In Brief

Environment

Disinfection Threatens Aquatic Ecosystems

On April 10, Chinese scientists at the CAS Research Center for Eco-Environmental Sciences reported in *Science* that the massive use of disinfectants to contain the spread of coronavirus disease 2019 (COVID-19) may cause collateral damages to the aquatic ecosystems (doi: 10.1126/science.abb8905). China has dispensed at least 2,000 tons of disinfectants in Wuhan City alone. These chemicals can get into sewage systems and pollute drinking water resources. Both the direct runoff and indirect sewage effluents will eventually end up in lakes and rivers, putting aquatic ecosystems at risk. They caution the potential backfire from polluted water, and call on the governments of China and other affected countries to conduct aquatic ecological integrity assessments during and after the pandemic to protect biodiversity.

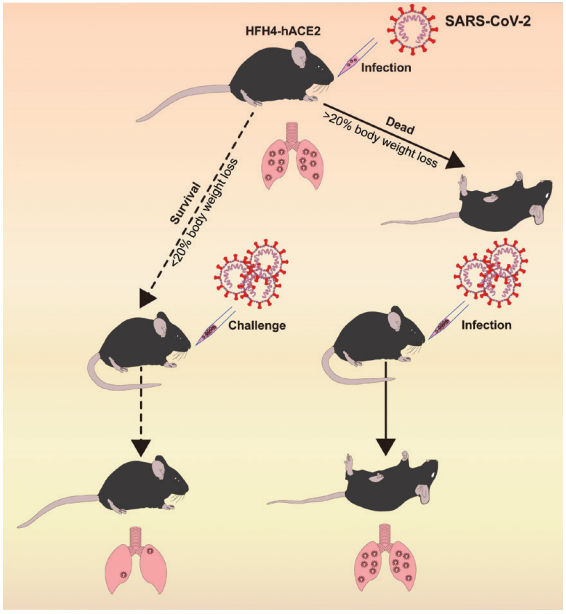
COVID-19

SARS-CoV-2 Infection in Human ACE2 Transgenic Mice

Mouse infection model plays a vital role in understanding viral pathogenesis, vaccine development, and drug screening. There is no reason it should be absent from the global confrontation with the ongoing COVID-19 pandemic caused by SARS-CoV-2.

Previous study in March this year, Dr. SHI Zhengli, a famous Chinese virologist at the Wuhan Institute of Virology (WHIOV), Chinese Academy of Sciences, demonstrated that SARS-CoV-2 can use human, bat, or civet ACE2 (a cellular receptor rich in the lining of the blood vessels) for cell entry, but not the mouse ACE2 (*Nature* 2020 doi: 10.1038/s41586-020-2012-7). In other words, SARS-CoV-2 does not infect mice in nature. However, mice genetically engineered to carry the human ACE2 would become vulnerable to SARS-CoV-2 and thereby a useful tool for testing potential vaccines and therapeutics.

As reported in *Cell* on May 21, SHI Zhengli and YANG Xinglou, another WHIOV virologist, successfully developed a SARS-CoV-2 transgenic mouse infection model carrying the human version of ACE2 (doi:



The surviving mice from the attack of a relatively small army of SARS-CoV-2 could protect the host from a stronger reinfection. (Image by WHIOV)

10.1016/j.cell.2020.05.027).

They found, the infected mice generated typical interstitial pneumonia and pathology that were similar to those of COVID-19 patients. Like in humans, the lung is the primary target of this virus, although the eye, heart, and brain could also be infected in accordance with the tissue ACE2 abundance.

They also found that the surviving mice once exposed to a low amount of the virus could better withstand a reinfection at higher amounts. While the naïve-infected mice had a hard time and developed severe symptoms, only mild pneumonia was observed in the mice that have already survived once from viral infection. Which parts of the mouse immune system enable such protection, however, remains unclear.

All in all, the hACE2 mouse established in this study, partially recapitulating the pathology of COVID-19 in humans, may provide a valuable platform for testing potential vaccines and therapeutics in the battle with SARS-CoV-2.

COVID-19

Neutralizing Antibody Enters Phase I Clinical Trial

After the approval by the National Medical Products Administration (NMPA), the first subject from the Shanghai-based Huashan Hospital of Fudan University on the morning of June 7 received an injection of JS016 – a recombinant, fully human, monoclonal neutralizing antibody against COVID-19, as reported by Xinhua. This is so far the world's first clinical trial concerning using anti-COVID-19 antibody on a healthy human participant following confirming its protective efficacy in nonhuman primates.

The antibody, codeveloped by biopharmaceutical company Junshi Biosciences, the CAS Institute of Microbiology and others, is a reward of treasure-hunting from the blood of a convalescent donor once infected with COVID-19 (*Nature* 2020, doi: 10.1038/s41586-020-2381-y).

By taking a protein fragment close to the tip of SARS-Cov-2 surface spike protein as a bait, scientists fished out particular memory B-cells that carry the COVID-19 neutralizing antibody on the surface and contain the antibody genes in the core. As a result, they identified two specific human-origin monoclonal antibodies (CA1 and CB6) that show neutralizing ability *in vitro* against SARS-Cov-2. Notably, the CB6 antibody can inhibit SARS-CoV-2 infection in rhesus monkeys at both prophylactic and treatment settings. Structural analysis indicates the binding sites of SARS-CoV-2 in hACE2, its natural target, are highly overlapped with the binding sites of the virus in the CB6 antibody. Through joined efforts, this COVID-19 neutralizing antibody is currently in phase-I clinical trial, representing a big shot in fighting off the COVID-19 pandemic.

Couple of day earlier, using the same strategy, another group of scientists at the CAS Institute of Microbiology together with others, identified two human-origin monoclonal antibodies that could block the virus binding to its cellular receptor, and hence protect the antibody-given mice from COVID-19. Turn to page 78 for more detail.