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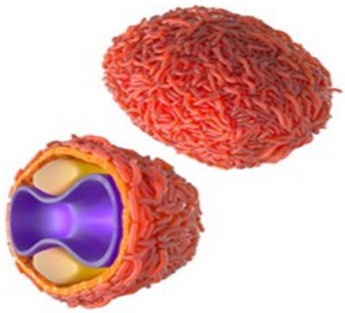
A Review on MPOX: Epidermiology, Signs and Symptoms, Prevention and About Their Medications

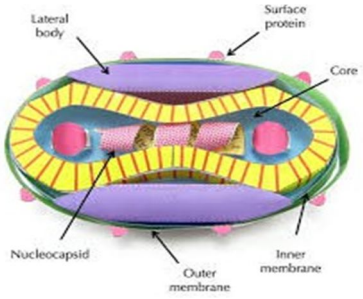
Prof. Mrs. Pooja Deshmane[1], Tejas Yadav[2], Prashant Aher[3], Santosh Adhe[4], Gajanan Ambhure[5], Agra Mudassir Mujeeb UR Rehman[6]
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Abstract: ***Monkeypox is a viral zoonotic disease caused by the monkeypox virus, a member of the Orthopox virus genus. Historically, monkeypox was transmitted through direct contact with infected animals or humans, or via contaminated materials. However, recent observations suggest, that the virus can also spread through close physical contact, including during sexual activity. Although monkeypox is not classified as a sexually transmitted infection, sexual transmission can occur due to the close contact involved. The disease presents with symptoms like the smallpox, including fever, rash, and swollen lymph nodes. Understanding the multifaceted transmission pathways of monkeypox, including potential sexual transmission, is crucial for effective public health interventions and prevention strategies.***
Keywords: Mpox, sexually transmitted disease, smallpox.

I. INTRODUCTION

Monkeypox virus (MPXV) is a type of Orthopox virus that leads to a disease like smallpox. Over 97,000 cases have been confirmed in the 2022 outbreak as of 25 June 2024, with more expected. There have been reports of 207 deaths worldwide. There have been instances of Monkeypox (m-pox) cases over 110 countries, with the majority being listed in non-endemic countries consisting of the country of China. In the most recent epidemic, the reported mortality rate was relatively low at 0.46% compared to the expected indigenous strains of MPXV. In August, the number of global infection cases hit a peak. 2022 when the outbreak first started. At that moment, there have been reports of two distinct clades. Clade- I am predominantly found in Central Africa, particularly in the Democratic Republic of the Congo (DRC) and is linked to severe clinical symptoms and significant mortality rates ranging from 4-11%. while clade II was predominantly restricted to West Africa until the worldwide outbreak in 2022 results in milder symptoms and a mortality rate below 4%. Currently, most, genetic information is available. Sequences are linked to clade IIb, which sparked the current worldwide outbreak. Monkeypox outbreak occurring between 2022 and 2024. It differs in phylogenetic lineage from previous. Endemic strains of MPXV suggest potential variations in its virological characteristic. Hence, it is essential to recognize nucleotide conservation for upcoming primer design in nucleic acid studies tests for acidity.[1]





Orthodox viruses are DNA viruses with a double-stranded structure that are zoonotic and share a phylogenetic relationship with reservoirs found in a variety of wild and domestic animals, including food animals and rodents. The majority of these viruses only affect animals and do not harm humans, but a few can be transmitted to humans through respiratory droplets or direct contact with skin lesions or contaminated surfaces. New orthopox viruses continue to be reported often, bringing the total number of known species to 17.

