



# The Brazilian Journal of INFECTIOUS DISEASES

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## Letter to the Editor

# Emergent diseases in emergent countries: we must study viral ecology to prevent new epidemics



Recently Africa has seen the resurgence of Ebola virus in the largest outbreak hitherto recorded in the current history. This outbreak scared people worldwide and required the intervention of the World Health Organization, governments of several countries, medical and research institutions and non-governmental organizations such as Doctors Without Borders. In Brazil, the number of dengue cases in 2015 was the largest ever recorded (1,649,008 probable cases<sup>1</sup>) and the increasing number of people infected with Chikungunya and Zika viruses shows that the country is not prepared to deal with the proliferation of the mosquito *Aedes aegypti*, the main vector of Dengue, Chikungunya, and Zika viruses. Additionally, big events like the Olympic Games (that will be held in Brazil in 2016) can facilitate the international spread of these viral diseases. This alert was recently reinforced by Bogoch and colleagues when discussing the probable pattern of the Zika virus spread from Brazil to other countries.<sup>2</sup> The examples of diseases caused by different viruses demonstrate one crucial fact: neglected viruses emerge and proliferate, when favorable ecological conditions are in place. What does that mean? Environmental disturbances and their influence on these pathogens are and will increasingly be a global problem. This becomes an even greater concern when scientific communities and government do not give the necessary attention to this issue.

Environmental disturbances are also largely related to socioeconomic factors. Thus, it should be considered that epidemics are a problem with social and environmental aspects. For example, economic and social factors (such as wildlife hunting) associated with environmental factors (such as deforestation) are quoted as facilitators for the emergence of zoonotic diseases. These factors facilitate the transmission of viruses from wild animal to humans (an excellent review on these issues was conducted by Pike and colleagues<sup>3</sup>).

Returning to the example of the most recent Ebola virus outbreak. It is believed that disordered human occupation of forest areas has contributed to the passage of the virus from their natural hosts to the human population. In addition, poor living conditions and the precarious health institutions of affected countries must have contributed to pathogen dissemination. Furthermore, Dengue, Chikungunya, and Zika viruses infect people through mosquitoes bite, and the proliferation of

these vectors is facilitated by increasing urban waste, allowing water accumulation, and thus creating an environment conducive to the proliferation of mosquito larvae. Again, these examples highlight how environmental disturbances interfere in the viral ecology and contribute to the increase of cases of viral diseases.

Hemorrhagic fevers caused by Ebola virus and even the Dengue virus are classic examples of how severe can be the infection by these pathogens. Similarly, cases of microcephaly in children born from mothers infected with Zika virus represent another example of immediate problems caused by viral epidemics in population terms. Here, it is important to note that, despite being very probable, the relationship between the virus and this brain malformation has yet to be confirmed. There are also long-term problems caused by the emergence of viral pathogens. HIV, for example, was discovered few decades ago. However, when ecological and social factors beneficial to HIV proliferation emerged, the world witnessed the rise of a pandemic hitherto unimagined, which last over 30 years and yet seems to be far from being controlled.

The Brazilian biodiversity is extremely wide, so it should still hide countless unknown pathogens. Not less important, we should emphasize the Brazilian (always mentioned as a continental country) diversity in terms of climate, geographical differences, and even uses and habits of the population. As previously stated, pathogens will emerge when ecological conditions are favorable. Therefore, a pertinent question would be: Is Brazil a “nursery room” for the emerging of brand new viral diseases? (or even more troubling: How many different potential human pathogens are already present in our environment just waiting for the right conditions to show up?) Pathogens already known, but neglected, may also resurge and come back to frighten the population and those responsible for public health agencies. The only way to get around this is by trying to identify early on in the wild nature viruses with potential to cause future outbreaks in the human population and study the ecology and the genetics of these pathogens. This would allow us to identify what changes in environmental and social factors may contribute to the emergence of an epidemic. Similarly, it would allow us to fight against future epidemics when it occurs. At the international level, there are already actions that would help recognizing viruses that can

cause epidemics. It could be highlighted the Global Viral initiative ([www.globalviral.org](http://www.globalviral.org)), that has the mission of “( . . ) to promote understanding, exploration and stewardship of the microbial world”. Similarly, the Brazilian scientific community should turn its attention to these problems and take the opportunity to explore this research field yet so little studied in our country. This will have a very positive impact not only on the generation of knowledge but also on the health of the population, which now suffers the effects of diseases that so far have not received the deserved attention from the scientific and governmental communities.

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### Conflict of interest

The authors declare no conflicts of interest.

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