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Harnessing Genetic Selection to Combat PRRS: Evidence from a Multiyear, Multiline Study

C. A. Sevillano¹, E. F. Knol¹, J. R. Dunkelberger^{1,2}

¹ *Topigs Norsvin Research Center, Meerendonkweg 25, 5216TZ s-Hertogenbosch, Netherlands,* ² *Topigs Norsvin USA, 1650 W 82nd St, MN 55431 Bloomington, United States*

Porcine reproductive and respiratory syndrome (PRRS) is a major global disease affecting pigs at all stages of production. Breeding for increased natural resilience to PRRS virus (PRRSv)-infection is a promising control strategy. Since 2018, Topigs Norsvin has collected data for crossbred animals from multiple genetic lines exposed to various disease challenge conditions. Our previous analyses validate the existence of substantial, naturally occurring genetic variation in host response to PRRSv challenge. This specific study evaluated the impact of selecting boars for reduced mortality under PRRS challenge (using these trials data as reference population) on the performance of their offspring post-PRRSv-infection.

Data was collected on 2,711 three-way commercial crossbred Topigs Norsvin pigs. A total of 93 boars from two sire lines were selected based on extreme breeding values (BV) for mortality under challenge, derived using data collected from previous PRRS challenge trials. Boars with low vs. high BVs were selected to sire the High Robust and Low Robust progeny groups, respectively.

Pigs were inoculated with a highly pathogenic North American PRRSv isolate at ~52 days of age and followed until marketing. Data was recorded at the individual level, including body weight at multiple time points and mortality events. Mortality rate and average daily gain (ADG) were calculated using data collected from 0 to 28 days post-inoculation.

Results from this study demonstrated that pigs sired by High Robust boars had a significantly ($P = 0.05$) lower mortality rate (18.6%) than those sired by Low Robust boars (24.2%). Additionally, progeny of High Robust sires had significantly ($P = 0.02$) greater ADG under challenge (360 g/day) than the progeny of Low Robust sires (320 g/day).

In conclusion, this study shows that a multiline, multipathogen training population can be used to select for reduced mortality under PRRS challenge in an independent population. The sizeable and significant impact of selection on mortality, even for a binary trait, demonstrates that genetic selection can be used as an effective strategy to mitigate the impact of PRRS on health and production.