ELECTRONIC SUPPLEMENTARY MATERIAL (ESM)

Comb colour measurements

Figure S1 shows a representative digital photograph taken of the red grouse combs. The areas used for measuring the colour of the comb and grey reference are shown. We used the largest rectangular area fitted within the comb area, as shown in the figure. The grey reference was obtained from Dulux ® (Ebony Mists 1–6) grid. The same reference (Ebony Mists 4) was used for all comb photographs. We obtained the average component of red (R) of the combs and from the grey reference for each comb, using RGB system and Adobe Photoshop 7.0.

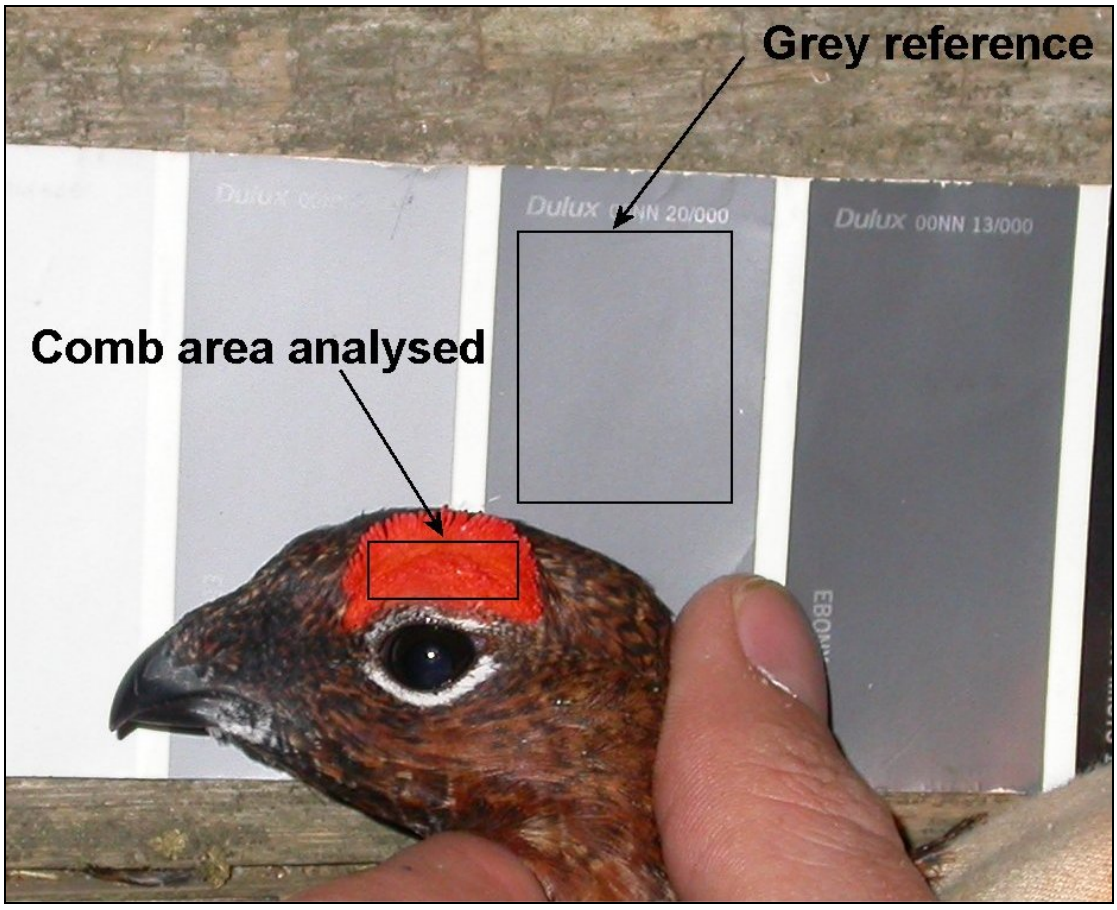

Figure S1. Digital photograph of a male red grouse showing the area of comb and grey reference used for colour measurements.

We evaluated the repeatability by comb colour measures by measuring twice a sample of males in two ways: repeatability of R-values (adjusted for the R-value of the reference) (1) within the same picture and (2) between two different pictures of the

same combs taken at the same time. Repeatability values were calculated following Lessells and Boag (1987). Comb redness measurement were highly and significantly repeatable both within (repeatability = 0.98, $F_{14,29} = 111.09$, $p < 0.001$) and between pictures (repeatability = 0.80, $F_{13,27} = 8.98$, $p < 0.001$)

Parasite counts

We used faecal eggs counts to estimate the abundance of *T. tenuis* and coccidian in free living males, following a reliable and well established method for red grouse (Shaw & Moss, 1989; Moss et al., 1993; Mougeot et al., 2003; Seivwright et al., 2005; Mougeot et al., 2005; Mougeot et al., 2006).

We used a McMaster egg counting technique (MAFF, 1986). For each faecal sample, approximately 0.20 g (range 0.19–0.21 g) of weighed mixed faecal material was put into a shaker tube with 10 glass balls and 5ml of saturated NaCl solution. The tube was shaken until the faecal matter was suspended. Using a Pasteur pipette, a sample of the faecal suspension was extracted and carefully run into one chamber of a McMaster counting slide. The tube was shaken again and another sample extracted and run into the second section of the chamber. The saline suspension was left to settle for 2–3 min, allowing the eggs to float to the top of each chamber. Eggs were then counted beneath a marked grid on each chamber using a compound microscope with 40× magnification. Two separate counts of coccidia and T. tenuis eggs were performed for each sample. Counts of both parasites' eggs were highly and significantly repeatable (*T. Tenuis* egg counts: repeatability = 0.97; $F_{24,49} = 68.44$, $p < 0.001$; Coccidia egg counts: repeatability = 0.83, $F_{24,49} = 10.55$, $p < 0.001$). The number of eggs per gram of faecal material was calculated by multiplying the average number of eggs counted under both grids by the total volume of faecal suspension contained in both chambers and then dividing this by the quantity of faeces used in the suspension.

Additional results

Table S1. Mean (± SD) abundance of coccidia (oocysts per g) and *T. tenuis* (worms per grouse), plasma carotenoid concentration (µg/ml), measured relative to a lutein standard, and comb redness before and after treatment in both experimental groups.

		Coccidia abundance			*T.tenuis* abundance			Carotenoids			Comb redness		
		mean	sd	n	mean	sd	n	mean	sd	n	mean	sd	n
Control	Before treatment	9182.91	10612.03	25	446.28	376.03	25	12.21	1.59	25	33.26	2.77	25
	After treatment	5654.94	6780.33	21	372.67	241.70	21	13.21	1.82	21	19.53	2.98	21
Dosed	Before treatment	10939.63	14885.68	12	352.61	290.73	12	11.40	1.50	12	25.71	4.22	12
	After treatment	4881.33	4496.69	9	0.00	0.00	9	14.10	1.44	9	28.73	4.67	9

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