



LETTERS TO THE EDITOR

Spread of ZIKV and YFV to China: Potential implications



To the Editor,

Introduction

As reported recently, Zika virus (ZIKV) and other flaviviruses have been identified in different regions of the world leading to significant concerns for public health.^{1–4} ZIKV disease is a well-known vector-borne disease which is transmitted by the *Aedes* mosquito genus, and it was recently discovered that sexual transmission of ZIKV was possible.⁵ Human infections usually present mild symptoms, but for women who are pregnant or planning to be pregnant, ZIKV may cause microcephaly in the fetus.⁶ The strong link of current ZIKV epidemics in South America to spiking cases of microcephaly in Brazil prompted the WHO to declare a global public health emergency on February 1, 2016 (http://apps.who.int/iris/bitstream/10665/204371/1/zikasitrep_12Feb2016_eng.pdf?ua=1). A relative to ZIKV, yellow fever virus (YFV) is also a member of the *Flaviviridae* virus family and is transmitted by the same mosquito species, *Aedes aegypti*.⁷ Yellow fever has a long history. Although the virus itself is thought to have originated in Africa, the first recorded outbreak of YFV occurred in Barbados in 1647⁸ and was followed by cases in Yukatan in 1648, New York in 1668, and Philadelphia in 1793, respectively. Since the 17th century epidemics have also spread to West Africa, other tropical and subtropical regions of the Americas as well as Europe. YFV was first isolated in 1927 from a patient.⁹ The development of a vaccine in 1946 led to a notable reduction of the disease burden in endemic countries.¹⁰ The common reported symptoms are fever, malaise, myalgia, headache, nausea and dizziness. Severe YFV infections cause prostration, liver damage, acute renal failure and central nervous system manifestations.¹¹

Imported Zika virus and Yellow fever virus cases in China and clinical syndromes

By March 26th, 2016, China had twelve imported cases of ZIKV and six imported cases of YFV infections, which could cause major challenges for public health (Fig. 1, Tables S1 and S2). On February 6th, a 34-year-old Chinese male traveler returning from Venezuela was admitted to a local

hospital in Ganxian, China and became the first confirmed case of a ZIKV infection in China (http://www.chinacdc.cn/mtbd_8067/201602/t20160214_125262.html). On March 12th, 2016, the first imported case of YFV was also first reported in China (<http://www.nhfpc.gov.cn/>). Of note, all six imported cases of YFV had a history of working in Angola and were not vaccinated before going there. Five of six YFV patients had fever and other mild clinical symptoms including malaise. Cases 1 & 2 had severe liver damage and case 6 had no syndrome. Cases 1 & 2 are in stable condition.

What is the big risk which could be caused by imported cases in developing countries such as China?

In 2015, due to a lack of timely and effective control measures, Brazil became the center of the ZIKV outbreak and potentially millions of Brazilians were infected.^{12,13} In order to prevent such outbreaks and infection rates in China and other non-endemic countries, surveillance at country borders will be an important measure to prevent the import of ZIKV and YFV. For example, the second imported ZIKV case in China was caught early due to the detection of a fever when entering the country and was then confirmed as a ZIKV case (http://www.aqsiq.gov.cn/zjxw/zjxw/zjftpxw/201602/t20160215_461558.htm). Most people infected with ZIKV will not show any clear symptoms,¹⁴ because the viremia is too short to detect viral RNA by PCR, and serologic tests for ZIKV can often be falsely positive because of cross-reaction with other flaviviruses such as Dengue virus and YFV.¹⁵ So the development of a rapid, specific and sensitive diagnostic test is urgently needed in China, and it should be able to distinguish ZIKV from other viruses, particularly Dengue and Yellow fever virus infections.

In China, *Aedes* is broadly distributed in southern China (resulting in a large number of dengue cases). Here the warm weather and precipitation are ideal for promoting the population growth of *Aedes*,¹⁶ and the risk of imported ZIKV and YFV spreading within these areas is large. Without proper measures to control ZIKV and YFV in southern China, imported cases run a high risk of becoming the source of an outbreak.

