**Zoonotic Anaplasma and Ehrlichia Infections and their Potential Reservoirs: A Review**

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**ABSTRACT**

Anaplasma and Ehrlichia infections are diseases caused by pathogens in the family anaplasmataceae. Despite majority of the species not been of zoonotic importance, *A. phagocytophilum* and *E. chaffeensis* are of serious public health concern and cause severe economic losses. The difficulty in their diagnosis due to unspecific clinical signs as well as limitation in diagnostic techniques in resource poor regions have resulted in underreporting and misdiagnosis. Consequently, there has been limited epidemiological information of these important infections in these regions.

Livestock and especially cattle have been documented as the potential domestic reservoir but due to the limited knowledge on the extent of these infection, communities continue to engage in risky practices that predispose them to these infections. This paper reviewed literature from the main databases; Google scholar, HINARI, AGORA and Pubmed using keywords to establish the research gaps especially in the tropics that needs to be addressed so as to improve our understanding of these important tick-borne zoonosis. The major finding is the limited information on the extent of infection of *A. phagocytophilum* and *E. chaffeensis* in both cattle and humans in the tropics, and lack of clarity on the actual tick species responsible for the transmission in the tropics. In conclusion, there is need to improve our understanding on the epidemiology of these life-threatening zoonosis, so as to enable physicians include them among the differential diagnosis of the febrile conditions. Moreover, effective prevention and control is anchored on vector and reservoir identification, therefore the need for clarification on these aspects.

**Key words:** Zoonosis, Tick-borne, *Anaplasma phagocytophilum*, *Ehrlichia chaffeensis*, Cattle

**INTRODUCTION**

Anaplasma and Ehrlichia are a tick-borne pathogens of the family anaplasmataceae that are of veterinary and human importance (Al-badrani, 2013). They infect a wide range of hosts that includes cattle, goats, sheep, mice, deer, horses, dogs and humans (Dumler et al., 2001; Gajadhar et al., 2010). Majority of the species in these two genera are not known to infect humans and are host specific; these include Anaplasma marginale, A. centrale, A. bovis, A. platys and E. ruminantium. However, *A. phagocytophilum* and *E. chaffeensis* are important zoonotic infections that have continually been neglected (Hotez and Kamath, 2009) with underreporting and possibly misdiagnosis (Mcquiston et al., 2003). Their unspecific clinical presentation in both human and animals may explain the limited information available on these infections (Childs and Paddock, 2003; Dumler et al., 2007; Said et al., 2018) despite their serious public health impact being well documented (Maeda et al., 1987; Dumler et al., 2007). They are emerging zoonosis whose discussion on their importance began in 1984 when *Ehrlichia chaffeensis* was first discovered (Maeda et al., 1987) and later in 1994 when *Anaplasma phagocytophilum* was noted to cause human disease (Chen et al., 1994). This literature review aims at discussing *A. phagocytophilum* and *E. chaffeensis* as emerging zoonosis and the involvement of cattle as possible domestic reservoirs that pose great public health threat to the cattle owners.

The discussion begins with the public health importance and the economic impact of the infections, understanding of the etiology, transmission and the epidemiology of *A. phagocytophilum* and *E. chaffeensis*, then a brief discussion on the important concepts used followed by diagnostic techniques before finally concluding. Literature used and discussed on this paper was obtained through search of the key words in Google scholar, HINARI, AGORA and Pubmed. Only literature that substantially contributed to key areas of this paper was included.

**Public health impact**

The public health importance of *A. phagocytophilum* and *E. chaffeensis* has been well documented and the infections have even been classified as notifiable diseases in...
the USA (Council of State and Territorial Epidemiologists, 2010). A high hospitalization rate that ranges between 36 to 64% (Paddock and Childs, 2003; Dumler, 2013; Heitman et al., 2016) and fatality rate of up to 26.5% (Li et al., 2011; Zhang et al., 2014) have been reported. Human Granulocytic Anaplasmosis (HGA) caused by *A. phagocytophilum* increases prevalence of opportunistic infections and neurologic involvement is a possible complication (Ismaiel et al., 2010; Rikihisa, 2010). Human monocytic ehrlichiosis (HMA) caused by *E. chaffeensis* is more severe than HGA with higher chances of complications which include fulminant shock, disseminated intravascular coagulopathy and renal failure especially in immunosuppressed patients due to HIV infection or organ transplants (Safdar et al., 2002; Paddock and Childs, 2003; Dumler et al., 2007; Sachdev et al., 2014; Heitman et al., 2016). The venerable population of the geriatric and children are severely affected by these infections (Schutze et al., 2007; Bao et al., 2009; Heitman et al., 2016). Preventive measures are anchored in identification of the reservoirs and the vectors for effective control strategies.

