



The Potential Transmission of Covid-19 by American Cockroach (*Periplaneta Americana*)

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Hypothesis

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Abstract

COVID-19 is a global disease with high mortality and prevalence, which has caused many problems in today's world. In addition to the lungs, the disease affects other vital organs and has long-term effects, even if cured. Therefore, the identification of the transmission methods of this disease has special importance. So far, the transmission from the surface as well as respiratory droplets of the infected person has been proven. The virus has also been shown to be present in the blood, urine, semen, and feces. On the other hand, the role of insects in the transmission of diseases in some infectious diseases has been confirmed. Therefore, it is necessary to study possible transmission routes, especially through insects such as cockroaches.

Keywords: Transmission; Covid-19; Cockroaches

Hypothesis

The American cockroach is one of the insects that are important for the mechanical transfer of pathogens in health. The insect lives inside buildings, often in sewers and sewage collection systems, and also found in toilets and warehouses [1-12]. On the other hand, due to being omnivorous, opportunistic feeder and feeding on human sewage and wastes, as well as feeding by human foods and its residuals, also traffic in and around human places, it is considered a demonic insect [13,14]. Most of the activity of this insect takes place at night and during the day it lives in cracks, crevices, and dark places [15]. Behavioral and nutritional habits, as well as the many micro-hairs in the insect's body,

have the potential to become infected with pathogens in human fecal and mechanically transmit them to human food and household items and surfaces. In various experimental and laboratory articles, the infection of this insect has been confirmed to more than 100 types of microorganisms, including bacteria, viruses, protozoa, fungi, and helminthic worm eggs, and the possibility of their mechanical transmission [16,17]. The ability of infected insects to infect surfaces with the microorganisms has also been confirmed [18]. Also, the insect has been shown that to be able to store and repel the polio virus and hepatitis B virus in the laboratory [19]. Therefore, given that the presence of the active coronavirus in human feces has been proven [20], and also because the transmission of SARS, as another member of

the corona virus family, has been confirmed through sewage [21]. Hence, it is possible that insects can transmit COVID-19 through sewage and human waste [22,23]. Amongst, the American cockroach can be considered one of the riskiest candidates in the spread of this virus among humans, even during the quarantine period, due to its constant contact with waste and sewage and moving in different rooms and units of buildings. In Figure 1 the proposed mechanism

for transmitting the coronavirus through the American cockroach has been shown. According to this mechanism, the coronavirus can be transmitted to the healthy person through an American cockroach that fed on or exposed to the fecal matter of a COVID 19 patient and by the movement of this insect and its transfer to the living environment of the healthy person and contaminating of surfaces, food or dishes, and kitchen sink (Figure 1).

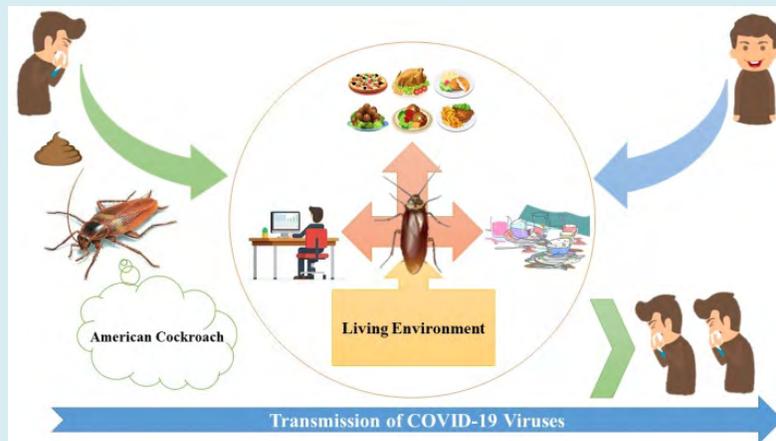


Figure 1: Proposed mechanism of coronavirus transmission through American cockroaches.

Proposed Methods

To confirm the transmission of the virus, anesthetize 100 American cockroaches that have been bred in the laboratory for several generations in an insectarium under CO_2 gas, transfer them all to a suitable container without food, and keep them hungry for 48 hours. Then, take the positive and fresh feces of COVID-19 patients and provide them with complete safety conditions in terms of masks, gloves, etc. under the laboratory hood inside two suitable containers, the entrance of which is blocked with a net and around their entrance to prevent cockroaches or to contaminate the grid, the greased grease is applied, then the cockroaches are anesthetized, and 5 of them are transferred to one container and the other 95 to another container. An hour after the call, we kill and take out the containers of 5 containers with CO_2 . The insect's legs, mouthparts, and insect antennae are then removed and placed in a sterile container and sent for Real Time –Polymerase Chain Reaction analysis. Then the insect's external body should be washed with normal saline and send it for analysis. The insect's external body is then placed in a container containing 70% alcohol. After two minutes, the insect is taken out and dissected, then the insect's alimentary canal is separated and sent for Real Time –Polymerase Chain Reaction analysis. Insects in the second container after 8 hours of exposure, should be anesthetized and all 95 of them are transferred to a container containing water and food.

Insect containers should be numbered from one to 19, No. 1 within 8 hours of exposure immediately, No. 2 after 16 hours, No. 3 after 24 hours and insects in the other containers could be sent for analysis every 24 hours up to day 14 according to the described methods respectively. Also, the excreta of insects inside each container should be collected separately and sent for analysis. If more than one insect is dead in a container before testing, the reduced number will be provided from 16 containers onwards.

Conclusion

Due to living of American cockroaches in the homes, World Health Organization recommended insecticides including: Bendiocarb, Hydramethylnon, Boric acid, Fenoxycarb, Flufenoxuron, Pyriproxyfen, Hydroprene, Dinotefuran, Imidacloprid, Chlorpyrifos, Chlorpyrifos-methyl, Diazinon, Fenitrothion, Malathion, Pirimiphos-methyl, á-Cypermethrin Pyrethroid, β-Cyfluthrin, Bifenthrin, Cyfluthrin, Cyphenothrin, D,D-trans-Cyphenothrin, Cypermethrin, Deltamethrin, Esfenvalerate, Etofenprox, λ-Cyhalothrin, Permethrin, Fipronil, Sulfluramid for control of this pests in the homes. Cockroaches constitute an important reservoir for pathogens. Therefore, close contact with cockroaches especially in human dwellings should be discouraged. Due to the low standard of sanitation in the world, there is a need to properly educate the population on

the dangers associated with cockroaches and how to control them. Environmental hygiene is very necessary and should be encouraged in every locality, to reduce the population and bad effects of cockroaches in human surroundings.

Declarations

- **Ethics Approval and Consent to Participate:** Not applicable
- **Consent for Publication:** Applicable
- **Availability of Data and Material:** Applicable
- **Competing Interests:** The authors declare that they have no competing interests.
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