How important is it to prevent the outbreaks?

Since ZIKV and YFV are vector-borne diseases, the significant risk factor for these infections is the presence of the

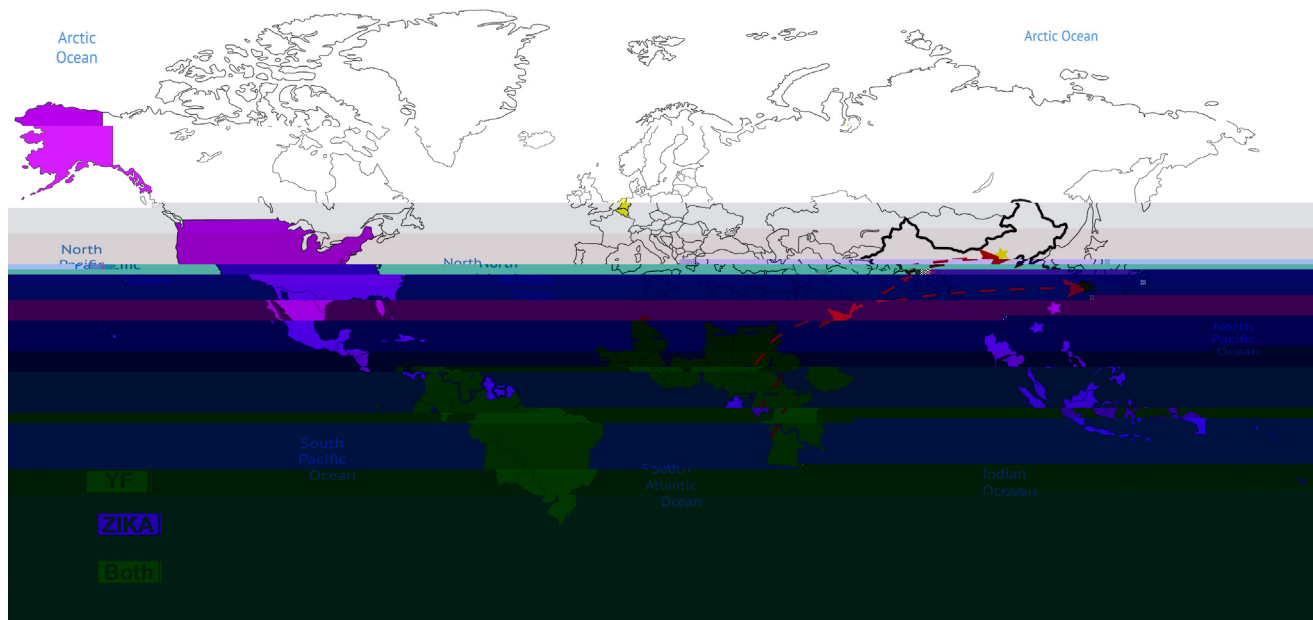


Figure 1 World map documenting all known imported Zika virus or Yellow fever cases to China and affected countries. Countries affected by Zika virus are shown in purple. Countries affected by Yellow fever virus are shown in yellow. Black arrows show Zika virus importations in China and red shows imported Yellow fever cases.

mosquito vector. Therefore, the people who reside in or who are traveling in an area where there is active transmission of those viruses, should protect themselves from mosquito bites. Therefore reducing the population of mosquito vectors through the use of mosquitocide at the community level is important to prevent the outbreaks.

China has a large population and is in a period of rapid economic development, which leads to frequent population exchange between China and other countries. The high rate of travel combined with southern China's natural climate and *Aedes* mosquito population, make it imperative to prevent the import and spread of ZIKV and YFV in order to prevent future outbreaks in human populations. Fortunately, the development of new technology of China may become central to preventing ZIKV from entering the country. We need to take all necessary measures to control *Aedes* mosquitos before the weather becomes warm while applying strict border surveillance to prevent the importation of ZIKV and YFV into southern China.

Competing interests

The authors declare that they have no competing interests.

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Supplementary data

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