Breeding for improved animal health

Alan Twomey[1] and Siobhan Ring[2]

[1]Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork; [2]Irish Cattle Breeding Federation, Shinagh House, Bandon, Co. Cork

Summary

- Significant genetic differences between cattle exist for a wide range of health traits.
- Breeding is a long term and sustainable strategy that can improve the resistance of cattle to many diseases.
- Selecting animals with better genetic merit for disease resistance will improve the health status of your herd, reduce production costs, and increase profitability.

Why breed for health?

As cow reproductive performance and longevity continue to improve, animal health is now a growing concern, especially as cow age increases. It is often believed that disease can only be prevented by farm management practices such as biosecurity, vaccination and hygiene. But even in some of the best managed herds, cattle can succumb to disease. Therefore, cattle vary in their genetic ability to resist infection to multiple diseases.

Genetic differences in animal susceptibility

Animal resistance to almost every health trait is under genetic control, and can therefore be included in animal breeding programs if sufficient data were available. Despite the low heritability, rapid genetic gain is achievable for all health traits. For example, recent research undertaken by Teagasc Moorepark revealed that 2% of the inter-animal variability in susceptibility to Johne's disease in dairy cows was due to genetic differences; this is similar to calving interval. Substantial genetic gain for calving interval has been achieved in the last 20 years, and this rapid genetic gain is therefore also achievable for Johne's disease.

New breeding values for TB and liver fluke

Since January 2019, following extensive research conducted by Teagasc Moorepark, breeding values for resistance to both TB and liver fluke have been available for AI sires from www.icbf.com. This enables identification of sires that will produce progeny genetically more resistant to TB and liver fluke. Just like the current health traits in the EBI, it is favourable to select sires that have lower breeding values for resistance to TB and liver fluke. Breeding values for resistance to TB and liver fluke are expressed as the expected prevalence of infection in that animal's progeny. Thus, if a bull has a breeding value of 2% for TB resistance, on average, 2% of his progeny are expected to become TB reactors in their lifetime if in infected herds. A similar system has been developed for liver fluke. The optimum use of breeding values for TB and liver fluke is to select sires that have the highest EBI but also have the lowest breeding values for TB and liver fluke resistance (Figure 1). In the future, it is planned that these breeding values will be available for all animals and included in the health sub-index of the EBI.

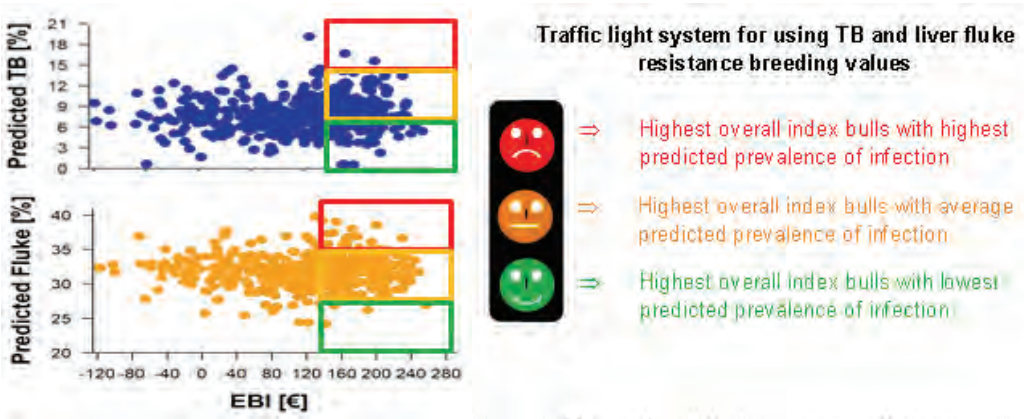

Figure 1. *Optimum use of breeding values for resistance to TB and liver fluke*

Do breeding values for health traits really work?

Genetic evaluations for health traits were validated by calculating a breeding value for each of the health traits for a group of animals using only data from their ancestors (i.e., no health data from any animal in this group were used to calculate their own breeding values). These animals were then followed throughout their lifetime to determine whether or not they were diagnosed as infected with TB, liver fluke, lameness or mastitis. As expected, animals with favourable genetic merit for resistance to the individual health traits (i.e., a low breeding value) were less likely to be diagnosed infected to the respective disease. The difference in prevalence between animals that were in the best 20% and the worst 20% based on their genetic merit for the individual health traits was 26% for TB, 17% for liver fluke, 58% for lameness and 44% for mastitis (Figure 2). Selecting animals with a lower breeding value for resistance to health traits will therefore reduce prevalence of the respective disease in your herd.

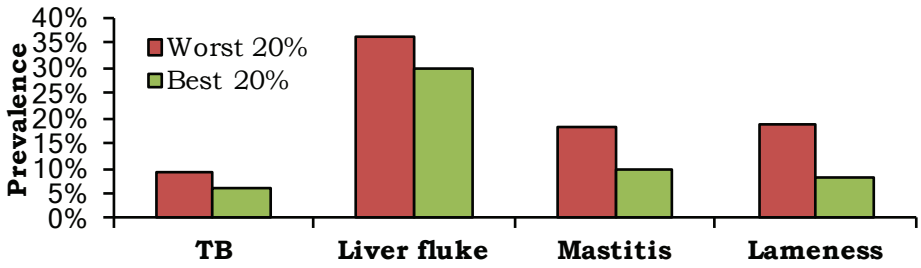

Figure 2. *Prevalence of diseases in cows in the worst 20% and best 20% of the respective disease based on breeding values for each disease using ancestry information only*

Conclusions

As cow fertility improves and cows live longer, animal health will become the main cause of involuntary culling. Animal breeding is a complementary tool to current herd health management practices, which is both an economically and environmentally sustainable way of reducing disease in your herd.