Short Communication

Antiviral Vector Effects of Ivermectin on COVID-19: An Update

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Abstract

Ivermectin proposes several potentials effects, with its antimicrobial, antiviral, and anti-cancer properties. In a recently published systematic review, Ivermectin is effective on several enveloped, positive-sense, single-stranded RNA viruses such as Zika Virus, Dengue Virus, Yellow Fever Virus, West Nile Virus, Venezuelan Equine Encephalitis Virus, Chikungunya Virus, Semliki Forest Virus, Sindbis Virus, Porcine Reproductive and Respiratory Syndrome Virus, and Human Immunodeficiency Virus Type 1. Also, SARS-CoV-2 is considered as an enveloped, positive-sense, single-stranded RNA virus that was inhibited by Ivermectin in in-vitro evaluations. Although several clinical trials about the effectiveness of Ivermectin on COVID-19 are on the way, the current in vitro research is usually used in the early stages to outline new medications. Additionally, further clinical trials are required to confirm the safety and efficacy of ivermectin for human use against COVID-19 either therapeutic or preventive. We reviewed the vector effects of ivermectin on COVID-19.

Keywords: Antiviral, COVID-19, Ivermectin, RNA virus, Viral vector

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Ivermectin and COVID-19

Ivermectin proposes several potentials effects, with its antimicrobial, antiviral, and anti-cancer properties. In a recently published systematic review, Ivermectin has been successful to overcome several enveloped, positive-sense, single-stranded RNA viruses such as Zika Virus, Dengue Virus, Yellow Fever Virus, West Nile Virus, Hendra Virus, Newcastle Virus, Venezuelan Equine Encephalitis Virus, Chikungunya Virus, Semliki Forest Virus, Sindbis Virus, Avian Influenza A Virus, Porcine Reproductive and Respiratory Syndrome Virus, and Human Immunodeficiency Virus Type 1. Also, SARS-CoV-2 is considered as an enveloped, positive-sense, single-stranded RNA virus that was inhibited by Ivermectin in in-vitro evaluations (1). It has been revealed that ivermectin with a single addition to Vero-hSLAM cells two hours post-infection with SARS-CoV-2 could affect an almost 5000-fold reduction in viral RNA (2).

Although several clinical trials about the effectiveness of Ivermectin on COVID-19 are on the way (3), the current in vitro research is generally utilized in the initial steps to outline new medications. Additionally, further clinical trials are required to verify the safety and efficacy of ivermectin to be used against COVID-19 in human beings, either for therapeutic or preventive purposes (4).

In addition to the antiviral effects of Ivermectin in in-vitro and in-vivo studies mentioned earlier, the Mosquitocidal effects of Ivermectin on viral transmission control in some mosquito-borne viruses have been investigated. The exact antiviral mechanism of Ivermectin was not investigated in these studies. In an in vitro study, the injectable form of Ivermectin at a dose of 400 mg/kg significantly reduced the susceptibility of Culicoides sonorensis (Diptera: Ceratopogonidae) to bluetongue virus (BTV)-17, a double-strand RNA virus, without a significant effect on the mortality rate of this vector. The authors concluded that Ivermectin could inhibit BTV-17 in Culicoides sonorensis. However, in this study, Ivermectin did not significantly alter the rate of infection caused by epizootic hemorrhagic disease (EHDV) virus, a double-strand RNA virus, in vectors. The study aimed to investigate the insecticidal effect of this drug on the vector of two viruses, BTV and EHDV, called Culicoides sonorensis (5).

In a study of mosquitoes infected with DENV-2 called Aedes albopictus, the average infection rate followed by Ivermectin doses of 0, 2, 4, 8, 16, 32, and 64 ng/mL were 84.62%, 85.29%, 82.54%, 74.24%, 63.33%, 54.29%, and 42.62%, respectively, so that the rate of infection decreased with increasing dosage. At concentrations above 16 ng/mL, the DENV-2 loads in mosquitoes showed a significant decrease. In this study for the first time, the researchers acknowledged that Ivermectin, directly and indirectly, inhibits DENV-2 in mosquitoes (6).

In another in-vivo and in-vitro study, Nguyen and colleagues concluded that Ivermectin-treated bird feed could be a new method of controlling WNV transmission. In this study, researchers demonstrated the effects of Ivermectin as a systemic endectocide in birds and suggested the possibility of using Ivermectin to control the transmission of WNV. Ivermectin had the lowest lethal concentrations resulting in 50% mortality (LC50) compared with eprinomectin and selamectin, which were 49.94, 101.59, and 151.46 ng/mL, respectively (7). In another study on FDA-approved anti-flaviviral drugs, researchers tested the mosquitocidal effect against Aedes aegypti and their antiviral effect on Zika virus, an enveloped, positive-sense, single-stranded RNA viruses. They showed that Ivermectin had strong adulticidal activity and showed the highest mosquito mortality at a dose of 100 μM (8).

Conclusion

The COVID-19 pandemic has had several consequences including social inference beyond the spread of disease, showing that the international community was not ready for this outbreak. Due to inadequate researches by international organizations and lack of clinical guidelines, there is a long distance to reach promising outcomes.

We do believe that with the potential paucity of a vaccine or effective treatment, all potential therapeutics should be meticulously explored especially the cost-effective ones; Ivermectin is one of these potential therapeutic agents.

Acknowledgment

None.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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