

# Consequences of the withdrawal of dimetridazole on intestinal parasitism in ducks

A. DERNBURG, M-C. ROGIER-SADERNE, C. CHAUVE, L. ZENNER

THE protozoan flagellates *Tetratrichomonas gallinarum* and *Tritrichomonas eberti* have been associated with outbreaks of duck enteritis that are characterised by dark greenish or brown diarrhoea, soiled tail feathers, apathy, limping and/or pica (Leibovitz 1973, Tsai and others 1997, Gavaret and others 2000). Food conversion efficiency decreases in affected ducks and subsequent liver fattening may be affected (Bollinger and Barker 1996, Zwick 1996). At postmortem examination, the caecae are distended with large amounts of liquid or pasty faecal matter, and the mucous membrane is thickened and inflammatory.

Experimental infection of ducklings with *Tetratrichomonas* species has resulted in mild diarrhoea, suggesting that the flagellates are either non-pathogenic or only pathogenic in birds with compromised immune systems (Reynaud and Chauve 1987, Pecka 1991). Nevertheless, French producers of ready-to-fatten ('prêt à gaver' [PAG]) and finished foie gras ducks consider flagellates to be the primary pathogens causing enteritis. Dimetridazole (DMZ) was used by producers to control flagellates until 1995, when its use in food-producing animals was banned by the European Union. The most common preventive measure against flagellates in use today is water acidification (reducing the pH of drinking water by adding organic or mineral acids), although little is known about its efficacy in comparison with DMZ.

This short communication compares the prevalence of flagellates in ducks during the three years before (January 1, 1994 to December 31, 1996) and after (January 1, 1997 to December 31, 1999) the withdrawal of DMZ; 1996 has been included in the 'use' period because producers reported utilising DMZ reserves as late as September 1996.

Farms belonging to the 'Syndicat des Eleveurs de Palmipèdes Prêts à Gaver du Périgord' (SEPPAG), the union of PAG duck producers of the Périgord region, were separated in the analysis because they follow stringent specifications regarding the origin, rearing, housing, feeding and transportation of ducks, and prophylaxis and sanitary measures; DMZ was replaced by water acidification as a prophylactic regimen after the DMZ ban (Association Foie Gras Périgord 2000).

Laboratory reports relating to flocks made by the Departmental Veterinary Laboratory (DVL) of Dordogne were analysed. Producers used the DVL to help diagnose disease outbreaks and to control the health status of animals before sale. The DVL recorded the number of ducks received, their species (*Cairina moschata*, *Anas platyrhynchos* or hybrid mule), their age, the type of production (reproducers, PAG or finishing), their origin, the reasons for analysis (control disease) and, when available, clinical signs and/or mortality rates. After a rapid clinical examination, the ducks were euthanased and examined postmortem, and their digestive tracts were examined for flagellates, helminths, fungi and pathogenic bacteria. Flagellate infection was assessed by depositing a scraping of the caecal lining on a slide with a drop of warm saline solution and examining the slide microscopically at  $\times 400$  magnification. The number of mobile flagellates was

TABLE 1: Scale for evaluating the intensity of an infection with flagellates

Number of flagellates per slide	Intensity	Rating
0	0	None
<5	+	Light
5-10	++	Moderate
11-20	+++	Heavy
>20	++++	Very heavy

assessed by a simple scale (Table 1). The average intensity of infection was defined as the total score on this scale, divided by the number of samples analysed during that period. Statistical relationships between the presence of flagellates and period or origin were tested by a chi-squared test. Multiple logistic regression analysis was performed using 'reasons for analysis' as the dependent variable and 'origin', 'presence/absence of flagellates' and 'period' as explanatory variables. The contribution of each factor to the model was assessed by the calculation of odds ratios (ORs).

During the six years of the study, there were 204 laboratory reports relating to outbreaks of disease and 768 controls. 'Poor growing and/or liver fattening' and 'digestive disorders' were each cited 18 times as the primary sign in sick animals; in these cases, flagellates were present eight and seven times, respectively. Diseased animals were significantly more likely to have come from independent producers that were not part of SEPPAG (OR 0.081; 95 per cent confidence interval 0.046 to 0.144), but disease was not found to be related to the presence of flagellates or the period. Flagellates were the most common organism found in the digestive tract of both control and sick ducks, followed by *Candida albicans*; there were 15 cases of concurrent flagellates and *C. albicans* in healthy ducks and 29 cases in sick ducks (Table 2). *Aspergillus* species (0.7 per cent), *Capillaria* species (0.5 per cent), *Pasteurella multocida* (2.2 per cent), *Escherichia coli* (1.3 per cent), *Salmonella* Typhimurium (0.7 per cent), *Streptococcus* species (0.4 per cent), *Pseudomonas* species (0.1 per cent) and *Aeromonas* species (0.1 per cent) were also found, either alone or in combination with another organism.

