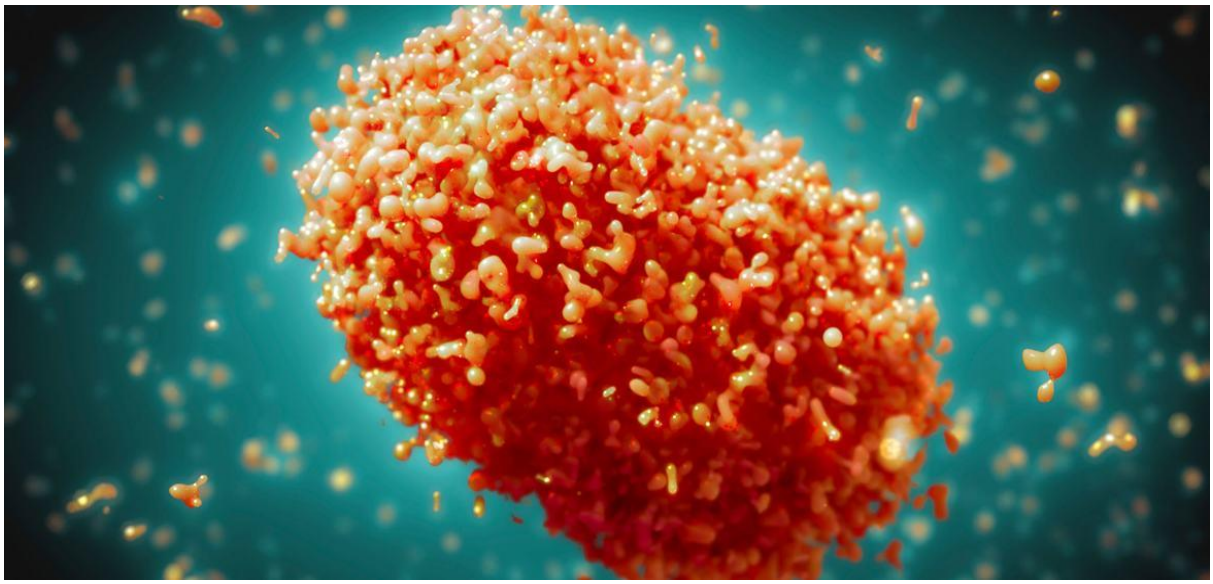
Monkeypox

Source Guide



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Introduction

Monkeypox is a rare disease caused by infection with the monkeypox virus. Monkeypox virus is part of the same family of viruses as variola virus, the virus that causes smallpox. Monkeypox symptoms are similar to smallpox symptoms, but milder, and monkeypox is rarely fatal. Monkeypox is not related to chickenpox.

Monkeypox was discovered in 1958 when two outbreaks of a pox-like disease occurred in colonies of monkeys kept for research. Despite being named "monkeypox," the source of the disease remains unknown. However, African rodents and non-human primates (like monkeys) might harbor the virus and infect people.

The first human case of monkeypox was recorded in 1970. Prior to the 2022 outbreak, monkeypox had been reported in people in several central and western African countries. Previously, almost all monkeypox cases in people outside of Africa were linked to international travel to countries where the disease commonly occurs or through imported animals. These cases occurred on multiple continents.

https://www.cdc.gov/poxvirus/monkeypox/about.html

Fact Sheet

https://www.who.int/news-room/fact-sheets/detail/monkeypox

Key facts

- Vaccines used during the smallpox eradication programme also provided protection against monkeypox. Newer vaccines have been developed of which one has been approved for prevention of monkeypox
- Monkeypox is caused by monkeypox virus, a member of the Orthopoxvirus genus in the family Poxviridae.
- Monkeypox is usually a self-limited disease with the symptoms lasting from 2 to 4 weeks. Severe cases can occur. In recent times, the case fatality ratio has been around 3–6%.
- Monkeypox is transmitted to humans through close contact with an infected person or animal, or with material contaminated with the virus.
- Monkeypox virus is transmitted from one person to another by close contact with lesions, body fluids, respiratory droplets and contaminated materials such as bedding.
- Monkeypox is a viral zoonotic disease that occurs primarily in tropical rainforest areas of central and west Africa and is occasionally exported to other regions.
- An antiviral agent developed for the treatment of smallpox has also been licensed for the treatment of monkeypox.
- The clinical presentation of monkeypox resembles that of smallpox, a related orthopoxvirus infection which was declared eradicated worldwide in 1980. Monkeypox is less contagious than smallpox and causes less severe illness.
- Monkeypox typically presents clinically with fever, rash and swollen lymph nodes and may lead to a range of medical complications.

Introduction

Monkeypox is a viral zoonosis (a virus transmitted to humans from animals) with symptoms similar to those seen in the past in smallpox patients, although it is clinically less severe. With the eradication of smallpox in 1980 and subsequent cessation of smallpox vaccination, monkeypox has emerged as the most important orthopoxvirus for public health. Monkeypox primarily occurs in central and west Africa, often in proximity to tropical rainforests, and has been increasingly appearing in urban areas. Animal hosts include a range of rodents and non-human primates.

The pathogen

Monkeypox virus is an enveloped double-stranded DNA virus that belongs to the *Orthopoxvirus* genus of the *Poxviridae* family. There are two distinct genetic clades of the monkeypox virus: the central African (Congo Basin) clade and the west African clade. The Congo Basin clade has historically caused more severe disease and was thought to be more transmissible. The geographical division between the two clades has so far been in Cameroon, the only country where both virus clades have been found.

Natural host of monkeypox virus

Various animal species have been identified as susceptible to monkeypox virus. This includes rope squirrels, tree squirrels, Gambian pouched rats, dormice, non-human primates and other species. Uncertainty remains on the natural history of monkeypox virus and further studies are needed to identify the exact reservoir(s) and how virus circulation is maintained in nature.

Outbreaks

Human monkeypox was first identified in humans in 1970 in the Democratic Republic of the Congo in a 9-month-old boy in a region where smallpox had been eliminated in 1968. Since then, most cases have been reported from rural, rainforest regions of the Congo Basin, particularly in the Democratic Republic of the Congo and human cases have increasingly been reported from across central and west Africa.

Since 1970, human cases of monkeypox have been reported in 11 African countries: Benin, Cameroon, the Central African Republic, the Democratic Republic of the Congo, Gabon, Cote d'Ivoire, Liberia, Nigeria, the Republic of the Congo, Sierra Leone and South Sudan. The true burden of monkeypox is not known. For example, in 1996–97, an outbreak was reported in the Democratic Republic of the Congo with a lower case fatality ratio and a higher attack rate than usual. A concurrent outbreak of chickenpox (caused by the varicella virus, which is not an orthopoxvirus) and monkeypox was found, which could explain real or apparent changes in transmission dynamics in this case. Since 2017, Nigeria has experienced a large outbreak, with over 500 suspected cases and over 200 confirmed cases and a case fatality ratio of approximately 3%. Cases continue to be reported until today. Monkeypox is a disease of global public health importance as it not only affects countries in west and central Africa, but the rest of the world. In 2003, the first monkeypox outbreak outside of Africa was in the United States of America and was linked to contact with infected pet prairie dogs. These pets had been housed with Gambian pouched rats and dormice that had been imported into the country from Ghana. This outbreak led to over 70 cases of monkeypox in the U.S. Monkeypox has also been reported in travelers from Nigeria to Israel in September 2018, to the United Kingdom in September 2018, December 2019, May 2021 and May 2022, to

Singapore in May 2019, and to the United States of America in July and November 2021. In May 2022, multiple cases of monkeypox were identified in several non-endemic countries. Studies are currently underway to further understand the epidemiology, sources of infection, and transmission patterns.

Transmission

Animal-to-human (zoonotic) transmission can occur from direct contact with the blood, bodily fluids, or cutaneous or mucosal lesions of infected animals. In Africa, evidence of monkeypox virus infection has been found in many animals including rope squirrels, tree squirrels, Gambian pouched rats, dormice, different species of monkeys and others. The natural reservoir of monkeypox has not yet been identified, though rodents are the most likely. Eating inadequately cooked meat and other animal products of infected animals is a possible risk factor. People living in or near forested areas may have indirect or low-level exposure to infected animals.