**Economic impact**

In addition to the public health impact of these infections, they also cause severe morbidity and mortality in cattle (Stuen, 2007). The sudden drop in milk yield, decreased weight gain, abortions and infertility in the affected cattle leads to reduced productivity and negative economic impact on livestock production worldwide (Stuen et al., 2013; Njiiri et al., 2015). Severe hematologic disorder and the suppression of both humoral and cellular immunity in the sick animals is likely to increase susceptibility and severity to other diseases like babesiosis (Woldehiwet, 2010). Domestic animals and specifically cattle have been reported as important reservoir of these infections (Mcquiston et al., 2003; Lee et al., 2005; Matsumoto et al., 2006; Sen et al., 2011) posing a serious threat especially to the livestock-keeping communities. There is therefore need to focus on investigation of these infections in regions with minimal information to curb the threat to human health as well as severe mortality and morbidity in cattle (Dumler et al., 2005; 2007, Ismaiel et al., 2010; Li et al., 2011; Tsiodras et al., 2017) by constituting adequate preventive measures.

**Etiology**

Bacteria in the family anaplasmataceae are the known pathogens causing human ehrlichiosis and anaplasmosis (Dumler et al., 2001). *Anaplasma phagocytophilum* has been known to infect a wide range of hosts including humans due to its high adaptability (Stuen, 2007). The strains are however, highly variable and with different pathogenicity (Dunning Hotopp et al., 2006). Cattle are the main competent domestic host (Noaman and Shayan, 2009; Stuen et al., 2013; Atif, 2015) of this infection. Extensive studies to identify cattle as potential reservoirs of human ehrlichiosis and anaplasmosis have been conducted in the USA (Stuen et al., 2013), Europe (Dreher et al., 2005; Matsumoto et al., 2006) and Asia (Oshiro et al., 2008; Ybañez and Inokuma, 2016). However, in Africa few studies (Ben Said et al., 2018), mainly in Algeria (Dahmani et al., 2015), Tunisia (M‘ghirbi et al., 2016), South Africa (Mshali et al., 2015), Ethiopia (Teshale et al., 2018, 2015) and Uganda (Muhanguzi et al., 2010) have been conducted in cattle despite livestock keeping being a major economic activity in many African countries. In Kenya, Njiiri et al. (2015) and Kitaa, (2014) reported the first cases of HGA and HME pathogens in cattle and dogs respectively, an indication of possible re-emergence in the cattle population in Kenya.

*Ehrlichia chaffeensis* is the causative agent of human monocytic ehrlichiosis (Paddock and Childs, 2003; Dong et al., 2013). The pathogen has however been detected from ticks found feeding on cattle in various parts of the world (Wen et al., 2002; Dantas-Torres et al., 2012; Iweriebot et al., 2017). Only two reports of *E. chaffeensis* have been confirmed in Kenya; one in buffalo (Jagoro et al., 2016) and another in the dogs (Kitaa, 2014). This begs the question as to what role cattle play in the transmission of this pathogen to human.

*Ehrlichia ruminantium* has been mainly known as a cattle pathogen that causes high morbidity and mortality with nearly 76% animals at risk in Africa (Dantas-Torres et al., 2006; Fuente, 2008; Allsopp, 2010; Melaku et al., 2014). This has resulted in loss of livelihood assets especially in livestock depend communities. The pathogen is however thought to be zoonotic following fatal human cases reported in South Africa (Louw et al., 2005; Rikihisa, 2010). This raises further concerns beyond the loss of livelihoods, are human lives also at stake? A possible re-emergence of zoonotic *E. ruminantium*.

