

Human Monkeypox Virus and its Management

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Abstract

Monkeypox virus (MPXV) is an enveloped double-stranded DNA virus that results in a smallpox-like human disease. This causative organism belongs to the Orth poxvirus genus. It is known to affect the neurological, respiratory, and gastrointestinal systems. In the modern 2022 outbreak that is in the main affecting guys who've intercourse with guys (MSM) presently the febrile prodromal can be absent and skin/mucosal lesions can be remoted to the genital and anal regions. Rarely, MPV in all likelihood has the capacity to be neuroinvasive primarily based totally on animal models, preceding case series, and initial reviews presently below investigation. Even alevn though neurologic manifestations of human MPV contamination are rare, given the sheer numbers of growing instances for the duration of the world, neurologists have to be organized to recognize, diagnose, and deal with capacity neuroinvasive sickness or different neurologic symptoms. While maximum instances of Monkeypox may have moderate and self-confined disease, with supportive care being usually sufficient, antivirals (e.g. tecovirimat, brincidofovir, cidofovir) and vaccinia immune globulin intravenous (VIGIV) are to be had as treatments. Antivirals may be taken into consideration in extreme disease, immunocompromised patients, paediatrics, pregnant and breastfeeding women, complex lesions, and whilst lesions seem close to the mouth, eyes, and genitals. The motive of this quick evaluate is to explain every of those countermeasures.

Keywords: Monkeypox virus, Management, Outbreak, Diagnose

Introduction

Monkeypox isn't associated with chickenpox. Monkeypox were given its call after the disorder become determined in colonies of monkeys stored for studies with inside the 1950s. The first said case of human Monkeypox happened in 1970 in a toddler from the Democratic Republic of Congo (DRC), previously called Zaire. The foremost animal reservoir for Monkeypox has now no longer been conclusively determined, however rodents including Gambian massive rats and twine squirrels are suspected to be a reservoir. The virus is concept to be transmitted to human beings via near touch with inflamed animals. For example, infections are believed to arise via cuts with inside the pores and skin whilst coping with or ingesting inflamed animals. Monkeypox was discovered in 1958 when two outbreaks of a smallpox-like disease occurred in research monkey colonies. Despite being dubbed "monkey pox," the source of the disease remains unknown. However, African rodents and non-human primates (like monkeys) can harbor the virus and infect humans. However, the Monkeypox virus, a member of the same family of viruses as smallpox, is much less dangerous and experts say the likelihood of infection is low. Monkeypox is a milder form caused by the Monkeypox virus, which belongs to the same group of viruses known as orthopoxviruses it is usually found in Africa and in the African rainforest. It is milder compared to smallpox. (1)

Monkeypox virus (MPV, MPXV, or hMPXV) is a species of double-stranded DNA virus that reasons Monkeypox in human beings and different mammals. The genome is about one hundred ninety kb Monkeypox virus a orthopoxviruses which makes it carefully associated with the variola (VARV), cowpox (CPX), and vaccinia (VACV) viruses. Monkeypox is an infectious viral disorder which could arise in human beings and a few different animals Symptoms consist of fever, swollen lymph nodes, and a rash that bureaucracy blisters after which crusts over. The time from publicity to onset of signs and symptoms degrees from 5 to twenty-one days. The length of signs and symptoms is generally to 4 weeks There can be moderate signs and symptoms, and it could arise with none signs and symptoms being known. The conventional presentation of fever and muscle pains, observed with the aid of using swollen glands, with lesions all on the identical stage, has now no longer been observed to be not unusualplace to all outbreaks. Cases can be severe, in particular in children, pregnant ladies or humans with suppressed immune systems.(2)

Monkeypox is a unprecedented disorder as a result of contamination with the Monkeypox virus. Monkeypox virus is a part of the equal own circle of relatives of viruses as variola virus, the virus that reasons smallpox. Monkeypox signs are just like smallpox signs once the fever breaks a rash can develop, regularly starting at the face, then spreading to different elements of the body, maximum usually the arms of the arms and soles of the feet. The rash, which may be extraordinarily itchy or painful, adjustments and is going via specific tiers earlier than sooner or later forming a scab, which later falls off. The lesions can reason scarring. (3)

