Haemoproteus Columbae in domestic pigeons in Sebele, Gaborone, Botswana

E.Z. MUSHI[1], M.G. BINTA[2], R.G. CHABO[1], M. MATHAIO[1] and R.T. NDEBELE[1]

ABSTRACT

MUSHI, E.Z., BINTA, M.G., CHABO, R.G., MATHAIO, M. & NDEBELE, R.T. 1999. *Haemoproteus columbae* in domestic pigeons in Sebele, Gaborone, Botswana. *Onderstepoort Journal of Veterinary Research,* 66:29–32

Mature and immature stages of *Haemoproteus columbae* gametocytes, an avian haemosporidian protozoan parasite were found in 75% of blood smears prepared from 30 healthy domestic pigeons in Sebele location, Gaborone, Botswana. Parenteral administration of an immuno-suppressive dose of dexamethasone, lowered the level of parasitaemia, the packed cell volume and the heterophil: lymphocyte ratio in the test pigeons. However, both the dexamethasone-treated and the control pigeons remained clinically normal.

Keywords: Botswana, dexamethasone, *Haemoproteus columbae*, pigeons

INTRODUCTION

Haemoproteus species are commonly occurring avian haemosporidian parasites (Bennett 1987). *Haemoproteus columbae* occurs in pigeons widely in tropical and subtropical regions (Springer 1972). The natural hosts of this parasite include domestic pigeons (*Columba livia domestica),* many species of wild pigeons, mourning doves (*Zenaidura macroura),* turtle doves and other wild bird species (Soulsby 1986). It is usually non-pathogenic (Soulsby 1986) and in pigeons only causes disease when they are stressed (Zinkl 1986).

This paper describes the first demonstration of *H. columbae* in domestic pigeons in Botswana and attempts to produce overt disease in parasitized pigeons under exogenous stress.

[1] Animal Science and Production,Botswana College of Agriculture, Private Bag 0027, Gaborone, Botswana

[2] National Veterinary Laboratory, Private Bag 0035, Gaborone, Botswana

Accepted for publication 22 January 1999—Editor

MATERIALS AND METHODS

During a survey of backyard poultry kept by members of staff of the Botswana College of Agriculture at Sebele near Gaborone (Mushi, unpublished) a number of households were found to keep pigeons (*Columba livia domestica*). Blood smears were obtained from the brachial veins of 30 pigeons from several households. They were air dried, fixed in ethanol, stained with Giemsa stain and microscopically examined for haemoparasites.

Six adult pigeons were obtained from the different households and kept in a metal cage. The birds were fed on commercial pigeon feed consisting of mixed seeds and water was provided *ad libitum.* Blood smears made from them were stained with Giemsa and examined for haemoparasites. Blood specimens collected in heparin were collected from each pigeon and used for making blood smears and the packed cell volume (PCV) was determined by the microhaematocrit method (Jain 1986). The degree of parasitaemia was determined by counting the number of parasitized red blood cells (RBC) in the 1000 RBC examined.

Three of the six pigeons were injected with 0,5 mℓ dexamethasone intramuscularly and 1,0 mℓ was

