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Confounding factors affecting faecal egg count reduction tests for anthelmintic efficacy

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Abstract

Anthelmintic resistance (AR) is a major global problem in livestock and humans and increasingly drives parasite management decisions. Assessment of AR relies on the faecal egg count reduction test (FECRT). Despite technical improvements to the FECRT and its interpretation, multiple confounding factors can affect results yet are usually ignored, such as pharmacokinetic behaviour among drugs, parasites, and host types and individuals that affecting the therapeutic anthelmintic response; helminth demographics affecting test repeatability; and technical errors. Confounding factors are numerous, highly likely to occur in farm environments, and rarely possible to control. Evaluation of AR in practical and research settings should attempt to reduce and account for confounders in FECRT and, where possible, consider trends in observed efficacy against a background of natural variation. To examine this aim, simulations were performed based on species identification data within FECRT for nematodes in sheep and cattle, to quantify the effects of variation in species composition on AR classification. Results show that misclassification is likely to be common and could account for seasonal inconsistency in FECRT outcomes. Improved methods for species identification have the potential to greatly improve FECRT accuracy. Pharmacokinetic and pharmacodynamic confounders are more difficult to surmount, and it is already widely recommended to reduce their influence where possible, and consider their potential role in cases of treatment failure. Given the frequency of pharmacokinetic / pharmacodynamic drivers of reduced anthelmintic efficacy in livestock, however, repeated assessment is an important tool to detect trends and reach robust conclusions. Simulations are extended to consider the relative value of thorough but rare FECRT, and frequent but imprecise forms of FECR-based monitoring, to provide early warning of AR. This approach shows the limitations of optimising FERCT for maximum technical accuracy. Holistic and pragmatic consideration of anthelmintic efficacy is needed to provide evidence to support farm decisions.

Presenting author biography

Eric Morgan is Professor in Veterinary Parasitology at Queen's University Belfast, and Diplomate of the European Veterinary Parasitology College (DipEVPC). His research interests centre on the epidemiology of animal diseases under climate change, especially helminths in grazing ruminants, and consequences for their management. This includes the use of experiments, computer models and field trials to develop

efficient and sustainable approaches to control under increasing anthelmintic resistance. He supports the development and dissemination of best practice in parasite control through industry and government bodies, including COWS, SCOPS, EU COST Action COMBAR, and the Star-IDAZ international research consortium on animal health.