Now, 34 years later, we are faced with an amazingly similar situation. An unprecedented outbreak of Monkeypox has occurred, now disproportionately affecting men who have sex with men in numerous countries where the disease is not endemic, including the United States. Although not as life-threatening as HIV, Monkeypox can cause serious illness, including ocular involvement, soft tissue superinfection, and distressing anogenital lesions. At the end of the outbreak, the CDC reported 47 cases (37 confirmed and another 10 probable human cases).Cases were relatively mild (no fatalities), but the outbreak prompted significant response and investigation. How did Monkeypox, an African virus, get into prairie dogs in the United States. (4) The introduction of Monkeypox can be traced back to the importation of a large shipment of small mammals (including rodents) taken from the wild from West Africa. Some of these rodents found their way to a prairie dog breeder, and all infected people had bought prairie dogs as pets. This incident serves as an example of the danger of importing exotic wild animals for the pet trade.Occurs mainly in remote parts of central and West African countries near tropical rainforests. There have been more than 1,200 cases of Monkeypox in these regions since the beginning of the year. Central African: Known to have the mildest form West Africa, now common in other regions of the world. , Democratic Republic of the Congo, Gabon, Ivory Coast, Liberia, Nigeria, Republic of the Congo, Sierra Leone and South Sudan. The true burden of Monkeypox is unknown. Since 2017, Nigeria has experienced a major outbreak with more than 500 suspected cases and more than 200 confirmed cases and a fatality rate of around 3%. Cases are still being reported to this day. Monkeypox is a disease of global public health concern, affecting not only West and Central African countries but the rest of the world. In 2003, the first outbreak of Monkeypox outside of Africa occurred in the United States and was linked to contact with infected prairie dogs. (5)

Monkeypox...virus

Etiology

Monkeypox is caused by the apepox virus, a species of double-stranded DNA virus that causes apepox in humans and other mammals. The genome is approximately 190 kb in size. Oxpox virus (CPX) and vaccinia (VACV). The virus was first isolated from smallpox-like vesiculopustular lesions in monkeys imported to Denmark. Over the next few years, similar outbreaks in monkeys were observed elsewhere. A widespread outbreak occurred in a Rotterdam zoo in 1966. The virus was thought to first affect South American giant anteaters before spreading to other great apes and monkeys. First human infections were found in people from Liberia and the Democratic Republic of Congo in 1970, which confirmed hMPXV as a distinct virus.(6)

