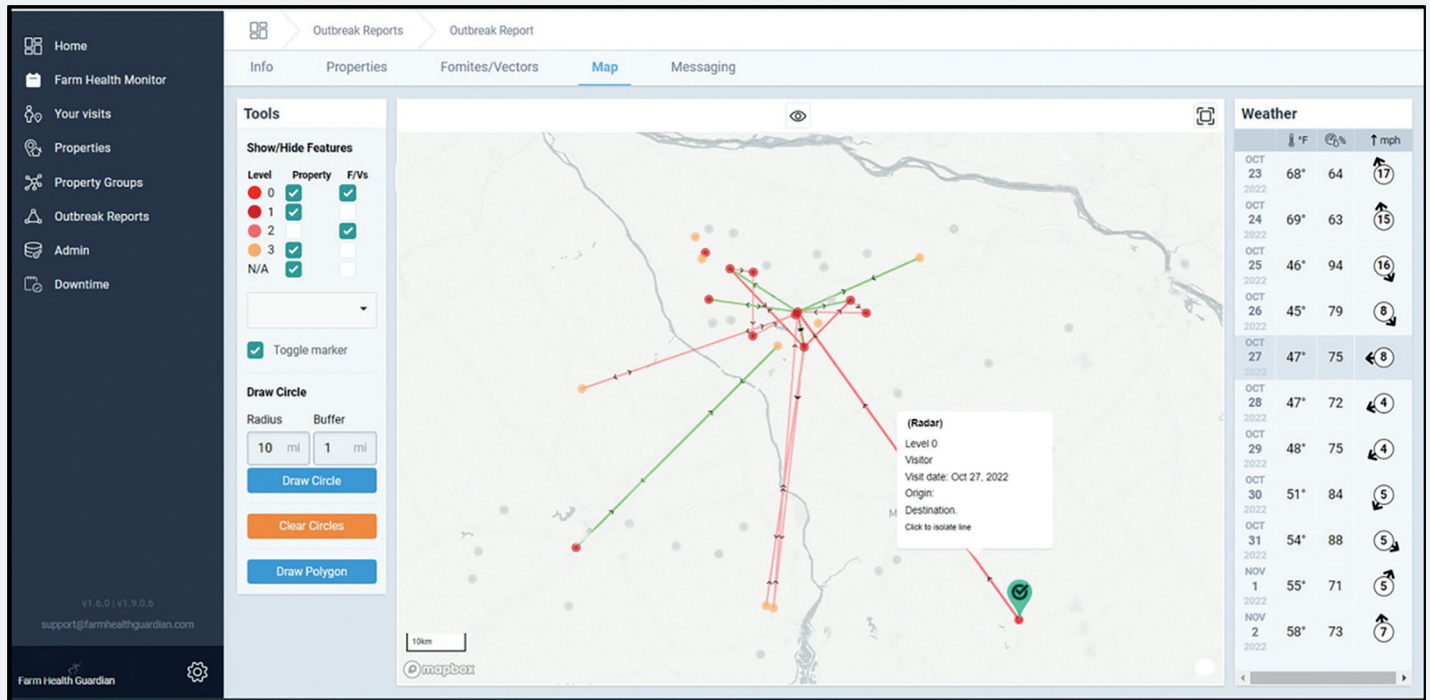


Figure 3: A map generated by Farm Health Guardian software showing movements between farm properties using demonstration data. Green lines indicate a clean truck; red lines indicate truck movement between properties within the incubation period; orange dots are properties that had indirect contact with the index farm; and grey dots represent properties that had no contact.



In addition, the software recorded examples where equipment normally dedicated to a site, was used on another site or, other trailers visited sites that typically have dedicated equipment. These examples of non-dedicated equipment use occurred in 14 of 25 weeks. These changes are intentional and approved decisions based on business needs at the time and may not have increased biosecurity risks. The FHG software and visualization of data provide an accurate reflection of what is actually happening, proving to be a valuable tool for a large system.

Discussion

Research shows that real-time notifications about biosecurity breaches greatly improves compliance by personnel, reducing the risk of disease spread.³ When disease hits or is suspected, the speed of response is critical in preventing spread which reduces risk of additional financial losses. (In the US, PRRS is estimated to cause annual losses of around \$1.2 billion⁴ from 2016 to 2020; the 2014 PED outbreak is estimated to have resulted in a loss of approximately \$1 billion).⁵ One of the lengthiest and most onerous parts of a disease investigation is finding out who travelled to what farm and where they went to next. In a disease simulation exercise using Farm Health Guardian technology, Pillen had complete access to this data in minutes, via a trace out report generated by the software (Figure 3) versus days to manually gather the same information through phone calls, emails, texts, and paper logbooks. Additionally, using the software to conduct disease investigations greatly improved the confidence of the information. Digital, unbiased, automated data guarantees the accuracy of the trace out report, which in turn helps ensure that disease response is more efficient and effective.

The company says it's an efficient way for their team to keep everyone informed and to receive communication about the health status of different farms. Ryan Strain, director of transportation and environmental at Pillen testifies to the impact the technology has had. "Biosecurity isn't a simple subject," he says. "Every day things change. We also rely on human interpretation. This technology helps eliminate varied responses to what's happening in the health pyramid."

References

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