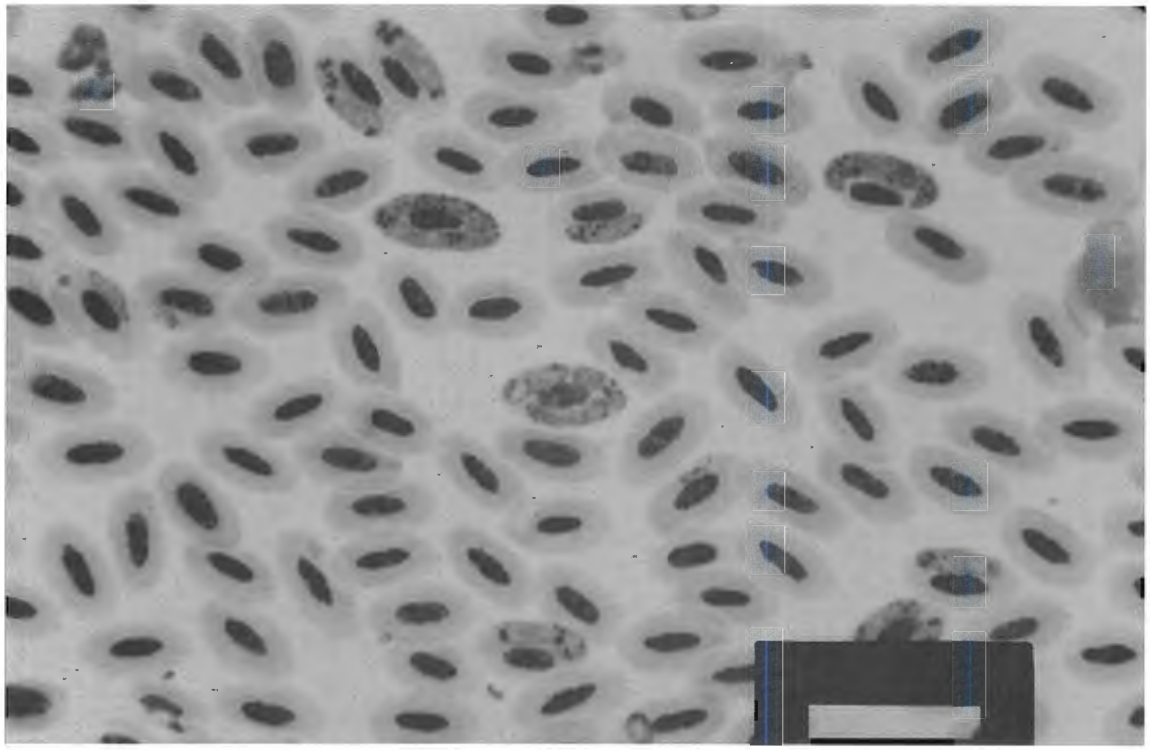

FIG. 1 *Haemoproteus columbae* in pigeon erythrocytes, x100

given on the 4th day. The other three pigeons acted as untreated controls. The heterophil:lymphocyte (H:L) ratio was determined by counting 200 such cells on the feathered edge of the smear. All six pigeons were sampled every other day.

RESULTS

Microscopic examination of Giemsa stained blood smears revealed that the erythrocytes of 75% of the pigeons were parasitized by *H. columbae* gametes. The blood parasite was identified as *H. columbae* by Dr F.W. Huchzermeyer of the Ostrich Unit at the Onderstepoort Veterinary Institute. In some of the pigeons the parasitaemia was very high and consisted of immature and mature gametocytes (Fig. 1). On clinical examination the pigeons were found to be healthy and their PCV values (Fig. 4) were within the normal values. The PCV and heterophil:lymphocyte ratios (H:L) of the three pigeons treated with dexamethasone did not differ from the un-inoculated controls (Fig. 2 and 3) when these were determined 2 days before and on d 2 and 4 after each had received 0,5 mℓ of it. However, when the dose of dexamethasone was increased to 1,0 mℓ per pigeon, the PCV showed a drop after 24 h (Fig. 2) which persisted for 8 d. The H:L ratio was markedly elevated (Fig. 3). The degree of parasitaemia did show some fluctuation, but by the end of the trial had reverted to what it was in the beginning (Fig. 4). Despite these changes, the health of the three treated pigeons was not affected for they continued to eat as well as they had before commencement of the trial.

DISCUSSION

Species of *Haemoproteus* have always been considered relatively benign parasites exerting little or no deleterious effects on their hosts (Soulsby 1986). However, there have been reports of their pathogenicity in various species (Markus & Oosthuizen 1972; Atkinson, Greiner & Forrester 1986; Hartley 1992). A more recent account of the pathogenicity of *H. columbae* was given by Earle, Bastianello, Bennett & Krecek (1993).

