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Ebola Origin and Therapies

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Abstract

Ebola epidemic was re-outbreak again last year. The medical capabilities against disease spreads or therapeutics need to be boosted. Many targeted therapies are still under investigations and newly licensed in a small scale. This article outlines multiple phases of Ebola epidemics-its origin and therapeutic options and economic conditions in these medications. New ideas and future perspectives are given.

Keywords: Ebola; Virus origin; Antiviral vaccine; Antiviral drugs; Virus epidemics; Disease complications; Ebola transmission; Human genomes; Traditional Chinese medicine; Drug patents

Introduction

Backgrounds

Outbreak of Ebola epidemics in West Africa 2014 shocked the world greatly. Despite the gradual control of Ebola epidemics in outbreak regions, factors behind the Ebola outbreak remain elusive. Moreover, many targeted therapies are still under investigations and no 100% effective drugs have been discovered and licensed. Herein, viral origin and effective therapies are given and separately discussed.

Viral origin

Viral origin studies play important roles for disease control and therapeutic options. Known from history, many deadly viruses, such as plague (black deaths), rabies and yellow fever all come from sources of wild life [1-4]. If we cannot rule out all possibility of Ebola virus spread from other living resources, we might never have the chance of completely eradicating disease epidemics and finally eliminate Ebola forever. We previously suggest that systematic detections of Ebola virus or other toxic chemicals, heavy metals or biology between insects, animals and living resources are important steps for completely controlling the diseases [1]. Yet, this work is not easily accomplished owing to many current technical weaknesses and so on [3].

Possible routes of human-to-human Ebola transmission

Since no definite clue about human-to-human Ebola transmission has been found, a systematic study on human-to-human Ebola transmission is necessary. If we can specify the exact Ebola transmission routes between humans, we may not be so vigilance for everything because too much question marks are remained on this issue.

Possible routes of human-to-human Ebola transmission are indispensable parts of Ebola researches and preventions. They are outlined as:

- Respiratory tract transmissions (from contaminated air and contaminated space).
- Infect Ebola virus from the different types of touch among people, e.g., kiss, handshaking, public bathing or swimming pools, public utensils and so on.
- Contract infections from pollutants (such as urine, feces, contaminated syringes and cloth washing).
- Viral transmission from media of mosquito.
- Sexual intercourse transmission (both homo- and hetero sexualities).
- Mother-to-children transmissions.

A lot of different factors may induce human-to-human Ebola transmission. Some of them can be predicted. Some of them can not be predicted. Let's time to speak out their destinations (Table 1).

Disease complications in survival patients

With the accumulating numbers of Ebola survivors, a number of Ebola complications in patients (post-Ebola syndromes) have been found-including hearing loss, eye problems, fatigues, erectile dysfunction. To these complication treatments, boosting therapeutic studies are needed [5-7].

Different types of therapeutic options against Ebola

After outbreak of new deadly virus epidemics, first reflection for virologists is always the antiviral vaccines. However, the successful stories are very limited. Otherwise, ethical concerns regain its importance in therapeutic studies in normal humans and at least a few months interval must be spent for new vaccine assessments [1-3,8,10]. This is usually proved too little and too later for quick control of deadly virus outbreak and save the lives of wide populations (Table 2).

Patents for Ebola treatment

Different from therapeutic vaccines, quick establishments of antiviral drug development pipelines and arsenals for clinical utilizations ought to be equipped and effective and matured systems should be ready for the times. Further suggestions are given as chemical drug patents, AVI-6002, AVI-7537, AVI-7539, BCX4430, brincidofovir, favipiravir and TKM-100802 etc. [9].

Finally, traditional Chinese medicine (TCM) therapies [10] might also be a useful way for its low toxicity and mixture ingredients as drug cocktail suitable for deadly viral infection control and treatments. Of course, the drug combinations of TCM therapy might be slightly

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Infectious routes	Viral types
Foods	Avian flu
Air or water	Seasonal flu
Mosquito	Yellow fever
Animal bites	Rabies
Pollutants	Hepatitis virus A

Table 1: Examples of different viral origin for deadly infectious diseases.

Therapeutic types	Present status
Supportive care	Fluids or electrolytic balancing agents
Infectious symptoms	Fever, hemorrhage, respiratory etc.
Disease complications	Just be reported
Vaccines	Undertaking
Biotherapies	Oligo-DNA and antibodies
Antiviral chemicals	Patents under investigations
Traditional Chinese medicines	Needs international cooperation

Table 2: Different types of therapeutic options for Ebola therapies.

Names	Characteristics	Targeted molecules and pathways
AVI-6002	Antisense oligomers (single strand)	Gene expression Antiviral
BCX4430	Small-molecule chemicals	RNA polymerase
CMX-1 (brincidofovir)	Lipid conjugated cidofovir	DNA polymerase
Favipiravir (T-705, Avigan)	Small-molecule chemicals	Virus replication RNA-dependent RNA polymerases
TKM-100802	Small-interfering RNA (double strand)	Gene expression Cytokine release

Table 3: Brief introductions of presently patented compounds for Ebola therapeutics.

changed for a variety of virus infections. It also needs time and paradigms propagations (Table 3).

Conclusion

Ebola re-outbreak in the mid of 2014 was a good lesson for us. Worldwide cooperation has been strengthened and boosted. At least, some novel researches are initiated and preventive systems are verified. With all these efforts, we feel safer than ever before. We herein call for stronger international cooperation and share medical experience and capabilities for virus control and treatments between countries of both developing and developed.

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