Developing parasite control strategies in organic systems

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ABSTRACT

Organic farmers have taken a lead in attempting to reduce dependence on pharmaceutical control of parasites in farmed livestock. Focussing on management and nutrition, the objective of this research is to further develop control strategies, which can support and increase the flexibility of clean grazing systems for sheep and cattle. The approach has been to combine on-farm epidemiological studies, with replicated experiments, in order to develop and demonstrate better systems of control applicable to UK organic farms. Preliminary data from the first years' epidemiological studies are presented in this paper.

Key words: organic ruminant production, internal parasites

INTRODUCTION

Internal parasites are a potentially serious threat to the health, welfare and productivity of organically managed livestock (Keatinge,1996). The ultimate goal is to eliminate dependence on antiparasitic drugs, however this is rarely achieved in practice (Roderick & Hovi, 1999). The standards for organic production emphasise preventive control strategies based on grazing management, appropriate breeding and good nutrition. The approach has a sound scientific basis. The value of clean grazing for conventional production is well established (Emmerson, 1983), and equally applicable to organic systems. However, organic farmers must be even more adaptable in their management strategies, if strategic drenching is to be avoided. Resistance to roundworms is moderately heritable (Stear & Murray, 1994). Many organic farmers attempt to select for greater resistance/resilience, particularly if maintaining a closed flock/herd. This, however, is a long-term strategy. The beneficial effect of nutrition (Holmes,1993), the potential use of novel crops (Niezen *et al* 1996) and possibilities for biological control (Thamsborg *et al*, 1999) have also been recognised. More specifically, the importance of protein nutrition for the maintenance of host immunity to nematode infection has been described by Coop & Kyriazakis (1999). However, less clear is the extent to which these strategies can be deployed, ideally in combination, to deliver effective parasite control on UK organic farms.

MATERIALS AND METHODS

For the current project, a major challenge is to deliver improvements in parasite control during a 3-4 year study, given the complex interactions of host/parasite/environment, and the study of naturally-acquired infections under a range of differing farm and epidemiological circumstances. The approach has been to combine detailed on-farm studies, with replicated experiments examining the role of nutrition and novel crops for parasite control. This paper reports preliminary results from the on-farm epidemiological studies.

Five commercial organic farms were selected to reflect a range of production systems - specialist hill sheep, upland beef and sheep, lowland intensive sheep, specialist dairying, and lowland mixed arable / livestock. The aim was to select farms with a more mature organic system i.e. from sector body records already operating at a low level of anthelmintic input. The study combines the use of standard epidemiological techniques, with close collaboration of the researchers, participating farmers and their veterinary advisers. The overall objective is to provide an assessment of the level and pattern of parasite challenge, critical points for disease control in each system, and the degree of success achieved with current management practices.

In the first year of a three-year study, sentinel groups representing typical stock and management practices for each farm were identified. Herbage samples were taken monthly for pasture larval counts from May 2000. Faecal samples were taken from lambs monthly from approximately 8 to 16 weeks of age. Monthly faecal samples were taken at pasture from growing dairy-bred cattle over the summer period. Few parasitological data are available for 2001 due to restrictions imposed by Foot and Mouth Disease. However, data collection is continuing, with the intention to collect a further two years' epidemiological data during 2002/03.

RESULTS

All farms had reduced anthelmintic use since conversion to organic production. Control was generally underpinned by grazing management, within the constraints of farm resources and diversity of enterprises available.

Faecal egg output data (excluding nematodirus) for growing lambs during the 2000 grazing season are given in Table 1.

Nematodirus was present in all sheep systems tested (Table 2).

Despite relatively high levels of faecal egg output, the best control was achieved in the mixed lowland system. Animals performed satisfactorily, with very few incidences of disease recorded. Total anthelmintic input in 2000 was limited to 5-6 individual drenches per 100 lambs. No anthelmintic was used during 2001. This low level of input was possible due to a good mix of enterprises (beef, sheep, arable, pigs), modest stocking rates (approximately 7 ewes/ha), alternate grazing of cattle and sheep, a sequence of crops for autumn (rape/mustard) and winter use (undersown clover), and the continuing refinement of a system based on closed flocks/herds. Pasture larval counts also reflected a moderate challenge, peaking at over 3000 larvae/kg DM during August.