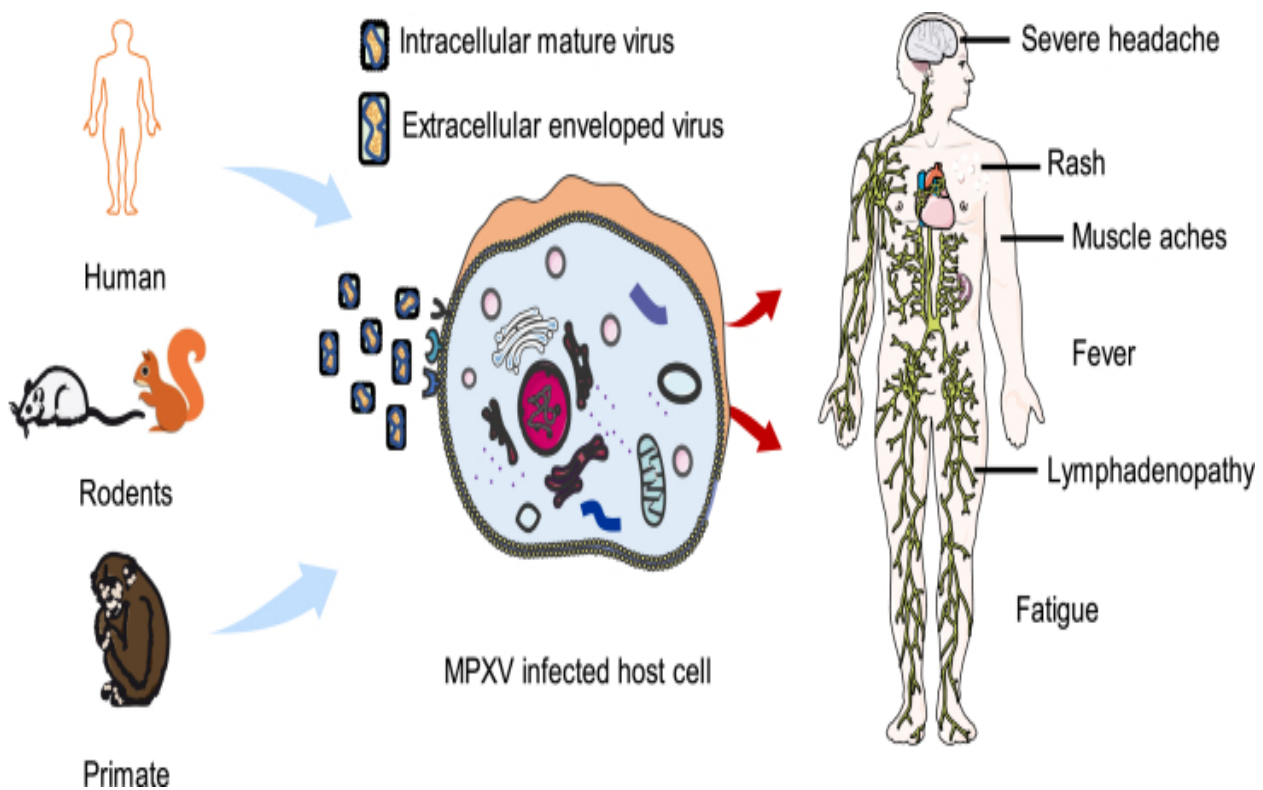


Fig 1: Monkeypox virus

Morphology of MPXV:-

Due to their geographic origin, the two separate MPXV clades are restricted to West Africa (WA) and the Congo Basin (CB), although the CB clade is reportedly more severe and transmissible. MPXV is an enveloped double-stranded DNA virus, 200–250 nm in size, comprising a tubular surface protein and a dumbbell-shaped capsid core. The DNA is approximately 197 kb in size and is covalently linked at its ends by palindromic hairpins and inverted terminal repeats comprising tandem repeats, hairpin loops, and few open reading frames. Although MPXV is a DNA virus, it completes its entire life cycle in the cytoplasm of the infected host cell. The MPXV genome encodes all proteins required for viral DNA replication, transcription, virion assembly and efflux. Extracellular enveloped virus. Intracellular mature

virus is released by cell lysis, while extracellular enveloped virus is released by actin interaction within infected cells, and this has been attributed to rapid long-distance transmission.(7, 8)

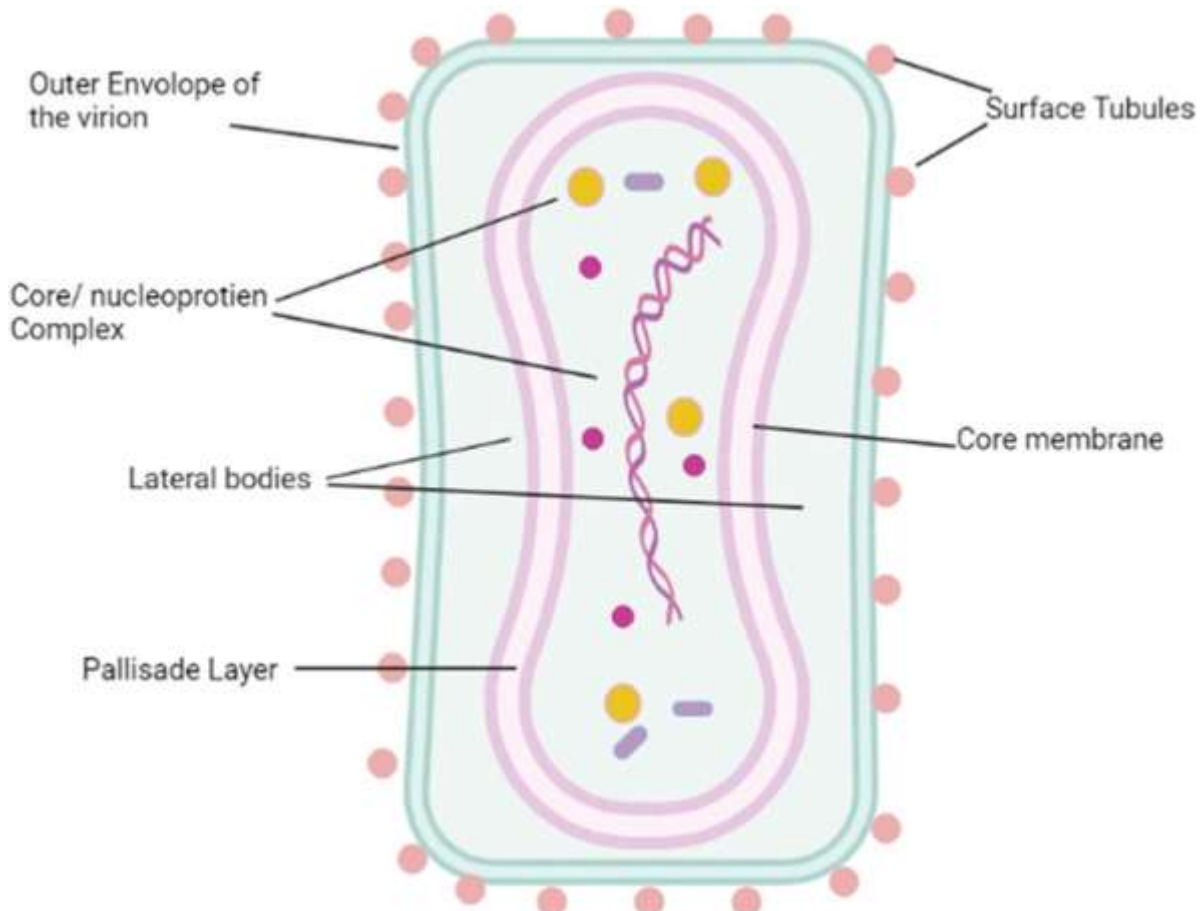


Fig2: Morphology of MPXV

Diagnosis of Monkeypox

Since monkeypox infections can present with signs comparable to different infectious diseases, like chickenpox, or positive sexually transmitted infections, like herpes, it is critical to consult your fitness care company when you have symptoms and signs, or when you have come into near contact with a showed or suspected case of monkeypox. Diagnosis of monkeypox is with the aid of using culture, polymerase chain reaction (PCR), immunohistochemistry, or electron microscopy, relying on which checks are available. PCR assays the use of pores and skin lesions (roof or fluid from vesicles and pustules and/or dry crusts) are the gold standard sample. Blood PCR is restricted with the aid of using the fast period of viremia and isn't recommended.(9)

What are the symptoms of Monkeypox?

