

CAPRINE HELMINTHIASIS: RELATIONSHIP BETWEEN FAECAL EGG COUNT AND WORM BURDEN

D.A. Israf, R.A. Sani and R.A. Halim

Faculty of Veterinary Medicine and Animal Science,
Universiti Pertanian Malaysia, 43400 UPM Serdang, Selangor, Malaysia.

SUMMARY

Correlation analysis was used to assess the validity of the faecal egg count (FEC) technique in determining worm burden in caprine gastrointestinal helminthiasis. Faecal egg counts prior to natural death and total worm counts of the entire gastrointestinal tract of kid goats that had been submitted for necropsy were performed. The worm species present included *Haemonchus contortus* and *Trichostrongylus colubriformis*. Among kids aged below 6 months there was a significant positive correlation between FEC and worm burdens and the 'total pathogenic index' (TPI). Among kids aged above 6 months, significant positive correlation existed between FEC and *H. contortus* populations and also the TPI; however there was no correlation between FEC and *T. colubriformis* burdens.

Keywords: Helminthiasis, caprine, faecal egg count, worm burden.

Success in diagnosing parasitic gastroenteritis (PGE) in young ruminants depends upon the accuracy of the faecal egg count (FEC) in reflecting worm burdens. Studies in cattle demonstrated a lack of correlation between FEC and worm burdens (McKenna, 1981). In sheep however, numerous studies have demonstrated a strong positive correlation between FEC and worm burdens (Poteet and Conway, 1966; Le Jambre *et al.*, 1971; Whitlock *et al.*, 1972; Roberts and Swan, 1981; Coadwell and Ward, 1982). Goats are known to be more susceptible to helminthiasis in comparison to sheep (Anon, 1987) but so far there are no reports on the validity of the FEC technique for diagnosing helminthiasis in goats. With this fact in mind, and due to the importance of this technique in determining development of immunity and of anthelmintic resistance (faecal egg count reduction test), we examined the correlation between worm burdens and FEC in several local goats.

Seventeen Kacang-cross goat kids grazed on improved pasture were submitted to the Department of Veterinary Pathology and Microbiology, Universiti Pertanian Malaysia on various occasions for necropsy. These kids were involved in a larger project and died in the field due to various disease conditions. Faecal samples were obtained *per rectum* and subjected to a Modified McMaster egg counting technique (Ministry of Agriculture, Fisheries and Food, 1986) while the whole length of the gastrointestinal tract, from the abomasum distally, was removed for total worm counts according to the description by Collins and Charleston (1977). All variables were log₁₀-transformed prior to statistical analysis. Correlation analysis was used to

burdens. The use of the 'total pathogenic index' (TPI) as described by McKenna (1981) was tested for correlation with the FEC.

Density-dependent regulation refers to the reduction in fecundity due to increased worm populations and this mechanism has been described in sheep and cattle helminthiasis. Therefore, in view of the fact that kids above six months of age may accumulate high worm burdens due to prolonged grazing and a poor immune response, we decided to analyse our data based on two age groups viz. below and above 6 months in order to exclude the possible effect of this mechanism upon the analysis. The worm species present in all animals were identified as *Haemonchus contortus* and *Trichostrongylus colubriformis*. Table 1 presents the individual FEC and worm burdens. Table 2 presents the correlation coefficient and level of significance of correlation between FEC and worm burdens and also against the TPI. Among the animals aged below six months, there was a strong positive correlation between FEC and *H. contortus*/*T. colubriformis* populations and the TPI. In a similar manner, the FEC correlated well with *H. contortus* populations and the TPI in the animals above 6 months of age, however, there was no significant correlation between FEC and *T. colubriformis* populations.

This study has demonstrated the possibility of using FEC to make reasonable deductions about the level of infection in young goat kids. The good positive correlation between FEC and worm burdens suggest that immune effector mechanisms which culminate in reduced fecundity may be non-functional. Indeed, sheep below 6 months of age are unresponsive to

remain unresponsive (based on FEC) up to the age of 12 months (Israf and Sani, unpublished data). It is possible that the presence of highly prolific *Haemonchus* species coupled with the small sample size could be responsible for the lack of correlation between FEC and *T. colubriformis* numbers in older kids.

