A review: microbiology perspective of zika virus

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Abstract. The aim of review is to increase a quality of information about zika virus in microbiology perspective. Zika virus is an emerging-mosquito borne that was founded in Uganda 1947. Zika virus was transmitted to human in 1954 in Nigeria and first human infection in Asia were reported in Indonesia, Central Java in 1977. WHO was declared that zika virus was a global health emergency in 2016. Zika virus is flavivirus that was brought by mosquito (Aedes aegypti and Aedes albopictus). Zika virus had a several fatal effect like microencephaly and Guillain-Barre syndrome. Recently there is no medicine or vaccine for zika virus. Early diagnostic will help HCP (Health Care Professional) to provide early treatment for human infected. There was several rapid diagnostic for zika virus like ZnO nanostructure and paper disc.

1. Introduction
WHO was declared that zika virus was a global health emergency in 2016 [1]. Zika virus belongs to flaviviridae family that transmitted through the bite of two mosquito, Aedes aegypti and Aedes albopictus. Zika virus was founded from rhesus monkey in Uganda forest in 1947. Zika virus was transmitted to human in 1954 in Nigeria and it was transmitted to human in Africa in 1977 [2]. Based on CDC reports, in 2018 there was 148 cases of zika virus in US territory and 74 cases in US states.

2. Aim
Aim of review is to increase a number of information about zika virus based on microbiology perspective.

3. Discussion
Zika virus is positive-sense RNA virus and member of Flaviviridae family that its very close to other virus like Yellow Fever, West Nile virus, Dengue and Chikungunya. Zika virus has two lineage, african and asian lineage [2]. Zika virus can spread through bite of Aedes aegypti and Aedes albopictus, sexual transmission with infected people both man or woman and pregnant woman who susceptible to zika virus. Pathogenesis of zika virus commonly unknown. Virus replicate itself through skin dendrites and spread to lymph nodes and blood stream. Zika virus known to cause Guillain-Barre Syndrome and microencephaly [3].
The higher incidence of Zika virus, the development of diagnostic is very crucial. Diagnosis for Zika virus can be done with two ways, antibody and sequencing of viral genome. There are several diagnostic test for Zika virus such as RT-PCR, ELISA, RT-LAMP, immunochromatography and CRISPR-Cas13. However, development of diagnostic for Zika virus is difficulty due to cross reactivity with Dengue and limited access to public health services [4]. Because of this problem, scientist develop a variety of diagnostic test for Zika virus such as ZnO nanostructures-based rapid electrochemical biosensor and paper disc of RNA-based sensor.

ZnO nanostructure-based rapid electrochemical biosensor was develop by Faria and Mazon (2019). There are three component on this technology, Printed Circuit Board (PCB), ZnO nanostructure and ZIKV-NS1 antibody. These component were characterized with different methods. PCB have three electrode system that consist of gold trail as working electrode and silver trail as reference electrode. ZnO nanostructure were grown in PCB and it was characterized by Scanning Electron Microscope (SEM). After ZnO-NR combined with PCB, ZIKV-NS1 was immobilized on ZnO-NR surface by cystamine and glutaraldehyde. The result of this research was successful. The sensor showed that there were not cross reactivity with Dengue. The immosensor showed stability and specificity to ZIKV-NS1 [4].

Figure 1. Phylogenetic tree of the NS5 gene of flavivirus [2].
Paper disc RNA-based sensor was developed by Wyss Institute for Biologically Inspired Engineering, Harvard University. On this paper disc, they combined isothermal RNA amplification with toehold switch sensor. Inside toehold switch sensor, there is colorimetric detection to recognize zika virus which uses yellow substrate (chlorophenol red β-D-galactopyranoside) and purple product (chlorophenol red). It can discriminate the strain of zika virus using CRISPR technology. The process of diagnostic is from sample collection and we amplify it to get many copies of RNA. We use amplified RNA and put it in paper disc. It takes 30 minutes until 1 hour to see a color change on paper disc. It can be seen with the naked eye or with a more precise measurement using an electronic reader.

4. Conclusion
Zika virus is a flavivirus that belong to global health emergency in 2016 by WHO. Zika virus was transmitted by Aedes aegypti and Aedes albopictus. Zika virus cause a Guillain Barre Syndrome and microencephaly and development to zika virus diagnostic should be fast in the field. There are several rapid diagnostic for zika virus like ZnO nanostructure-based rapid electrochemical biosensor and paper disc RNA-based sensor. These rapid diagnostic can distinguish between strain like african or asian and also it can not cross-reactivity with dengue.

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