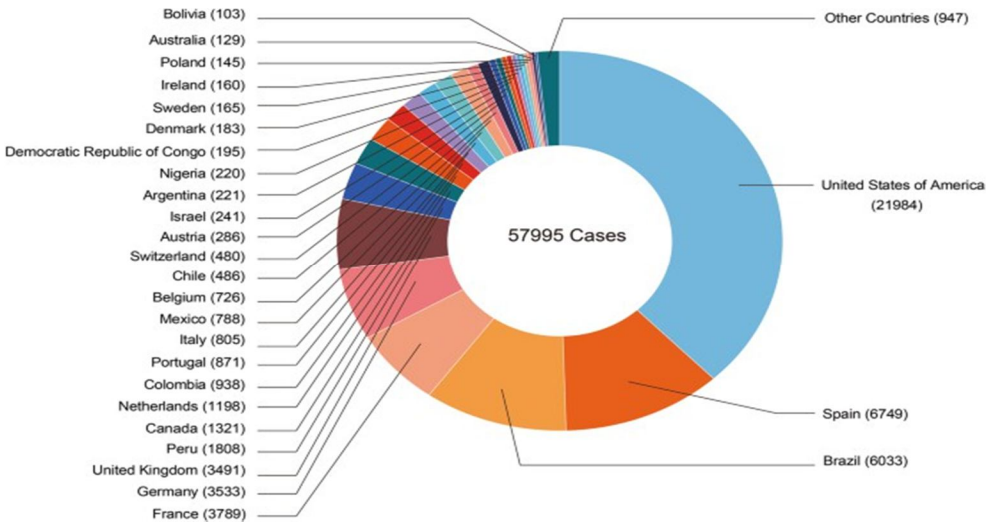
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Transmission from animals to humans has been documented for 8 viruses, with 5 also being transmitted from humans to humans (variola, monkeypox, vaccinia, cowpox, and buffalopox). Monkeypox is the primary cause of human infections. [1,2]

Smallpox, also known as Variola, was successfully eradicated in part because it does not have an animal reservoir. Despite its name, rodents in Africa are the true primary hosts of monkeypox. Its introduction Europe and the US has happened by either bringing in African rodents or through direct person-to-person spread. Orthopoxviruses are big particles; their DNA, ranging from 170 to 250 kilobases, is twisted to create a brick-like form of the virion. Cytoplasmic inclusion bodies are seen in infected cells because replication takes place in the cytoplasm. The Monkeypox virus was initially discovered in 1959 as the cause of a pox infection in captive cynomolgus monkeys (Macaca fascicularis) in Copenhagen, Denmark. In the following decade, an additional eight outbreaks were recorded in the United States and the Netherlands among captive monkey populations imported from Malaysia, India, and the Philippines. Despite the fact that monkeypox virus was found in captive primates taken from Asian regions, there is no scientific proof showing that the virus exists in the wild outside of Africa. Despite not knowing for sure, research indicates that rope squirrels from the African genus, Funisciurus, are the like natural reservoir. Primates, rabbits, and various rodent species are susceptible to getting infected as well. The first case of human monkeypox was discovered in the Democratic Republic of the Congo (previously known as Zaire) in 1970, in a 9-month-old baby who was thought to have smallpox at first. Human illness in central and western Africa is mostly obtained through direct contact between animals and humans. It can also be passed from person to person through respiratory droplets or bodily fluids. [3]

Mpox is mainly transmitted through close contact with an infected person, such as household members. Interacting closely involves physical contact like touching or sex, kissing, and being in close proximity to someone with mpox, increasing the risk for those with multiple sexual partners. People can also become infected with mpox by coming into contact with contaminated items like clothing or bedding, through needle accidents in healthcare settings, or in places like tattoo shops within the community. The baby can acquire the virus either during pregnancy or childbirth. Getting infected with mpox while pregnant can be harmful for the fetus or newborn baby and may result in miscarriage, stillbirth, infant death, or difficulties for the parent. Mpox can be transmitted from animals to humans through bites, scratches, hunting, skinning, trapping, cooking, playing with animal carcasses, or consuming animals. [2]

II. EPIDERMIOLOGY



Monkeypox is endemic in the tropical rainforest regions of Central and West Africa, particularly in countries such as Cameroon, Central African Republic, Côte d'Ivoire, Democratic Republic of the Congo (DRC), Gabon, Liberia, Nigeria, Republic of the Congo, and Sierra Leone. Most cases are sporadic or occur during localized outbreaks, while cases outside endemic regions are usually linked to international travel or the importation of infected animals. Before 2022, instances outside Africa were reported in the United States, the United Kingdom, Israel, and Singapore. The monkeypox virus (MPXV) has two distinct genetic clades: the Central African clade and the West African clade. The West African clade generally results in a milder disease with a case fatality ratio (CFR) of about 3-6%, whereas the Central African clade is associated with higher transmissibility and CFRs as high as 10%. Cameroon is the only country where both clades have been confirmed. [2,4]