Human-to-human transmission can result from close contact with respiratory secretions, skin lesions of an infected person or recently contaminated objects. Transmission via droplet respiratory particles usually requires prolonged face-to-face contact, which puts health workers, household members and other close contacts of active cases at greater risk. However, the longest documented chain of transmission in a community has risen in recent years from 6 to 9 successive person-to-person infections. This may reflect declining immunity in all communities due to cessation of smallpox vaccination. Transmission can also occur via the placenta from mother to fetus (which can lead to congenital monkeypox) or during close contact during and after birth. While close physical contact is a well-known risk factor for transmission, it is unclear at this time if monkeypox can be transmitted

specifically through sexual transmission routes. Studies are needed to better understand this risk.

Signs and symptoms

The incubation period (interval from infection to onset of symptoms) of monkeypox is usually from 6 to 13 days but can range from 5 to 21 days.

The infection can be divided into two periods:

- the invasion period (lasts between 0–5 days) characterized by fever, intense headache, lymphadenopathy (swelling of the lymph nodes), back pain, myalgia (muscle aches) and intense asthenia (lack of energy). Lymphadenopathy is a distinctive feature of monkeypox compared to other diseases that may initially appear similar (chickenpox, measles, smallpox)
- the skin eruption usually begins within 1–3 days of appearance of fever. The rash tends to be more concentrated on the face and extremities rather than on the trunk. It affects the face (in 95% of cases), and palms of the hands and soles of the feet (in 75% of cases). Also affected are oral mucous membranes (in 70% of cases), genitalia (30%), and conjunctivae (20%), as well as the cornea. The rash evolves sequentially from macules (lesions with a flat base) to papules (slightly raised firm lesions), vesicles (lesions filled with clear fluid), pustules (lesions filled with yellowish fluid), and crusts which dry up and fall off. The number of lesions varies from a few to several thousand. In severe cases, lesions can coalesce until large sections of skin slough off.

Monkeypox is usually a self-limited disease with the symptoms lasting from 2 to 4 weeks. Severe cases occur more commonly among children and are related to the extent of virus exposure, patient health status and nature of complications. Underlying immune deficiencies may lead to worse outcomes. Although vaccination against smallpox was protective in the past, today persons younger than

40 to 50 years of age (depending on the country) may be more susceptible to monkeypox due to cessation of smallpox vaccination campaigns globally after eradication of the disease. Complications of monkeypox can include secondary infections, bronchopneumonia, sepsis, encephalitis, and infection of the cornea with ensuing loss of vision. The extent to which asymptomatic infection may occur is unknown.

The case fatality ratio of monkeypox has historically ranged from 0 to 11 % in the general population and has been higher among young children. In recent times, the case fatality ratio has been around 3–6%.

Diagnosis

The clinical differential diagnosis that must be considered includes other rash illnesses, such as chickenpox, measles, bacterial skin infections, scabies, syphilis, and medication-associated allergies. Lymphadenopathy during the prodromal stage of illness can be a clinical feature to distinguish monkeypox from chickenpox or smallpox.

If monkeypox is suspected, health workers should collect an appropriate sample and have it transported safely to a laboratory with appropriate capability. Confirmation of monkeypox depends on the type and quality of the specimen and the type of laboratory test. Thus, specimens should be packaged and shipped in accordance with national and international requirements. Polymerase chain reaction (PCR) is the preferred laboratory test given its accuracy and sensitivity. For this, optimal diagnostic samples for monkeypox are from skin lesions – the roof or fluid from vesicles and pustules, and dry crusts. Where feasible, biopsy is an option. Lesion samples must be stored in a dry, sterile tube (no viral transport media) and kept cold. PCR blood tests are usually inconclusive because of the short duration of

viremia relative to the timing of specimen collection after symptoms begin and should not be routinely collected from patients.

As orthopoxviruses are serologically cross-reactive, antigen and antibody detection methods do not provide monkeypox-specific confirmation. Serology and antigen detection methods are therefore not recommended for diagnosis or case investigation where resources are limited. Additionally, recent or remote vaccination with a vaccinia-based vaccine (e.g. anyone vaccinated before smallpox eradication, or more recently vaccinated due to higher risk such as orthopoxvirus laboratory personnel) might lead to false positive results.

In order to interpret test results, it is critical that patient information be provided with the specimens including: a) date of onset of fever, b) date of onset of rash, c) date of specimen collection, d) current status of the individual (stage of rash), and e) age.

Therapeutics

Clinical care for monkeypox should be fully optimized to alleviate symptoms, manage complications and prevent long-term sequelae. Patients should be offered fluids and food to maintain adequate nutritional status. Secondary bacterial infections should be treated as indicated. An antiviral agent known as tecovirimat that was developed for smallpox was licensed by the European Medicines Agency (EMA) for monkeypox in 2022 based on data in animal and human studies. It is not yet widely available.

If used for patient care, tecovirimat should ideally be monitored in a clinical research context with prospective data collection.

Vaccination

Vaccination against smallpox was demonstrated through several observational studies to be about 85% effective in preventing monkeypox. Thus, prior smallpox vaccination may result in milder illness. Evidence of prior vaccination against smallpox can usually be found as a scar on the upper arm. At the present time, the original (first-generation) smallpox vaccines are no longer available to the general public. Some laboratory personnel or health workers may have received a more recent smallpox vaccine to protect them in the event of exposure to orthopoxviruses in the workplace. A still newer vaccine based on a modified attenuated vaccinia virus (Ankara strain) was approved for the prevention of monkeypox in 2019. This is a two-dose vaccine for which availability remains limited. Smallpox and monkeypox vaccines are developed in formulations based on the vaccinia virus due to cross-protection afforded for the immune response to orthopoxviruses.

Prevention

Raising awareness of risk factors and educating people about the measures they can take to reduce exposure to the virus is the main prevention strategy for monkeypox. Scientific studies are now underway to assess the feasibility and appropriateness of vaccination for the prevention and control of monkeypox. Some countries have, or are developing, policies to offer vaccine to persons who may be at risk such as laboratory personnel, rapid response teams and health workers.

Reducing the risk of human-to-human transmission

Surveillance and rapid identification of new cases is critical for outbreak containment. During human monkeypox outbreaks, close contact with infected persons is the most significant risk factor for monkeypox virus infection. Health workers and household members are at a greater risk of infection. Health workers

caring for patients with suspected or confirmed monkeypox virus infection, or handling specimens from them, should implement standard infection control precautions. If possible, persons previously vaccinated against smallpox should be selected to care for the patient.

Samples taken from people and animals with suspected monkeypox virus infection should be handled by trained staff working in suitably equipped laboratories. Patient specimens must be safely prepared for transport with triple packaging in accordance with WHO guidance for transport of infectious substances.

The identification in May 2022 of clusters of monkeypox cases in several non-endemic countries with no direct travel links to an endemic area is atypical. Further investigations are underway to determine the likely source of infection and limit further onward spread. As the source of this outbreak is being investigated, it is important to look at all possible modes of transmission in order to safeguard public health.

Reducing the risk of zoonotic transmission

Over time, most human infections have resulted from a primary, animal-to-human transmission. Unprotected contact with wild animals, especially those that are sick or dead, including their meat, blood and other parts must be avoided. Additionally, all foods containing animal meat or parts must be thoroughly cooked before eating.

Preventing monkeypox through restrictions on animal trade

Some countries have put in place regulations restricting importation of rodents and non-human primates. Captive animals that are potentially infected with monkeypox should be isolated from other animals and placed into immediate quarantine. Any animals that might have come into contact with an infected animal should be

quarantined, handled with standard precautions and observed for monkeypox symptoms for 30 days.

