

Antibody-dependent enhancement effect as a potential threat induced by COVID-19

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Abstract

At present, Corona virus disease 2019(COVID-19) has become a major concern all over the world and leads to huge medical pressure. Antibody-dependent enhancement (ADE) of viral infection has been researched extensively in many viruses. It is not yet clear whether SARS-CoV-2 infection causes ADE effects. However, there is evidence that ADE may be found in COVID-19. We have discussed the possibilities of ADE effect induced by COVID-19 and proposed a series of measures to deal with it.

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To the Editor,

Corona Virus Disease 2019 (COVID-19) induced by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) has become a major concern all over the world. Until now, there is no effective treatment strategy for COVID-19.

In viral infections, there exists a group of phenomena in which secondary infection develops more severe clinical diseases than primary infection, known as Antibody-dependent enhancement of infection (ADE) effect. ADE of viral infection has been noted and researched extensively in many viruses. The complex of dengue virus and antibody can enter the immune cells through FcR and attenuate the inhibitory effect of the immune cells on the virus replication¹. Wan Y and colleagues revealed the molecular mechanism of ADE induced by MERS-COV, indicating that the receptor-binding domain (RBD)-specific neutralizing monoclonal antibody may mediate ADE of MERS-COV by mimicking the functions of viral receptors². The 1918 influenza pandemic known as the "Spanish Flu" has been the most serious infectious conditions in recent history³. The first wave of Spanish Flu was just like a common cold, while the second wave was much more contagious and deadlier than the first wave. ADE may be responsible for the large number of deaths among young adults during the Spanish pandemic.

It is not yet clear whether SARS-CoV-2 infection causes ADE effects. However, there is evidence that ADE may be found in COVID-19. Researchers found that seriously ill patients not only had a stronger IgG response but also a higher titre of total antibodies, which indicate the poorer prognosis⁴⁻⁵. Based on these results, Cao X summarized that it was suggestive of possible ADE of SARS-CoV-2 infection⁶. One of the most perplexing questions regarding the current COVID-19 coronavirus epidemic is the discrepancy

between the severity of cases observed in different countries, which arouse increasing attention and still appear to defy explanation. SARS-CoV-2 infection was more likely to affect older males with comorbidities⁷. While according to the Centers for Disease Control and Prevention of the United States, young adults make up a large portion of those infected and hospitalized. One probable answer is ADE of SARS-CoV-2 due to prior exposure to other coronaviruses.

If ADE has been confirmed in SARS-CoV-2 infection, patients who may appear to have staged a full recovery would be exposed to the risk of COVID-19 reinfection. WHO had already warned that "There is currently no evidence that people who have recovered from COVID-19 and have antibodies are protected from a second infection". Under threat of ADE effect, herd immunity strategy should be considered more fully to battle against the possible second wave of the COVID-19, in which new virus variants or the secondary infection may aggravates the epidemics. ADE may also be a significant obstacle to developing effective vaccines for SARS-CoV-2, since virus-specific antibodies conferred by vaccination of inappropriate concentration may enhance the ability of the virus to entry into target cells, leading to increased severity of the disease⁸. So all virus subtypes and antibody levels must be taken into account for the vaccine development and antibody-based therapies.

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