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Current and Emerging Challenges in Infectious Disease, and Are We Ready for the Next Pandemic?

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Abstract

Viruses remain a major global health concern, with the appearance of new viruses and the re-emergence of previously recognized viruses with altered epidemiology and pathogenicity occurring almost annually. Important recent examples include SARS-COV-2 the causative agent of the COVID-19 pandemic, the West African outbreak of Ebola virus, the recent spread of Monkeypox virus across Europe, the reported Henipah virus outbreak in China in 2021, and the epidemic of Zika virus in the South Americas. The constantly evolving relationship between pathogens and hosts, coupled to the movement of arthropods (insects) carrying dangerous viruses into new geographical regions driven by accelerated population growth and climate change, mean that that future virus pandemics that threaten human health are a certainty. Current and emerging virus infections present several challenges in the clinic. Vaccine programmes have been successful for recent virus outbreaks, but vaccine development is costly, time-consuming and cold-chain limitations prevent their global distribution. Effective antiviral drugs can circumvent many of these issues, but viruses can rapidly develop drug-resistance to antiviral monotherapies, meaning drug cocktails that target numerous stages of the virus lifecycle are required. These have been developed successfully in the past, but knowledge of the virus at the molecular level and effective drug-screening platforms using cell culture virus system are required.

To ensure we are prepared to combat emerging disease, the capacity to respond quickly and effectively with appropriate measures is essential. Here, the challenges for current and future virus infections will be discussed. These include the need for effective global surveillance to rapidly identify and isolate new virus outbreaks, the investment required in basic virology research to expedite effective antiviral drug design, the need for antiviral drugs to complement vaccine programmes, and the requirement for public education on virus transmission to limit human-to-human spread in the face of a future pandemic.