



ASSESSING *PLASMODIUM* SPP AND *LEUCOCYTOZOON* SPP IN INDIGENOUS CHICKEN FROM SOUTHEASTERN CÔTE D'IVOIRE

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ABSTRACT

This study carried out in the Southeastern area of Côte d'Ivoire from May 2017 to March 2018 in order to determine the prevalence of *Plasmodium* spp and *Leucocytozoon* spp in indigenous chicken. A total of 239 blood samples were collected by puncturing the brachial vein from chickens of both sexes. The study was done in two Regions: Abidjan District (Abidjan and Bingerville) and Ayeby Tiassa (Agboville and Sikensi). Microscopic technique has been used to determine the prevalence of *Plasmodium* spp and *Leucocytozoon* spp from the smear of chickens. *Leucocytozoon* spp was absent from the chickens. In addition, the chickens were infected by *Plasmodium* spp (8.36%). Prevalence of *Plasmodium* spp was higher in males (13.04%) than in females (5.44%). Adult chickens also showed a higher rate of 11.11% compared to younger which had 6.71 %. *Plasmodium* spp was more detected in rainy season 11.66% than in dry season (5.04%). Moreover, chickens were most infected in Abidjan District (11.66 %) than in Ayeby Tiassa Region (5.04 %).

KEYWORDS: chicken, Plasmodium, Leucocytozoon, Côte d'Ivoire.

INTRODUCTION

Haemosporidians are one of the most well known groups of parasitic protists. These parasites are common blood parasites of mammals, reptiles, amphibians and birds (Valkiunas, 2005). Bird haemosporidians are cosmopolitan in distribution and are also the largest group of haemosporidians by number of species (Marzal, 2012). Avian haemosporidians have been recorded in about 68% of the avian species which have been examined (Atkison and Van Riper, 1991).

The main genus of avian haemosporidians which are *Plasmodium* spp, *Haemoproteus* spp and *Leucocytozoon* spp can be pathogenic to their hosts (Bennett et al, 1993; Valkiunas, 1993). Comparatively, species of the genera *Plasmodium* and *Leucocytozoon* are considered to be more pathogenic than *Haemoproteus* spp. (Soulsby, 1982). *Plasmodium* and *Leucocytozoon* infections in chickens can cause anorexia, reduced weight gain, poor feed conversion, anaemia, green faeces and often death (Atkinson and Van Riper, 1991., Permin and Juhl, 2002; William, 2005).

The presence of avian haemosporidians have been reported in indigenous chickens of some African

countries like Ghana (Poulsen et al., 2000), Nigeria (Karamba et al., 2012) or Cameroon (Sehgal et al., 2006). In Côte d'Ivoire the presence of avian haemosparasites has been reported in wild birds with a higher prevalence along the coastal forested regions (Sehgal et al., 2010); however, no studies on them in chicken have previously been done. Thus, the objective of this work was to determine the prevalence of *Plasmodium* spp and *Leucocytozoon* spp in indigenous chickens of the Southeastern Côte d'Ivoire.

MATERIALS AND METHODS

Study area

This study was carried out in Abidjan District and in Ayeby Tiassa Region in the Southeasten of Côte d'Ivoire and are characterized by a dense vegetation. The annual average rain full is about 1600 mm per year and the temperature range from 26°C to 32°C (FAO, 2007). The Ayeby Tiassa Region covers the areas of Sikensi and Agboville; The Abidjan District covers Abidjan and Bingerville (Figure 1). Indigenous chicken are kept by local communities of these areas. In addition, prevalence of avian haemosporidians is higher in the zone (Sehgal et al., 2011).

