Exploring the Pathophysiological Concepts of Ebola Virus

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Introduction

The Ebola virus is a member of the filoviridae family. Formerly known as the "sudden-acute-obscure fever" group, three of the five species of ebolavirus have been identified, or four of the five known species of ebolavirus have been identified, four of which are known to cause disease in humans (Martines, Ng, Greer, Rollin, and Brantly, 2015). The Ebola virus is a member of the filoviridae family. Five different species have been identified, four of which are known to cause disease in humans (CDC, 2015). The Ebola virus has historically stranded, negative preparedness to adequately triage and prevent a possible pandemic. Working closely with local, state, and federal leaders is critical to ensuring that the United States is prepared to deal with any potential threat in the future. Additionally, our strategy has been a mix of risk communication and behavior change. The reality of continual terrorist threats is now for all of us to recognize. We have to come to understand that many of the threats we face are not new, they are primarily a response to new forms of terrorist activity. The military, the police, the other first responders, and the public health community all need to be prepared to deal with any potential threat. We now have to plan for the nation to live in this new normal. This means that the threat of terrorism is ever present, and we need to be prepared.

Pathophysiology

Once the virus enters the body, it can quickly spread to all cell types including epithelial cells, dendritic cells, monocytes, hepatocytes and endothelial cells (Brantly & Chertow, 2015). Macrophages and monocytes are thought to be the first cells to be infected, causing the release of pro-inflammatory cytokines. Ebola has been found in fat and lymph nodes in the news lately as the result of the recent 2014 outbreak in West Africa that eventually found its way into the United States. According to Bray and Chertow (2015), 174 cases of Ebola were reported worldwide. The number of confirmed cases of Ebola is 20745, including 5047 deaths. The cumulative number of probable, confirmed, and suspected cases is 20745. Unfortunately, there were fatalities in this outbreak. The first fatality was reported in 1976 in the Ebola River Valley, where they are capable of causing end organ damage and death. If the virus enters the body, it can quickly spread to all cell types including epithelial cells, dendritic cells, monocytes, hepatocytes and endothelial cells (Brantly & Chertow, 2015). Macrophages and monocytes are thought to be the first cells to be infected, causing the release of pro-inflammatory cytokines. Ebola has been found in fat and lymph nodes.

Case Study

J.M. is a 34-year-old E.R nurse who is employed at a large metropolitan hospital in Columbus, Ohio. J.M. cared for a middle-aged man approximately one week ago who embarked on a mission trip to West Africa educating the community on the prevention of sexually transmitted infections (STIs). This patient’s health rapidly declined and he ultimately expired in the hospital for reasons that are currently being investigated by the coroner. The patient was placed under care of J.M. as J.M. now presents with complaints of generalized weakness, fatigue, myalgia, abdominal pain, diarrhea, and vomiting that began approximately 3 days ago and her symptoms have progressively worsened. She states that she has been looking for work around the town.

Clinical Manifestations

Ebola virus has an incubation period of 2 to 21 days, but generally causes sudden systemic symptoms, including fever, chills, and general malaise. The virus most often causes death within 1 week, although some patients survive and recover. The symptoms are nonspecific and include flu-like symptoms such as fever, chills, and general malaise which develop gradually over a period of 2 to 21 days. These early symptoms are often difficult to distinguish from other viral infections but making it challenging to diagnose early. As the disease progresses, gastrointestinal symptoms, including nausea, vomiting, and diarrhea become apparent along with the development of a rash, cough, and jaundice (Feldmann & Giddins, 2011). The virus is highly capable of infectivity. “Outbreaks of nosocomial amplification in resource-limited settings are their hallmark” (Nault, 2014). The rapid replication of the virus within the host’s receptor cell leads to cellular necrosis and subsequent release of a large number of new virus particles into the surrounding space (Brantly & Chertow, 2015). “In cases of severe infection, there is a massive release of pro-inflammatory mediators and vasoactive substances, which produce an inflammatory cytokine cascade that results in the release of pro-inflammatory cytokines which cause the body to shut down” (Feldmann & Giddins, 2011). The system-wide virus replication and release, the general dysregulation of the host immune response, the virus-induced abnormalities, the impairment of the vascular system, and hypocoagulability results in disseminated intravascular coagulation, shock and multiorgan failure” (Feldmann & Giddins, 2011, p. 83).

Nursing Implications

The medical community, including nurses and advanced practice nurses, are frontline health care providers in the outbreak response. This understanding leads to better care for patients, is often considered the fatal stage of the disease course and is generalized dysregulation of the host immune response, the virus-induced abnormalities, the impairment of the vascular system, and hypocoagulability results in disseminated intravascular coagulation, shock and multiorgan failure” (Feldmann & Giddins, 2011, p. 83).

Conclusion

Clearly, the Ebola virus is capable of producing widespread morbidity and mortality. While the recent outbreak of Ebola virus that penetrated American soil was terrifying, our nation’s preparedness to adequately triage and prevent a possible pandemic. Working closely with local, state, and federal leaders is critical to ensuring that the United States is prepared to deal with any potential threat in the future. Additionally, our strategy has been a mix of risk communication and behavior change. The reality of continual terrorist threats is now for all of us to recognize. We have to come to understand that many of the threats we face are not new, they are primarily a response to new forms of terrorist activity. The military, the police, the other first responders, and the public health community all need to be prepared to deal with any potential threat. We now have to plan for the nation to live in this new normal. This means that the threat of terrorism is ever present, and we need to be prepared.

References


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