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Genetic-epidemiological modeling of gastrointestinal parasitism in sheep.

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Purpose

The parasite gastrointestinal is the most pervasive challenge in grazing small ruminants, conducting to considerable production loss. Its control with the use of anthelmintic treatments is no longer sustainable due to the development of parasitic resistance to these anthelmintic. So we need to find complementary strategies: host nutrition, grazing management, targeted selective treatments, breeding for resistance to parasitism...

Method

A previous deterministic, dynamic model (Vagenas et al., 2007 ; Laurenson et al. 2011) was developed for *Teladorsagia Circumcinta* in growing lambs (from weaning, during less than four months). From this model, we developed a model to account for these different strategies, and predict their consequences on productivity and level of parasitism in lambs and ewes. We added the possibility of housing the reproducing ewes and a supplementary module offered the opportunity of managing the different age classes of the flock, mating the females with selected sires and having new females entering in the flock each year: so, we have a sustainable flock simulated over several years and allowing to investigate the alternatives to the use of anthelmintic on a long-term option (several years). Further of this, we proposed a set of parameters for modeling infection by one of the most frequent parasite *Haemonchus Contortus* (instead of *Teladorsagia Circumcinta* previously modeled).

Results/Conclusion

To validate our new model, a unique Uruguayan data set measured on a flock naturally infected by *Haemonchus Contortus* is used (several years of parasitism infection measures are available during growing and parturition periods of female sheep).

In parallel, we had conducted a sensitive analysis in order to identify the parameters resulting in the bigger output traits variations and so we are estimating them.

Relevance

This improved model is helpful to investigate a lot of situations without having to resort to many experiments which require infestations costing animals. An important issue of our model is to advise sheep farmers about the optimal proportion of genetically resistant animals to introduce in the flock in order to control parasitism infection.