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First Cases of Transplacental Transmission of *Anaplasma* spp. in Gabon: Cases Reports and Brief Review of the Literature

Author(s)

Lambert Mulakwa Morisho[1,2,3], Jean Jordan Ekogha Ovono[1,2,3], Charles Bamavu Amisi[1,2,3], Serge Gakne Manikase[2,3]

Affiliation(s)

[1]Centre Hospitalier Universitaire Amissa Bongo de Franceville, Department of Pediatrics, Franceville, Gabon

[2]Tropical Infectiology, Ecole Docorale Régionale de l'Afrique Centrale d'Infectiologie Tropicale à Franceville, Franceville, Gabon

[3]Centre Interdisciplinaire de Recherches Médicales de Franceville, Franceville, Gabon

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Abstract

Anaplasma spp. is an emerging human zoonosis, usually transmitted by tick bites. Human-to-human transmission is rare, and transplacental transmission is even less common. No cases of transplacental transmission have been previously reported.

We report the cases of patients who were followed up for febrile syndrome diagnosed with maternal-fetal infection and treated with antibiotic therapy and hemodynamic correction. Investigation of the etiology revealed *Anaplasma* spp. in a neonatal infection.

These cases prove that transplacental transmission of *Anaplasma* spp. is possible and that surveillance is important.

Keywords: *Anaplasma* spp., transplacental, transmission, case report, Gabon

Introduction

Originally considered for their importance in veterinary medicine, infections caused by Anaplasmataceae are becoming increasingly apparent in humans and are sometimes involved in the emergence of species that are not yet fully characterized.[1,2]

The emergence of these species as pathogenic agents, including *Anaplasma* spp., has had a remarkable impact on the health of humans and animals. This is due to the inversion of habitats resulting from the development of human activity, which brings humans closer to animal reservoirs, and to the domestication of animals, which facilitates the transmission of pathogens.[1,3,4]

Correspondence: Lambert Mulakwa Morisho, Centre Hospitalier Universitaire Amissa Bongo de Franceville, Department of Pediatrics, Franceville, Gabon; Tropical Infectiology, Ecole Docorale Régionale de l'Afrique Centrale d'Infectiologie Tropicale à Franceville, Franceville, Gabon; Centre Interdisciplinaire de Recherches Médicales de Franceville, Franceville, Gabon
E-mail: lambmorisho@gmail.com **ORCID:** 0009-0008-2070-8280

Several studies have reported the transmission of *Anaplasma* spp. to humans (accidental hosts) by tick bites, but only a few cases have demonstrated transmission from human to human. However, after a thorough literature review, no previously reported case in Gabon involved transplacental transmission. This study aimed to demonstrate that *Anaplasma* spp. is also involved as an emerging pathogen in febrile syndrome in neonatology and that it can be transmitted transplacentally. We report a case of anaplasmosis in two newborns consulted for febrile syndrome.

Case Report

Neonates were enrolled in the febrile syndrome study after obtaining informed and signed consent from two of their parents. In a context of high malaria endemicity, blood samples were taken to investigate the different pathogens of bacterial origin involved in pediatric and especially neonatal febrile syndrome. We followed two newborns, one with a late maternal-fetal infection and the other with an early infection (neonatal infection); their clinical characteristics were similar to those of the syndromic diagnosis, comparable to those of the pathogens (group B *Streptococcus*, *Escherichia coli*, *Listeria monocytogenes*) most frequently encountered in this context, where routine antibiotic therapy was initiated, proportional to the regional pathogens according to the therapeutic algorithm. We noted good progress in all these patients. The first was discharged on the third day of hospitalization and the second on the fifth. After the sample collection campaign, we proceeded to the molecular analysis in the search for zoonotic bacteria that occur in humans, of which *Anaplasma* spp. was screened and found in these two newborns. They are listed below with clinical and paraclinical data (**Table 1**).

For the first newborn: On 23 February 2023, a newborn baby in his second day of life after a pregnancy of 37 weeks' amenorrhoea and 2 days, male, weighing 3200 g. He was admitted with a fever that had been present for 1 day without treatment, but the maternal history suggested a urogenital infection with no documented therapeutic initiation but domestication of dogs and cats has been reported. A fever of 39.1°C was recorded on admission, with a heart rate of 166 beats per minute and a respiratory rate of 68 cycles per minute. The newborn presented with dyspnoea but had good skin coloration and a neurological examination marked by the weak presence of archaic reflexes. Biological tests showed the hemoglobin level to be within norms at 20.8 mg/dL and the hematocrit at 45%. White blood cells were normal at 9200 cells/mm^3 and platelets at 167,000 cells/mm^3, and C-reactive protein (CRP) was positive as part of the inflammatory work-up. Antibiotic therapy (ampicillin and gentamicin) was given based on a probable neonatal infection.

