Project Title: Transcriptomics of IPSC derived neuronal cells upon infection with neurotropic viruses

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Project Description:

The recent worldwide epidemic of Zika virus illustrates the importance of Flaviviruses as an emerging human pathogen. Some of the factors contributed to the spread of this virus which is transmitted by Aedes species mosquitoes include urbanization and globalisation leading to higher international mobility. For example, the severity of Zika virus fever leading to many new neurological phenomena in particular towards newborns and the ability of the virus to spread to new regions previously not known for Flavivirus infection has led to a strong interest in developing novel strategies for the prevention and treatment of Zika virus induced disease. In addition to that, Zika virus has been shown to be spread via sexual transmission from person to person which is very uncommon for a Flavivirus. There are few important questions arises from this. How did this virus acquire the ability to induce severe neuropathogenesis in cases involving pregnant woman and their fetus? Can other Flaviviruses acquire such ability in the future and cause far more severe consequences? We strongly believe that understanding how Zika virus together with a panel of neurotropic Flavivirus (EV-D68, Coxsackie and JEV interacts with human genes, in particular human neuronal genes and the identification of host-virus transcriptomics associated with its pathogenesis, virulence and replication is crucial and these novel discoveries maybe targeted for future treatment and prevention measures, for example by using CRISPR/Cas9 guided multi gRNAs delivery to infected region to prevent viral replication.

Required skills (preferably not necessary):

1. Biomedical Sciences/Neuroscience/Molecular Virology or other equivalent Hons or Master's degree
2. Experience on experimental molecular virology (infection), animal handling techniques, stem cells
3. Strong writing and analytical skills

References

1. Araújo, TVB de., et al., (2016). Association between Zika virus infection and microcephaly in Brazil, January to May, 2016: preliminary report of a case-control study. Lancet Infect Dis, 1, 16(12), 1356–63.

2. Dick, G.W.A., et al., (1952). Zika Virus (I). Isolations and serological specificity. Trans R Soc Trop Med Hyg, 1, 46(5), 509–20.

3. Grant, A. et al., (2016). Zika virus targets human STAT2 to inhibit type I Interferon signalling. Cell Host Microbe, 19, 882–890.

4. Kalkeri, R., & Murthy, K.K. (2017). Zika virus reservoirs: Implications for transmission, future outbreaks, drug and vaccine development F1000 Research, 6, 1850.

5. MacNamara, F.N. (1954). Zika virus : A report on three cases of human infection during an epidemic of jaundice in Nigeria. Trans R Soc Trop Med Hyg, 1, 48(2), 139–45.

6. Mazzon, M., et al., (2009). Dengue virus NS5 inhibits interferon alpha signalling by blocking signal transducer and activator of transcription 2 phosphorylation. J Infect Dis, 200, 1261–1270.

7. Ming, G.L., et al., (2016). Advances in Zika Virus Research: Stem Cell Models, Challenges, and Opportunities. Cell Stem Cell, 19(6), 690–702.

8. Mlakar, J., et al., (2016). Zika virus associated with microcephaly. N Engl J Med, 374, 951–958.