Table 1. Faecal egg and worm counts of individual kids

Age group (n)	FEC	Hc count	Tc count
Below 6 months (8)	250	700	900
	6500	3000	4000
	1500	900	1800
	1200	400	2000
	2909	1000	1800
	2000	1800	1500
	1846	1000	700
	1600	1500	3000
Above 6 months (9)	9400	3800	6500
	2526	2000	4600
	3200	2000	3000
	5200	3000	7000
	13500	6000	4500
	5800	2800	5000
	4200	1500	6000
	3800	2500	3000
	2000	1800	1500

FEC = Faecal egg count

Hc = *H. contortus*

Tc = *T. colubriformis*

Table 2. Correlation analysis between FEC, worm counts and TPI

Correlations tested	Correlation coefficient (r)	Level of significance
Aged below 6 months (n = 8)		
FEC x Hc	0.9443	0.0001
FEC x Tc	0.9341	0.0001
FEC x TPI	0.8963	0.001
Aged above 6 months (n = 9)		
FEC x Hc	0.8814	0.01
FEC x Tc	0.3806	not significant
FEC x TPI	0.9164	0.01

FEC = Faecal egg count;

Hc = *H. contortus*

Tc = *T. colubriformis*; TPI = Total pathogenic index

The TPI is a point system whereby numbers of different worm genera are weighted according to their relative pathogenicity. In this system every 500 *H. contortus* or 6000 *T. colubriformis* were assigned one point. Thus for a burden consisting of 1000 *H. contortus* and 6000 *T. colubriformis* the TPI was $2 + 1 = 3$. There will be biasness to some extent which increases the subjectivity of making diagnoses based on this system since highly pathogenic species will dominate and have a significant influence on the index calculations. However, it would be safer to relate high FEC with pathogenicity rather than actual worm burden. In general, pathogenicity is linked to fecundity and highly prolific genera such as *H. contortus* will be more pathogenic. This is probably the reason why there was no correlation between *T. colubriformis* and FEC in the older kids. The *H. contortus* populations and TPI were well positively correlated with FEC and this may be due to the relatively higher egg output of *H. contortus*. It must be emphasised that a larger group size would have been desirable however, due to circumstances out of our control this was not possible. It is hoped these findings will bring about awareness in the interpretation of the FEC.

ACKNOWLEDGEMENTS

We thank Dr. Mohamed Ali Rajion, En. Sharifuddin and staff of the UPM Small Ruminant Unit for provision of animals.

REFERENCES

- Anon (1987). Goats develop some resistance to worms. *Goat Health and Prod.* 1: 2.
- Coadwell, W.J. and Ward, P.F.V. (1982). The use of faecal egg counts for estimating worm burdens in sheep infected with *Haemonchus contortus*. *Parasitol.*, 85: 251-256.
- Collins, G.H. and Charleston, W.A.G. (1977). Gastrointestinal worm counting techniques. Department of Veterinary Pathology and Public Health, Massey University.
- Le Jambre, L.F., Ratcliffe, L.H., Uhazy, L.S. and Whitlock, J.H. (1971). Faecal egg output of lambs in relationship to *Haemonchus contortus* burden. *Int. J. Parasitol.*, 1: 157-160.
- McKenna, P.B. (1981). The diagnostic value and interpretation of faecal egg counts in sheep. *NZ Vet J.*, 29: 129-132.
- Ministry of Agriculture, Fisheries and Food (1986). Manual of Veterinary Parasitological Laboratory Techniques. Reference Book 418. 3rd en. Her Majesty's Stationary Office, London, pp.11-12.
- Poteet, R. and Conway, D.P. (1966). Relation between faecal egg counts and parasite counts in sheep infected by the

- nematode *Haemonchus contortus*. Agricultural Experimental Station, Division of Agriculture, University of Arkansas. Rep. Series, 151: 1-8.
- Roberts, J.L. and Swan, R.A. (1981). Quantitative studies of ovine haemonchosis. 1. Relationship between faecal egg counts and total worm counts. *Vet. Parasitol.* 8: 165-171.
- Whitlock, J.H., Crofton, H.D. and Georgi, J.R. (1972). Characteristics of parasite populations in endemic trichostrongylidosis. *Parasitol.*, 64: 413-427.
-

RINGKASAN

HELMINTIASIS KAPRIN: PERKAITAN DI ANTARA KIRAAN TELUR DENGAN BEBAN CACING

Analisis korelasi telah diguna untuk menilai kesahihan teknik kiraan telur tinja (FEC) untuk menentukan beban cacing dalam helmintiasis gastrousus kaprin. Perkiraan telur tinja sebelum berlaku maut semula jadi dan perjumlahan bilangan cacing pada keseluruhan trakus gastrousus telah dilakukan pada anak kambing yang dihantar untuk nekropsi. Spesies cacing yang wujud termasuk *Haemonchus contortus* dan *Trichostrongylus colubriformis*. Di kalangan anak yang berumur kurang daripada 6 bulan, korelasi positif tererti wujud di antara FEC dan beban cacing dan 'jumlah indeks patogen' (TPI). Di kalangan anak kambing berumur lebih daripada 6 bulan, korelasi positif tererti wujud di antara FEC dan populasi *H. contortus* dan juga TPI; bagaimanapun tiada korelasi yang wujud di antara FEC dan beban *T. colubriformis*.