The invasion phase (lasts 0–5 days) the rash usually begins within 1 to 3 days of the onset of the fever. The rash is concentrated on the face and extremities rather than the trunk. It affects the face (95% of the time) and the palms and soles (75% of the time). The cheek mucosa is also affected (in 70% of cases), genitals (30%) and conjunctiva (20%) and the cornea. The rash progresses sequentially from patches (flat-based lesions) to papules (firm, slightly raised lesions), vesicles (lesions filled with clear fluid), pustules (lesions filled with yellowish fluid) and scabs that dry up and fall off.

The number of injured varies between a few and several thousand. Large areas of skin are shed. Monkeypox symptoms last 2 to 4 weeks and may include:

- Fever
- Chills.
- Swollen lymph nodes
- Exhaustion
- Muscle aches and backache
- Headache
- Respiratory symptoms (e.g. sore throat, nasal congestion, or cough)

You can spread Monkeypox while you have symptoms. So from when your symptoms start until your rash and scabs heal.(10, 11)

How to spread Monkeypox virus

Smallpox can be transmitted in a number of ways, but the most common way it is transmitted from person to person is through skin-to-skin contact. The virus can also be transmitted through bodily fluids exchanged during more intimate and prolonged physical contact, such as kissing, caressing, or sex. “In general, close contact is required for Monkeypox to spread. Do not touch an infected person's bedding, towels, or clothing. Do not share eating utensils or cups with someone who has Monkeypox. Regularly wash and disinfect objects and surfaces that come in direct contact with a person's infected skin. Contact.) Wear gloves when cleaning or handling potentially contaminated areas or objects. Keep your hands clean by using alcohol-based hand sanitizer (preferred) or soap and water alcohol-based hand (12)

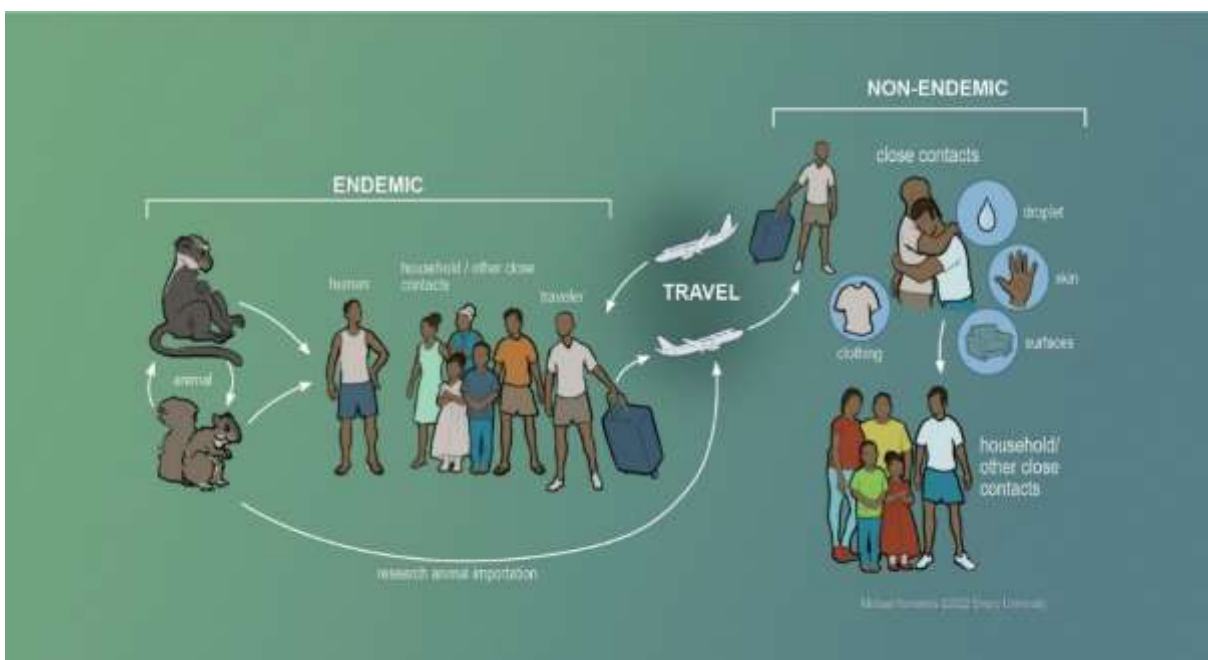


Fig 3: Spread Monkeypox Virus

Approach

Management strategies depend on disease severity and focus on the following principles:

- Infection prevention and control
- Symptomatic treatment
- Optimized supportive care
- Management of skin lesions
- Management of complications
- Antiviral therapy.

