Smarter
SMAll RuminanTs breeding for Efficiency and Resilience

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When, why & how to breed for disease resilience in livestock

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Infectious diseases are a major threat to sustainable production of high-producing animals, including sheep and goats. Breeding for increased disease resilience has been a research focus for many years, but is not yet explicitly implemented into any practical breeding program. Instead, breeders tend to indirectly select on resilience by selecting for high productivity in challenge conditions.

Within Smarter, we investigated how future breeding programs may benefit from recent research on disease resilience. Disease resilience can be estimated using reaction-norms of changes in productivity with increasing infection challenge.

We found that the genetic merit for disease resilience can be predicted far more accurately if genomic data are available, and if productivity phenotypes of related animals exist for a wide range of different challenge levels. Selecting for high productivity without explicitly estimating disease resilience may indirectly improve disease resilience, but only if the productivity measurements of animals are collected in infectious as well as disease free conditions.

We also show that breeding animals with higher disease resilience may not necessarily improve herd resilience if more resilient animals are also more infectious. Hence it is important to also measure pathogen load of individual animals. The most promising break-throughs in genetic improvement of disease resilience rely on technological innovations such as routine genotyping or automated data generation that provide accurate and frequent estimates of productivity and health.

Related papers:

Ghaderi Zefreh, M., Doeschl-Wilson, A. B., Riggio, V., Matika, O., & Pong-Wong, R. (2023). Exploring the value of genomic predictions to simultaneously improve production potential and resilience of farmed animals. Frontiers in genetics, 14, 1127530.

Knap, P. W., & Doeschl-Wilson, A. (2020). Why breed disease-resilient livestock, and how? Genetics Selection Evolution, 52, 1-18.

Doeschl-Wilson, A., Knap, P. W., Opriessnig, T., & More, S. J. (2021). Livestock disease resilience: from individual to herd level. Animal, 15, 100286.

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