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Sars-Cov-2: underestimated damage to nervous system

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Dear Editor,

Coronaviruses (CoVs) are large enveloped positive-stranded RNA viruses, which generally induce enteric and respiratory diseases in animals and humans[1]. Novel coronavirus pneumonia (NCP, also called COVID-19) emerged in December 2019 in Wuhan, China[1]. This novel CoV(SARS-CoV-2) has caused a national outbreak of severe pneumonia in China, and rapidly spreads around the world.

On March 4, gene sequencing confirmed the presence of SARS-CoV-2 in the cerebrospinal fluid of a 56-year-old patient with NCP in Beijing Ditan Hospital. The patient was diagnosed with viral encephalitis, and the patient's central nervous system was attacked by SARS-CoV-2. This indicates that SARS-CoV-2 can directly invade the nervous system of patients, instead of injuring the nervous system through the immune response to SARS-CoV-2. This is the first evidence that SARS-CoV-2 has directly invaded the nervous system.

Genomic analysis shows that SARS-CoV-2 is in the same Betacoronavirus clade as

MERS-CoV and SARS-CoV, and shares highly homological sequence with SARS-CoV[1]. The public evidence shows that COVID-19 shares similar pathogenesis with the pneumonia induced by SARS-CoV or MERS-CoV[2]. Moreover, the entry of SARS-CoV-2 into human host cells has been identified to use the same receptor as SARS-CoV[1]. Previous studies have shown that SARS-CoV and MERS-CoV possess neuroinvasive properties, which can be detected in human brains. CoVs may enter the CNS through two distinct routes: hematogenous dissemination or neuronal retrograde dissemination. I think that the way of neuronal retrograde dissemination is more worrying.

HCoV-OC43 RNA, a kind of human coronaviruses, could be detected for at least a year in the CNS of infected mice that survived the virus-induced acute encephalitis[3]. Therefore, an apparently innocuous human respiratory pathogen may persist in the human CNS as a component of the brain, like herpes simplex virus (HSV) in a large proportion of the population. If SARS-CoV-2 exists for a long time, like HSV, and it will recur again in predisposed individuals.

In addition, the presence of HCoV-229E and HCoV-OC43 was detected in various neurological diseases in humans, including multiple sclerosis (MS)[4]. Multiple sclerosis truly represents a human neurological disease where an infectious agent or agents may play a triggering role, with viruses the most likely culprit in genetically predisposed individuals[5].If the SARS-CoV-2 is latent in CNS for a long time, will the cured patients reappear with neurological diseases because of the latentness of the SARS-CoV-2, which is a doubt for the late neurological complications of the cured patients. If the SARS-CoV-2 is latent in the nervous system for a long period of time, will the cured patients reappear with neurological

diseases? This is a question for the cured patients. It is worthy of our further discovery and exploration. In addition, we should also be aware of this problem in further clinical work, strengthen the alertness of clinicians, and jointly solve this problem.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Declarations

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