

Seroprevalence survey of equine anaplasmosis in France and in sub-Saharan Africa

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Equine anaplasmosis is a vector-borne disease transmitted by ticks belonging to the *Ixodes* genus, especially *I. ricinus* in metropolitan France. The causative agent is a bacterium of the Anaplasmataceae family: *Anaplasma phagocytophilum* [1]. The clinical presentation ranges from asymptomatic, where horses are infected but do not show outward signs of disease, to others that present with signs consistent with a febrile illness (fever, lethargy, anorexia), icterus, ataxia and oedema of members. The first clinical case was described in the USA and then in Europe (predominately in France in 2000) [2]. The aspects in veterinary public health are important: human cases were recognised in 1994 in the USA and in Europe in 1995 [3]. The epidemiology of equine anaplasmosis is quite unknown: the reservoir has not been identified and the cases' repartition has to be detailed.

The goal of this study is to assess the prevalence of *Anaplasma* in equines in France and Africa using a serological method and to detect eventual risk factors.

Blood samples were obtained on 570 horses in 13 sites in metropolitan France (408), in French Guyana (49) and in five African countries (Ivory Coast, Chad, Gabon, Congo (DR) and Djibouti) (113). On each site, if the number of horses was less than 30 all horses were tested, otherwise only 30 subjects were selected.

The blood samples were tested using an ELISA Dot-Blot method (SNAP[®] 4Dx, IDEXX Laboratories Inc., Westbrook, ME, USA), allowing detection of both Ig M and Ig G. The percentages were compared using the chi-squared test ($\alpha = 5\%$).

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The results are shown in Table 1. None of the horses tested from Africa, French Guyana or in the southern France group had antibodies to *A. phagocytophilum*. The seroprevalences in the centre-western and eastern regions in France were 16.0% and 20.1%, respectively. Among the northern France group (included the centre-western and eastern France groups), 23.1% of females and 15.8% of males tested positive; 24.5% of ponies and 16.8% of horses; 14.3% of 0–5 year old subjects, 18.6% of 6–10 year old ones, 17.7% of 11–15 year old ones, 21.4% of 16–20 year old ones and 14.3% of 21–25 year old ones. The prevalences in Africa, French Guyana and metropolitan France were statistically different ($p < 0.01$). In metropolitan France, a significant difference appeared between the northern and the southern groups ($p < 0.00001$). The difference between the centre-western and eastern groups wasn't statistically significant. Among the northern group, no risk factors were identified (sex, pony vs. horse and/or age). At the site of Metz, the ponies had higher infection rate than the adult horses ($p < 0.0001$).

The vector of equine anaplasmosis in metropolitan France is a hard tick, *Ixodes ricinus*. Its preferred environment is humid areas near woods or prairies. The ticks don't constitute the reservoir of the disease. This reservoir has not been determined. Our study confirms that the positive horses are only detected in the preferential areas of the vector (northern France). This finding is in contrast to other studies that have shown the existence of the pathogen in the south (11.3% in Leblond *et al.* in 2005) [4]. The differences may be explained by the poor specificity of the serological method and the fact that different geographic regions in southern France were evaluated.

The commercial kit used in this study is recommended by the manufacturer as a canine

Table 1. Seroprevalence of equine anaplasmosis in France and in sub-Saharan Africa

Location			In-clinic ELISA (Snap [®] 4Dx)
Country	Region	City	
Metropolitan France			55/408 (13.5%)
	Centre-west		23/144 (16%)
		Coëtquidan	4/20 (20%)
		Fontainebleau	9/49 (18.4%)
		Olivet	4/19 (21%)
		Saumur	3/31 (9.7%)
		Tours	3/25 (12%)
	East		32/159 (20.1%)
		Mourmelon	7/47 (14.9%)
		Dieuze	3/23 (13%)
		Metz	8/24 (33.3%)
		Verdun	6/40 (15%)
		Bitche	8/25 (32%)
	South-east		0/105 (0%)
		Marseille	0/30 (0%)
		Draguignan	0/34 (0%)
		Orange	0/41 (0%)
French Guyana			0/49 (0%)
Africa			0/113 (0%)
		Ivory Coast	0/25 (0%)
		Gabon	0/38 (0%)
		Chad	0/20 (0%)
		Congo (DR)	0/20 (0%)
		Djibouti	0/10 (0%)

test. However, because the assay uses antigen-specific conjugate, it can work with samples irrespective of the species from which the samples are derived. We used the SNAP[®] 4Dx to assess the prevalence of antibodies to *A. phagocytophilum*

in horses. One interesting finding is that the ponies were more infected than the horses. These results may be explained by their higher rate of infestation by ticks and by their lifestyle, which subjects them to longer duration of time spent outside.

Our results show that equine anaplasmosis should be included in northern France in the differential diagnosis of unknown origin fevers. Other tick-borne diseases may present similar clinical presentations, such as babesiosis and borreliosis. Complementary examinations are available to confirm the infection by *A. phagocytophilum*: blood smears or PCR.

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