

Establishment and application of COVID-19 animal models

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The coronavirus disease 2019 (COVID-19) pandemic caused by severe acute respiratory syndrome - coronavirus 2 (SARS-CoV-2) has resulted in an unprecedented public health emergency and international concern. The study of animal models of COVID-19 is urgently needed especially for rapid development of effective vaccines and treatments.

Based on the well-established technical system and resource center for animal models of major and emergent infectious human diseases, our team has firstly build up the COVID-19 human ACE2 transgenic mice model and rhesus monkey model. Animal models witnessed weight loss, virus replication in lung tissue, virus-specific antibodies as well as pathological lesions. Golden hamster model and cat model were subsequently established. Animal models of diseases can bridge clinical problems and basic research, and comparative medicine makes a great contribution.

According to the Koch's postulates, it has been confirmed that the SARS-COV-2 is the pathogenic pathogen of COVID-19, and human angiotensin-converting enzyme 2 (hACE2) is the invasion receptor of SARS-COV-2 *in-vivo*. Taking advantage of the COVID-19 animal models, studies have been carried out in the transmission ability of SARS-CoV-2 by respiratory droplets, direct contact, aerosol, fecal-oral and conjunctiva contact. Pathogenic mechanisms including immune response, protection against reinfection have also been explored by animal model studies.

The animal models achieved the evaluation of a series of drugs, traditional Chinese medicines (TCM) and antibodies on the effect of disease prevention and treatment. Our team also completed a series of pharmacodynamics research on different types of coronavirus vaccines, including virus vector vaccines, inactivated vaccines, mRNA vaccines, DNA vaccines, attenuated virus vaccines, recombinant protein vaccines.