How monkeypox relates to smallpox

The clinical presentation of monkeypox resembles that of smallpox, a related orthopoxvirus infection which has been eradicated. Smallpox was more easily transmitted and more often fatal as about 30% of patients died. The last case of naturally acquired smallpox occurred in 1977, and in 1980 smallpox was declared to have been eradicated worldwide after a global campaign of vaccination and containment. It has been 40 or more years since all countries ceased routine smallpox vaccination with vaccinia-based vaccines. As vaccination also protected against monkeypox in west and central Africa, unvaccinated populations are now also more susceptible to monkeypox virus infection.

Whereas smallpox no longer occurs naturally, the global health sector remains vigilant in the event it could reappear through natural mechanisms, laboratory accident or deliberate release. To ensure global preparedness in the event of reemergence of smallpox, newer vaccines, diagnostics and antiviral agents are being developed. These may also now prove useful for prevention and control of monkeypox.

Bibliography

The bibliography comprises some of the latest and updated journal articles that cover monkeypox disease.

Title: Recent advances in the diagnosis monkeypox: implications for public health.

Author: Matthew W. McCarthy

Source: Expert Review of Molecular Diagnostics.

Abstract:

Monkeypox virus is a zoonotic double-stranded DNA poxvirus in the genus Orthopoxvirus, family Poxviridae. Until recently, monkeypox was found primarily in Central and West Africa, where the virus had split into Congo Basin and West African clades. On 6 May 2022, monkeypox was detected in the United Kingdom and the virus has now been detected in every continent except Antarctica. The current outbreak represents the first documentation of widespread community transmission outside of Africa. On 23 July 2022, the World Health Organization declared monkeypox a public health emergency of international concern and issued a series of guidance and recommendations for governments, health professionals and the public. This manuscript reviews what is known about monkeypox virus, with a focus on recent diagnostics and epidemiologic advances, and explores how recent advances in our understanding of the virus will be used to combat the expanding outbreak.

Title: Marburg Virus Re-Emerged in 2022: Recently Detected in Ghana, another Zoonotic Pathogen Coming Up Amid Rising Cases of Monkeypox and Ongoing Covid-19 Pandemic- Global Health Concerns and Counteracting Measures.

Author: Ranjit Sah,Aroop Mohanty,Abdullah Reda,Abdelmonem Siddiq,Ranjan K. Mohapatra &Kuldeep Dhama

Source: Veterinary Quarterly

Abstract:

Marburg virus (MARV), a highly pathogenic virus, the cause of a deadly disease Marburg virus disease (MVD), has recently been in news during mid of July 2022 owing to its outbreak in Ghana, an African country, wherein two infected persons died (Hussain 2022; WHO 2022a; Zhao et al. 2022). More recently, the third death due to MVD has been reported in Ghana (Reuters 2022). MARV is an enveloped single-stranded RNA virus of the Filovirus genus belonging to the Filoviridae family that also contains the Ebola virus responsible for Ebola virus disease (EVD). EVD and MVD have both prompted health agencies to be on alert and implement national and regional emergency responses from time to time (Adepoju 2021). Marburg Virus Disease (MVD), formerly known as Marburg hemorrhagic fever (MHF), is a very deadly and fatal illness in humans and non-human primates (NHPs). According to the Center for Disease Control and Prevention (CDC), Atlanta, GA, USA, the virus was first detected in the city Marburg (Germany) in August 1967 when 31 cases of MVD were reported and caused an outbreak (Feldmann et al. 1996; Bharat et al. 2011). The name Marburg originated from this city and thus the virus was named as Marburg Virus (MARV). It was thought that the MARV infection might have been transmitted to Germany through Uganda by importation of infected African green monkey (Cercopithecus aethiops) tissue for poliomyelitis vaccine development. MARV is believed to be the first filovirus discovered (Siegert et al. 1968).

Title: Therapeutic strategies to address monkeypox

Author: Matthew W. McCarthy

Source: Expert Review of Anti-infective Therapy, 17 Aug 2022

Abstract:

Monkeypox is a viral zoonosis, with symptoms similar to those seen in smallpox patients, although the clinical presentation may be less severe. Until recently, human monkeypox infection was rare, and primarily occurred in Central and West Africa. An international outbreak began in May 2022, and monkeypox has now been detected on every continent except Antarctica. The first recognized case from the current outbreak was confirmed in the United Kingdom on 6 May 2022, in an adult with travel links to Nigeria, but it has been suggested that cases had been spreading in Europe for months. On 23 July 2022 the Director-General of the World Health Organization declared the monkeypox outbreak a public health emergency of international concern. There are no treatments specifically for monkeypox virus infections. However, monkeypox and smallpox viruses are genetically similar, and

therapeutics developed to combat smallpox may be used to treat monkeypox. This manuscripts reviews what is known about these potential treatments, including tecovirimat and brincidofovir, based on a literature search of PubMed through 9 August 2022, and explores how these therapeutics may be used in the future to address the expanding monkeypox pandemic.

Title: The detection of monkeypox virus DNA in wastewater samples in the Netherlands

Author: de Jonge, Eline F.;Peterse, Céline M.;Koelewijn, Jaap M.;van der Drift, Anne-Merel R.;van der Beek, Rudolf F.H.J.;Nagelkerke, Erwin;Lodder, Willemijn J.Send mail to Lodder W.J.

Source: Science of the Total Environment, Volume 85215, December 2022.

Abstract:

As of 18 August 2022, 1087 confirmed cases of monkeypox are reported in the Netherlands. Monkeypox virus likely ends up in wastewater because i) skin flakes from areas affected by the typical rash and scabbing may wash off, and ii) monkeypox virus has been detected in animal and human feces. Here we describe a method to qualitatively detect monkeypox virus DNA in wastewater, that may prove a valuable surveillance tool for outbreaks.

Title: Current status of monkeypox vaccines.

Author: Marion F. Gruber

Source: npj Vaccines volume 7, Article number: 94 (2022)

Abstract:

Monkeypox disease is caused by infection with the monkeypox virus, an orthopoxvirus belonging to the same poxviridae family as variola and vaccinia viruses. Monkeypox disease was initially diagnosed in 1970 in the Democratic Republic of the Congo (DRC) and has since spread to other countries in Africa, in particular regions of West and Central Africa where it is endemic1. Prior to 2022, occasional outbreak outside Africa were linked to international travel or imported animals2. In May 2022, multiple clusters of monkeypox were reported in European countries and North America. The number of weekly reported new cases has since dramatically increased resulting in the WHO declaring this outbreak a public health emergency of international concern3. On August 4, 2022, monkeypox was declared a public health emergency in the US4. As of August 3, 2022, more than 25,000 confirmed cases have been reported to WHO across 85 countries with the majority

of the cases reported from the European region and regions of the Americas5. Males between 18–44 years of age are disproportionally affected by this outbreak and accounting for 79% of cases. Most of those affected by the current outbreaks are gay, bisexual, or other men who have sex with men. According to the U.S. Center for Disease Control and Prevention (CDC), many of the initial patients reported international travel prior to the onset of symptoms, but since late June 2022, an increasing number of cases are now linked to local community transmission6.

Title: Clinical features, hospitalisation and deaths associated with monkeypox: a systematic review and meta-analysis

Author: Benites-Zapata, Vicente A.a;Ulloque-Badaracco, Juan R.a;Alarcon-Braga, Esteban A.a, b;Hernandez-Bustamante, Enrique A.c, d;Mosquera-Rojas, Melany D.a, b;Bonilla-Aldana, D. Katterinee, f;Rodriguez-Morales, Alfonso J.e,

Source: Annals of Clinical Microbiology and Antimicrobials, Volume 21, Issue 1December 2022.