Patients benefit from supportive care and pain control that is implemented early in the disease course. However, this may not be adequate in some patients (e.g., immunocompromised patients), and antiviral therapy may be required.

There is a lack of high-quality evidence-based clinical management guidelines to guide clinical decision-making. Recommendations across guidelines vary, and there are limited recommendations for different risk groups and complications. (13)

Management

- Patient isolation
- Protection of compromised pores and skin and mucous membranes
- Rehydration remedy and Nutritional support
- Symptom alleviation
- Monitoring and remedy of complications (14)

Patient isolation

Friends, own circle of relatives or others without a critical want to be with inside the domestic ought to now no longer visit. Avoid near touch with others. Avoid near touch with pets with inside the domestic and different animals. Do now no longer interact in sexual pastime that entails direct bodily touch. Do now no longer proportion probably infected items, which include mattress linens, clothing, towels, wash cloths, ingesting glasses or consuming utensils. Limit infection inside household Considerations for keeping apart with animal's with inside the domestic(15)

Protection of compromised pores and skin and mucous membranes

*Skin rash

- Clean with smooth antiseptic
- Mupiroic Acid/Fucidin
- Cover with moderate dressing if extensive lesion present
- Do now now not touch/ scratch the lesions
- In case of secondary infection relevant systematic
- antibiotics may be considered

* Genital ulcers

Sitz bath

* Oral ulcers

Warm saline gargles/ oral topical anti-inflammatory

Gel

***Conjunctivitis**

Usually, self-limiting

Consult Ophthalmologist if signs and symptoms persist or there are pain/ visible disturbances

Rehydration remedy and dietary support

Dehydration can arise in support affiliation with terrible appetite, nausea, vomiting and diarrhoe

Encourage ORS or oral fluids

Intravenous fluids if indicated

Encourage nutritious and good enough diet

Symptom alleviation

***Fever**

Tepid sponging

Paracetamol as required

***Itching/Pruritus**

Topical Calamine lotion

Antihistaminic

***Nausea and vomiting**

Consider anti-emetics

***Headache/ malaise**

Paracetamol and good enough hydration

Monitoring and treatment of complication

The patient should closely monitor for the appearance of any of the following symptoms during the period of isolation

- Pain in eye or blurring of vision
- Shortness of breath, chest pain, difficulty in breathing
- Altered consciousness, seizure
- Decrease in urine output
- Poor oral intake
- Lethargy (14)

Management for controlling the spread of MPXV infection

The HCSP's recommended method is constructed round tracking contacts and keeping apart unwell sufferers. For inflamed sufferers for whom a specialized scientific opinion (referent infectious sicknesses specialist) has decided that this degree is clinically appropriate, domestic isolation is recommended as a concern after a documented evaluation, with the implementation of psychological, socioeconomic, and scientific aid if necessary. Regular cleansing of flooring and surfaces, normal vacuuming of dust, and washing of garments in touch with the inflamed patient's body (if possible, at 60 °C for half-hour with detergent) have to all be executed to lessen the chance of environmental

contamination. Sharing of objects or sanitary centers isn't always recommended; instead, normal and thorough cleansing with a not unusualplace detergent is recommended after every interplay with an inflamed patient. Personal transportation or personnel with biohazards schooling have to be used to move sufferers from houses to healthcare centers. After the trip, the car have to be very well cleaned.(16)

Health government ought to have interaction in proactive conversation approximately the risks of contamination and transmission to elevate recognition amongst the overall public and people who're at excessive danger for extreme contamination via way of means of regularly updating their hints as new statistics will become available. The key message in danger conversation is that MPXV is unfold via close, direct contact, specifically among individuals of the identical household. This consists of sexual contact (which could bring about an ano-genital blistering contamination) and the sharing of objects. A stability ought to be maintained among caution the ones maximum at danger (the populace in which the virus first unfold) and informing the public, who ought to be reminded that the information at the quantity of the virus's unfold amongst the overall populace are nonetheless very preliminary.(17)

He indexed the subsequent factors to hold in thoughts as they'll assist save you the unfold of Monkeypox:

