Fomite Persistency of PRRSV is affected by Relative Humidity and Storage Temperature

Janak Dhakal[1,2], Vanessa Whitmore[1], Jayeshbhai Chaudhari[1,3], Hiep Vu[1], Byron D. Chaves[1,4]
[1] University of Nebraska-Lincoln, [2] University of Maryland Eastern Shore, [3] Harvard University, [4]*Present address:* Rutgers University

Key Points:

- PRRSV remains infectious on surfaces for up to 7 days under cold and low humidity conditions.
- Higher temperature and relative humidity significantly reduce PRRSV survival on fomites.

Introduction

Porcine reproductive and respiratory syndrome virus (PRRSV) continue to be one of the most economically important diseases in swine production systems. In addition to direct transmission, indirect spread via contaminated fomites such as equipment, surfaces, and transport vehicles plays a critical role in maintaining virus circulation. Environmental persistence is therefore a key factor influencing transmission risk. While previous studies have demonstrated that PRRSV survival is affected by environmental conditions, the combined effect of temperature and relative humidity on common non-porous surfaces remains incompletely understood. The objective of this study was to evaluate PRRSV persistence on polypropylene and stainless-steel surfaces under different temperature and humidity conditions over time.

Methods

The study utilized the PRRSV strain FL-12. To simulate common farm fomites, stainless steel (SS) and polypropylene (PP) coupons were used as test surfaces. These coupons were coated with a standardized "soil load" (bovine albumin, mucin, and yeast extract) to mimic organic contamination. The surfaces were inoculated with a viral suspension (~6 log $TCID_{50}$) and incubated under four environmental combinations: 4ºC (39.2ºF) or 25ºC (77ºF), each at 40-45% and 65% relative humidity (RH). Samples were collected on days 0, 1, 3, 5, and 7. Virus recovery was performed using an elution buffer, and infectivity was quantified via $TCID_{50}$assays on MARC-145 cells.

Results

The persistence of PRRSV was strongly influenced by environmental conditions, particularly temperature. At 4°C (39.2 °F), infectious virus was recovered from both PP and SS surfaces for up to 7 days, with titers remaining above approximately 3 log $TCID_{50}$ at the end of the study period. In contrast, at 25°C, viral survival was substantially reduced. Under lower humidity (40–45% RH), infectious virus was detectable up to day 3 on polypropylene and only up to day 1 on stainless steel. At 25°C and 65% RH, no infectious virus was detected beyond day 0 for either surface. Relative humidity also affected viral persistence, with lower RH conditions generally supporting longer survival compared to higher RH. Across most time points and conditions, viral titers were higher at 40–45% RH than at 65% RH. Surface type influenced recovery as well, with polypropylene consistently yielding higher viral titers than stainless steel.

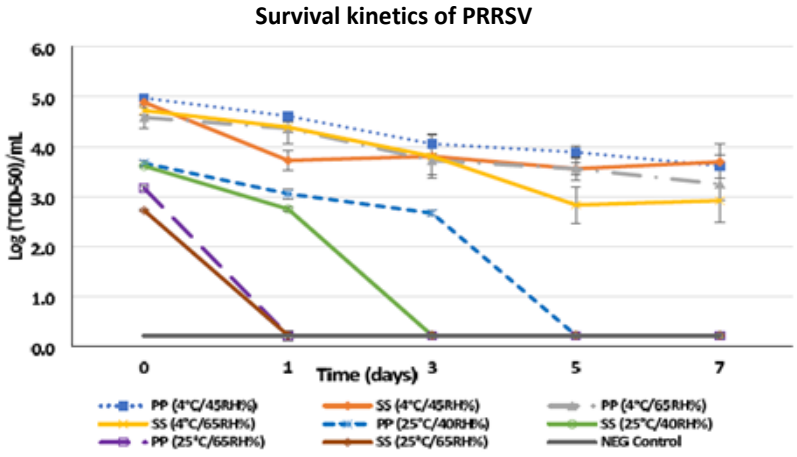

Figure 1: Survival kinetics of the porcine reproductive and respiratory syndrome virus (PRRSV) on polypropylene (PP) and stainless steel (SS). Viral titers (log TCID50/mL) were measured over 7 days at 4 °C (45% and 65% RH) and 25 °C (40% and 65% RH). Day 0 represents the time within 1 h of inoculation. Negative control (NEG Control) data are included for baseline comparison. Error bars represent

Discussion

The results of this study indicate that PRRSV survival on fomites is highly dependent on environmental conditions, with colder and drier environments favoring prolonged persistence. Under refrigerated conditions, infectious virus remained detectable for at least 7 days, highlighting the potential risk associated with contaminated surfaces in cold environments such as transport systems, feed storage, and winter production settings. In contrast, warmer temperatures, particularly when combined with higher relative humidity, led to rapid viral inactivation, often within 24 hours. The observation that polypropylene surfaces supported greater viral recovery than stainless steel suggests that material type may influence the risk of fomite-mediated transmission. Overall, these findings reinforce the importance of considering environmental factors when designing biosecurity protocols.

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