Anticipation

1. What data needs to be collected for prevention of future outbreaks? What kind of analysis models and co-operations do we need to acquire & analyze such data?

   • For spillover events, more research is needed for bat reservoir species. Where the reservoir species are known (such as Rousettus aegyptiacus for Marburg virus) information on bat population density, virus prevalence in the population, viral load in bodily fluids and information on transmission would be valuable for predicting spillover events. In the case of Marburg, socioeconomics data is also highly valuable to understand spillover risk factors (e.g. mining activities, demographics). Where the reservoir is not well established, more research to identify the bat reservoirs is needed. Also, more information on the locations of transmission to humans such as in mines or areas where the bats feed.
   • For prevention, programs such as safety precautions in miners and education of populations in areas of high bat population would be valuable for prevention.
   • For persistent virus in survivors, more research is needed on the mechanisms of persistence and re-emergence. Combined clinical research and research in animal models will be needed.
   • More research is needed to be able to identify whether cases result from spillover or from virus persisting in survivors. Data are needed on the rate of evolution in the reservoir species versus in immune privileged sites such as semen or the central nervous system. This can also be done retrospectively, looking at samples from past outbreaks that were not analyzed with modern genomics tools.

2. Would it be worthwhile to setup a web-based filovirus surveillance database?

   • A web-based filovirus surveillance database would be worthwhile for data sharing, inputting data in real time, although there will be limitations related with specific capacity in endemic countries. The datasets would also allow better modelling
   • For Genomics, this can be modelled on the genomics done for COVID 19 with a platform like GSAID. For serology, standardized serology testing is needed.

3. Do we have the right diagnostic tools? If not, what tools need to be implemented?

   • For Ebola Zaire, the GeneXpert is widely used, but this is not available for the other Ebola species or for Marburg. This is a gap that could be addressed.
   • Improved serologic assays that can distinguish between the different Ebola species are needed.
   • Point of care assays are needed. Better lateral flow tests that are more sensitive, more durable (with longer shelf life) and that do not require refrigeration are needed.
   • Multiplex assays would have great utility, although it was noted that those can be high cost. For multiplex lateral flow assays, there are technical hurdles, including the dilution of sample that is usually required.

4. What tools do we have in place to prevent relapse and initiation of outbreaks via transmission from survivors?

   • More research is needed to understand the mechanisms of persistence, reactivation and transmission.
   • There is overlap with the other areas in terms of whether survivors should receive a vaccine boost at some point and also the use of therapies.

5. What is the role of domestic animal and wildlife surveillance for outbreak prevention? What is the best strategy?