**Transmission by tick vectors**

Tick bites are the predominant route of transmission of the pathogens to humans (Childs and Paddock, 2003; Walker et al., 2014), therefore necessitating the need to investigate the actual tick species involved. Identification of the actual tick vectors of *A. phagocytophilum* and *E. chaffeensis* is important so as to develop effective control strategies. *Ixodes* species and *Amblyomma americanus* ticks are the documented vectors of zoonotic anaplasmosis and ehrlichiosis respectively (Rikihisa, 2010; Aktas et al., 2011; Stuen et al., 2013). These are temperate tick species and would not be found in the tropics (Walker et al., 2014). In their reviews, Atif, (2015), Ybañez and Inokuma, (2016) and Ben Said et al. (2018) noted that *A. phagocytophilum* and *E. chaffeensis* can be detected in a wide range of other tick species other than the well documented ticks. Consequently, *Amblyomma hebraeum*, *Rhipicephalus evertsi*, *R. decoloratus* species have been incriminated to vector *A. phagocytophilum* in South Africa (Mshali et al., 2015; Iweriebot et al., 2017) and *Rhipicephalus pulchellus*, *A. variegatum* and *A. leptum* in Ethiopia (Teshale et al., 2015). Additionally, Iweriebot et al. (2017) only detected *E. chaffeensis* in *A. hebraeum* in South Africa. In Kenya, Mvamuye et al. (2017) collected ticks from vegetation shared between wildlife and livestock and isolated *A. phagocytophilum* and *E. chaffeensis* from *R. maculatus* and *A. eburneum* respectively. These were questing ticks therefore difficult to associate them with transmission of any pathogen. Moreover, Doudier et al., (2010) cautions that detection of pathogen’s DNA in ticks does not necessarily imply vector competence. Therefore, the knowledge gap on possible ticks that transmit the pathogens from the domestic reservoirs to humans needs to be addressed especially in the tropics.
Epidemiology
Overview

Despite the serious health implication of *Anaplasma* and *Ehrlichia* infection, there is limited understanding of its epidemiology in the tropics unlike the rest of the world. This has resulted in people continually engaging in risky activities that pose public health risk to them (Parola et al., 2005; Ndeereh et al., 2016). Increased diagnosis and reporting in the various regions of the world has been informed by clear epidemiological mapping of these diseases in reservoirs, vectors and improved diagnostics (Doudier et al., 2010; Fang et al., 2015; Heitman et al., 2016). Therefore, the urgency and timeliness of understanding the epidemiological status of the reservoirs and the risk they pose to humans in the various regions is necessary.

Prevalence

There are few confirmed human cases of zoonotic *Anaplasma* and *Ehrlichia* infections in Africa. Ndip et al. (2010) clarifies that this may not imply that the diseases are absent in the population, but possibly misdiagnosis due to similarity in the clinical signs with other endemic febrile diseases such as Malaria and typhoid (Childs and Paddock, 2003; Mcquiston et al., 2003). Khatat et al., (2016) reported a high sero-prevalence of 37% in healthy individuals in Morocco almost similar to the one by Atif, (2015) of 36% in the USA, an indication that the infection rate may actually be high in Africa. The limited research as well as low perceived public health threat attributed to these infections in Africa may be a contributing factor to the few reports.

There is limited information on the actual prevalence of these infections in cattle in Africa. Using molecular techniques, Teshale and Muhanguzi reported similar prevalence of *A. phagocytophilum* infection at 2.7% in Ethiopia and Uganda respectively (Muhanguzi et al., 2010; Teshale et al., 2018). Ben Said et al. (2018) on the other hand in his review reported prevalence as high as 41% in cattle in Algeria (Dahmani et al., 2015). Dahmani et al., (2015) however used a newly developed diagnostic tool which had high sensitivity and possibly explains this high prevalence. There are however no studies on natural infection of cattle with *E. chaffeensis*, despite the pathogen being severely isolated from ticks attached to cattle (Mtshali et al., 2015; Iweriebor et al., 2017). In spite of this, experimentally infected calves presented with a fatal disease of *E. chaffeensis*, a very similar disease to the one observed in humans (Delos Santos et al., 2007). The question now is whether cattle play a reservoir role to this pathogen. The wide prevalence variations necessitate investigation into the specific geographical area prevalence so as to understand the extent of these zoonotic infections.

Risk factors

Studies on risk factors for zoonotic *Anaplasma* and *Ehrlichia* infections in human and animals have been carried out independently of each other. Ndip et al. (2010), Comer et al. (2001), Da Costa et al. (2005), Vorou et al. (2007) identified some of the human risk factors as contact with infected livestock and ticks, increased outdoor activities, living in rural areas and warmer seasons. In the different cattle production systems, animal contact is common therefore the urgent need to investigate their infection status so as to determine the risk posed to human.

