ANNALES DE PARASITOLOGIE

HUMAINE ET COMPARÉE

Tome 57

1982

N° 3

© Masson, Paris, 1982.

Annales de Parasitologie (Paris)
1982, t. 57, n° 3, pp. 203-208.

MÉMOIRES ORIGINAUX

A *LEUCOCYTOZOON* OF BUZZARD (*BUTEO BUTEO* (L.), ACCIPITRIDAE)

from Northern Italy

L. SACCHI and Cl. PRIGIONI*

SUMMARY. A protozoan belonging to the genus *Leucocytozoon* (Haemosporida, Leucocytozoidae) was found in *Buteo buteo* (Aves, Accipitridae). The gametocytes of this parasite present in peripheral blood are described and compared biometrically to those of other known species. The possibility of identifying this species using current taxonomic methods is discussed.

Observations sur un *Leucocytozoon* de la Buse (*Buteo buteo* (L.), Accipitridae) de l'Italie du Nord.

RÉSUMÉ. Un protozoaire du genre *Leucocytozoon* (Haemosporida, Leucocytozoidae) a été trouvé chez *Buteo buteo* (Aves, Accipitridae). Les gamétocytes de ce parasite dans le sang périphérique sont décrits et ils sont comparés avec ceux d'autres espèces. Nous examinons la possibilité de classer cette espèce, d'après les actuelles méthodes taxonomiques.

Introduction

Parasites of the genus *Leucocytozoon* (Haemosporida, Leucocytozoidae) have been recorded in at least 40 species of Falconiformes from various geographic areas (Africa, Asia, Europe, North America) since the beginning of this century (Sambon 1908). From these records, eight species of *Leucocytozoon* have been described: *L. toddi* (Sambon 1908), *L. audieri* (Laveran and Nattan-Larrier 1911), *L. mathisi* (França 1912), *L. martyi* (Commes 1918), *L. circaeti* (Sergent and Fabiani 1922), *L. franchini* (França 1927), *L. bacelari* (Tendeiro 1947) and *L. beaurepairei* (Travassos Santos Diaz 1954).

However, according to Hsu *et al.* (1973) *L. mathisi*, *L. martyi*, *L. circaeti*, *L. audieri* found in Accipitridae and *L. beaurepairei* in Sagittaridae, are synonymous with

* Istituto di Zoologia, Università di Pavia, Piazza Botta, 9, 27100 Pavia, Italy.

Accepté le 2 novembre 1981.

L. toddi, and according to Greiner and Kocan (1977), *L. bacelari* and *L. franchini* found in species of Accipitridae, can be considered synonymous with *L. toddi*.

In this paper we describe the gametocytes of a *Leucocytozoon* found in a Buzzard (*Buteo buteo*) in Italy and we discuss the taxonomic position of this parasite. This represents the first report of a *Leucocytozoon* in this host from Italy or Europe.

Methods

Blood smears were obtained in November 1980 from an adult Buzzard. The smears were air-dried, fixed in 100% methanol and stained in Giemsa. Photographs were taken with a Leitz Orthoplan microscope equipped with an Orthomat, and measurements were made with a Visopan Reichert microscope following criteria proposed by Bennett and Campbell (1975).

The gametocytes, parasitized cells and uninfected erythrocytes were traced on millimetered paper and the relative areas were determined by counting the squares. The indices defined by Bennett *et al.* (1974) were calculated. Gametocytaemia was expressed as the number of parasites per 1,000 erythrocytes.

Results

In blood smears two gametocyte forms were present: one oval and the other elongate. These forms are very different both in shape and in size. The *Table I* compares the occurrence of the two forms in a first blood sample and in a sample taken six days later.

TABLE I. — Occurrence of gametocytes of oval and elongate forms in two samples of blood.

	First sample	second sample
No. gametocytes examined	928	944
% macrogametocytes		
oval	94.22	53.72
elongate	5.78	46.28
% microgametocytes		
oval	92.44	65.18
elongate	7.56	34.82
Sex ratio (micro/macro)		
oval	0.61	0.60
elongate	0.82	0.37
Blood parasitaemia was 7.3% in both samples.		

Description of the parasite.

Host: *Buteo buteo*, Accipitridae.

Locality: Pavia, northern Italy.

Immature gametocytes (fig. 1a). Oval or round stained blue; nucleus diffuse,

faintly coloured. Host cell nucleus hypertrophic, pushed to the periphery of the parasite; host cell cytoplasm, faintly coloured, shows two large expansions.

Macrogametocytes (fig. 1b, d, f and Table II). Oval or elongate, stained deep blue with numerous vacuoles; nucleus irregular or oval, variable in position, faintly rose coloured, without a distinct nucleolus.

FIG. 1. — Gametocytes of *Leucocytozoon* of *B. buteo*.

a) immature gametocyte; b) oval macrogametocytes; c) oval microgametocyte; d) oval microgametocyte (upward) and oval macrogametocyte; e) elongate microgametocyte (upward) and elongate macrogametocytes; f) elongate microgametocyte (upward) and elongate macrogametocytes.