Abstract:

Introduction: A multicountry monkeypox disease (MPX) outbreak began in May 2022 in Europe, leading to the assessment as a potential Public Health Emergency of International Concern (PHEIC) on June 23, 2022. Some observational studies have partially characterised clinical features, hospitalisations, and deaths. However, no systematic reviews of this MPX outbreak have been published. Methods: We performed a systematic review with meta-analysis, using five databases to assess clinical features, hospitalisations, complications and deaths of MPX confirmed or probable cases. Observational studies, case reports and case series, were included. We performed a random-effects model meta-analysis to calculate the pooled prevalence and 95% confidence interval (95% CI). In addition, we carried out a subgroup analysis according to the continents and a sensitivity analysis excluding studies classified as having a high risk of bias. Results: A total of 19 articles were included, using only 12 articles in the quantitative synthesis (meta-analysis). For 1958 patients, rash (93%, 95% CI 80–100%), fever (72%, 95% CI 30–99%), pruritus (65%, 95% CI 47–81%), and lymphadenopathy (62%, 47–76%), were the most prevalent manifestations. Among the patients, 35% (95% CI 14–59%) were hospitalised. Some 4% (95% CI 1–9%) of hospitalised patients had fatal outcomes (case fatality rate, CFR). Conclusion: MPX is spreading rapidly, with a third of hospitalised patients, but less than 5% with fatal outcomes. As this zoonotic virus spreads globally, countries must urgently prepare human resources, infrastructure and facilities to treat patients according to the emerging guidelines and the most reliable clinical information.

Title: Monkeypox 2022 Identify-Isolate-Inform: A 3I Tool for frontline clinicians for a zoonosis with escalating human community transmission

Author: Koenig, Kristi L.a, bSend mail to Koenig K.L.;Beÿ, Christian K.a;Marty, Aileen M.c

Source: One Health, Volume 15December 2022

Abstract:

Monkeypox 2022, a zoonotic virus similar to smallpox, presented as a rapidly escalating human outbreak with community transmission outside endemic regions of Africa. In just over one month of detection, confirmed cases escalated to over 3300, with reports of patients in at least 43 non-African nations. Mechanisms of transmission in animals and the reservoir host remain uncertain; spread from humans to wild or domestic animals risks the creation of new endemic zones. While initial cases were reported in men who have sex with men (MSM), monkeypox is not considered a sexually transmitted infection. Anyone with close contact with an infected person, aerosolized infectious material (e.g., from shaken bedsheets), or contact with fomites or infected animals is at risk. In humans, monkeypox typically presents with a non-specific prodromal phase followed by a classic rash with an incubation period of 5–21 days (usually 6–13 days). The prodrome may be subclinical, and the monkeypox virus may be transmissible from person-to-person before observed symptom onset. Most clinicians are unfamiliar with monkeypox. Information is rapidly evolving, producing an urgent need for immediate access to clear, concise, fact-based, and actionable information for frontline healthcare workers in prehospital, emergency departments/hospitals, and acute care/sexual transmitted infection clinics. This paper provides a novel Identify-Isolate-Inform (3I) Tool for the early detection and management of patients under investigation for monkeypox 2022. Patients are identified as potentially exposed or infected after an initial assessment of risk factors and signs/symptoms. Management of exposed patients includes consideration of quarantine and post-exposure prophylaxis with a smallpox vaccine. For infectious patients, providers must immediately don personal protective equipment and isolate patients. Healthcare workers must report suspected and confirmed cases in humans or animals to public health authorities. This innovative 3I Tool will assist emergency, primary care, and prehospital clinicians in effectively managing persons with suspected or confirmed monkeypox.

Title: Combating the global spread of poverty-related Monkeypox outbreaks and beyond

Author: Tambo, Ernesta,;Al-Nazawi, Ashwaq

Source: Infectious Diseases of Poverty, Volume 11, Issue 1December 2022

Abstract:

The current unprecedented Monkeypox outbreaks emergence and spread on non-endemic countries has led to over 3413 laboratory confirmed cases and one death, and yet, does not constitute a public health emergency of international concern as June 23th 2022. We urgently call for collective regional and global partnership, leadership commitment and investment to rapidly strengthen and implement Monkeypox World Health Organization outbreak Preparedness and emergency response actions plans implementation against Monkeypox outbreak. Given the importance of human–animal–environment interface and transmission dynamics, fostering global and regional One Health approach partnership and multisectoral collaboration programs have timely and robust sustained investment benefits on poverty-linked Monkeypox and other emerging epidemics population-based programs, while leveraging from lessons learnt. Moving forward requires addressing priority research questions listed and closing the knowledge gaps for Monkeypox and others neglected tropical diseases roadmap implementation in vulnerable and at risk countries.

Title: The global monkeypox outbreak: Germ panic, stigma and emerging challenges.

Author: Lee A.C.K.; Morling J.R.b

Source: Public Health in Practice, Volume 4December 2022

Abstract:

Monkeypox has been in the headlines following the detection of multiple cases in more than two dozen countries worldwide [1]. As of June 2, 2022, there have been 780 laboratory confirmed cases reported in countries where the disease is not normally endemic. The rapid rise in the number of detected cases was unexpected. Yet we should not have been surprised. Monkeypox is not a new disease with human cases recognized since the 1970s. There have been thousands of cases in West and Central Africa where the disease is endemic [2]. Consequently, the risk of importation to non-endemic settings has always been lurking in the background.

Neither is it surprising that the global outbreak has attracted much media interest and generated public alarm. New exotic sounding emerging infectious diseases that the public are unfamiliar with can induce public anxiety that is disproportionate to the actual risks [3]. Indeed, it can lead to “germ panic” and fear of contagion that are further exacerbated by the perception of the disease insidiously and rapidly

spreading in the population. The media clamour and broadcasting of the disturbing visible pox disfigurements will undoubtedly heighten concerns further. Social media misinformation is likely to fuel public anxiety, as we have seen with the recent COVID19 pandemic as well as past epidemics such as Ebola in 2014 [4].

The public health problem with germ panic is the likely effect it will have on stigmatizing the condition. Affected individuals may be perceived to be in some way "unclean" vectors of disease. It is therefore unfortunate that the current global outbreak of monkeypox appears to predominantly involve gay, bisexual and men who have sex with men (GBMSM). Unfortunately, a strong undercurrent of homophobia still persists in many societies worldwide. Consequently, there is a real danger that monkeypox will lead to further stigma being directed to those who are GBMSM.

Title: Clinical characteristics and comparison of longitudinal qPCR results from different specimen types in a cohort of ambulatory and hospitalized patients infected with monkeypox virus.

Author: Nörz, Dominika, Thomas Theob, g;Tang, Hui Tinga;Grewe, Ilkab;Hermanussen, Lennartb;Matthews, Hannac;Pestel, Juliac;Degen, Olafc;Günther, Thomasd;Grundhoff, Adamd;Fischer, Nicolea;Addo, Marylyn M.b, e, f, g

Source: Journal of Clinical Virology, Volume 155October 2022

Abstract:

Background: The ongoing monkeypox virus outbreak includes at least 7553 confirmed cases in previously non-endemic countries worldwide as of July 2022. Clinical presentation has been reported as highly variable, sometimes lacking classically described systemic symptoms, and only small numbers of cutaneous lesions in most patients. The aim of this study was to compare clinical data with longitudinal qPCR results from lesion swabs, oropharyngeal swabs and blood in a well characterized patient cohort. Methods: 16 male patients (5 hospitalized, 11 outpatients) were included in the study cohort and serial testing for monkeypox virus-DNA carried out in various materials throughout the course of disease. Laboratory analysis included quantitative PCR, next-generation sequencing, immunofluorescence tests and virus isolation in cell culture. Results: All patients were male, between age 20 and 60, and self-identified as men having sex with men. Two had a known HIV infection, coinciding with an increased number of lesions and viral DNA detectable in blood. In initial- and serial testing, lesion swabs yielded viral DNA-loads at, or above 106 cp/ml and only declined during the third week.

Oropharyngeal swabs featured lower viral loads and returned repeatedly negative in some cases. Viral culture was successful only from lesion swabs but not from oropharyngeal swabs or plasma. Discussion: The data presented underscore the reliability of lesion swabs for monkeypox virus-detection, even in later stages of the disease. Oropharyngeal swabs and blood samples alone carry the risk of false negative results, but may hold value in pre-/asymptomatic cases or viral load monitoring, respectively

Title: Monkeypox outbreak: a perspective on Africa's diagnostic andcontainment capacity.