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Since 1970, cases have been reported from ten African countries, with the DRC being the most affected. Reported cases in the DRC Increased dramatically from 38 in the 1970s to 18,788 between 2010 and 2019. Nigeria followed with 181 cases, while the Republic of Congo and Central African Republic reported 97 and 67 cases, respectively. Over 90% of these cases occurred in individuals without a history of smallpox vaccination. The median age of infected individuals rose from 4 years in the 1970s to 21 years in the 2010s. The overall CFR was 8.7%, with 10.6% for the Central African clade and 3.6% for the West African clade. In the 1970s, all deaths were in children under 10, but by the 2010s, this age group accounted for only 37.5% of deaths. The rise in cases is attributed to declining immunity from the cessation of smallpox vaccination and increased human encroachment into wildlife areas. [4]

Cases outside Africa were first reported in the U.S. in 2003, with 53 people affected after contact with infected prairie dogs. Most were vaccinated against smallpox, and there were no fatalities. Between 2018 and 2021, a few isolated cases occurred without deaths in Israel, Singapore, and the UK, primarily among travelers returning from Nigeria. On May 6, 2022, the UK reported a monkeypox case in a traveler returning from Nigeria. Following this, cases surged, particularly among individuals without travel history to endemic areas. From January 1 to July 22, 2022, 16,016 confirmed monkeypox cases and five deaths were reported globally across 75 countries. The highest case counts were in Spain (3,125), the U.S. (2,316), Germany (2,268), and the UK (2,137), while Africa reported 301 lab-confirmed cases and all five deaths. On July 23, 2022, the WHO declared monkeypox a public health emergency of international concern (PHEIC). A multicountry study from May to June 2022 found that among 528 infections, the median age of patients was 38, with 98% identifying as gay or bisexual men, and 41% were HIV-positive. [5]

III. CAUSES

A. *Animal To Person Transmission*

1) Animal Reservoirs: Various species, including squirrels and other rodents, can harbor the virus and transmit it to humans. [4]
2) Direct Contact with Infected Animals: Handling or consuming bushmeat from infected animals, particularly rodents and primates, can lead to zoonotic transmission. [6]
3) Bites or Scratches from Infected Animals: Close contact with infected animals, including bites or scratches, can directly transmit the virus. [6]
4) Exposure to Animal Bodily Fluids: Contact with bodily fluids (blood, saliva, or urine) of infected animals can facilitate the spillover of the virus to humans. [7]
5) Urbanization: Increased human encroachment into natural habitats can lead to greater exposure to wildlife that may carry the virus. [5]
6) Environmental Reservoirs: Changes in habitat and environmental conditions may increase the interaction between humans and wildlife, leading to higher transmission rates. [7]
7) Climate Change: Alterations in climate patterns can impact animal migration and habitats, potentially leading to increased human-animal interactions. [8]

B. *Person To Person Transmission*

1) Skin-to-Skin Contact: The virus can be spread through direct skin-to-skin contact during sexual activities, including contact with lesions or rashes. [9]
2) Respiratory Droplets: Close-range respiratory droplet transmission can occur, particularly in situations of prolonged face-to-face contact. [9]
3) Contaminated Surfaces and Objects: The virus can survive on surfaces and objects, and transmission can occur through contact with contaminated materials like bedding or clothing. [8]
4) Public Events and Gatherings: Events that involve close interaction, such as festivals or social gatherings, can facilitate the spread of the virus. [7]
5) Sexual Transmission: As noted earlier, mpox can be transmitted through sexual activities involving close contact and exposure to bodily fluids. [10]
6) Increased Risk in Men Who Have Sex with Men (MSM): Recent outbreaks have shown higher incidence rates among MSM, highlighting the role of sexual networks in the transmission of mpox. [10]
7) Homophobia and Stigma: Stigmatization of affected communities can hinder effective public health messaging and discourage individuals from seeking care or reporting symptoms. [9]
8) Mother-to-Child Transmission: Vertical transmission may occur during pregnancy or childbirth if the mother is infected. [10]

C. Transmission Through Body Fluids

1) Contact with Infected Bodily Fluids: Transmission can occur through contact with blood, saliva, or other bodily fluids of an infected person, especially in close settings. [11]

2) Transmission via Semen: Some studies suggest that mpox may be detectable in semen, indicating potential sexual transmission through ejaculate. [11]