In the present study, a high parasitaemia of *Haemoproteus* was demonstrated in the erythrocytes of a high proportion of apparently healthy pigeons. This high prevalence could be attributed to the presence of blood sucking vector flies. The pigeon fly, *Pseudolynchia canariensis,* is a proven vector of *H. columbae* (Bennet & Peirce 1990). This fly was, however, not encountered in the present study. According to Soulsby (1986), some species of *Culicoides* have been implicated as vectors of *Haemoproteus* spp. Since recent studies conducted in Botswana have reported the presence of various *Culicoides* spp. in the vicinity of the homesteads where the pigeons were kept (Mushi, Isa, Chabo, Binta, Sakia & Kapaata

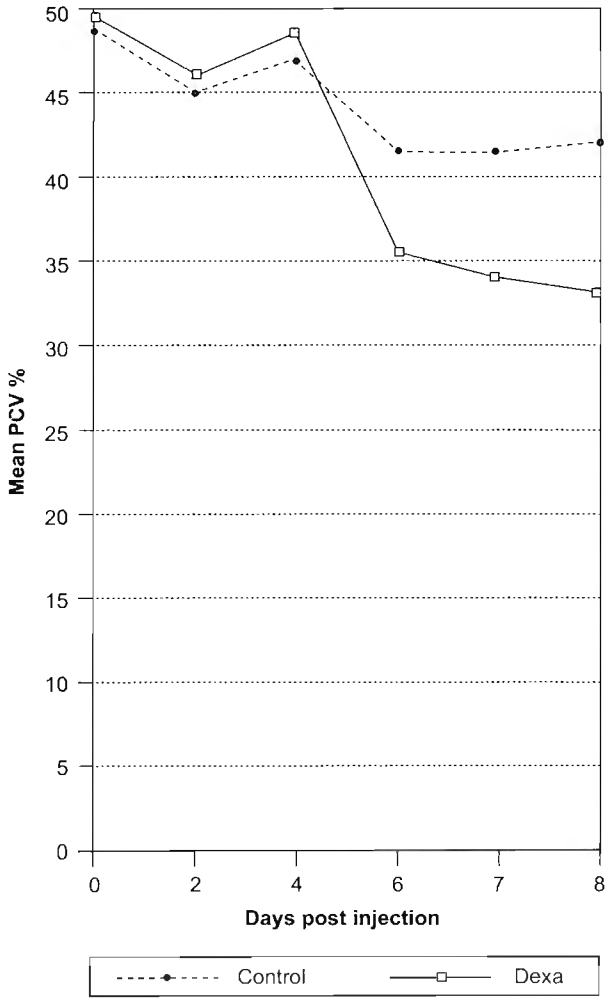

FIG. 2 Comparison of mean packed cell volume in pigeons injected with dexamethasone and contols