TABLE II. — Measurements* of uninfected erythrocytes and of gametocytes and calculated indices of *Leucocytozoon* from *Buteo buteo*.

	length	width	area	Parasite index ¹	Host parasite index ²	Host nuclear index ³
Erythrocyte	10.0 (0.4)	7.6 (0.4)	77.3 (7.5)			
Erythrocyte nucleus	5.6 (0.5)	2.4 (0.2)	11.0 (1.6)			
Oval macrogametocyte	18.4 (0.8)	10.7 (0.6)	155.2 (6.9)	2.0	2.6	1.6
Host cell nucleus	11.9 (0.8)	2.3 (0.3)	18.2 (2.4)			
Oval microgametocyte	16.0 (1.3)	10.4 (0.7)	144.0 (13.8)	1.8	2.3	1.9
Host cell nucleus	11.0 (0.7)	2.6 (0.5)	21.4 (3.7)			
Elongate macrogametocyte	24.8 (1.4)	5.8 (0.3)	117.1 (3.4)	1.5	1.9	1.8
Host cell nucleus	11.8 (1.4)	2.2 (0.3)	20.1 (3.2)			
Elongate microgametocyte	20.9 (1.4)	7.1 (0.7)	120.3 (3.5)	1.5	2.0	2.2
Host cell nucleus	11.2 (0.7)	3.0 (0.4)	24.2 (2.9)			

* means of 10 samples in μm and standard deviation in parenthesis.

1. = mean area of gametocyte/mean area of uninfected erythrocyte.

2. = mean area of the host cell-parasite complex/mean area of uninfected erythrocyte.

3. = mean area of the host cell nucleus of the gametocyte/mean nuclear area of uninfected erythrocyte.

Microgametocytes (fig. 1c, d, f and Table II). Oval or elongate, cytoplasm homogeneously stained pink-violet without vacuoles or granulations, nucleus diffuse, faintly coloured without a distinct nucleolus.

Host cells enclosing gametocytes apparently erythrocytes or erythroblasts, oval or spindle shaped with remaining host cell cytoplasm forming short wide polar elongations or long thin spindle shaped elongations (cytoplasmatic horns), poorly coloured, paler than those of uninfected erythrocytes.

Nucleus of host cells flattened, stained dark red, usually pushed to the peripheral of the parasite.

Schizogony: unknown.

Vector: unknown.

Comments

Most species of *Leucocytozoon* of Falconiformes are described from oval and elongate forms of the gametocytes, observed in peripheral blood of the vertebrate host. Another form (round) was observed by Franchini (1923) in *L. franchini*, and by Dutton *et al.* (1907) and by Tendeiro (1947) in *L. bacelari*. This form was in host cells lacking the polar cytoplasmatic horns which characterize the host cells of the elongate forms. Round and elongate forms were found in the same vertebrate host by Tendeiro (of both macro- and micro- gametocytes) and by Franchini (only of microgametocytes). In the other species of *Leucocytozoon* with two gametocyte

forms (*L. simondi* in Anseriformes and *L. danilewskyi* in Strigiformes), the two forms appear at particular points of the complex life cycle of the parasite (Desser 1967; Khan 1975); but for *Leucocytozoon* in Falconiformes this aspect remains unknown.

The *Leucocytozoon* found by us in *Buteo buteo* shows oval (not round) and elongate forms (fig. 1). We consider the oval form (distinguished by us from the elongate form on the basis of biometric measurements, Table II) to be a stage in the maturation of the final elongate form. This is supported by the observation that the ratio elongate/oval forms increased in the blood of our host bird (Table I). So, the fact that the descriptions of *Leucocytozoon* in Falconiformes were made on different forms and stages, makes the problems of synonymy difficult to resolve.

In a recent systematic revision of the *Leucocytozoon* of Falconiformes, Greiner and Kocan considered all species synonyms of *L. toddi*. Thus, according to these Authors, the different characters of the eight species of *Leucocytozoon* defined so far fall within the variability that *L. toddi* manifests in its different vertebrate hosts.

This proposal simply sets apart and does not resolve the taxonomic problems, so we do not class the parasite observed by us as *L. toddi*.

The problem of the taxonomy of *Leucocytozoon* in the genus *Buteo* was first examined by Coetney and Roudabush (1937). They indicated that the *Leucocytozoon* of *B. borealis* (= *B. jamaicensis*) was very similar to *L. mathisi* found previously in *Accipiter nisus* (França 1912) and they named it *L. mathisi buteonis*. They also found considerable morphological, but not biometrical, affinities of their parasite with *L. laverani* (= *L. franchini*, França 1927), found by Franchini (1923) in *Circus macrourus*¹. No mention however was made by these Authors of the *Leucocytozoon* found in Italy in *Accipiter nisus* by Franchini (1924), who identified it as *L. mathisi*.

The parasite found by us in *B. buteo* is similar to the description of *L. mathisi* and *L. franchini* by Franchini and *L. mathisi buteonis* by Coetney and Roudabush. It is also similar in morphology to *L. mathisi* observed by França, who however did not give measurements for comparison. The record of *Leucocytozoon* in *B. buteo* by Jakunin (1972) lacks a description. We do not conclude that *L. mathisi* and *L. franchini* are synonymous and that our parasite belongs to the former species.

