Yakob, Laith; Walker, Thomas; (2016) Alternative vector control methods to manage the Zika virus outbreak: more haste, less speed - Authors' reply. The Lancet Global health, 4 (6). e365-e366. ISSN 2214-109X DOI: https://doi.org/10.1016/S2214-109X(16)00086-3

DOI: https://doi.org/10.1016/S2214-109X(16)00086-3

Alternative vector control methods to manage the Zika virus outbreak: more haste, less speed

Authors' reply

In response to our Comment[1] promoting the development of novel approaches to controlling *Aedes aegypti*, Christophe Boëte and R Guy Reeves argue for the continued reliance on current techniques—mosquito breeding site management and adulticidal spraying—to contain the current Zika virus outbreak. We agree that inclusion of these more traditional approaches might be justified as part of a wider, integrated, vector management programme. However, current vector control strategies for *A aegypti* do not appear to be stopping the rapid increase in the number of dengue cases in recent decades in Brazil (figure).[2] These techniques have repeatedly proven inadequate in protecting contemporary Latin American populations. Even in well resourced mosquito control programmes, insecticides and breeding site management continue to fail in mitigating outbreaks. In Singapore, for example, a large increase in dengue incidence has been reported in the past 40 years[3] despite decades of sustained and rigorously enforced national control campaigns.[4] Globally, the number of dengue cases reported to WHO has increased steadily from an average of less than 1000 cases per year in the 1950s to more than 3 million cases per year in 2013.[5]

Therefore, we welcome the support from Jérémy Bouyer and colleagues for novel mosquito control technologies in the context of the current Zika virus outbreak. We appreciate that several technologies exist for the control of *A aegypti* mosquitoes but are at different stages of development and testing. The focus of our Comment[1] was on the only two approaches, to our knowledge, which have undergone preliminary field trials in Latin American countries currently with Zika virus outbreaks: the Release of Insects carrying Dominant Lethal genes (RIDL) and the release of *Wolbachia*-infected mosquitoes. Although both approaches have been reported to yield successful trials in Brazil,[6] further field trials are needed to establish whether they could have an effect on Zika virus transmission. Unpublished results suggest that *Wolbachia* reduces the transmission potential of the Zika virus in *A aegypti* and both of these novel control strategies have been endorsed by WHO to tackle the current Zika virus outbreak.[7]

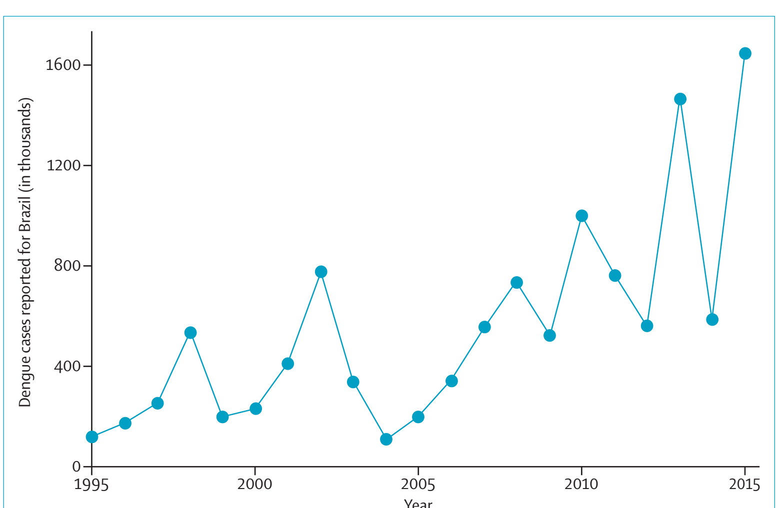

Figure: **Increase in dengue cases reported in Brazil during the past 20 years**
Data are from Pan American Health Organization and WHO.[2]

RIDL effectiveness might be reduced due to the presence of tetracycline in some natural environments. Further research will be needed to assess the spread and concentrations of tetracycline in natural surface waters. In areas where contamination with this drug is deemed a potential threat to effectiveness of this control method, the release of a higher number of RIDL males might be needed.[8] Bouyer and colleagues suggest that the use of the Sterile Insect Technique (SIT) might provide a safer alternative to RIDL. Unfortunately, because of an absence of empirical data from field trials, theoretical analyses are the only sources to assess SIT for *A aegypti* control. Mathematical models indicate that significantly higher numbers of radiation-sterilised males would need to be released to match RIDL effectiveness.[9] Additionally, such models suggest that SIT releases that are insufficient to collapse wild populations might actually risk inflating wild *A aegypti* populations by alleviating competition pressure at the mosquito's larval stages.[8,9]

No mosquito control approach is likely to provide the perfect standalone solution. Furthermore, with the rapidly expanding global distribution of arboviruses and their vectors,[10] different control tools and combinations are more likely to be more suitable in different ecological and epidemiological settings. An independent body dedicated to impartial assessment of the many up-and-coming technologies alongside the traditional approaches to mosquito control is needed to inform a modernised, integrated vector management approach for the containment and mitigation of public health emergencies, such as the ongoing Zika virus outbreak.

We declare no competing interests.

For more about the **use of *Wolbachia* against dengue** see http://www.eliminatedengue.com

*Laith Yakob, Thomas Walker
laith.yakob@lshtm.ac.uk

Department of Disease Control, London School of Hygiene & Tropical Medicine, London WC1E 7HT, UK

1 Yakob L, Walker T. Zika virus outbreak in the Americas: the need for novel mosquito control methods. *Lancet Glob Health* 2016; **4:** e148–49.
2 PAHO, WHO. Dengue: PAHO/WHO data, maps and statistics: annual cases reported of dengue. http://www.paho.org/hq/index.php?option=com_topics&view=rdmore&cid=6290&Itemid=40734 (accessed March 1, 2016).
3 Struchiner CJ, Rocklöv J, Wilder-Smith A, Massad E. Increasing dengue Incidence in Singapore over the past 40 years: population growth, climate and mobility. *PLoS One* 2015; **10:** e0136286.
4 Ooi EE, Goh KT, Gubler DJ. Dengue prevention and 35 years of vector control in Singapore. *Emerg Infect Dis* 2006; **12:** 887–93.
5 Stanaway JD, Shepard DS, Undurraga EA, et al. The global burden of dengue: an analysis from the Global Burden of Disease Study 2013. *Lancet Infect Dis* 2016; published online Feb 10. DOI 10.1016/S1473-3099(16)00026-8.
6 Carvalho DO, McKemey AR, Garziera L, et al. Suppression of a field population of *Aedes aegypti* in Brazil by sustained release of transgenic male mosquitoes. *PLoS Negl Trop Dis* 2015; **9:** e0003864.
7 WHO. Mosquito control: can it stop Zika at source? http://www.who.int/emergencies/zika-virus/articles/mosquito-control/en/ (accessed March 1, 2016).
8 Yakob L, Bonsall MB, Alphey L. *Aedes aegypti* control: the concomitant role of space, competition and transgenic technologies. *J Appl Ecol* 2008; **45:** 1258–65.
9 Yakob L, Bonsall MB. The importance of space and competition in optimizing genetic control strategies. *J Econ Entomol* 2009; **102:** 50–57.
10 Furuya-Kanamori L, Liang S, Milinovich G, et al. Co-distribution and co-infection of chikungunya and dengue viruses. *BMC Infect Dis* 2016; **16:** 84.