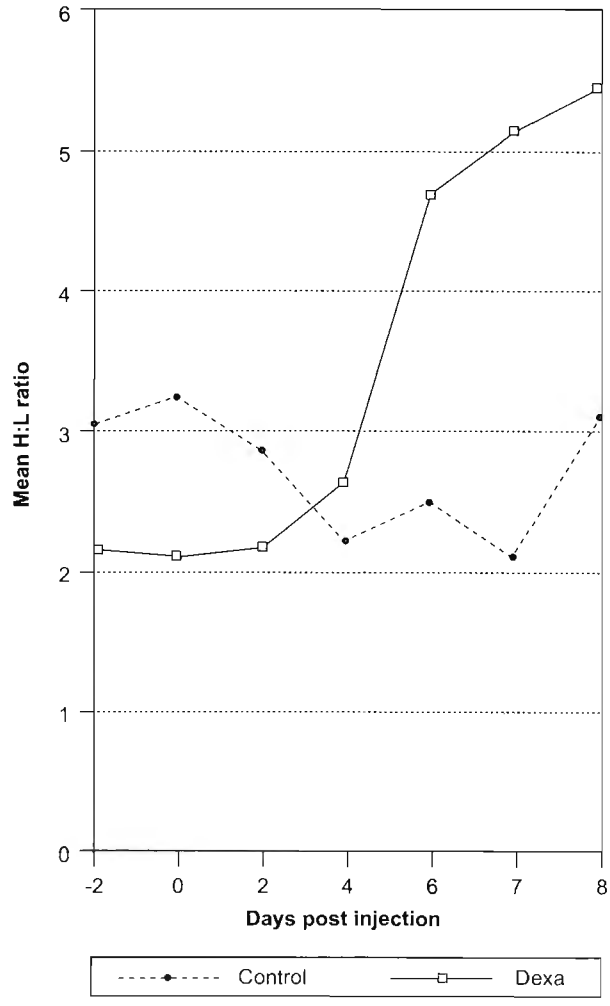

FIG. 3 Comparison of mean heterophil:lymphocyte ratios in pigeons injected with dexamethosone and controls

1998), it is therefore possible that *Culicoides* spp. were responsible for the high incidence of this haemosporidian parasite in domestic pigeons in this location.

Gametocytes of these parasites were found in the cytoplasm of erythrocytes together with black pigment granules (Coles 1986). Although *H. columbae* has been demonstrated in pigeons from other countries, this is the first report of its occurrence in Botswana.

Parenteral administration of dexamethasone, a synthentic steroid with potent glucocorticoid activity (Rijnberk & Mol 1989), lowered the level of parasitaemia, PCV and H:L ratio in the test pigeons. The PCV values of the control pigeons were within the normal range for pigeons (Kalomenopoulous & Koliakos 1989). Exogenous steroid administration is known to induce a heterophilic leukocytosis, lymphopenia and basophilia (Woerpel & Rosskopf 1984; Coles 1986; Campbell & Coles 1986). Dexamethasone therefore simulated the endogenous steroid-induced stress reaction described for birds previously (Maxwell 1993). Despite this stress, as indicated by the lowered H:L ratio and a reduction in the PCV, the pigeons remained clinically normal.

It was observed that the parasites had degenerated within the cytoplasm of the erythrocytes resulting in a decline in the level of parasitaemia in the dexamethasone-treated pigeons. The cause of this reaction could not be explained. This reduction was however short-lived for the degree of parasitaemia then reverted to pre-immunosuppressive levels within several days of the second injection of dexamethasone.

It can therefore be concluded that moderate stress did not induce the parasites to exert overt clinical disease. One reason for this is that it is possible that the parasite, *H. columbae* did not proliferate in vertebrate

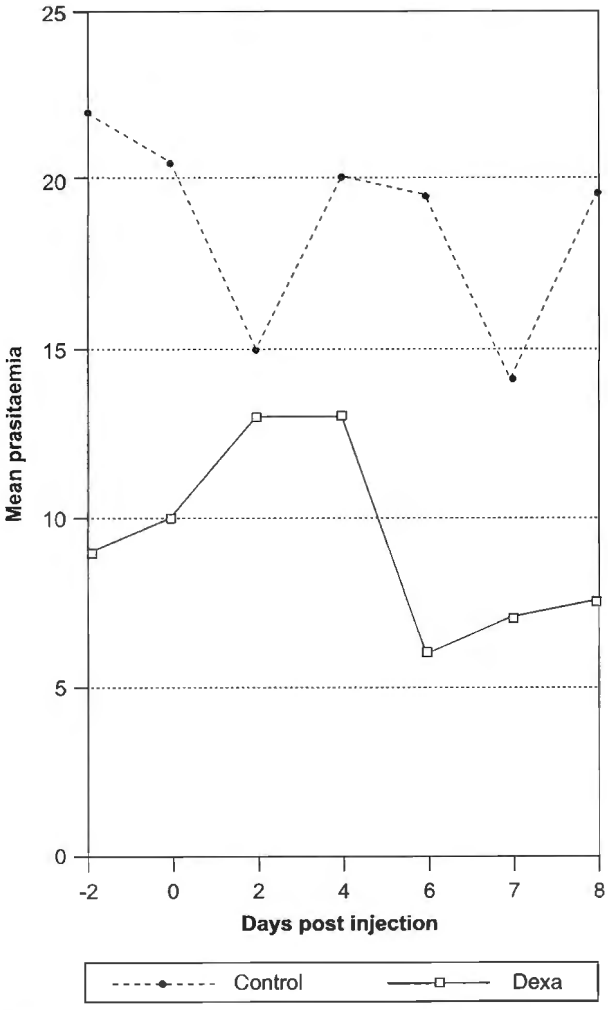

FIG. 4 Comparison of mean parasitaemia in pigeons injected with dexamethasone and controls

erythrocytes as suggested by Soulsby (1986). The schizogenous phase of its life cycle takes place in endothelial cells whilst asexual reproduction is completed in blood sucking hippoboscid flies.