Author: Moyo, Enosa;Musuka, Godfreyb;Murewanhema, Grantc;Moyo, Perseverancea;Dzinamarira, TafadzwadSend mail to Dzinamarira T.

Source: International Journal of Infectious Diseases, Volume 123, Pages 127 - 130

Abstract:

Since the first monkeypox (MPX) case was reported in humans in 1970, there have been several outbreaks of the disease. MPX is endemic in central and western Africa. MPX virus infection is confirmed using the conventional polymerase chain reaction, which detects the viral DNA in samples from the rash. Of concern is that the current outbreak has affected five regions of the world. Although MPX confirmatory tests are available worldwide, there are concerns about Africa's capacity to diagnose and contain the disease. The challenges faced by Africa include a lack of adequate laboratory infrastructure and health care workers, weak disease surveillance systems, and a lack of MPX knowledge among health care workers and communities. These challenges can be addressed by mobilizing resources for MPX virus testing, strengthening surveillance systems, collaboration among countries, training health care workers, task shifting, and engaging communities.

Title: Monkeypox 2022: Gearing Up for Another Potential Public Health Crisis

Author: Ranganath, Nischala, Pritish K.a;O'Horo, John ;Sampathkumar, Priyaa;Binnicker, Matthew J.c;Shah, Aditya S.

Source: Mayo Clinic proceedingsOpen AccessVolume 97, Issue 9, Pages 1694 - 1699

Abstract:

Monkeypox virus, a member of the Orthopoxvirus genus, was first identified as the etiology of monkeypox in 1970 in the Democratic Republic of Congo and remains

endemic in regions of Central and West Africa. Following the most recent outbreak of monkeypox in multiple countries throughout Europe and North America, the infection has been declared a public health emergency by the Centers for Disease Control and Prevention. Within this report, we aim to provide clinicians with a focused overview of the epidemiology, clinical manifestation, diagnosis, and approaches to treat and prevent monkeypox infection amidst the global outbreak.

Title: Editorial: Current Status of Non-Endemic Global Infections with the Monkeypox Virus.

Author: Parums, Dinah V.

Source: Medical science monitor: international medical journal of experimental and clinical research, Volume 28, Pages e9382031 September 2022

Abstract:

Monkeypox is caused by an orthopoxvirus, which is a DNA virus. Monkeypox is a zoonotic viral infection that has been endemic in West Africa and Central Africa for over a decade. Between 1 January and 22 June 2022, the World Health Organization (WHO) reported 3,413 laboratory-confirmed cases of monkeypox from 50 countries. Most cases (86%) were reported from Europe, with 2% from Africa and 11% from North and South America. In the US, the Centers for Disease Control and Prevention (CDC) identified an outbreak of monkeypox on May 17, 2022. In 99% of cases, the patients were men, 94% reported male-to-male sexual contact or intimate contact in the three weeks before they experienced symptoms of infection, 46% reported one or more genital lesions, and 41% had HIV infection. This initial data from the US showed widespread community transmission of monkeypox that mainly affected bisexual, gay, other men who had sex with men, and also ethnic and racial minority groups. Therefore, public health efforts in the US aim to prioritize these specific demographic groups for infection prevention and testing. By August 4, 2022, the US Department of Health and Human Services declared the monkeypox outbreak a public health emergency. This Editorial aims to present the current status of non-endemic global infections with the monkeypox virus, and current strategies for its prevention and management.

Title: Rapid Adaptation of Established High-Throughput Molecular Testing Infrastructure for Monkeypox Virus Detection.

Author: Nörz, Dominik;Tang, Hui Ting;Emmerich, Petra;Giersch, Katja;Fischer, Nicole;Schmiedel, Stephan;Addo, Marylyn M.;Aepfelbacher, Martin;Pfefferle, Susanne;Lütgehetmann, Marc

Source: Emerging infectious diseases, Volume 28, Issue 9, Pages 1765 - 17691 September 2022.

Abstract:

Beginning in May 2022, a rising number of monkeypox cases were reported in non-monkeypox-endemic countries in the Northern Hemisphere. We adapted 2 published quantitative PCRs for use as a dual-target monkeypox virus test on widely used automated high-throughput PCR systems. We determined analytic performance by serial dilutions of monkeypox virus reference material, which we quantified by digital PCR. We found the lower limit of detection for the combined assays was 4.795 (95% CI 3.6-8.6) copies/mL. We compared clinical performance against a commercial manual orthopoxvirus research use only PCR kit by using clinical remnant swab samples. Our assay showed 100% positive (n = 11) and 100% negative (n = 56) agreement. Timely and scalable PCR tests are crucial for limiting further spread of monkeypox. The assay we provide streamlines high-throughput molecular testing for monkeypox virus on existing broadly established platforms used for SARS-CoV-2 diagnostic testing.

Title: Monkeypox emergency: Urgent questions and perspectives.

Author: Rothenburg, Stefan;Yang, Zhilong;Beard, Pip;Sawyer, Sara L.;Titanji, Boghuma;Gonsalves, Gregg;Kindrachuk, Jason

Source: Cell, Volume 185, Issue 18, Pages 3279 - 32811 September 2022

Abstract:

Amidst the COVID-19 pandemic, we now face another public health emergency in the form of monkeypox virus. As of August 1, the Centers for Disease Control and Prevention report over 23,000 cases in 80 countries. An inclusive and global collaborative effort to understand the biology, evolution, and spread of the virus as well as commitment to vaccine equity will be critical toward containing this outbreak. We share the voices of leading experts in this space on what they see as the most pressing questions and directions for the community.

Title: Is there a need to be worried about the new monkeypox virus outbreak? A brief review on the monkeypox outbreak.

Author: Shaheen, Noura ;Diab, Rehab Adel ;Meshref, Mostafac;Shaheen, Ahmeda;Ramadan, Abdelraouf ;Shoib, Sheikh

Source: Annals of Medicine and Surgery, Volume 81September 2022

Abstract:

The Monkeypox virus (MPXV) is a double-stranded DNA virus related to the orthopoxvirus genus in the family of poxviridae. MPXV is endemic in central and Western African countries. There have been several outbreaks of MPXV in non-endemic countries since it was discovered in 1958 in lab monkeys. The current spread of MPXV is different from previous outbreaks, raising concerns about its potential to cause pandemics around the world. In order to reduce the spread of the disease, several countries imposed different preventive measures. The MPXV virus is believed to be transmitted either through wild animals, such as rodents or through infected individuals. Every year, Africa experiences a few thousand cases, mostly in the west and central regions. The number of cases outside Africa has previously been limited to a handful associated with travel to Africa or with the importation of infected animals. In this narrative review, we will discuss the clinical diagnosis, transmission, distribution, treatment, and prevention of the recent monkeypox outbreak around the world.

Title: The first case of monkeypox virus infection detected in Taiwan: awareness and preparation.

Author: Yang, Zih-Syuana, b;Lin, Chih-Yena, b;Urbina, Aspiro Nayima;Wang, Wen-Hunga, c, d;Assavalapsakul, Wanchaie;Tseng, Sung-Pinb;Lu, Po-Lianga, c;Chen, Yen-Hsua, c, d;Yu, Ming-Lungf;Wang, Sheng-Fana, b, gWang S.-F.

Source: International Journal of Infectious DiseasesOpen AccessVolume 122, Pages 991 - 995September 2022.

