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Editorial

Animal Models for COVID-19

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INTRODUCTION

Basic research on SARS-CoV-2 is essential to understand its detailed pathophysiology and identify best drug targets. Models that can faithfully reproduce the viral life cycle and reproduce the pathology of COVID-19 are required. Here, we briefly review the cell lines, organoids, and animal models that are currently being used in COVID-19 research.

CELL LINES AND ORGANOIDS FOR SARS-COV-2 RESEARCH

An in vitro cell model for SARS-CoV-2 research is essential for understanding the viral life cycle, for amplifying and isolating the virus for further research, and for preclinical evaluation of therapeutic molecules. This section lays out the cell lines used to replicate and isolate SARS-CoV-2, as well as organoids that can be used to examine the effects of SARS-CoV-2 infection on specific human tissues.

ANIMAL MODELS FOR SARS-COV-2 RESEARCH

The complex pathophysiology of the disease will only be understood by reproducing tissue-specific and systemic virus–host interactions. While cell lines and organoids are faster systems to study the virus and its interactions inside host cells, these can only reproduce the symptoms of COVID-19 in a specific cell type or organ, respectively. However, the pathology of COVID-19 can be reproduced and observed in a tissue-specific and systemic manner in animal models. Several different animals are being used to study the disease and to test candidate therapeutic compounds

One of the works that set the pace for discovery of animal models was conducted SARS-CoV-2 infection experiments using cells that expressed ACE2 proteins taken from multiple animal species, from mice to humans Small animals like mice and Syrian hamster are advantageous to study SARS-CoV-2, as they reproduce faster; however, to faithfully reproduce COVID-19 pathology in humans, larger animal models are preferred. Kim et al. reported nonlethal acute bronchiolitis in the lungs of a ferret model. Another study showed that SARS-CoV-2 can replicate in ferrets and cats, but not in pigs, chickens, and ducks. Based on these findings, it is recommended to use ferrets and cats when selecting large experimental animals rather than rodents. Rhesus macaques have also been used in COVID-19 studies where the therapeutic effects of adenovirus-vectored vaccine, DNA vaccine candidates expressing S protein, and remdesivir treatment were confirmed. While these models probably are best in replicating virus–human host interactions, a major limitation is that the reproduction rate in cynomolgus and rhesus monkeys is less and slower. Hence this can be preceded by experiments with transgenic mice and Syrian hamsters.

CONCLUSION

COVID-19 has spread rapidly all over the world in the past 5 months. Even now, the number of infected people and deaths continues to rise. At this time, there are no therapeutic prevention or intervention methods available. While multiple clinical trials are currently underway, in parallel, preclinical research on in vitro and model organisms is also needed, both to understand the virus and to test therapeutic agents for safety and efficacy.

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