REFERENCES

ATKINSON, C.T., GREINER, E.C. & FORRESTER, D.J. 1986. Pre-erythrocytic development and associated host responses to *Haemoproteus meleagridis* (Haemosporina: Haemoproteidae) in experimentally infected domestic turkeys. *Journal of Protozoology,* 33:375–381.

BENNETT, G.F. 1987. Companion bird medicine, edited by E.W. Burr. Ames: Iowa State University Press: 120.

BENNETT, G.F. & PEIRCE, M.A. 1990. The haemoproteid parasites of the pigeons and doves (Columbiadae). *Journal of Natural History,* 24:311–325.

CAMPBELL, T.W. & COLES, E.H. 1986. Avian Clinical Pathology, in *Veterinary Clinical Pathology,* edited by E.H. Coles, W.B. Saunders, Philadelphia: 279–301.

COLES, E. H. 1986. Haemoproteus, in *Veterinary Clinical Pathology*, edited by E.H. Coles. Philadelphia: W.B. Saunders.

EARLE, R.A., BASTIANELLO, S.S., BENNETT, G.F. & KRECEK, R.C. 1993. Histopathology and physiology of the tissue stages of *Haemoproteus columbae* causing mortality in Columbiformes. *Avian Pathology,* 22:67–80.

HARTLEY, W.J. 1992. Some lethal avian protozoan diseases of native birds in Eastern Australia. *Journal of the South African Veterinary association,* 63:90.

JAIN, N.C. 1986. Haematologic techniques, in *Schalm's Veterinary Haematology,* edited by N.C. Jain, 4th edition, Philadelphia: Lea & Febiger: 20–86.

KALOMENOPOULOUS, M. & KOLIAKOS, G. 1989. Total body haematocrit and erythrocyte life span in pigeons (*Columba livia*). Comparative Biochemistry and Physiology, 92:215–218.

MARKUS, M.B. & OOSTHUIZEN, J.H. 1972. Pathogenicity of *Haemoproteus columbae. Transactions of the Royal Society of Tropical Medicine and Hygiene,* 66:86–187.

MAXWELL, M.H. 1993. Avian leucocyte response to stress. *Poultry Science,* 49:34–42.

MUSHI, E.Z., ISA, J.F.W., CHABO, R.G., BINTA, M.G., SAKIA, R.M. & KAPAATA, R.W. 1998. Culicoides associated with dairy cows at Sebele, Gaborone, Botswana. *Tropical Animal Health and Production,* 30:305–307.

RIJNBERK, A. & MOL, J.A. 1986. Adrenocortical Function, in *Clinical Chemistry of domestic animals,* edited by J.J. Kaneko, 4th edition, San Diego: Academic Press: 610–626.

SPRINGER, W.T. 1972. Other blood and tissue protozoa, in *Diseases of Poultry,* edited by M.S. Hofstad, 6th edition. Ames: Iowa State University press: 727–740.

SOULSBY, E.J.L. 1986. Genus Haemoproteus Kruse, 1890, in *Helminths, Arthropods and Protozoa of Domesticated Animals,* 7th edition, edited by E.J.L. Soulsby, London: Bailliere Tindall: 700–706.

WOERPEL, R.W. & ROSSKOPF, W.J. 1984. Clinical experience with avian laboratory diagnostics. *Veterinary Clinics of North America Small Animal Practice,* 124:249–272.

ZINKL, J.G. 1986. Avian Haematology, in *Schalm's Veterinary Haematology.* 4th edition, edited by N.C. Jain. Philadelphia: Lea & Febiger: 256–273.