Avian influenza A H7N9 virus efficiently infects and induces apoptosis in human CD14+ monocytes

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Following the 2013 outbreak of human infection with avian influenza A H7N9 virus, sporadic human infections have continued to occur in China. To better understand the mechanisms as how H7N9 virus causes severe illness in human, we infected human PBMCs with H7N9 (A/Anhui/1/2013) and compared to H5N1 (A/VNM/1194/2004) and 2009 pandemic H1N1 (A/HK/415742/2009) viruses. We found that H7N9 virus was as infectious as H5N1 virus to PBMCs with large proportion of cells expressing viral antigen at 12 hours after inoculation with 2 M.O.I of each viruses, while pH1N1 infected much less of cells. Moreover, our results showed that H7N9 induced cytokine responses that were similar to that of H5N1, but different from that of pH1N1. Result of multi-color flow cytometry indicated that all three viruses were able to infect multiple cell types including CD14+ monocytes, CD4+ T cells, CD8+ T cells and CD19+ B cells. Among different cell types, CD14+ monocytes were highly susceptible to both H7N9 and H5N1 infection but less susceptible to pH1N1 infection. Surprisingly, we found that H7N9 and H5N1 virus infection caused CD14+ monocytes quickly disappeared from the PBMC culture within 12 hours. Further study of purified the CD14+ monocytes showed that both H7N9 and H5N1 caused rapid down regulation of cell surface CD14 molecules, induced massive activation of caspase 3. TNEUL assay indicated that H7N9 and H5N1 induced apoptotic cell death in monocytes. Overall, these results suggested H7N9 virus is highly infective to human immune cells; infection of PBMCs provoked similar profile of cytokine responses and massive apoptosis of monocytes as seen in highly pathogenic H5N1 virus infection. H7N9 and H5N1 may share similar pathogenic mechanisms to cause severe disease in humans.

Biography

Andrew Chak Yiu Lee is currently a PhD candidate in the Department of Microbiology, The University of Hong Kong. His research focuses on the pathogenesis of avian influenza A H7N9 virus.

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