

Orthopoxvirus Infections and the Nervous System: Insights into Smallpox and Monkeypox Complications

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Introduction

Orthopoxviruses, including variola virus (smallpox) and monkeypox virus, are members of the Poxviridae family. These viruses are known for their ability to cause severe systemic infections and, in some cases, neurological complications. The nervous system is a common target for orthopoxvirus infections, leading to a range of clinical manifestations from mild encephalitis to severe, life-threatening conditions. This review explores the mechanisms of orthopoxvirus neuroinvasion and the resulting neurological complications, with a focus on smallpox and monkeypox.

Smallpox, caused by variola virus, is a highly contagious disease that has been eradicated. However, the potential for biological warfare using smallpox remains a concern. Monkeypox, caused by monkeypox virus, is a zoonotic disease that has recently gained attention due to its ability to spread between humans. Both viruses can cause neurological complications, including encephalitis and myelitis. Understanding the pathogenesis of these complications is crucial for developing effective treatments and preventive strategies.

Overview of orthopoxvirus infections

Smallpox (variola virus):

Smallpox is a highly contagious disease caused by the variola virus. It is characterized by a prodromal phase followed by a rash that progresses through several stages: macules, papules, vesicles, and pustules. The disease is highly fatal, with a mortality rate of approximately 30%. The virus is transmitted through direct contact with infected individuals or contaminated objects. Smallpox was declared eradicated in 1980.

Monkeypox:

Monkeypox is a zoonotic disease caused by the monkeypox virus. It is characterized by a prodromal phase followed by a rash that progresses through several stages: macules, papules, vesicles, and pustules. The disease is less contagious than smallpox, with a mortality rate of approximately 10%. The virus is transmitted through direct contact with infected individuals or animals, or through contaminated objects. Monkeypox was first identified in 1970 in a young boy in Sierra Leone.

Neurological Complications of Orthopoxvirus Infections

Orthopoxvirus infections can lead to a variety of neurological complications, including encephalitis, myelitis, and meningitis. These complications are caused by the direct invasion of the nervous system by the virus. The virus can enter the nervous system through the bloodstream or through the olfactory and optic nerves. The resulting neurological complications can range from mild encephalitis to severe, life-threatening conditions. Understanding the mechanisms of orthopoxvirus neuroinvasion is crucial for developing effective treatments and preventive strategies.

1. Smallpox and the Nervous System

Smallpox is a highly contagious disease that can cause severe neurological complications. The virus enters the nervous system through the bloodstream or through the olfactory and optic nerves. The resulting neurological complications can range from mild encephalitis to severe, life-threatening conditions. Understanding the mechanisms of orthopoxvirus neuroinvasion is crucial for developing effective treatments and preventive strategies.

Post-Vaccinal Encephalitis:

Post-vaccinal encephalitis is a rare neurological complication that can occur after vaccination with a live attenuated orthopoxvirus vaccine. It is characterized by a prodromal phase followed by a rash that progresses through several stages: macules, papules, vesicles, and pustules. The disease is highly fatal, with a mortality rate of approximately 30%. The virus is transmitted through direct contact with infected individuals or contaminated objects.

vaccinia virus, post-vaccinal encephalitis, 100,000

2. Monkeypox and Neurological Complications

Encephalitis, encephalitis

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Cognitive and Psychological Symptoms:

cognitive impairments,

Mechanisms of Neurological Involvement in Orthopoxvirus Infections

Direct Viral Invasion:

Immune-Mediated Inflammation:

immune-mediated response.

Vaccine-Related Neurological Effects:

vaccinia virus

Management of Neurological Complications

Supportive Care:

Antiviral Therapy:

Immunotherapy:

Future Research Directions

1. Epidemiological Studies:

2.

Mechanistic Studies:

3.

Vaccine Safety:

Conclusion