The second newborn: On 20 March 2023, he was on his 28th day of life after a pregnancy of 38 weeks amenorrhoea and 5 days, male, weighing 4500 g. He was brought to the clinic with a fever that had been present for 2 days and was treated at home with paracetamol. It should be noted that the mother had had a urogenital infection during the last trimester, with no evidence of recovery and no notion of domestication of animals. On admission, his temperature was 40°C, and her heart and respiratory rates were 178 beats per minute and 56 cycles per minute respectively. The general condition was altered by fever, dehydration, mucocutaneous pallor, and a neurological examination marked by a drop in muscle tone and weakness of archaic reflexes. Biological investigations showed anemia with hemoglobin at 7.8 mg/dL and hematocrit at 23%. With a hyperleukocytosis of 27600 cells/mm^3 and a hypoplakettosis of 137000 cells/mm^3, the CRP was negative as part of the inflammatory work-up. Hemodynamic correction by transfusion of iso group blood and antibiotic therapy (ceftriaxone) for late maternal-fetal infection complicated by severe sepsis in septic shock.

Whole blood samples (5 mL) from the study, including those from the two neonates, were centrifuged to separate the erythrocyte pellet from the plasma so that the pellet could be stored below 20°C; the pellet was then used for molecular analysis. Following the manufacturer's protocol, DNA extraction was performed using the Minikit whole blood genomic DNA purification kit (Thermo Scientific).

This was followed by PCR (polymerase chain reaction) amplification of *Anaplasmataceae* family genes encoding 23S rRNA and *Anaplasma* spp. genus DNA encoding rpoB (**Table 2**); these amplifications were performed in a Bio Rad® thermocycler (Mercure de Coanette, France).[5-7] This *in vitro* replication technique used specific primers (**Table 2**) for amplification of extracted DNA fragments for the detection of *Anaplasma* spp. Amplified DNA fragments were analyzed by electrophoresis on 2% agarose gel and visualized by ultraviolet light (520 nm) using Vilber E-Box (Grosseron, France).

Discussion

Anaplasmosis, ehrlichiosis, and neo-rickettsiosis are a group of intracellular bacterial infections belonging to the *Anaplasmataceae* family, which are equally specialized in their life cycle and have the particularity of infecting a

Table 1. *Clinic and biological parameters*

	Clinical parameters					Biological parameters					
	Age (days)	Gender	Weights (g)	T° (°C)	HF (b/m)	BF (c/m)	Hb (mg/dL)	Hc (%)	WBC (cells/mm^3)	Plt (cells/mm^3)	CRP
Patient 1	2	M	3200	39.1	166	68	20.8	45	9200	167000	Positive
Patient 2	28	M	4500	40	178	56	7.8	23	27600	137000	Negative

CRP: C-reactive protein (reference <5 mg/L= negative); WBC: White blood cells (reference 10-20 × 10^3 cells/mm^3); Hb: Hemoglobin (reference18-23 mg/dL); Plt: Platelets (reference 150-450 × 10^3/mm^3); Hc: Haematocrit (reference 35-50%); HF: Heart frequency (reference 120-160 b/m); BF: Breath frequency (reference 30-50 c/m); T°: Temperature (reference 36.5-37.5°C)

Table 2. *Primers for PCR*

Species	Target gene	Primers	Sequences (5'-3')	T° (°C)	Expected sizes	References
Anaplasmataceae	23S rRNA	TtAna-F	TGACAGCGTACCTTTTGCAT	54	191 bp	7
		TtAna-R	GTAACAGGTTCGGTCCTCCA			
Anaplasma spp.	rpoB	Ana-rpoBF	GCTGTTCCTAGGCTYTCTTACGCGA	51	525 bp	7
		Ana-rpoBR	AATCRAGCCAVGAGCCCCTRTAWGG			

PCR: Polymerase chain reaction; T°: Temperature

variety of hosts, reservoirs, and vectors. *Anaplasma* are vector-borne bacteria associated with ticks of the order Ixodida.[2]

Anaplasmosis is an emerging zoonotic infection that is becoming increasingly prevalent in our communities, where it is probably under-estimated due to a lack of investigative tools, given the high seroprevalence figures observed in the United States (11-15%) and Europe (2-28%).[6,8] But even more, the study carried out in Taiwan, showed 31.8% (87/274) of *Anaplasma phagocytophilum*.[4] The availability of diagnostic tools and various initiatives to investigate this emerging pathogen have led to it being found in newborn infants. The proximity of the forest and the promiscuity of animals (domestication) as an intermediate host are thought to be factors in this emerging infection.[4]

The detection of *Anaplsama* spp. in newborns raises the possibility of vertical transmission between vertebrates, something that has never been documented in our environment, let alone researched.