On the other hand, animal risk factors have been reported by Atif, (2015; Ben Said et al. (2018); Melaku et al. (2014); Muhanguzi et al. (2010) and Stuen et al. (2013) to be tick abundance, tick control practices, breeds, age of animal and production system. Identification of these factors in different cattle production systems would protect the reservoir from infection and subsequently humans, an approach advocated for by WHO, (2004) and Dantas-Torres et al. (2012). Moreover, human and animal risk factors are interdependent, so assessing their combined effect would be more realistic.

Doudier et al. (2010) in his review noted climate change is the major driver of re-emergence of zoonotic infections including anaplasmosis and ehrlichiosis. Majorly because of the increased vector populations to new areas where reservoir hosts are present (Paddock and Childs, 2003; Ogden et al., 2013). Conversely, Randolph et al. (2010) and Fang et al. (2015) argues that human behavior more than climate change is the key driver to re-emergence of zoonosis. There is therefore need to investigate tick vector species in new endemic areas that would potentially transmit *Anaplasma* and *Ehrlichia* infections.

Immunosuppression is a risk factor to *Anaplasma phagocytophilum* and *Ehrlichia chaffeensis* infections (Paddock and Childs, 2003; Parola and Raoult, 2001; Heitman et al., 2016). Population of immunosuppressed individuals has been on the rise especially in developing countries including Kenya due to rise in HIV infections (Kamali et al., 2015; Kerubo et al., 2015). Additionally, the geriatric and children are also at higher risk of infection due to the low immunity (Paddock and Childs, 2003; Walker et al., 2004; Schatzel et al., 2007; Bao et al., 2009). There is therefore a public health threat when the domestic reservoirs are infected, hence the importance determining the actual domestic reservoirs.

Diagnosis
Overview

The diagnosis of *A. phagocytophilum* and *E. chaffeensis* is very challenging due to the ambiguity of clinical signs in both animals and humans thereby necessitating the use of laboratory techniques (Jin et al., 2012). The available diagnostic techniques are microscopy, serology and molecular techniques (Gokce et al., 2008; Ybañez and Inokuma, 2016). The decision to use one or the other or a combination depends on the sensitivity required and the stage of the infection (Jin et al., 2012). The unavailability as well as cost of some of these diagnostic tests have limited diagnosis of this infections and may have led to misdiagnosis and underreporting.

Microscopy

Microscopy has routinely been used since it is cheap and easily availability (Dumler et al., 2005; Al-badran, 2013; Noaman and Shayan, 2009). It involves identification of bluish-purple moruli in neutrophils or mononuclear cells under a light microscope (Matsumoto et al., 2006; Gokce et al., 2008; Silaghi et al., 2018). The results therefore depends on ones experience and at times artifacts can be confused for moruli, hence the low sensitivity that has been associated with this technique (Paddock and Childs, 2003; Walker et al., 2004; Ereremeva and Dasch, 2011; Teshale et al., 2016, 2018).
Moreover, the test cannot differentiate the different species of the organisms therefore confirmatory diagnosis cannot be established (Paddock and Childs, 2003). Nevertheless, Atif (2015) emphasizes its usefulness in acute phase of the infections but its accuracy declines rapidly by the second week.

Serology

Indirect fluorescent test (IFAT) and ELISA are the available serological tests and are more sensitive than microscopy (Da Costa et al., 2005; Milner and van Beest, 2013; Khatat et al., 2016; Mdladla et al., 2016). Dumler’s reclassification of the many pathogens in the Anaplasma and Ehrlichia genera highlighted the close similarity in the genome of these pathogens (Dumler et al., 2001). Therefore, cross-reactivity is a major limitation in the use of serology for diagnosis of Anaplasma and Ehrlichia infections (Dreher et al., 2005; Gokce et al., 2008; Atif, 2015; Heitman et al., 2016; Kelly et al., 2011; Semu et al., 2001). Conversely, Jin et al. (2012) found IFAT to be more sensitive on 2-4 weeks after the infection, a very similar finding to that of Dreher et al. (2005). It is therefore important to know the time of the infection for one to identify the most useful technique for diagnosis.