Abstract:

Objectives: Monkeypox has recently been detected outside African countries. This study aimed to report and analyze the first case of monkeypox virus infection in Taiwan. Methods: The global epidemiological information was collected from the World Health Organization (WHO) and US Centers for Disease Control and Prevention (CDC). The data from the first confirmed Taiwanese monkeypox case was obtained from Taiwan Centers for Disease Control. Monkeypox diagnosis and prevention strategies were obtained from WHO guidelines on monkeypox. Phylogenetic tree analysis and sequence alignment and comparison were used to identify the phylogeny and single nucleotide polymorphism (SNP) characterization. Results: Epidemiological data indicated that since 2013, monkeypox has caused

outbreaks outside African countries through contact with infected animals and international travels. Recently, two confirmed monkeypox cases were reported in Singapore and South Korea. On June 24, 2022, Taiwan CDC reported the first confirmed case of monkeypox virus infection in a 20-year-old man who returned from Germany, from January to June 2022. This is the third confirmed case of an imported monkeypox infection in Asia. Phylogenetic analysis demonstrated that this imported monkeypox virus belonged to the West African clade and is clustered with the 2022 European outbreak monkeypox isolates. Full-length sequence analysis indicates that this virus contains 51 SNPs, and has five variant SNPs compared with the recent outbreak strains. Conclusion: This study suggests that active surveillance, enhancing border control, and the development of vaccines and antiviral drugs are urgently required to prevent and control the burden of monkeypox disease.

Title: Monkeypox caused less worry than COVID-19 among the general population during the first month of the WHO Monkeypox alert: Experience from Saudi Arabia.

Author: Temsah, Mohamad-Hania,-H.;Aljamaan, Fadia,.;Alenezi, Shuliweeha, , Khalida, ;Saddik, Basemaf,;Alhaboob, Alia ;Bahabri, Nezari.;Alshahrani, Fatimaha, ;Alrabiaah, Abdulkarima,.;Alaraj, Alik, .;Bahkali, Feras.

Source: Travel Medicine and Infectious Disease, Volume 491 September 2022.

Abstract:

Background: Monkeypox re-emerged in May 2022 as another global health threat. This study assessed the public's perception, worries, and vaccine acceptance for Monkeypox and COVID-19 during the first month of WHO announcement. Methods: A large-scale, cross-sectional survey was conducted between May 27 and June 5, 2022, in Saudi Arabia. Data were collected on sociodemographic characteristics, previous infection with COVID-19, worry levels regarding Monkeypox compared to COVID-19, awareness, and perceptions of Monkeypox, and vaccine acceptance. Results: Among the 1546 participants, most respondents (62%) were more worried about COVID-19 than Monkeypox. Respondents aged 45 years and above and those with a university degree or higher had lower odds of agreement with Monkeypox vaccination (OR 0.871, p-value 0.006, OR 0.719, p-value <0.001), respectively. Respondents with moderate to a high level of self and family commitment to infection control precautionary measures and those who expressed self and family worry of Monkeypox infection had significantly higher

odds of vaccination agreement (OR 1.089 p-value = 0.047, OR1.395 p-value = 0.003) respectively. On the other hand, respondents who previously developed COVID-19 were significantly more worried about the Monkeypox disease (1.30 times more, p-value = 0.020). Conclusion: Worry levels amongst the public are higher from COVID-19 than Monkeypox. Perception of Monkeypox as a dangerous and virulent disease, worry from contracting the disease, and high commitment to infection precautionary measures were predictors of agreement with Monkeypox vaccination. While advanced age and high education level are predictors of low agreement with vaccination.

Title: Demographic and clinical characteristics of confirmed human monkeypox virus cases in individuals attending a sexual health center in London, UK: an observational analysis.

Author: Girometti, NicolòaSend mail to Girometti N.;Byrne, Rutha;Bracchi, Margheritaa;Heskin, Josepha;McOwan, Alana;Tittle, Victoriaa;Gedela, Keertia;Scott, Christophera;Patel, Sheela;Gohil, Jesala;Nugent, Diarmuida;Suchak, Taraa

Source: The Lancet Infectious Diseases, Volume 22, Issue 9, Pages 1321 - 1328September 2022.

Abstract:

Background: Historically, human monkeypox virus cases in the UK have been limited to imported infections from west Africa. Currently, the UK and several other countries are reporting a rapid increase in monkeypox cases among individuals attending sexual health clinics, with no apparent epidemiological links to endemic areas. We describe demographic and clinical characteristics of patients diagnosed with human monkeypox virus attending a sexual health centre. Methods: In this observational analysis, we considered patients with confirmed monkeypox virus infection via PCR detection attending open-access sexual health clinics in London, UK, between May 14 and May 25, 2022. We report hospital admissions and concurrent sexually transmitted infection (STI) proportions, and describe our local response within the first 2 weeks of the outbreak. Findings: Monkeypox virus infection was confirmed in 54 individuals, all identifying as men who have sex with men (MSM), with a median age of 41 years (IQR 34–45). 38 (70%) of 54 individuals were White, 26 (48%) were born in the UK, and 13 (24%) were living with HIV. 36 (67%) of 54 individuals reported fatigue or lethargy, 31 (57%) reported fever, and ten (18%) had no prodromal symptoms. All patients presented with skin lesions, of which 51 (94%) were anogenital. 37 (89%) of 54 individuals had skin lesions affecting more than one anatomical site and four (7%) had

oropharyngeal lesions. 30 (55%) of 54 individuals had lymphadenopathy. One in four patients had a concurrent STI. Five (9%) of 54 individuals required admission to hospital, mainly due to pain or localised bacterial cellulitis requiring antibiotic intervention or analgesia. We recorded no fatal outcomes. Interpretation: Autochthonous community monkeypox virus transmission is currently observed among MSM in the UK. We found a high proportion of concomitant STIs and frequent anogenital symptoms, suggesting transmissibility through local inoculation during close skin-to-skin or mucosal contact, during sexual activity. Additional resources are required to support sexual health and other specialist services in managing this condition. A review of the case definition and better understanding of viral transmission routes are needed to shape infection control policies, education and prevention strategies, and contact tracing. Funding: None.

Related Web Sites

Some selected legitimate and authenticated web sites for international authorities are listed below along with their links which cover vast information on monkeypox disease and provide instructions and guidelines on the disease.

1. **World Health Organization (WHO):**

https://www.who.int/news-room/fact-sheets/detail/monkeypox

WHO (World Health Organization) is the directing and coordinating authority for health within the United Nations system. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries and monitoring and assessing health trends. In the 21st century, health is a shared responsibility, involving equitable access to essential care and collective defense against transnational threats.

2. **Pan American Health Organization:**

https://www.paho.org/en/monkeypox

PAHO is the specialized international health agency for the Americas. It works with countries throughout the region to improve and protect people's health. PAHO engages in technical cooperation with its member countries to fight communicable and no communicable diseases and their causes, to strengthen health systems, and to respond to emergencies and disasters. PAHO is committed to ensuring that all people have access to the health care they need, when they need it, with quality and without fear of falling into poverty. Through its work, PAHO promotes and supports the right of everyone to good health.

3. **United Nations Information Center:**

https://un.org.au/?s=monkeypox

The 63 United Nations Information Centers or UNICs, make up the global network of field offices of the UN Department of Public Information (DPI) which was established in 1946, by General Assembly resolution 13 (I), to promote global awareness and understanding of the work of the United Nations.

4. **Centers for Disease Control and Prevention:**

http://www.cdc.gov

Centers for disease control and prevention. CDC works 24/7 keeping America safe from health, safety, and security threats, both foreign and domestic. Whether diseases start at home or abroad, are chronic or acute, curable or preventable, human error or deliberate attack, CDC fights disease, and supports communities and citizens to do the same.

5. **Webmd:**

http://www.webmd.com

WebMD provides valuable health information, tools for managing your health, and support to those who seek information. You can trust that our content is timely and credible.

Frequently Asked Questions (FAQ) on Monkeypox

https://www.cdc.gov/poxvirus/monkeypox/faq.html

What is monkeypox?

Monkeypox is a rare disease caused by infection with the monkeypox virus. Monkeypox virus is part of the same family of viruses as variola virus, the virus that causes smallpox. Monkeypox symptoms are similar to smallpox symptoms, but milder, and monkeypox is rarely fatal.

Is monkeypox deadly?

Infections with the type of monkeypox virus identified in this outbreak—the Clade IIb —are rarely fatal. Over 99% of people who get this form of the disease are likely to survive. However, people with weakened immune systems, children under 8 years of age, people with a history of eczema, and people who are pregnant or breastfeeding may be more likely to get seriously ill or die.

What are the symptoms of monkeypox?

