# The Wean-down Project

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**Key Points:**

- **According to the model, the wean-down can help farms to reach TTS sooner.**
- **High biosecurity in the farrowing house plays a vital role when it comes to decrease the transmission in the farrowing house between piglets and also to reduce the TTS.**
- **We invite SHMP sow herds to enroll in a wean-down project where we compare TTS in wean-down vs tradition elimination programs.**

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We have developed a SI (Susceptible –Infectious) Reed Frost model in order to simulate the effect of a wean-down in a sow farm once its prevalence in the farrowing piglets is low.

Published (Diaz et al., 2015; Reynolds et al., 2014; Allerson et al., 2014) and unpublished (Hunter et al., 2016, in preparation) information suggest that piglets have a fundamental role in keeping PRRS and influenza infections in the farrowing house. Furthermore, preliminary data support that piglets are born PRRS negative some weeks before the farm reaches stability. Therefore these piglets are believed to get infected due to the infectious pressure coming from older piglets. A study published in 2009 (Cano et al.) described an experiment whereby sows that were infected at 90d of pregnancy farrowed litters with up to 50% PCR negative piglets and all remaining piglets became PCR positive by 4 days or age.

A key observation for PRRS virus in sow farms is that infected litters and piglets within litters can be commingled with naïve litters and piglets within litters and yet, the rate of new infection can gradually decrease such that virus can be eventually eliminated. A measure of the rate of infection, called the basic reproductive ratio ($R_0$), reflects this rate of infection and when less than 1, the pathogen dies out. So, if biosecurity is good enough, and herd immunity is high enough and the virus' innate infectiousness is low enough, PRRS virus will die out. In this rationale, virus will disappear sooner in farms with higher and stricter levels of those measures and consequently their time to reach stability (TTS) will be lower.

Our assumptions in the model:

1) After an outbreak, sows develop immunity against the virus and do not get infected again nor shed the virus in the farrowing house.
2) The prevalence of newborn PCR positive piglets decreases over time and eventually reaches 0.
3) All positive piglets from all the batches are considered equally infectious and exert an infectious pressure on the naïve piglets of all weeks of lactation.
4) Once the piglets are infected, we assumed that they remain PCR positive until weaning.
5) Internal biosecurity and herd immunity are increased after the herd becomes infected and both these influences cause transmission to decrease.

The model simulated a farm with 50 farrows per week and 13 piglets per litter. The starting prevalence of positive (week 1) piglets at birth was 50% and after the 8th week it decreased by 10% weekly until it reached 0 at week 16. The $R_0$ at the beginning of the outbreak was 3.5 to simulate a completely susceptible population. At 8 weeks after infection, $R_e$ was reduced to 1.5 to mimic high herd immunity and further reduced to .24 at 16 weeks corresponding to stepped-up internal biosecurity. With these assumptions, the herd reached stability at approximately 28 weeks after infection (add 12 weeks of testing before this would be apparent) (Figure 1).

In a second simulation, we performed a wean-down (weaning all piglets older than 1 week) at 16 weeks after the herd was infected. In this scenario, the herd reached stability sooner after infection. That is, by lowering the prevalence of infected pigs, we decreased the time for the herd to achieve stability.

We need to weigh the cost of a wean-down versus the benefit of achieving stability sooner. And while a lower wean age will increase the cost, the herd may achieve stability sooner.

Results from this model should be interpreted with caution. A wean-down will not reduce time to stability if the internal biosecurity is not good enough or if litters continue to be born virus positive. However, under some circumstances, we expect that lowering the prevalence of infected pigs will allow the farms to decrease TTS and ultimately wean negative piglets.

We are inviting SHMP participating herds to enroll in a wean-down project. We are able to subsidize testing costs to confirm stability with a grant of $1,000 per herd from Boehringer Ingelheim. Our goal is to enroll 30 wean-down herds and compare their TTS to 30 matched non wean-down herds. The power of this study will come in comparing TTS across such large number of herds to determine likelihood of success and associated risk factors. Please contact Bob Morrison (BobM@UMN.Edu) if you would like to enroll.

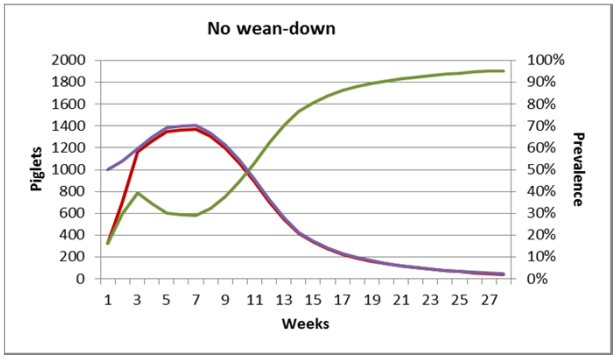


**Figure 1**. Piglets PRRS infection dynamics (Infected, susceptible and prevalence) in the farrowing room as predicted by the model.

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**References**

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