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Out of the shadows, into the spotlight: Invisible zoonotic diseases in Brazil



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Zoonotic diseases (ZDs) are infectious diseases caused by pathogens, originating from domestic and wild animals, responsible for most emerging human diseases.¹ Brazil is a megadiverse country where the consequences of biodiversity loss, due to habitat alteration mainly associated with deforestation or forest degradation, in addition to climate change and overexploitation of resources, among other factors, have the potential to increase the incidence of ZDs.

Underestimation of the burden of some zoonoses, limited resources and lack of information on their significance and distribution have continually led many of these diseases to be forgotten. This is the case of ZDs like the Brazilian spotted fever (BSF), hantavirus and arenavirus diseases, Q-fever and bartonellosis in Brazil. The ability to identify new cases is still very challenging and the current COVID-19 health crisis have increased the invisibility of these ZDs. Although these diseases exhibit different incidence, lethality, and transmission routes, recent outbreaks in different Brazilian regions have served as a reminder of their silent circulation and significant impact on public health. Here we focus the attention on their human and animal health impact exemplified by recent outbreaks in Brazil.

The diagnostic of these zoonoses can be difficult especially during the initial phase when patients usually present unspecific clinical manifestations as is the case for BSF, a tick-borne zoonosis caused by *Rickettsia rickettsii*, an important zoonosis in Brazil. After three decades of quiescence, the disease re-emerged with high case-fatality rates due to delayed diagnosis and treatment. In 2011, we reported five fatal cases of BSF in employees of an animal shelter in an urban area² and, more recently, two fatal cases were reported during military field training in Rio de Janeiro state. Even with a history of exposition to dogs and ticks, BSF was misdiagnosed as dengue or COVID-19, highlighting the importance of the differential diagnoses considering endemic diseases like BSF.

A similar scenario is observed for hantaviruses, a fatal rodent-borne viral disease responsible for the hantavirus pulmonary syndrome (HPS) in the Americas, a zoonosis under-diagnosed in Brazil. The high prevalence of dengue, leptospirosis, influenza and COVID-19 compromises the clinical and laboratory diagnosis by health professionals due to the overlap of clinical signs.³ In 2015, we reported a fatal human case of HPS in which patients' clinical condition was initially interpreted as dengue, resulting in an inappropriate medical support treatment. Following the notification of this HPS case, an eco-epidemiological study was conducted in the region revealing hantavirus infection in the household and work contacts of the HPS patient and rodents collected in the area.⁴

Detection of these pathogens can be particularly challenging when they present a wide range of hosts and a high resistance in the environment, like *Coxiella burnetii*, an agent of Q fever, which can survive for long periods in the environment and can be transmitted to humans by inhalation of contaminated aerosols, particularly from birth products from ruminants. In Brazil, there is still a shortage of data related to the prevalence and distribution of *C. burnetii* infection, especially in rural areas. Q fever has been identified in military personnel during a survival training program in the wild and confirmed in a patient with severe pneumonia associated with polyarthritis in urban settings.^{5,6}

In relation to *Bartonella* spp., studies have shown the presence of several species in vertebrates and invertebrates collected in Brazil, showing the lack of host specificity of the genus.⁷ Most *Bartonella*-associated infections that occur in Brazil are caused by *B. henselae*, the causative agent of the "cat scratch disease". Due to the diversity of clinical manifestations of bartonellosis in humans, including neurological manifestations and endocarditis confirmed in these last two decades, this zoonosis has been mistaken with other diseases in Brazil, leading to a delay in diagnosis and treatment.⁸

Another zoonotic agent considered invisible in Brazil is Sabiá virus, responsible for the Brazilian hemorrhagic fever (BHF), a rare and highly lethal disease that reemerged in 2020.⁹ Since 1990, when BHF was first described, novel mammarenavirus were identified in the Brazilian territory, two of

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them – Aporé and Xapuri - are closely related to highly pathogenic arenaviruses from South America, which should serve as a warning given their potential to cause human diseases.¹⁰

In conclusion, anthropogenic activities, especially those associated with the incursion of the human population into wild areas, coupled with globalization effects have facilitated the rapid spread of zoonosis, many of that have frequently been overlooked, like the ones presented in this work. These diseases are an important cause of morbidity/mortality, yet little effort is moved towards a better understanding of their complex dynamic cycles, through which man is infected accidentally. These outbreaks' responses resulted in many lessons learned, leading to changes in approach and preparedness of local surveillance, although a thorough One Health approach at the human-animal-ecosystem interface needs to be further considered for effective investigation, prevention and control of ZDs.

Declaration of interests

The authors declared no conflicts of interest.

Author contributions

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