Symptoms of monkeypox can include:

- Fever
- Headache
- Muscle aches and backache
- Swollen lymph nodes
- Chills

Respiratory symptoms (e.g. sore throat, nasal congestion, or cough)

A rash that can look like pimples or blisters that appears on the face, inside the mouth, and on other parts of the body, like the hands, feet, chest, genitals, or anus.

The rash goes through different stages before healing completely. The illness typically lasts 2-4 weeks.

Sometimes, people get a rash first, followed by other symptoms. Others only experience a rash.

What should I do if I have monkeypox symptoms?

- See a healthcare provider if you notice a new or unexplained rash or other monkeypox symptoms.
- Remind the healthcare provider that monkeypox is present in the United States.
- Avoid close contact (including intimate physical contact) with others until you see a healthcare provider.
- Avoid close contact with pets or other animals until you see a healthcare provider.
- If you're waiting for test results, follow the same precautions.
- If your test result is positive, stay isolated and observe other prevention practices until your rash has healed, all scabs have fallen off, and a fresh layer of intact skin has formed.
- Remain isolated if you have a fever, sore throat, nasal congestion, or cough. Only go out to see a healthcare provider or for an emergency. Avoid public transportation.
- If you must leave isolation, cover the rash and wear a well-fitting mask.

How does monkeypox spread?

Monkeypox can spread from person to person through direct contact with the infectious rash, scabs, or body fluids. It also can be spread by respiratory secretions during prolonged, face-to-face contact, or during intimate physical contact, such as kissing, cuddling, or sex.

Monkeypox can spread from the time symptoms start until the rash has fully healed and a fresh layer of skin has formed. Anyone in close personal contact with a person with monkeypox can get it and should take steps to protect themselves.

How can monkeypox be prevented?

- Avoid close, skin-to-skin contact with people who have a rash that looks like monkeypox.
- Avoid contact with objects and materials that a person with monkeypox has used.
- Wash your hands often with soap and water or use an alcohol-based hand sanitizer, especially before eating or touching your face and after you use the bathroom.

What treatments are available for monkeypox?

There are no treatments specifically for monkeypox virus infections. However, because of genetic similarities in the viruses, antiviral drugs used to treat smallpox may be used to treat monkeypox infections.

Is there a vaccine to prevent monkeypox?

Because monkeypox and smallpox viruses are genetically similar, vaccines developed to protect against smallpox viruses may be used to prevent monkeypox infections.

The U.S. government has two stockpiled vaccines—JYNNEOS and ACAM2000—that can prevent monkeypox in people who are exposed to the virus.

Who should get vaccinated?

CDC recommends vaccination for people who have been exposed to monkeypox and people who may be more likely to get monkeypox, including:

- People who have been identified by public health officials as a contact of someone with monkeypox

- People who know one of their sexual partners in the past 2 weeks has been diagnosed with monkeypox
- People who had multiple sexual partners in the past 2 weeks in an area with known monkeypox

Could my pet get monkeypox?

Monkeypox is zoonotic, meaning it can spread between animals and people. However, CDC does not currently believe that monkeypox poses a high risk to pets. We are continuing to monitor the situation closely.