3) Transmission via Vaginal Fluids: Like semen, there is potential for mpox to be transmitted through vaginal fluids during sexual intercourse. [12]

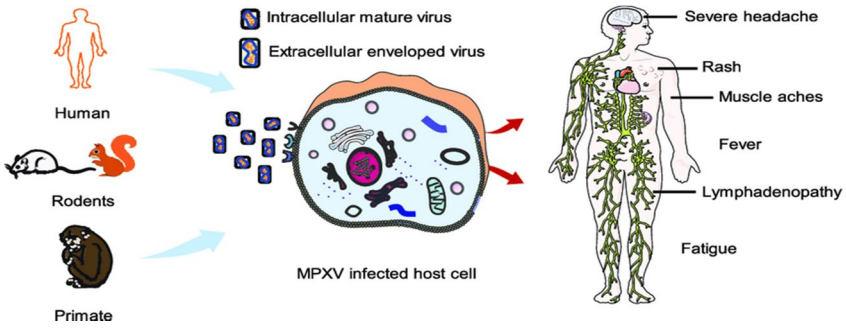
4) Mucosal Contact: Contact with mucosal surfaces (oral, vaginal, or anal) can facilitate transmission if exposed to infected bodily fluids. [13]

5) Indirect Transmission via Contaminated Fluids: Shared sex toys or other items that meet infected bodily fluids may pose a risk of transmission. [12]

IV. SIGNS AND SYMPTOMS:

A. Initial Symptoms (Prodromal Phase): [14,15]

- Fever: Typically high, often appearing 1-3 days before the rash.
- Headache: Severe headache is common.
- Muscle Aches: Generalized myalgia.
- Back Pain: Discomfort in the back.
- Fatigue: Feeling of weakness and tiredness.
- Lymphadenopathy: Swelling of lymph nodes, which is notable compared to other poxviruses.
- Chills: Episodes of shivering or cold sweats
- Lesions: Besides the characteristic rash, lesions may appear in the mouth, genitals, or around the eyes.



B. Rash Phase: Rash Development: Begins 1-3 days after fever onset.

- Starts as macules (flat red spots).
- Progresses to papules (raised bumps).
- Evolves into vesicles (fluid-filled blisters).
- Advances to pustules (pus-filled lesions).
- Ends with crusting and scabbing [17]



- Gastrointestinal Issues: Nausea, vomiting, and diarrhea may occur. [15]
- Respiratory Symptoms: Mild cough or sore throat may be present. [16]
- Conjunctivitis: Redness or inflammation of the eyes can occasionally occur. [16]
- Neurological Issues: Rare complications such as encephalitis or confusion. [15]

V. PREVENTIONS

A. Animal to Person Transmission

1) Avoid Contact with Wild Animals: Limit exposure to wild animals that may harbor the virus, particularly in regions where mpox is endemic. [18]

2) Public Health Surveillance: Implement surveillance systems to monitor and control outbreaks in animal populations, which can help prevent spillover to humans. [19]

3) Control Animal Populations: Manage populations of rodents and other animals known to carry the virus, especially in areas where human-animal contact is likely. [19]

4) Habitat Management: Manage habitats to reduce human-animal interactions, especially in areas where mpox is endemic. This includes controlling access to forests or wildlife habitats. [20]

5) Safe Handling of Animals: Educate communities about safe practices for handling potentially infected animals, including wearing gloves and avoiding contact with bodily fluids. [20]

B. Person to Person Transmission

1) Isolation of Infected Individuals: Individuals diagnosed with mpox should be isolated to prevent spreading the virus to others until they are no longer contagious. [19]

2) Use of Personal Protective Equipment (PPE): Healthcare workers and caregivers should use appropriate PPE, including masks, gloves, and gowns, when caring for infected individuals. [21]

3) Good Hygiene Practices: Frequent handwashing with soap and water or using hand sanitizer, especially after contact with infected persons or contaminated surfaces, is crucial. [21]

