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Editorial

Priorities for research on tropical viruses after the 2014 Ebola epidemic

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The ongoing Ebola epidemic is changing our view of the threat posed by hemorrhagic fever viruses. The unprecedented death toll has reached nearly 8000 in Guinea, Sierra Leone and Liberia, and the death of more than 200 health care workers is having a devastating impact on the health infrastructure of these countries. Countermeasures to contain the epidemic have not fundamentally changed since the virus was discovered in the 1970s: identification and isolation of cases, tracing and quarantine of contacts, and disinfection measures. Today the main differences are the availability of improved personal protective equipment for doctors and nurses and the implementation of PCR-based diagnostics in some local laboratories, allowing for the rapid identification of patients. As in the first recorded outbreaks of the virus in former Zaire, the mortality is still 50–70% despite better supportive patient care. In terms of specific medical interventions, two experimental antiviral drugs and a monoclonal antibody cocktail have been given to a handful of patients and vaccine candidates based on recombinant adenovirus and vesicular stomatitis virus, respectively, are being rushed into clinical development [1,2]. An effort is also underway to generate immune plasma from Ebola survivors, which has shown some therapeutic efficacy in a small number of patients in previous outbreaks. Whether any of these interventions will be timely enough to contribute to the control of the epidemic remains to be seen.

Assuming that this epidemic will eventually be brought under control through massive national and international efforts, two important questions need to be addressed: What should be done to prevent the next Ebola epidemic? And what is the state of affairs with respect to controlling the many other tropical viruses potentially capable of causing devastating outbreaks or epidemics?

Filoviruses, Arenaviruses, Yellow fever virus, Crimean-Congo hemorrhagic fever virus, Dengue viruses, Hantaviruses and Chikungunya virus are of zoonotic origin and cause severe and life threatening illness, including hemorrhagic fever. They all occur sporadically as well as in outbreaks and some, like Crimean-Congo and Chikungunya virus, have recently expanded their geographical range of endemic transmission. On the one hand, enormous progress has been made in the basic molecular understanding of these RNA viruses, including study of their pathogenicity using reverse genetic systems, development of novel vaccine candidates and identification of potential antiviral lead compounds. However, their control is still hampered by delayed diagnosis in endemic areas, operational challenges in implementing community wide control measures and lack of specific medical interventions. The only exception is Yellow fever, for which a very effective vaccine is available.

In this special issue of the Journal of Clinical Virology important aspects of the epidemiology, diagnosis, pathogenesis, therapy and prevention of these viruses are being reviewed. All articles have been co-authored by virologists from non-endemic countries, who are actively involved in basic research, and virologists from tropical or subtropical endemic countries, who are actively involved in clinical research and control activities. Together they outline the scientific progress of the past 10 years and identify the current gaps in our knowledge as well as promising areas for translational research. They conclude that the scientific basis for the development of effective countermeasures against these tropical viruses has largely been generated. The challenge is to now bridge the gap between preclinical research and clinical development of vaccine candidates and antivirals, along with implementation of diagnostic capacity in endemic areas. This can only be achieved through a concerted effort of the scientific community in collaboration with companies possessing relevant know-how, as well as involvement of local governments. It will be important to tackle the major impediments to the availability of drugs and vaccines against these diseases, which are the lack of a market and the complexity of product development. As an important first step, the Ebola vaccine candidates currently in phase 1 are to be moved directly into efficacy trials in healthcare workers exposed to the virus, and discussions on ethical issues of the appropriate trial design are underway that will hopefully generate guidelines for fast-tracking other vaccines as well [3]. Encouragingly, three Ebola vaccine candidates are now being developed by large pharmaceutical companies, which have the know-how to bring them to the market.

The 20th century has seen the emergence of hemorrhagic fever viruses such as Marburg and Ebola, Lassa fever and Crimean–Congo Hemorrhagic fever virus, which in the past could be contained with public health measures alone because the outbreaks occurred in relatively remote rural areas. In the future, these viruses will find

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their way much quicker into urban populations due to demographic changes and increased mobility in tropical countries. Furthermore, outbreaks are likely to occur more often, because widespread ecological changes will result in increased contact of humans with the vectors of these zoonotic diseases [4]. Without vaccines and drugs available for emergency use and implementation of diagnostic capabilities in the areas at risk, the 21st century will witness a growing number of outbreaks which can only be brought under control at great cost for the affected countries and international community. The time is now to translate the research findings of the past 10 years into pharmaceutical products aimed at controlling tropical viruses with epidemic potential.

Conflict of interest statement

I state no conflict of interest and approve the final version of the manuscript "Priorities for research on tropical viruses after the 2014 Ebola epidemic".

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