In fact we do not believe that one can take such a rigorous taxonomic position on the basis of general and in certain respects subjective criteria, and on non homogeneous biometric data of sexual forms only.

The taxonomic problem will unfortunately remain unsolved until the schizogonic and sporogonic cycles of the *Leucocytozoon* of the Falconiformes are fully known. In the absence of these data, and in the absence of any experimental test for parasitic specificity within the various species of Falconiformes, any taxonomic classification based on observations of the sexual forms alone must be considered only as a working hypothesis and therefore as a temporary solution.

1. Franchini (1923) named the vertebrate host of *L. laverani* (= *L. franchini*) with the vernacular Italian name "Albanella pallida" instead of the scientific name *Circus macrourus* (Gmelin 1771) of the family Accipitridae. This caused confusions and controversies regarding the classification of "Albanella pallida" by Hsu *et al.*, 1973, Fallis *et al.*, 1974, Greiner and Kocan 1977.

REFERENCES

- BENNETT G. F., CAMPBELL A. G. : Avian Leucocytozoidae. I. Morphometric variation in three species of *Leucocytozoon* and some taxonomic implications. *Can. J. Zool.*, 1975, 53, 800-812.
- BENNETT G. F., KHAN R. A., CAMPBELL A. G. : *Leucocytozoon gruzi* sp. n. (Sporozoa : Leucocytozoidae) from a sandhill crane, *Grus canadensis* (L.). *J. Parasitol.*, 1974, 60, 359-363.
- COATNEY G. R., ROUDABUSH R. I. : Some blood parasites from Nebraska birds. *Am. Midl. Nat.*, 1937, 18, 1005-1030.
- COMMES C. : *Leucocytozoon* et microfilaire d'un rapace diurne (*Astur badius* var. *sphenurus*). *Bull. Soc. Pathol. Exot.*, 1918, 11, 31-34.
- DESSER S. S. : Schizogony and gametogony of *Leucocytozoon simondi* and associated reactions in the avian host. *J. Protozool.*, 1967, 14, 244-254.
- DUTTON J. E., TODD J. L., TOBEY E. N. : Concerning parasitic Protozoa observed in Africa. Part. II. *Ann. Trop. Med. Parasitol.*, 1907, 1, 287-370.
- FALLIS A. M., DESSER S. S., KHAN R. A. : On species of *Leucocytozoon*. *Adv. Parasitol.*, 1974, 12, 1-67.
- FRANÇA C. : *Leucocytozoon* du geai, de l'épervier et de la bécasse. *Bull. Soc. Pathol. Exot.*, 1912, 5, 17-21.
- FRANÇA C. : Notes parasitologiques. *J. Sci. Math. Fis. Nat. (Lisbon)*, 1927, 24, 15-24.
- FRANCHINI G. : Hematozoaires de quelques oiseaux d'Italie. *Bull. Soc. Pathol. Exot.*, 1923, 16, 118-125.
- FRANCHINI G. : Observations sur les hematozoaires des oiseaux d'Italie. *Ann. Inst. Pasteur, Paris*, 1924, 38, 470-515.
- GREINER E. C., KOCAN A. A. : *Leucocytozoon* (Haemosporida : Leucocytozoidae) of the Falconiformes. *Can. J. Zool.*, 1977, 55, 761-770.
- Hsu C. K., CAMPBELL G. R., LEVINE N. D. : A check-list of the species of *Leucocytozoon* (Apicomplexa, Plasmodiidae). *J. Protozool.*, 1973, 20, 195-203.
- JAKUNIN M. P. : Blood parasites of wild birds of southeastern Kazakhstan (In Russian). *Tr. Inst. Zool. Akad. Nauk. Kaz. SSR.*, 1972, 33, 69-78.
- KHAN R. A. : Development of *Leucocytozoon ziemanni* (Laveran). *J. Parasitol.*, 1975, 61, 449-457.
- LAVERAN A., NATTAN-LARRIER L. A. : Sur un *Leucocytozoon* de l'aigle pêcheur *Haliaeetus vocifer*. *C. R. Seances Soc. Biol. Fil.*, 1911, 70, 686-688.
- SAMBON L. W. : Remarks on the avian haemoprotozoa of the genus *Leucocytozoon* (Danilewsky). *J. Trop. Med. Hyg.*, 1908, 11, 325-328.
- SERGEANT E. T., FABIANI G. : Sur un *Leucocytozoon* d'un rapace diurne d'Algérie (*Circaetus gallicus*) (Gmel.) *Arch. Inst. Pasteur Afr. Nord*, 1922, 2, 480.
- TENDEIRO J. : Acerca dos hematozoarios de algumas aves da Guiné Portuguesa. *Rev. Med. Vet. (Lisbon)*, 1947, 42, 285-350.
- TRAVASSOS SANTOS DIAS J. A. : Estudos sobre os hematozoarios das aves de Mocambique. I. *Leucocytozoon beaurepairei* n. sp., parasita do *Sagittarius serpentarius* (Miller 1779). *Bull. Soc. Estud. Mocambique*, 1954, 87, 1-14.