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Of goats and men: rethinking anaplasmoses as zoonotic infections

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Ticks transmit the widest variety of pathogens among arthropod vectors, leading to substantial public health threats and economic loss in livestock industries.¹ Novel tick-transmitted microbes with links to human disease continue to be discovered. In *The Lancet Infectious Diseases*, Hao Li and colleagues² describe a new tick-transmitted bacterium from patients in northern China. PCR and sequencing showed nucleotide variations signifying a phylogenetically distinct *Anaplasma* species. The provisionally nominated “*Anaplasma capra*”—so named for its discovery in goats (*Capra aegagrus hircus*)—joins the growing list of human anaplasmosis pathogens with pastoral origins. For decades, *Anaplasma phagocytophilum* has been recognised as a veterinary pathogen causing tick-borne fever among ruminants. But only recently has it been associated with human infection,³ with seroepidemiological evidence suggesting incidence as high as 36% in endemic regions of the USA and 28% in populations across 15 European countries.^{4,5} In 2010, a variant of *Anaplasma ovis*, which infects goats and sheep worldwide, was detected in a Cypriot patient following a tick bite,⁶ although no additional human cases have been reported.

Anaplasma species organisms have been detected in several ruminant species worldwide. Such reports could lead one to think that anaplasmoses are associated only with agricultural communities, but that is far from the case. Surveys of European green spaces suggest that tick-borne pathogens are common in urban areas.^{7,8} At present, 54% of the world’s population lives in urban areas and that proportion is expected to reach two-thirds by 2050.⁹ With greater urbanisation, human beings increasingly share environments with wild and domestic mammals that maintain tick populations and also serve as reservoirs for tick-borne pathogens. Aside from ruminants, common animals in cities, including rodents, birds, cats, and dogs, can host *Anaplasma* species.¹⁰ Considering the wide geographical spread of more than 19 tick species that can harbour anaplasmosis pathogens and the broad range of mammalian reservoirs,^{10,11} these pathogens are virtually ubiquitous in nature.

Li and colleagues sought “*A capra*” in patients who lived in areas where it had been identified in ticks and goats, rather than beginning with patients and seeking the cause of their tick-related febrile disease. In doing so, they discovered a new causative agent of human anaplasmosis. They noted several features of “*A capra*” illness that differ from

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Anaplasma phagocytophilum infection: unreliable visualisation of morulae (intracytoplasmic vacuolar inclusions of anaplasma) in peripheral blood samples; lower incidence of leucopenia, thrombocytopenia, and increased hepatic aminotransferase concentrations; low-to-undetectable seroreactivity to *A phagocytophilum* antigen; and more common rash and eschar. “*A capra*” infection presented with symptoms that could make diagnosis difficult. *A phagocytophilum* infection is not often lethal in immunocompetent individuals, but delaying antibiotic treatment can be fatal.¹² Morbidity and mortality associated with “*A capra*” is not yet known. Five of 28 patients with “*A capra*” infection were admitted to hospital, one of whom had CNS complications, suggesting that “*A capra*” could pose a substantial threat to public health.²

The big question remains: how many *Anaplasma* species that contribute to human disease remain undiscovered? The study by Li and colleagues provides us with a 2-month snapshot from a single region. With over 200 anaplasmosis and related ehrlichiosis cases of undetermined cause reported by the US Centers for Disease Control and Prevention in 2013,¹³ undiscovered anaplasma pathogens might already be causing human disease in the USA and elsewhere. Because human cases are generally under-reported,¹² the global burden of anaplasmoses on human health is probably underestimated. With increasing urbanisation and interactions between people and ticks, additional zoonotic pathogens, including *Anaplasma* species, are likely to be discovered.

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