- Keep distance from human beings who've lately been recognized with the virus or who is probably affected.
- If you're in near proximity to a person whose experiencing symptoms, placed on a face masks and preserve distance.
- Maintain good enough hand hygiene, in particular after interacting with inflamed or probably infected persons. Wear PPE package while being concerned for inflamed individuals. Use an alcohol-primarily based totally hand sanitizer, or wash your fingers with cleaning soap and water.
- Avoid touch with human beings who've lately visited the outbreak regions.
- It is really useful to chorus from touching gadgets which have come into touch with an inflamed person (like bedding, towels and private clothing) on account that Monkeypox virus also can switch thru surfaces and materials.
- Avoid sharing cups or consuming utensils with a person who has Monkeypox. If the use of disposable plates and cups, preserve accurate containment and disposal of infected waste.
- All ingredients that incorporate animal meat or components should be well cooked. 8. It is needed to easy and disinfect touched surfaces.(18)

General Considerations for Pain Management

Healthcare specialists have to verify ache in all sufferers with monkeypox virus contamination and apprehend that sizable ache can also additionally exist from mucosal lesions now no longer obvious on bodily exam; validation of the ache revel in can construct believe with inside the care issuer and care plan. Topical and systemic techniques have to be used to manipulate ache. Pain control techniques have to be individualized and patient-centered, tailor-made to the desires and context of a man or woman patient. Over-the-counter medications (e.g., acetaminophen, NSAIDs) are encouraged for standard ache manipulate for sufferers with Monkeypox. Topical steroids and anesthetics which includes lidocaine can

also be taken into consideration for neighborhood ache relief. Topical lidocaine or different topical anesthetics have to be used with warning on damaged pores and skin or on open or draining wounds.(19)

Oral antihistamines may also offer a few alleviation of pruritus related to monkeypox lesions. Topical dealers which include calamine lotion, petroleum jelly or colloidal oatmeal additionally may also enhance symptoms.

For control of oropharyngeal symptoms, sufferers can recollect rinsing the mouth with easy saltwater or an oral antiseptic (e.g., chlorhexidine mouthwash), neighborhood anesthetic (e.g., viscous lidocaine), and prescription analgesic mouthwash also can be taken into consideration.

To limit the danger for autoinoculation, individuals with MPV contamination or their caregivers ought to use disposable gloves whilst making use of topical medicines to lesions. Warm baths of water and baking soda or Epsom salt may be taken into consideration for symptomatic alleviation of rectal pain.(20)

Over-the-counter ache medications, which includes acetaminophen and nonsteroidal anti-inflammatory drugs, are advocated for trendy ache, consistent with the World Health Organization.

Uncontrolled ache following general remedy may also require the short-time period use of gabapentin or opioids, consistent with the CDC. If opioids are prescribed, “immediate-launch opioids at the bottom powerful dose must be prescribed for not than the predicted period of ache excessive sufficient to require opioids,” consistent with the agency. Constipation associated with opioid use may be averted or lessened with right hydration, exercising and fiber intake. Stool softeners and laxatives may be used as needed.(1)

Skine care management

For people who've evolved lesions from a monkeypox infection, care have to be taken to make sure lesions heal nicely with minimum scarring. Though statistics on lesion recuperation in monkeypox infections is limited, facts on wound recuperation in general, in addition to take care of comparable pores and skin lesions shape different infections, can resource in information a way to great take care of monkeypox lesions and save you scarring. (21)

- Wash pores and skin with a slight cleaning soap and water.
- Monkeypox lesions are taken into consideration infectious till they've healed.
- Antiseptics or antibacterial agents.
- They keep affected areas and individual lesions covered. If the lesion becomes infected.
- After the lesions have healed.
- Sun protection.
- Do not scratch.
- To assist soothe skin, baths can be taken.
- Certain sufferers may also qualify for monkeypox-precise therapeutics(22)

CLINICAL PRESENTATION

In the context of publicity and with inside the jungle environment, humans have an elevated threat of contracting monkeypox in the event that they stay in forested regions and are male, below 15 years of age and now no longer proof against smallpox. In the past, sufferer's commonly skilled

prodromal signs, such as fever, headache, chills, malaise, and lymphadenopathy, accompanied via way of means of the improvement of a feature rash. The rash typically begins off evolvedwith inside the mouth after which spreads to the face and extremities. Such as hands and soles. Each lesion starts off evolved as a patch after which develops into papules, vesicles, pustules and crusts. Pain can be felt but isn't always constantly present, and itching may also arise because the lesions heal. Unlike chickenpox, pores and skin lesions because of monkeypox are typically comparable in length and typically arise on the equal stage. The wide variety of lesions can variety from 10 to one hundred fifty and persist for as much as four weeks. Patients are contagious from the time signs begin (probably such as prodromal signs previous to the onset of the rash) till the lesions crust and fall off. With a new layer of pores and skin forming. Rarely, sufferers can expand headaches from monkeypox, such as bacterial superinfection, encephalitis, pneumonitis, and conjunctivitis/keratitis. The time to improvement of headaches and their frequency have now no longer been systematically determined Clinical protocols and contamination management in monkeypox outbreaks. Recognition of scientific presentation and a high index of suspicion are essential to identify capacity cases. These steps should be taken in conjunction with the Government Notice on Public Suitability for Touch Tracking and other addendums to the overall public suitability response.(24)