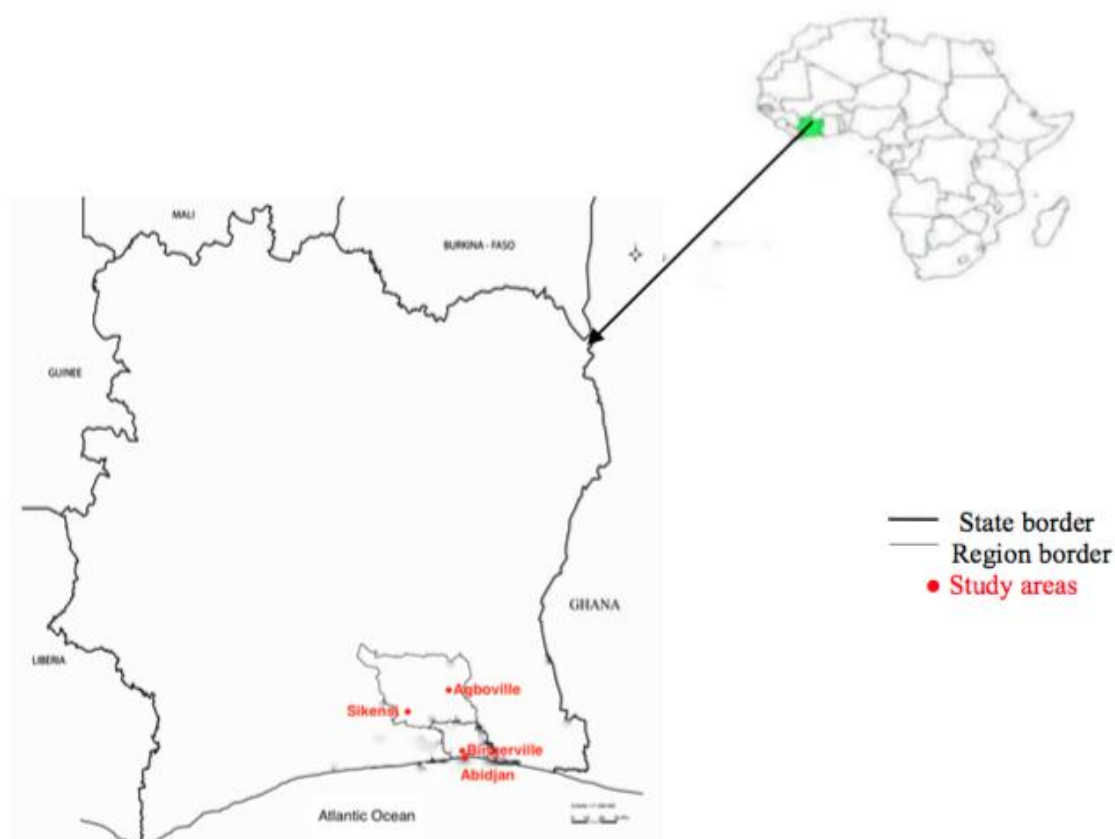


Figure 1: Location of Côte d'Ivoire in Africa and different study areas.

Collection of blood samples

A total of 239 blood samples were collected randomly in the Southeastern of Côte d'Ivoire from May 2017 to

March 2018. The table 1 shows the number of chickens sampled according to Region and localities. Blood was taken by puncturing the brachial vein from each chicken.

Table 1: Number of chickens sampled per Region and localities.

Region	Study areas	Number of chickens sampled
Abidjan District	Abidjan	60
	Bingerville	60
	Total	120
Ayeby Tiassa	Agboville	60
	Sikensi	59
	Total	119

Parasitological examination

A drop of each sampled blood was used to make blood films on ready-to-use glass slides. The smears were fixed in absolute methanol for 3 to 5 min and stained by immersing in jar containing diluted 10% Giemsa solution for 20 to 30 min. After staining, smears were air dried and then examined under oil immersion $\times 100$

magnification to identify the morphology of *Plasmodium* and *Leucocytozoon*. Haemoparasites were identified according to the description of Valkiunas (2005). Parasitemia was estimated as a percentage by actual counting of the number of parasites per 1,000 red blood cells or per 10,000 red blood cells if infections were light (i.e. $<0.1\%$), as recommended by Godfrey *et al.* (1987).

Statistical analysis

The prevalences were calculated as follows,

$$\text{Prevalence (\%)} = \frac{\text{Number of positive blood smears}}{\text{Total number of smears examined}} \times 100$$

The proportions of the various studied parameters were subjected to a Chi2 test and SPSS (statistical) software version 20 to evaluate their significant level. The prevalences were significant at 5%.

RESULTS AND DISCUSSION

Haemosporidians seen in blood films

Haemosporidians of genus *plasmodium* were recorded with an overall prevalence of 8.36 %. This prevalence is

comparable to results found in Nigeria (Igbokwe et al., 2008) where the prevalence of *Plasmodium* spp was 9.4 %; but it's lower than results found in Ghana (Poulsen et al., 2000) where 27 of 100 birds (27.0%) harbored *Plasmodium juxtannucleare*. All these studies showed low prevalence of *Plasmodium* spp in West Africa compared to studies in other areas of Africa such as Kenya where prevalence of *Plasmodium* spp was 53.5% (Sabuni, 2009). This variation in *Plasmodium* spp prevalence may be attributed to the geographical location of study sites and the size of samples in each study.

The chickens examined in this study lacked *Leucocytozoon* spp infection. These results are

comparable to the studies done by Poulsen et al. (2000) in indigenous chicken of Ghana. Sehgal et al. (2005) also did not find *Leucocytozoon* spp infection in wild birds in Abidjan area. Other studies done by Sehgal et al. (2006) showed that on 143 chicken tested in Uganda and Cameroon, 18.3% were infected with *Leucocytozoon schoutedeni*. This variation in *Leucocytozoon* prevalence may also be attributed to the geographical location of study sites.

Few development form of *Plasmodium* spp was found in the examined slides; most were trophozoites and meronts (Figure 2).