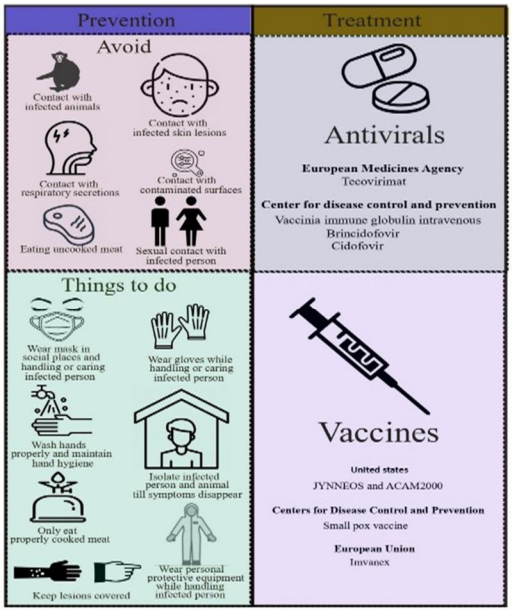
4) Avoiding Close Contact: Limit physical interactions with infected individuals, including avoiding direct skin- to-skin contact and sharing personal items. [22]

5) Public Health Guidelines: Follow public health recommendations regarding gatherings and events, especially during outbreaks, to limit potential transmission. [22]

6) Vaccination: Vaccination for close contacts of confirmed cases can help prevent the spread of the virus. [23]

7) Avoid Sexual Contact with Infected Individuals: Individuals should refrain from intimate or sexual contact with anyone suspected or confirmed to have mpox. [23]

8) Use of Barrier Protection: Employing condoms or dental dams during sexual activity can reduce the risk of transmission, although they may not eliminate it entirely due to skin-to-skin contact. [24]





VI. DIAGNOSE

A. Clinical Presentation

1) Symptoms: Initial symptoms often include fever, headache, muscle aches, backache, swollen lymph nodes, and fatigue. A distinctive rash usually develops 1-3 days after fever onset, progressing from macules to papules, vesicles, pustules, and finally crusts. [25]
2) Lymphadenopathy: This swelling of lymph nodes is particularly characteristic of mpox compared to other poxviruses like smallpox and chickenpox. [26]
3) Rash Development: A rash typically appears 1-3 days after the onset of fever, evolving through stages from macules to papules, vesicles, pustules, and finally scabs. [27]

B. Epidemiological History:

1) Exposure Risk: Assess recent travel to endemic regions (Central and West Africa) and contact history with infected individuals or animals. [28]
2) Risk Assessment: Document any recent travel to endemic areas in Central and West Africa or exposure to infected animals or people. [28]

C. Laboratory Testing:

1) Polymerase Chain Reaction (PCR): The primary method for confirmation. PCR testing is performed on skin lesion swabs, blood, or other fluids. [29]
2) Serological Tests: These are generally not used for acute diagnosis but may help determine previous exposure.

D. Differential Diagnosis

Conditions to consider include:

1) Chickenpox
2) Smallpox
3) Herpes simplex virus
4) Vaccinia virus infections
5) Other viral exanthems [30]

E. Public Health:

Reporting all suspected cases should be reported to health authorities for monitoring and outbreak control measures. [31]

VII. TREATMENT

A. Antiviral Treatments

1) Tecovirimat (TPOXX): The primary antiviral treatment recommended for mpox. Effective in reducing symptoms and preventing complications. Administered orally or intravenously. [32]
2) Brincidofovir: An alternative antiviral that may be used, particularly in cases resistant to other treatments.
3) Cidofovir: Used in some instances but less preferred due to potential side effects. [33]

B. Supportive Care:

1) Symptomatic Treatment: Pain management with analgesics, fever reducers, and hydration support. [33]
2) Wound Management: Care for skin lesions to prevent secondary infections. Keeping lesions clean and covered is essential. [33]

C. Public Health Measures:

1) Isolation: Infected individuals should isolate to minimize spread. Follow guidelines on the duration of isolation based on symptom resolution. [34]
2) Wound Care: Proper management of lesions to prevent secondary infections. [34]
3) Monitoring: Regular check-ups to manage complications or progression of the disease. [35]
4) Education: Informing patients about transmission and prevention strategies. [36]
5) Contact Tracing: Identifying and advising close contacts to limit further spread. [37]

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D. Additional Therapeutics:

Immunoglobulin: In severe cases, human immune globulin may be considered, especially in immunocompromised patients. [38]

E. Experimental Treatments:

Research is ongoing into additional therapeutic options, including newer antiviral agents and adjunctive therapies. [39]