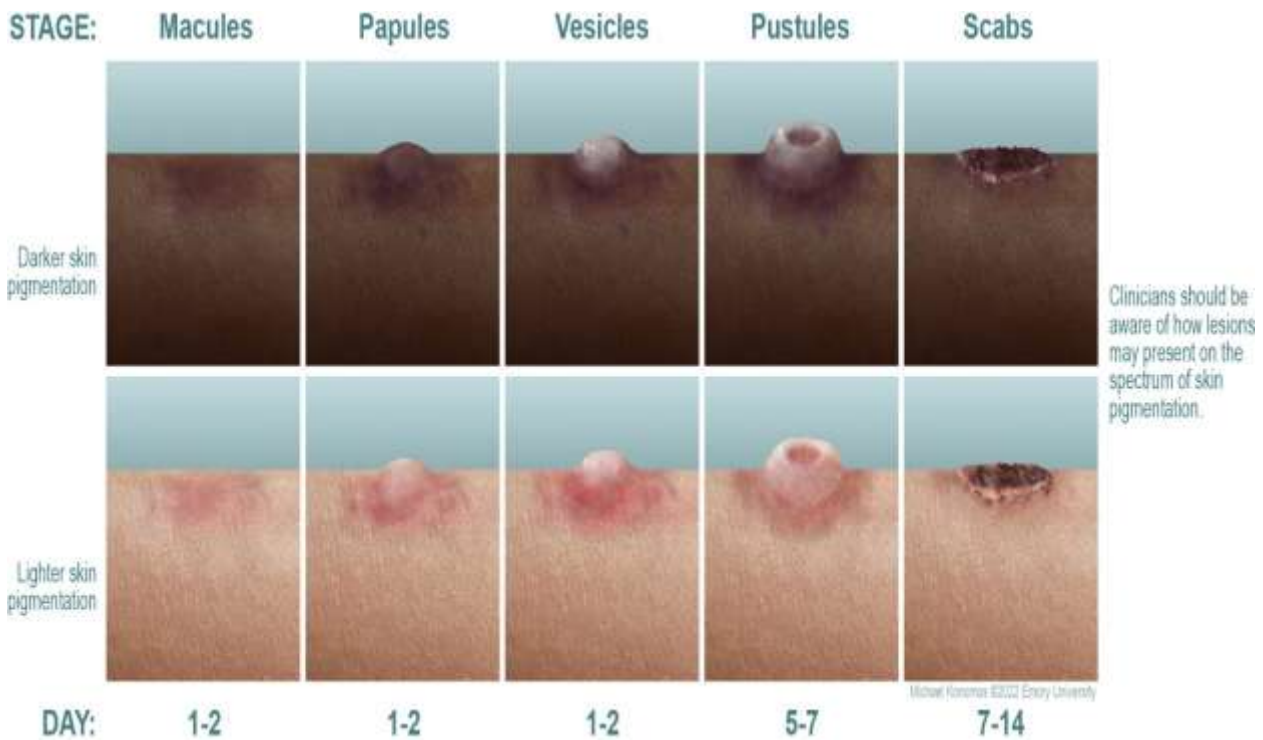


Fig 4: The improvement of a feature rash

Although workaround for Monkeypox infection is often supportive, antiviral providers and immune healing procedures immune healing procedures may be considered for people with mild to severe signs and symptoms or who have a high likelihood of developing serious illness. Vaccinating close to contacts with excessive-risk exposures and at-risk humans is also important for interrupting transmission chains and containing monkeypox outbreaks. Appropriate private shielding equipment (PPE) for medical settings consists of gown, gloves, a fit-tested N-90 5 or equivalent, and eye protection.(25)

Many competencies of monkeypox are similar to smallpox; but, in contrast to smallpox, monkeypox is frequently milder and presents with lymphadenopathy, which become usually absent in smallpox infection. It is also vital to phrase that the cutaneous manifestations of monkeypox can be harassed with one of a kind infections, collectively with chickenpox, molluscum contagiosum, herpes simplex virus, syphilis, impetigo, measles withinside the early degrees, and rickettsial diseases. In the contemporary 2022 outbreak, the presentation of monkeypox has had weird competencies in plenty of patients. For example, the characteristic rash stays present, but it is able to be constrained to the genital, perigenital, and perianal areas and present at one-of-a-type degrees of development. In addition, patients may additionally present with best moderate or absent prodromal symptoms and symptoms which may additionally begin afteerr onset of a localised rash. Therefore, it is crucially vital to recollect a massive spectrum of illness presentations as clinicians motive to because it must be diagnose patients while the area attempts to consist of the outbreak.(26)

