

## Timing of Water Application Differentially Regulates Development of *Haemonchus contortus* and *Trichostrongylus colubriformis*.

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*Haemonchus contortus* and *Trichostrongylus colubriformis* are important gastrointestinal nematodes of small ruminants in temperate areas with summer rainfall. Widespread anthelmintic resistance due to over-reliance on chemotherapy highlights the need for alternative forms of worm control which exploit knowledge of parasite ecology (Colvin *et al.* 2008, Bailey *et al.* 2009). Temperature and moisture are the most important determinants of the development of *H. contortus* and *T. colubriformis*. Understanding of the effect of rainfall timing in relation to faecal deposition is incomplete and improved understanding will benefit worm control programs.

A climate chamber experiment was conducted to determine the effect of varying the timing of water application on the development success of *H. contortus* and *T. colubriformis*. The experiment was a randomised 2 x 12 factorial design with 2 water application frequencies (32 mm as a single application or 16 mm as two equal applications on consecutive days), 12 water application days (days -4 to 7 relative to faecal deposition) and with 4 replicates. External to the factorial design was an unwatered control. Faeces were incubated using a diurnal temperature regime typical for January at Armidale, NSW with daily mean minimum and maximum temperatures of 11.7°C and 25.6°C respectively. Donor sheep (n=3; 6 months of age) were experimentally infected with *H. contortus* and *T. colubriformis* and grazed on pasture for between 28 and 35 days post infection (dpi) to ensure appropriate faecal consistency. At 35 dpi faecal worm egg count (WEC) was 5,073 eggs per g/faeces (epg) and comprised *H. contortus* (60%) and *T. colubriformis* (40%). Faeces from all sheep were mixed and 14 g placed on the surface of experimental containers containing a uniform mixture of steam sterilised soil and aggregate. Faeces were placed in the containers in uncompacted mounds to mimic deposition in the field. Faeces and soil (top 25 mm) were collected on day 14 to determine recovery of infective larvae (L3).

The benefit of water application for development to L3 was greatest when close to faecal deposition (Table 1). Greatest recoveries of *H. contortus* (p=0.011) and *T. colubriformis* (p=0.001) intra pellet L3 were from water on days 0 and 1. Extra pellet L3 recovery was greatest for *H. contortus* (p<0.001) when water was applied on day 0 but timing did not affect recovery of *T. colubriformis* (p=0.708). Total L3 recovery from water on days -1, 0 and 1 was greatest for *H. contortus* (p<0.001) while for *T. colubriformis* from water on days 0 and 1 (p<0.001). Intra pellet *T. colubriformis* and total *T. colubriformis* L3 recovery was greatest from single water application (p=0.002 and p=0.003 respectively). Other recoveries of L3 were unaffected by frequency of application.

**Table 1. Day 14 recovery of *H. contortus* and *T. colubriformis* infective larvae (L3) from faeces which received 32 mm water on either days -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7 in relation to faecal deposition.**

Source of L3	Significant watering days*	<i>H. contortus</i> L3 recovery (%)		Significant watering days*	<i>T. colubriformis</i> L3 recovery (%)	
		Mean of significant days	Mean other days		Mean of significant days	Mean other days
Intra pellet	0, 1	2.09	0.13	0, 1	3.60	0.68
Extra pellet	0	3.93	0.97	NS	0.34	
Total	-1, 0, 1	4.12	0.85	0, 1	4.06	1.01

\*Watering days with L3 recovery which were statistically greater than unwatered controls

The timing of water application was important for both *H. contortus* and *T. colubriformis*. Water application within 1 day of faecal deposition led to greatest L3 recovery. Extra pellet L3 was the dominant life stage for *H. contortus* whereas intra pellet L3 was dominant for *T. colubriformis*. Understanding of how timing of water, and hence rainfall, affects L3 development will enhance grazing management for worm control.

Bailey J.N., Walkden-Brown S.W. and Kahn L.P (2009). *Vet Parasitol*, **161**, 218.

Colvin A.F., Walkden-Brown S.W., Knox M.R. and Scott J.M (2008). *Vet Parasitol*, **153**, 108.

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