Table 1. Faecal egg output (e.p.g. fresh faeces – other strongyles)

Approx. age (weeks)		Hill	Upland beef/sheep	Specialist sheep	Lowland mixed
8 wks	Mean	-	259	23*	486
	log10 mean	-	1.994	0.550	2.561
	log10 s.d.	-	0.948	0.670	0.329
12 wks	Mean	586	15	124	641
	log10 mean	2.699	0.671	1.770	2.559
	log10 s.d.	0.288	0.674	0.730	0.486
		-			
16 wks	mean	316	128	477	813
	log10 mean	2.401	1.988	2.616	2.799
	log10 s.d.	0.331	0.351	0.261	0.377

** lambs drenched pre-sampling*

Table 2. Faecal egg output (e.p.g. fresh faeces – nematodirus)

Approx. age (weeks)		Hill	Upland beef/ sheep	Specialist sheep	Lowland mixed
8 wks	mean	-	330	6*	25
	log10 mean	-	1.709	0.086	1.075
	log10 s.d.	-	1.064	0.429	0.680
12 wks	mean	132	7	46	118
	log10 mean	1.955	0.253	0.997	1.960
	log10 s.d.	0.449	0.584	0.936	0.318
16 wks	mean	43	1	64	44
	log10 mean	1.361	0.127	0.913	0.844
	log10 s.d.	0.665	0.347	0.955	0.910

** lambs drenched pre-sampling*

On the extensively managed hill farm, parasite burden was at acceptable levels, at least up to the point of weaning. The main issues here are the extent to which parasite burden builds up on inbye fields, and subsequently, the potential challenge for lambs after weaning. Traditionally this problem is avoided by the sale of lambs as stores. Furthermore, given the general lack of supplementation, ewe nutrition may be severely compromised in more difficult seasons with possible consequences for peri-parturient immunity, and the perpetuation of infection to growing stock. Following the very difficult winter of 2001, for example, it was felt necessary to drench all ewes and lambs at marking to improve body condition and maintain the health of the flock.

On the specialist lowland sheep farm, Nematodirus resulted in a significant number of deaths during 2000, before treatment was given to lambs on a flock basis (Table 2). Working closely with the veterinary adviser, derogation was sought to treat lambs twice during spring 2001 in order to try to break the cycle. The situation is being closely monitored during 2002. However, with limitations on the proportion of arable cropping and cattle grazing available, more radical, longer-term options such as changing lambing date may yet have to be considered.

With careful grazing management, faecal egg counts in young dairy-bred stock were negligible for most of the summer. Levels rose towards the autumn, peaking at a mean of 75 e.p.g. (mean log10,1.716; log10 s.d., 0.509) in September. No drenching was required. Faecal egg counts in suckled calves were also extremely low. At least in one case, there was evidence that young suckled calves were perpetuating nematodirus infection, potentially acting as a biological bridge to the succeeding lamb crop. This could have significant consequences for alternate grazing of cattle and sheep where nematodirus is a problem.

CONCLUSIONS

The results to date indicate the range in epidemiology and disease risks present on organic farms. The individual nature of each farm, and the role of the farmer (and his advisers) in evolving a successful disease control policy are underlined. With sufficient diversity of cropping and stocking, it is possible to virtually eliminate anthelmintic. However, many farms face significant difficulties, particularly those systems dominated by sheep.

It is hoped that more detailed epidemiology planned for 2002/03 (including tracer lambs, production measurements and faecal culture) will provide a better insight into the pattern of peri-parturient rise in organically managed ewes, as well as the consequences of parasitism in growing lambs.

An aspect requiring further investigation, is the apparently higher tolerance to parasites (as measured by faecal egg counts) in some organic animals. For example, mean levels of over 1900 e.p.g. were recorded in a group of finishing lambs that continued to perform satisfactorily. Evidence from elsewhere in the project, indicates a much more mixed population of nematodes than generally encountered on conventional farms. In particular large bowel species such as *Oesophagostomum* and *Chabertia* are present in greater numbers. While contributing to faecal egg output, these species are less pathogenic, and hence have fewer consequences for livestock health and performance. The host:parasite relationship may also be modified by the fact that animals are exposed to an increasing challenge earlier in life. This apparent greater tolerance might therefore be explained by differences in parasite population profile (and relative fecundity), greater resilience in the stock due to genetic differences or previous exposure, or the fact that organic farmers require greater convincing before making a decision to drench. At a practical level a more comprehensive framework is required to aid decision-making on organic farms, rather than relying solely on faecal egg counts.

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