Effect of WUR Genotype on Resilience to a Multi-factorial Natural Disease Challenge in Pigs

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Summary and Implications

The objectives of this study were to evaluate the effect of WUR genotype on disease resilience in pigs. Phenotypic data from 2,133 wean to finish pigs were collected in a natural disease challenge trial and associated with genotype at the WUR gene, which has previously been found to be associated with resistance to PRRS. The results from this study suggest that pigs that carry the favorable allele at this genetic marker have higher resilience to this multi-factorial natural disease challenge, which included the PRRS virus. PRRS plays an influential role in the swine industry, yet vaccinations have limited effectiveness due to the virus' ability to mutate into new forms. Thus, leveraging genetics to develop more resilient commercial swine populations can not only mitigate the financial effects of various infectious diseases, but also increase the overall welfare of commercial swine.

Introduction

Infectious disease is one of the costliest factors in pig production and a detriment to animal welfare. Porcine reproductive and respiratory syndrome (PRRS) virus infections alone cost the US industry over 664 million dollars annually. Previous studies identified a Single Nucleotide Polymorphism (SNP) near the GBP5 gene (WUR) that was associated with resistance and resilience to PRRS, with the G allele being favorable over A. The objective of this study was to evaluate the effect of genotype at the WUR SNP with resilience to a multi-factorial natural disease challenge.

Materials and Methods

Data: Using a continuous flow system, a new batch of 60-75 naïve Yorkshire x Landrace nursery piglets was introduced every three weeks into a natural challenge facility that was initially seeded with multiple diseases, including PRRS. Traits recorded were growth rate, feed intake, backfat, loin depth, treatment rate, and mortality. Pigs were genotyped using a 600K SNP chip.

Statistical Analysis*:* Data from 2133 wean to finish pigs were analyzed using a univariate linear mixed model that included, pen, litter, and animal genetics as random effects and WUR genotype, age, and batch as fixed effects.

Results and Discussions

For the pigs used in this study, frequencies at WUR were 0.85, 0.14, and 0.01 for the AA, AG, and GG genotypes, respectively. The G allele was favorable for most traits (Table 1), with the contrast of AA vs AG significant for average daily gain in the nursery (0.339 vs 0.365 kg/d, p=0.01) and treatment rate (2.48 vs 2.16 treatments/180 days, p=0.07). Mortality rate was 26.0% for AA and 23.8% for AG (marginally significantly at p=0.08).

Table 1: Effect of WUR Genotype on Resilience and Performance Traits

Trait	AA	AG	p-value
Mortality (%)	26%	23.8%	0.08
# Treatments per 180 days	2.48	2.16	0.07
Nursery growth rate, g/day	339	365	0.01
Finisher growth rate, g/day	893	909	0.22
Loin Depth, cm^2	60.00	60.64	0.41
Back Fat, mm	17.46	17.65	0.82
Feed Intake, kg/day	2.21	2.26	0.13

In conclusion, this study validated the significance of the WUR marker under disease, as pigs that carried the favorable allele had higher growth rates, and lower treatment and mortality rates. This analysis suggests that commercial swine production can benefit from increased resilience associated with this genetic marker.

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