Molecular techniques

Molecular techniques are the most sensitive methods for diagnosis of A. phagocytophilum and E. chaffeensis and are used as confirmatory tests (Oteo et al., 2001; Louw et al., 2005; Jin et al., 2012; Dahmani et al., 2015; Njiiri et al., 2015; M’ghirbi et al., 2016; Byaruhanga, 2017). Molecular techniques involve the use of marker genes to detect A. phagocytophilum and E. chaffeensis DNA in blood or buffy coat (Dumler et al., 2001; Foley et al., 2011; Sen et al., 2011). Molecular methods assist to overcome the challenges of crossreactivity with closely related species in addition to detection of strain variation of pathogens, thereby their differences in virulence (Hotopp et al., 2006; Al-Khedery and Barbet, 2014). Moreover, these techniques allow for sequencing and phylogenetics so as to predict future patterns of invasion and diversity (Ogden et al., 1998). Despite molecular methods being the most sensitive, combining the three techniques would be most useful so as to maximize on their advantages (Oteo et al., 2001; Gokce et al., 2008; Beavers et al., 2014; Atif, 2015; Heitman et al., 2016) especially at the different stages of infections.

Treatment

Long-acting tetracyclines have been used effectively for both treatment and prophylaxis of Anaplasma and Ehrlichia infections in livestock (Stuen et al., 2013). On the other hand, doxycycline is very effective in treatment of human cases especially when early diagnosis is done (Dumler et al., 2007). Current disease prevention and control strategies in domestic animals are based on the reduction of tick-infestation by chemical acaricides through dipping or with variety of pour-on applications (Stuen, 2003). Prevention of human cases involves undertaking management practices aimed at controlling of tick on host and self-protection to avoid tick bites (WHO, 2004).

Concepts associated with A. phagocytophilum and E. chaffeensis

When discussing Anaplasma phagocytophilum and E. chaffeensis, there important concepts in literature that aid in their understanding.

Zoonosis

Defined as any disease that is naturally transmitted from vertebrate to human (WHO, 2004). Salyer et al. (2017) and Taylor et al. (2001) attribute nearly 61% of human pathogens and 75% of all the re-emerging diseases to be zoonotic, therefore prompting the urgency of continued investigation. Key drivers of re-emergence of these pathogens have been identified as importation, spread from nearby endemic areas, climate change influence resulting in changes in host vector ecology (Doudier et al., 2010; Ogden et al., 2013; Kulkarni et al., 2015). Countries in the tropics are not excepted by these global drivers especially climate change, therefore the need to continually investigate the potential re-emergence of zoonotic Anaplasma and Ehrlichia species.

The challenge with re-emerging zoonotic pathogens is the morbidity and even mortality they cause in human before their actual detection is done, this is evident by A. phagocytophilum which has been known as cattle pathogen since 1932 but its zoonotic nature only detected in 1994 (Chen et al., 1994; Paddock and Childs, 2003; Louw et al., 2005). Continued surveillance of the zoonosis, leading to prompt detection and diagnosis from the potential reservoirs will contribute to curbing this worrying situation (Wikel, 2018).

Variations in the strains of A. phagocytophilum is attributed to the increased immune-dominant region in its genome, implying differences in their pathogenicity in different hosts and even geographical areas (Hotopp et al., 2006; Trost et al., 2018). This necessitates the investigation into the strains specific to target geographic areas especially regions where limited information is available such as Africa.

Tick borne transmission

Tick-borne transmission implies diseases transmitted by ticks who suck blood from infected hosts and transmit the pathogens to either humans or animals (World Health Organization, 2014). Investigation of ticks as vectors is important since they are only second to mosquitoes in transmission of fatal human diseases (Parola and Raoult, 2001). Their role as vectors of human pathogen was only appreciated in the 20th century when Smith and Kilborne (1893) identified Boophilus annulatus tick to be the vector of Babesia bigemina (Smith and Kilborne, 1893). The adaptability of hard ticks to feed for long on one host therefore facilitating the transmission of pathogens and the painless bites makes them more serious vectors than the soft ticks (Stuen et al., 2013).

Anaplasma phagocytophilum and E. chaffeensis are known tick borne pathogens (Ismail and McBride, 2017; Lagler et al., 2017; Li et al., 2018). Ticks feed on a variety of hosts, both wild and domestic but humans are usually a coincidental host (Alberti et al., 2005). However, some ticks such as Ixodes spp., vectors of A. phagocytophilum are described as anthropophilic and these are attracted to human and are responsible for pathogen transmission (Atif, 2015; Stuen et al., 2013). This is evident in a study by Aktas et al. (2010) who found a high infection rate of 17%
in ticks collected from humans. Understanding the tick-vectors of important human pathogens will guide the development of control strategies (World Health Organization, 2014).

Co-infection of *A. phagocytophilum* with other zoonotic pathogens such as *Borrelia burgdorferi* or *Babesia microti* is common due to the shared vector tick (Sirigireddy and Ganta, 2005; Raileanu et al., 2018; Silaghi et al., 2018). Identification of the vectors therefore becomes important since a range of another important zoonosis can be controlled simultaneously.