After the ban on DMZ, flagellates were significantly more abundant in the controls from SEPPAG producers ( $P \leq 0.005$ ) and from all producers combined ( $P \leq 0.002$ ), but not among the independent PAG producers (Table 3). The intensity of infection also increased. However, although the prevalence and intensity of flagellate infections did increase after DMZ was withdrawn and replaced by water acidification, no increase

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A. Dernburg, DVM, PhD, Unité d'Épidémiologie, Agence Française de Sécurité Sanitaire des Aliments, 31 Avenue Tony Garnier, 69364 Lyon cedex 07, France

M-C. Rogier-Saderne, Centre de Formation Professionnel et de Promotion Agricole de la Dordogne, Avenue Churchill, BP 38, 24660 Coulounieix-Chamiers, France

C. Chauve, DVM, PhD, L. Zenner, DVM, PhD, Unité Mixte de Recherche PEV, ENVL/INRA 958, Ecole Nationale Vétérinaire de Lyon, 1 Avenue Bourgelat, BP 83, 69280 Marcy l'Etoile, France

TABLE 2: Enteric organisms present at postmortem examination in breeding, ready-to fatten and finishing ducks from 1994 to 1999

Year	Reasons for analysis	<i>Candida albicans</i> Flagellates	Other*	Flagellates + <i>C. albicans</i>	Flagellates + other	<i>C. albicans</i> + other	None	Total
1994	Control	51	9	1	1	0	90	152
	Sick	7	12	9	11	2	11	54
1995	Control	34	6	0	0	0	67	107
	Sick	10	4	1	3	4	7	32
1996	Control	50	3	3	0	0	72	128
	Sick	6	5	7	1	2	12	35
1997	Control	66	6	0	3	0	55	130
	Sick	8	4	4	6	0	6	30
1998	Control	53	6	1	3	0	68	131
	Sick	3	4	4	3	2	10	28
1999	Control	50	4	4	8	0	54	120
	Sick	5	4	3	5	1	6	25
Subtotal	Control	304	34	9	15	0	406	768
	Sick	39	33	28	29	11	52	204
Total		343	67	37	44	11	458	972

\* Other: *Aspergillus* species, *Capillaria* species, *Pasteurella multocida*, *Escherichia coli*, *Salmonella* Typhimurium, *Streptococcus* species, *Pseudomonas* species and *Aeromonas* species

**TABLE 3: Number and intensity of positive laboratory findings of flagellates in ready-to-fatten ducks before (1994 to 1996) and after (1997 to 1999) the use of dimetridazole in ducks was banned**

Intensity	Number of cases according to origin and year					
	SEPPAG		Independent producers		Total	
	1994-96	1997-99	1994-96	1997-99	1994-96	1997-99
0	203	154	47	40	250	194
+	33	39	9	12	42	51
++	33	46	6	17	39	63
+++	21	39	12	11	33	50
++++	14	10	4	6	18	16
Total	304	288	78	86	382	374
Positives (%)	33.2*	46.5*	39.7	53.5	34.6*	48.1*
Average intensity†	0.7	1.0	0.9	1.2	0.7	1.1

\* Significantly different ( $P \leq 0.005$ )

† Average intensity is calculated by adding up the intensity scores (that is, the number of crosses) and dividing the total score by the total number of samples analysed

SEPPAG Producers belonging to the Syndicat des Eleveurs de Palmipèdes Prêts à Gaver du Périgord; dimetridazole was used preventively until 1996, when it was replaced by water acidification

was seen in clinical cases of enteritis. Furthermore, the prevalence of *C albicans* increased between the two periods ( $P=0.046$ ). *C albicans* is often present in the gastrointestinal tract of normal birds and is considered non-pathogenic, except in immunodepressed animals or after prolonged antibiotic use (Chute 1997). It is best kept in check through proper sanitary and hygiene methods. In 1982, *C albicans* was present in 43 per cent of sick ducks presented for postmortem examination in the same region of France (Camguilhem and others 1982); in the present study the proportion was 36 per cent, suggesting that sanitary measures have improved since the earlier study. Stringent husbandry standards, as imposed by SEPPAG, do appear to have a positive impact on the health of PAG ducks. Duck producers may also now recognise that flagellates can be managed through improved husbandry. In addition, the changes in methods for managing flagellates correspond to the increasing public demand for 'natural' farm products.

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