Associations between weather events and PED

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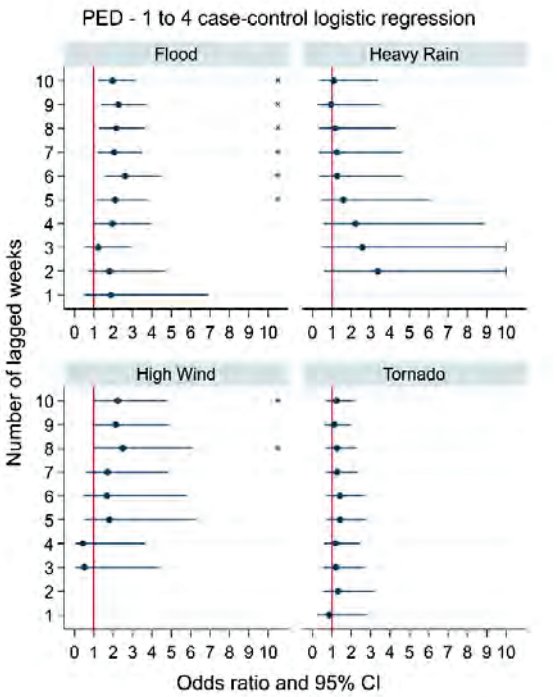
PEDV was introduced in North America around 2013[1], and since then, the estimated economic losses for PED are estimated to be approximately 150 million dollars a year[2]. Several risk factors for PEDV introduction were described, such as movement of personnel, vehicles, fomites, overall biosecurity measures taken on farms, proximity to positive farms, as well as the farm density in a region have also been shown to be associated with a higher chance of a farm being positive for PED[4-7]. Extreme weather events may change the exposure of animals to viruses that may be present on the environment either directly (via structural damage to farms, increase in the amount of virus from overflooded manure lagoons and roads) or indirectly (due to disruptions on personnel availability and routes trucks may be forced to do due to the weather event). We hypothesize that extreme weather events may change the risk of PED outbreak on swine farms. As such, our objective is to compare if farms that had PED outbreaks were exposed to extreme weather events more often than control farms.

We conducted a 1:4 case-control study to investigate if the frequency of exposure to extreme weather events was different between cases (farms experiencing new outbreaks of PED) and controls (farms not experiencing an outbreak of PED). Outbreaks of PED occurring in one swine-dense producing region of the US between 2014 and 2019 were identified via MSHMP. Extreme weather event data were obtained from the National Oceanic and Atmospheric Administration storm events database. A farm's exposure to a weather event was evaluated based on if a weather event was reported on each farm's county on each of the ten preceding weeks (lags) to an outbreak (for cases) or to the date in which controls were randomly selected. In order to account for other factors that could potentially impact the occurrence of PED, the farm's production system, type, size, year, season, altitude, the number of breeding sites within a 5km radius and county's pig density were controlled for. Association estimates (transformed to odds ratios) and their 95% confidence intervals of each weather event on the ten preceding weeks can be found on the figure on the right.



We found that flooding and high wind occurrence was associated with an increase in the risk of PED between 5 to 10, and 8 to 10 weeks after the events, respectively. We did not find significant associations between the occurrence of heavy rain or tornados and PED outbreaks, which potentially have too small of an effect or are not associated with the occurrence of PED. Overall, associations tended to be relatively weak and with wide confidence intervals.

The exact mechanism by which each weather event could act to change the risk of disease occurrence was not investigated. Further studies to investigate the association of weather events and disease occurrence on swine farms should be conducted, particularly if exposure to weather events can be assessed directly on farms, which is a big limitation of our analysis. We suggest that swine-producing companies in the U.S. should develop biosecurity protocols to account for extreme weather events and diminish the risk those may pose to the introduction of pathogens on their herds.

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