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Zika Virus (ZIKV) and Wastewater Treatment Plants

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Dear Editor,

Improper wastewater management and its discharge lead to environmental pollution and adverse effects on the ecosystems. In addition to unpleasant odors, stagnant wastewater, by providing requirements for successful growth of vectors (e.g. insect larva and ovals), plays a great role in transmission of vector-borne diseases (1). Also, extended ranges of microorganisms and pathogens including bacteria, viruses and protozoan exist in wastewater that can play an important role on spread of diseases and related outbreaks. Among treatment processes, natural systems such as septic tank and stabilization ponds are of interest according to economic and environmental point of views. Natural treatment systems are simple, effective and cost-beneficial, specially designed for tropical and sub-tropical regions, and consequently they are desirable for growth of aquatic insects (such as mosquitoes and dipterous) and spread of diseases. Based on literatures and reports, mosquitoes are the most abundant vectors with more than 100 species in these ponds (2). Also, other species that have been identified by researchers include Diptera (52%), Hemiptera (24%), Ciclopodidade (12%), Hydracarina (9.5%), Coleoptera (0.77%), Aranida (0.67%), Hymenoptera (0.58%), and Odonata (0.48%) (3). The families identified from Diptera order in the collected samples from the stabilization ponds involved Chironomidae and Culicidae (3). The most abundant mosquitoes have been reported to belong to the family Culicidae including the Aedes and Culex genuses (3). Magloire Kengne et al., 2003 through a one-year monitoring, surveyed the most abundant mosquitos' production in stabilization ponds in Cameron; the results showed a daily 43 imagoes/m^2 increase (4). In the study of Magloire Kengne et al., Mansonia and Culex were the most abundant breeding genera (4). Zika was initially isolated from a rhesus monkey in the Zika forest in Uganda in 1947, yet this was followed by many reported cases in Africa, Southeast Asia, and outbreak in Brazil, on February 1st, 2016 (5). The world health organization (WHO) declared Zika virus a public health emergency of international concern (PHEIC) (6). Fever, rash, Joint pain (Guillain-Barre syndrome) and conjunction are among the major symptoms of Zika virus infection yet infection during pregnancy can lead to more serious problems of fetal malformations (hydrocephaly) (7).

Zika-carrying mosquitos prefer to lay eggs in standing water such as lakes, ponds, marshes and septic tanks. Based on center for disease control (CDC) report "Aedes aegypti mosquitoes are more likely to spread viruses like Zika, dengue, chikungunya and other viruses than other types of mosquitoes"(8). It is important to mention that the vectorial capacity of any mosquito species is determined based on several factors including mosquito population density, blood sucking host preferences and density per man (9). Different studies revealed wastewater treatment systems as Aedes larvae and adult habitats (4). Burke et al., recovered Aedes from 49% of sampled tanks (10). Also, existence of Aedes larvae in stabilization pond was verified in another study (4). Therefore, septic tank and stabilization ponds can be a good candidate for laying the Zika-carrier mosquitos. Therefore, the population and community living near stabilization ponds and standing water are more exposed to risk and should be aware of the transmission mode and personal and engineering preventive methods (8). The principal physical methods that can reduce the risk of exposure include avoidance and keeping a proper distance, use of repellents and mosquito net, wearing clothing that covers as much of the body as possible (such as long-sleeved clothing, preferably light-colored), treated bed net, drainage and control of stagnant water around the home, and avoidance of unnecessary travels to contaminated area (11). The other mosquito control measures have been implemented all over the world and can be categorized as biological control encompassing usage of mosquito larvae eating fish and chemical control such as larvicide treatment on surface water of the ponds using insecticide from different classes including pyrethroids and organophosphorus compounds (12). As Zika sexual transmission has been well documented, in-

fected sexual partners should perform safer sex (use of condom) or abstain sexual activity during pregnancy (6).

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Footnote

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