CLINICAL MANAGEMENT

Supportive care is the cornerstone of scientific control for standard monkeypox infection. Maintaining good enough fluid stability is a part of supportive care. (Due to the opportunity of elevated insensible fluid losses from the pores and skin, reduced oral intake, and vomiting or diarrhea). Where indicated, extra measures which includes hemodynamic support, supplemental oxygen or different breathing support, and remedy of bacterial superinfections of pores and skin lesions have to be considered. Management of ocular infection/headaches, in particular ensuing in corneal scarring and/or lack of vision, is any other element of supportive care that has been defined with preceding OPXV infections. In this situation, capability methods to recall consist of early involvement of ophthalmology experts, the usage of lubricants, topical antibiotics, and in all likelihood topical antivirals which includes trifluridine

At the moment, there aren't anyt any FDA-authorized remedies for monkeypox withinside the United States. However, antiviral retailers with interest towards MPXV consist of cidofovir, brincidofovir (a lipid-conjugate prodrug of cidofovir), and tecovirimat. In addition to antiviral retailers, the FDA formerly authorized vaccinia immune globulin intravenous (VIGIV) for the remedy of vaccinia vaccination headaches which includes modern vaccinia and excessive generalised vaccinia.(27)

Tecovirimate

Tecovirimate is an antiviral drug used to treat smallpox in adults and children. There are no data on the effectiveness of tecovirimate in treating monkeypox in humans, but studies in a variety of animal species have shown that tecovirimate is effective. Treatment of diseases caused by orthopoxviruses. A clinical study focused on safety in healthy people without monkeypox virus showed that the drug had an acceptable safety profile; the effectiveness of Tecovirimat was noevaluated in this study. Tecovirimat is available in tablet or injection form.(28)

Cidofovir

Cidofovir is an antiviral drug used to treat cytomegalovirus (CMV) retinitis in patients with acquired immune deficiency syndrome (AIDS). There are no data on the efficacy of cidofovir in treating cases of monkeypox in humans. However, it has been shown to be effective against orthopoxviruses in in vitro and animal studies. It is not known whether a person with severe monkeypox infection will

benefit from treatment with cidofovir even if it is used can be considered in such cases. Brincidofovir may also have an improved protective profile over cidofovir. No serious renal toxicity or other adverse effects have been observed in the treatment of cytomegalovirus infection with brincidofovir compared to treatment at any time point the use of cidofovir.(29)

Brincidofovir

Brincidofovir is an antiviral drug marketed on June 4, 2021 for the treatment of human smallpox in adult and pediatric patients, including neonates. There are no data on the efficacy of brincidofovir in treating cases of monkeypox in humans. It has been shown to be effective against orthopoxviruses in in vitro and animal studies. CDC is developing an EA-IND to facilitate the use of brincidofovir to treat monkeypox. However, brincidofovir is not currently available through the SNS.(30)

VIGIV

Is used to treat complications of the vaccinia vaccine. CDC has an expanded access protocol that allows the use of VIGIV to treat orthopoxviruses (including monkeypox) in an outbreak. There are no data on the effectiveness of VIGIV in treating monkeypox virus infection. The use of VIGIV has no proven benefit in the treatment of monkeypox and it is not known whether a person with severe monkeypox infection will benefit from VIGIV treatment. However, healthcare providers may consider its use in severe cases. Prophylactic use of VIGIV may be considered in an exposed individual with severe T-cell immunodeficiency who is contraindicated for smallpox vaccination after exposure to monkeypox virus.(31)

Side effects

Oral: headache (12%), nausea (5%), abdominal pain (2%) and vomiting (2%). One subject was diagnosed with neutropenia.

IV: Infusion site pain (73%), Infusion site swelling (39%), infusion site erythema (23%), infusion site extravasation (19%) and headache (15%). (32)

Drug-drug interactions

Significant interactions have been reported in healthy adults with the concomitant use of repaglinide (hypoglycaemia) and midazolam (reduced effectiveness of midazolam).(28)

Pregnancy/Lactation

Although tecovirimate has not been studied in pregnant and lactating women, it will not be excluded from treatment if deemed appropriate after careful clinical assessment and discussion of the risks/benefits with the patient using a decision-making model. Data to demonstrate the presence or absence of fetotoxicity risk associated with tecovirimate, effects on milk production, presence of drug in breast milk and/or effects on breastfed infants. No fetotoxicity was observed in animal studies, although tecovirimate has been detected at levels in milk.(33)

Pediatrics

Tecovirimat has been used in a 28-month-old child with no side effects attributed to the drug, however no clinical trials have been conducted in pediatric populations. In pediatric patients < 2 years

amid theoretical concerns that renal immaturity in young pediatric patients could result in increased exposure to hydroxypropyl- β -cyclodextrin, a component of intravenous tecovirimat. Cyclodextrin. (34)

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