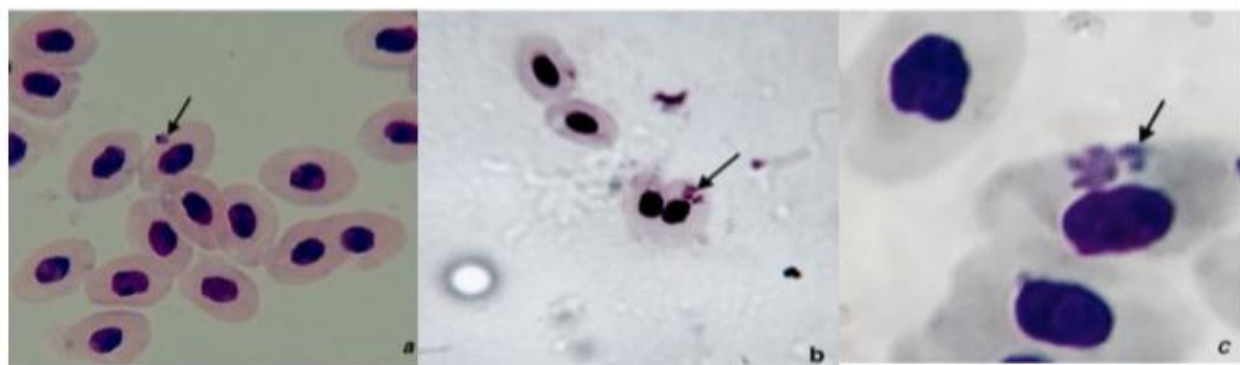


Figure 2: Blood stages of *Plasmodium* spp as seen in blood films. a: Trophozoites; b-c: meronts.

Moreover infected chickens presented a low parasitemia (0.02%). The activation of the immune system may explain this low parasitemia. Indeed, Cellier-Holzem et al. (2010), and Paulman and McAllister (2005) found that parasitemia of avian plasmodium was low in Reexposed birds.

Prevalence of *Plasmodium* spp according to age and sex

Among the age groups, adults birds had a slightly higher prevalence (11.11 %) than the younger birds (6.71%). Male birds also showed higher prevalence of 13.04% compared to female birds, 5.44% (Table 2). Statistical test didn't show significant differences in *Plasmodium* spp prevalence among age groups ($p=0.22$) but *Plasmodium* spp was significantly more prevalent in male birds than female birds ($p=0.038$).

Table 2: Prevalence of *Plasmodium* spp according to age and sex.

Parameters		Number examined	Number infected	Prevalence (%)	P value
Age groups	Adults	90	10	11.11	0.22
	Youngs	149	10	6.71	
Sexes	Females	92	12	13.04	0.038
	Males	147	8	5.44	

According to McCurdy et al. (1998) Male birds tend to have a higher prevalence of infection than females. But our results were in contrast to results found by Hasson (2015) who reported high prevalence in female than male chicken. We didn't explain this difference.

Prevalence of *Plasmodium* spp according to season

The prevalence of *Plasmodium* spp was higher in the rainy season (11.66%) than in the dry season (5.04%) (Table 3) but the difference was not significant ($p=0.06$).

Table 3: Prevalence of *Plasmodium* spp according to season.

Season	Number examined	Number infected	Prevalence (%)	P value
Rainy season	120	14	11.66	0.06
Dry season	119	6	5.04	

The same observation was done by Bennett et al. (1974) and Igbokwe et al. (2008). These results may be explained by the fact that the rainy season is favourable to vectors development.

Prevalence of *Plasmodium* spp according to study area

Between the four study areas, Abidjan was found to have the highest prevalence (13.33%) followed by Bingerville (10%), Agboville (6.67%) and Sikensi (3.39%); So prevalence of *Plasmodium* spp in Abidjan District (11.66%) was higher than in Ayeby Tiassa Region (5.04%), (Table 4).

Table 4: Prevalence of *Plasmodium* spp per study area

Region	Study areas	Number examined	Number infected	Prevalence (%)
Abidjan District	Abidjan	60	8	13.33
	Bingerville	60	6	10
	Total	120	14	11.66
Ayeby Tiassa	Agboville	60	4	6.67
	Sikensi	59	2	3.39
	Total	119	6	5.04

These results are comparable to those of Sehgal et al. (2011) which found that regions of high prevalence of *Plasmodium* spp in Côte d'Ivoire were the coastal forested regions.

CONCLUSION

This study has confirmed the presence of *Plasmodium* spp in indigenous chickens of the Southeastern of Côte d'Ivoire; but no infection with *Leucocytozoon* spp was found. The prevalence of *Plasmodium* spp was higher in Adult birds than younger birds; Male birds were also most infected than female birds. Moreover, indigenous chickens were most infected by *Plasmodium* spp in rainy season than dry season. The region, which showed the highest prevalence, was Abidjan District. This study was the first on avian haemosporidian in indigenous chickens of Côte d'Ivoire. Further study need to be done to evaluate the impact of infestation on the health and productivity of these birds.

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