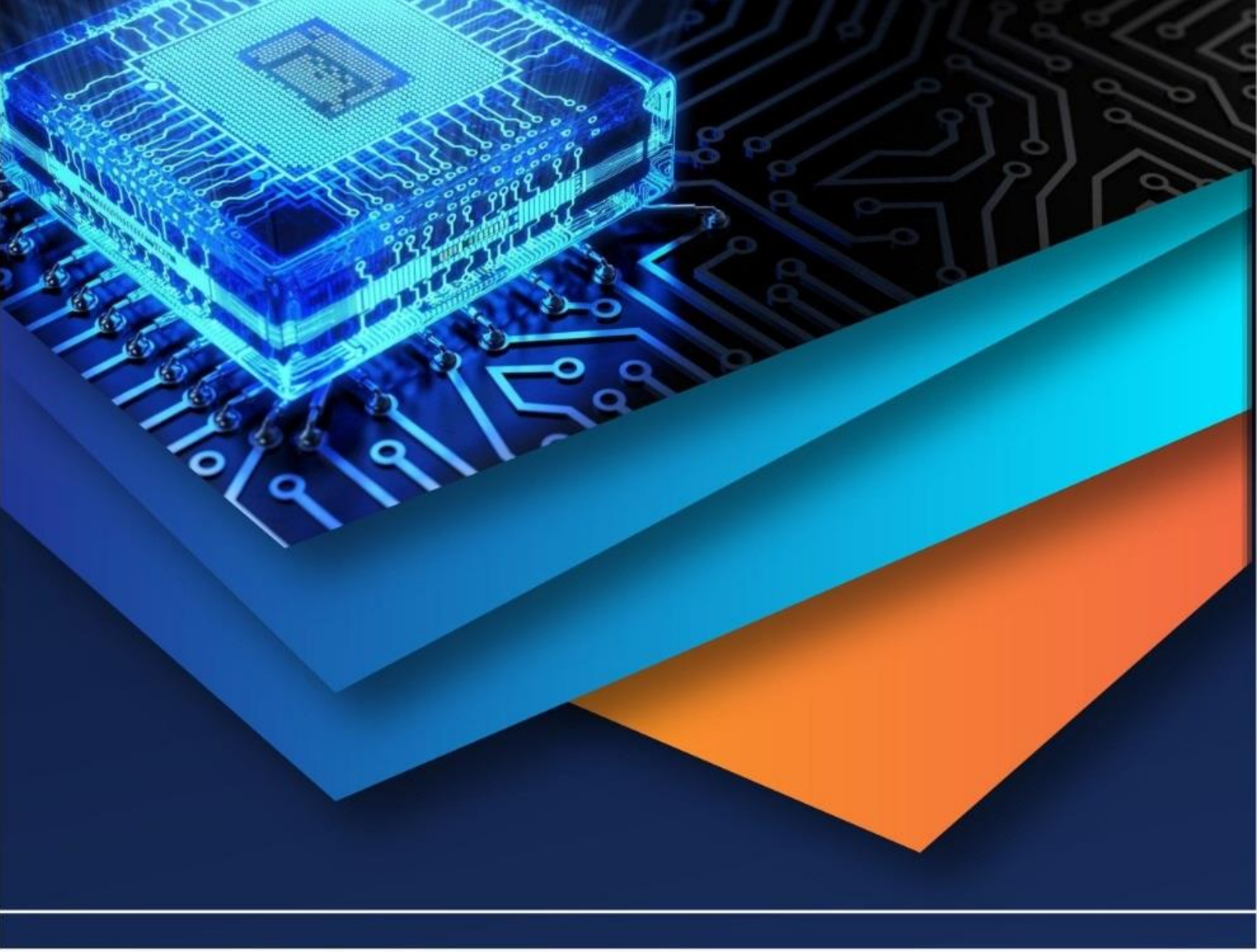
F. Vaccination:

JYNNEOS Vaccine: The JYNNEOS vaccine received approval from the U.S. Food and Drug Administration (FDA) on September 24, 2019, for the prevention of both smallpox and mpox (monkeypox). This vaccine contains a modified vaccinia virus (MVA) that stimulates the immune system to generate antibodies against both diseases without causing illness. It is given as two subcutaneous doses, typically spaced 28 days apart. [40]

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