The continued spread of ticks to new areas through climate change and host movement poses great risk to human health, there is hence a need for constant surveillance on the ticks, their reservoirs and pathogens to identify new endemic areas (Ogden et al., 2013; Wikel, 2018).

**Reservoirs**

There have been conflicting definitions of the term reservoir with some authors emphasizing on non-pathogenicity of the pathogen to the potential reservoir (Lloyd-smith et al., 2013) while others advocating for inclusion of ecology as part of the reservoir (Ashford, 1997). Haydon et al., (2002) ascribes this complexity to multi-host pathogens with complex pathogenesis. He therefore developed a more inclusive definition that a reservoir is one or two epidemiologically interconnected populations or environments in which pathogens can be maintained and from which infection can be transmitted to the target population (Haydon et al., 2002).

*Anaplasma phagocytophilum* depends on reservoirs and ticks to complete its life cycle and cause infection to human (Bakken and Dumler, 2000). Roe deer, mice, red deer and moose are some of the recognized wild reservoirs of *A. phagocytophilum* in temperate regions but a range of domestic animals are thought to be reservoirs in other areas (Sen et al., 2011; Milner and van Beest, 2013; Tros et al., 2018). Incidences of human anaplasmosis consistently coincide with regions with reservoirs and ticks (Doudier et al., 2010; Rosef et al., 2009; Ismail and McBride, 2017). Understanding of the specific reservoirs in the different geographical areas is important since the complete elimination of these infections requires disease control directed towards the reservoirs (Haydon et al., 2002; WHO, 2004).

Two cycles of transmission of *A. phagocytophilum* involving reservoirs seem to exist; the sylvatic cycle in the wild involving rodents, small mammals and the deer and the zoonotic cycle involving domestic animals and human (Foley et al., 2011; Keesing et al., 2012; Stuen et al., 2013; Blazejak et al., 2017). The tick vector takes part in the sylvatic cycle as well as bridging the two cycles and transmits the infection to human and domestic animals (Foley et al., 2011) (Figure 1).

![Fig. 1: Concept map on transmission of *A. phagocytophilum* and *E. chaffeensis* infection in cattle and humans.](image-url)
Human Granulocytic Anaplasmosis (HGA) caused by *A. phagocytophilum* is a tick-borne disease. The four basic stages in the life cycle of transmitting-ticks are egg, larva, nymph and adult (Ogden and Rosenberg, 2006) (Figure 1). *Anaplasma phagocytophilum* is transmitted during the feeding of either an infected nymph or adult since transovarial transmission does not occur (Strle, 2004; Ogden et al., 2013). The adult ticks are however more likely to transmit to domestic reservoirs since the nymphs feed more commonly on small mammals and rodents in the wild (Björsdorff et al., 2001; Ogden and Rosenberg, 2006; Foley et al., 2011; Keessing et al., 2012; Trost et al., 2018). A persisted infected state (PI) has been documented in *A. phagocytophilum* infection (Stuen et al., 2013). Cattle have been known to be PI and the domestic reservoirs and therefore posing a health risk to the humans when the appropriate vector ticks are present (Dumler et al., 2001; Ybanez and Inokuma, 2016). Humans once infected are a dead end host for the pathogen, therefore human to human infection does not occur (Stuen et al., 2013; Atif, 2015).

Conclusions

It is clear that *Anaplasma* and *Ehrlichia* infections are life-threatening diseases of key public health importance that have been neglected and overlooked in the Africa. There is a risk of re-emergence in new endemic areas where knowledge on epidemiologic drivers including domestic reservoirs and diagnosis is limited (Taylor et al., 2001). This limited information on the epidemiology of these diseases in Africa constraints the physicians on including them as important differential diagnosis among the febrile cases (Comer et al., 2001; Paddock and Childs, 2003; Dumler et al., 2005; Said et al., 2018; Teshale et al., 2018). This has led to misdiagnosis or delayed diagnosis, late treatment resulting in complications and unfavorable outcomes such as high hospitalization and fatality rates (Bakken and Dumler, 2000; Dumler et al., 2007; Beavers et al., 2014; Sachdev et al., 2014). There is therefore need to conduct epidemiological studies in the tropics critical in providing information on potential domestic reservoir and vectors of *Anaplasma* and *Ehrlichia* infections with an intention of providing guidelines on development of preventive measures, thereby safeguarding human health.

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