Bearing in mind that the probability of transmission of bacteria from ticks to humans or other vertebrates, in the event of a bite, requires a significant period of almost 36 hours.[9] Exposure of a newborn to such a sting does not seem to be obvious, but one of the newborns was less than 48 hours old. However, in the case of our two patients, we doubt the possibility of a bite (tick) due to the hygienic conditions (baths) requiring multiple changes of clothing and checks on their packaging (cradles).[10]

We believe that the presence of this germ in the newborn would suggest the possibility of definite vertical transmission. Although transmission from one vertebrate host to another is rare, transmission during blood transfusions in humans has been observed,[11,12] and even more so intrauterine transmission between cows and calves in veterinary medicine.[5]

Conclusions

These are the first cases of human-to-human transplacental transmission of *Anaplasma* spp. in Gabon. In a context where this infection has been associated with transplacental transmission (mother to child) during the intrauterine life of newborns, several arguments have been put forward to understand neonatal transmission of *Anaplasma* spp.

We urge clinicians to be aware that anaplasmosis, one of the emerging zoonosis, has the potential to be transmitted transplacentally and may be considered in the differential diagnosis of febrile syndromes in neonates when the environmental context of maternal life suggests proximity to a reservoir (dog, etc).

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Informed Consent: Informed consent was obtained from the parents of the patients.

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References

1. Dahmani M, Davoust B, Rousseau F, Raoult D, Fenollar F, Mediannikov O. Natural Anaplasmataceae infection in Rhipicephalus bursa ticks collected from sheep in the French Basque Country. *Ticks Tick Borne Dis.* 2017;8:18-24. *[CrossRef]*
2. Dahmani M, Davoust B, Brouqui P. Ehrlichioses Et Anaplasmoses Humaines. In 2018. p. 1744. *[CrossRef]*
3. Battilani M, De Arcangeli S, Balboni A, Dondi F. Genetic diversity and molecular epidemiology of Anaplasma. *Infect Genet Evol.* 2017;49:195-211. *[CrossRef]*
4. Tsai KH, Chung LH, Chien CH, Tung YJ, Wei HY, Yen TY, et al. Human granulocytic anaplasmosis in Kinmen, an offshore island of Taiwan. *PLoS Negl Trop Dis.* 2019 20;13:e0007728. *[CrossRef]*
5. Pusterla N, Pusterla JB, Braun U, Lutz H. Serological, hematologic, and PCR studies of cattle in an area of Switzerland in which tick-borne fever (caused by Ehrlichia phagocytophila) is endemic. *Clin Diagn Lab Immunol.* 1998;5:325-327. *[CrossRef]*
6. Strle F. Human granulocytic ehrlichiosis in Europe. *Int J Med Microbiol.* 2004;293 Suppl 37:27-35. *[CrossRef]*
7. Dahmani M, Davoust B, Benterki MS, Fenollar F, Raoult D, Mediannikov O. Development of a new PCR-based assay to detect Anaplasmataceae and the first report of Anaplasma phagocytophilum and Anaplasma platys in cattle from Algeria. *Comp Immunol Microbiol Infect Dis.* 2015;39:39-45. *[CrossRef]*
8. Aguero-Rosenfeld ME, Donnarumma L, Zentmaier L, Jacob J, Frey M, Noto R, et al. Seroprevalence of antibodies that react with Anaplasma phagocytophila, the agent of human granulocytic ehrlichiosis, in different populations in Westchester County, New York. *J Clin Microbiol.* 2002;40:2612-2615. *[CrossRef]*
9. Hodzic E, Fish D, Maretzki CM, De Silva AM, Feng S, Barthold SW. Acquisition and transmission of the agent of human

granulocytic ehrlichiosis by Ixodes scapularis ticks. *J Clin Microbiol.* 1998;36:3574-3578. *[CrossRef]*

10. Gurung R, Ruysen H, Sunny AK, Day LT, Penn-Kekana L, Målqvist M, et al; EN-BIRTH Study Group. Respectful maternal and newborn care: measurement in one EN-BIRTH study hospital in Nepal. *BMC Pregnancy Childbirth.* 2021 26;21:228. *[CrossRef]*
11. Centers for Disease Control and Prevention (CDC). Anaplasma phagocytophilum transmitted through blood transfusion--Minnesota, 2007. *MMWR Morb Mortal Wkly Rep.* 2008 24;57:1145-1148. *[CrossRef]*
12. Jereb M, Pecaver B, Tomazic J, Muzlovic I, Avsic-Zupanc T, Premru-Srsen T, Levicnik-Stezinar S, Karner P, Strle F. Severe human granulocytic anaplasmosis transmitted by blood transfusion. *Emerg Infect Dis.* 2012;18:1354-1357. *[CrossRef]*