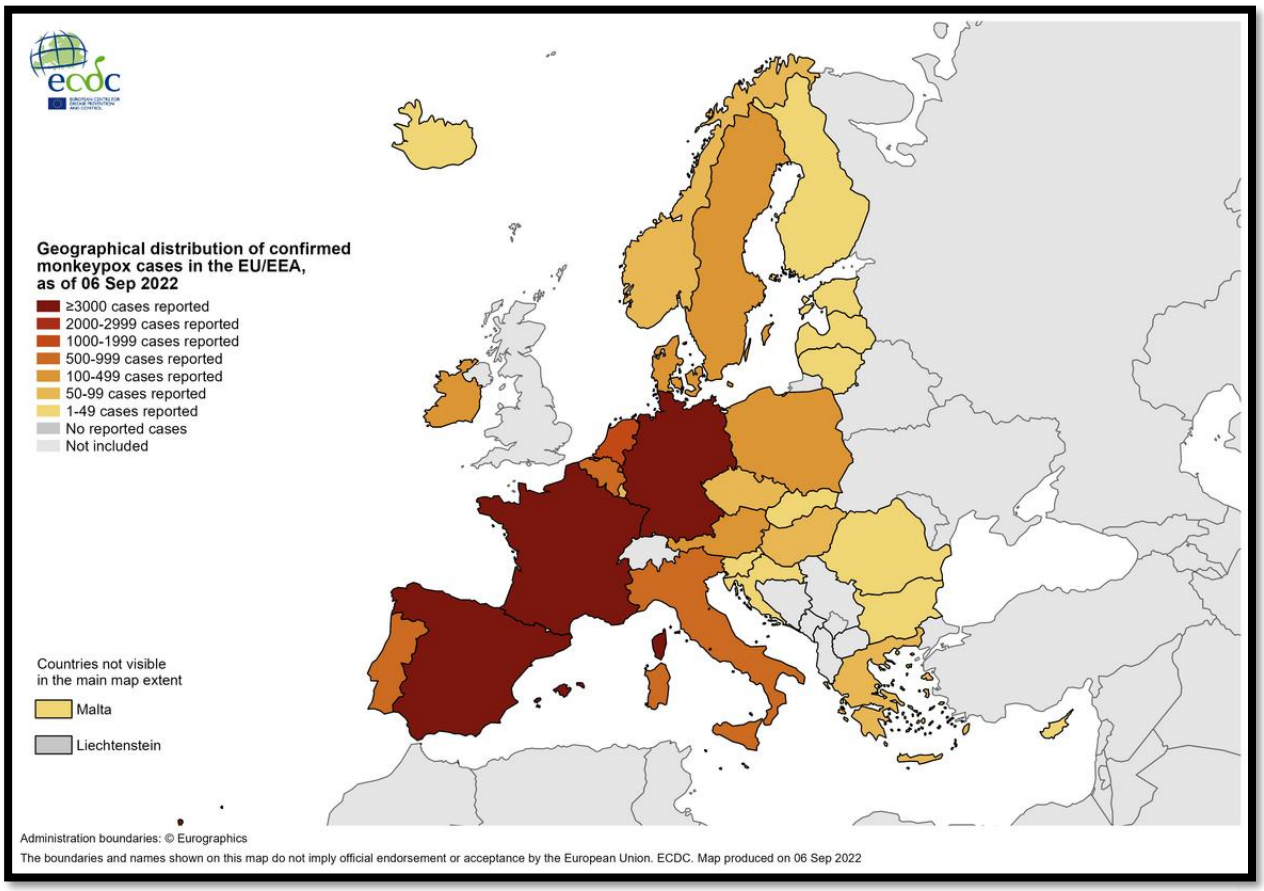
Statistical Reports on Monkeypox

1. Monkeypox situation update, as of 6 September 2022:

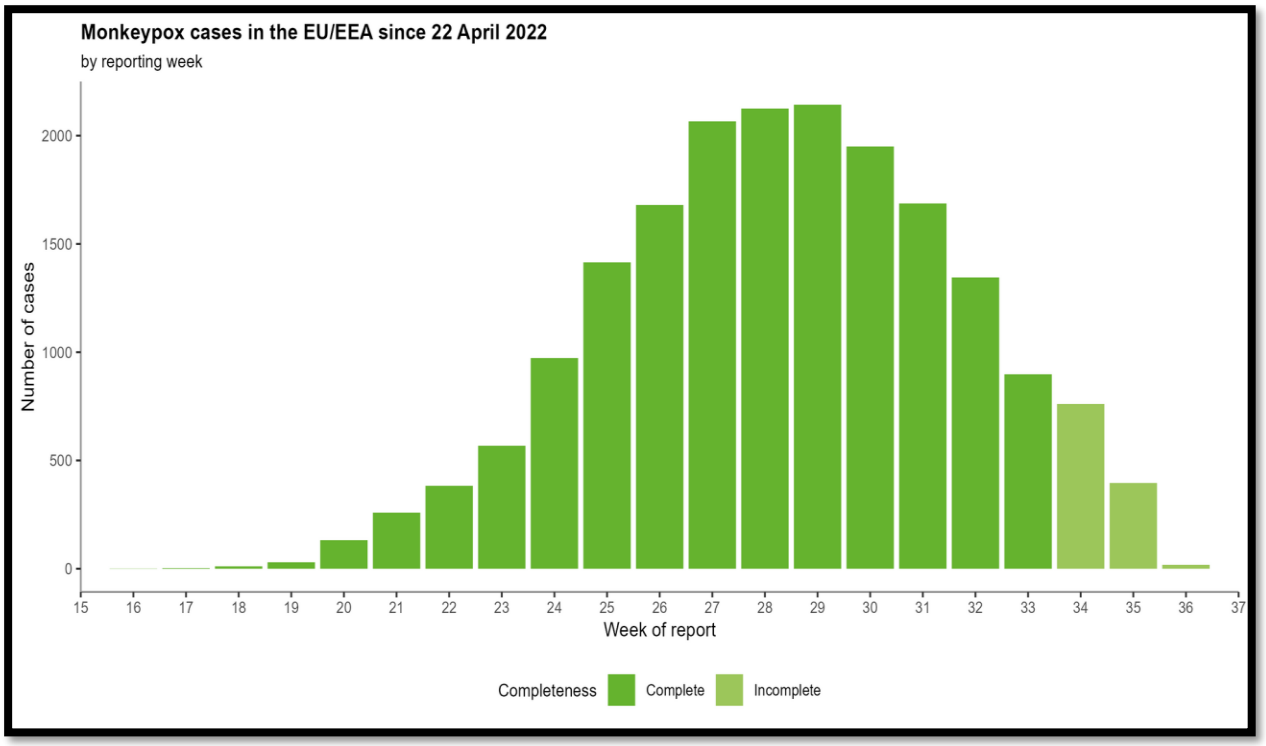
https://www.ecdc.europa.eu/en/news-events/monkeypox-situation-update

Since the start of the monkeypox outbreak and as of 6 September 2022, 18 844 confirmed cases of monkeypox (MPX) have been reported from 29 EU/EEA countries. In total, 47 cases have been reported from three Western Balkan countries and Turkey. The five countries reporting most cases since the start of the outbreak are Spain (6 749), France (3 645), Germany (3 505), Netherlands (1 172) and Portugal (789). Two deaths have been reported from Spain in July 2022, and one death from Belgium in August 2022. The highest cumulative notification rates have been reported in Spain, Luxembourg and Portugal.

Geographical distribution of confirmed monkeypox cases in the EU/EEA since the start of the outbreak, and as of 6 September 2022:



Number of confirmed monkeypox cases reported weekly in the EU/EEA, as of 6 September 2022



2. Multi-country monkeypox outbreak: situation update

https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON390

Since 13 May 2022, and as of 2 June 2022, 780 laboratory confirmed cases of monkeypox have been reported to or identified by WHO from 27 Member States across four WHO regions that are not endemic for monkeypox virus. Epidemiological investigations are ongoing. Most reported cases so far have been presented through sexual health or other health services in primary or secondary health care facilities and have involved mainly, but not exclusively, men who have sex with men (MSM).

While the West African clade of the virus has been identified from samples of cases so far, most confirmed cases with travel history reported travel to countries in Europe and North America, rather than West or Central Africa where the monkeypox virus is endemic. The confirmation of monkeypox in persons who have not travelled to an endemic area is atypical, and even one case of monkeypox in a non-endemic country is considered an outbreak. While most cases are not associated with travel from endemic areas, Member States are also reporting small numbers of cases in travelers from Nigeria, as has been observed before.

The sudden and unexpected appearance of monkeypox simultaneously in several non-endemic countries suggests that there might have been undetected transmission for some unknown duration of time followed by recent amplifier events.

WHO assesses the risk at the global level as moderate considering this is the first time that many monkeypox cases and clusters are reported concurrently in non-endemic and endemic countries in widely disparate WHO geographical areas.

WHO continues to receive updates on the situation in endemic countries.

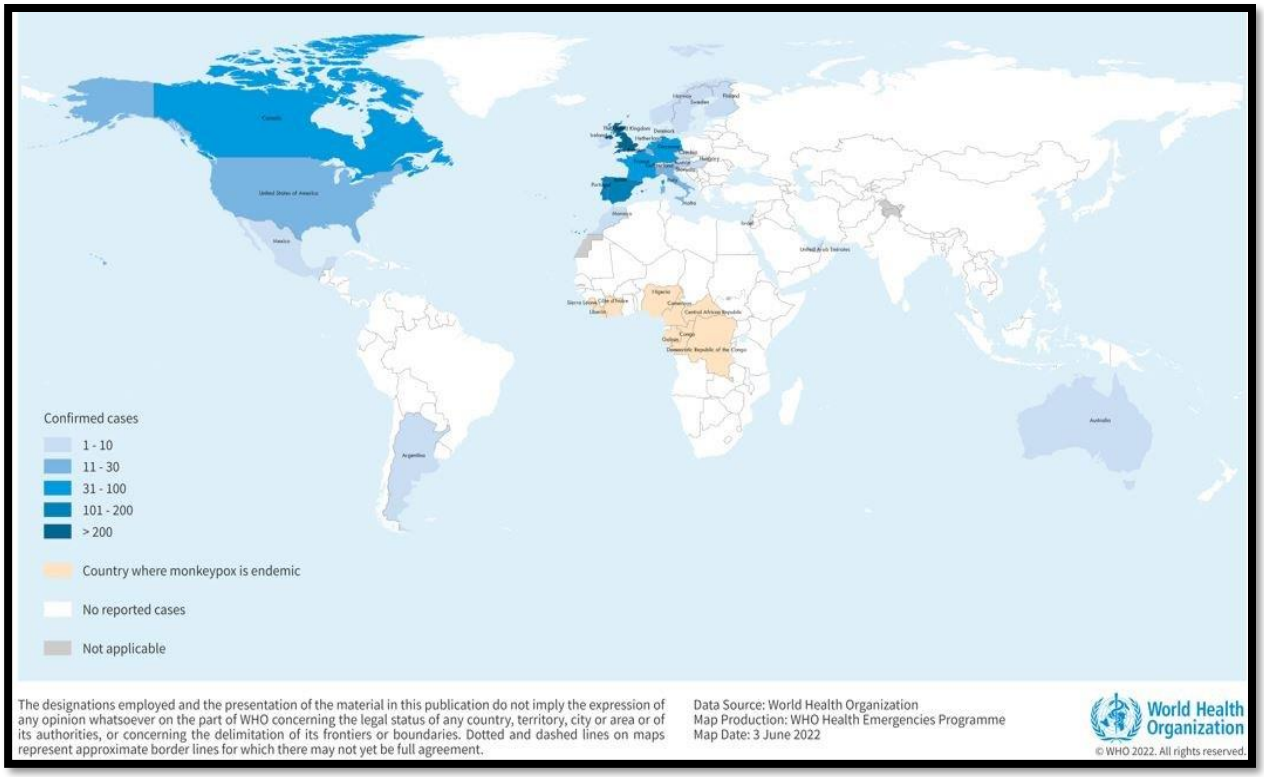


Figure1: Geographic distribution of cases of monkeypox in non-endemic countries reported to or identified by WHO from official public sources, between 13 May and 2 June 2022, 5 PM CEST.

Region	Country	Confirmed
AMRO	Argentina	2
	Canada	58
	Mexico	1
	United States of America	19
EMRO	Morocco	1
	United Arab Emirates	8
EURO	Austria	1
	Belgium	12
	Czechia	6
	Denmark	2
	Finland	2
	France	33
	Germany	57
	Hungary	1
	Ireland	4
	Israel	2
	Italy	20
	Malta	1
	Netherlands	31
	Norway	1
	Portugal	138
	Slovenia	6
	Spain	156
	Sweden	4
	Switzerland	4
	United Kingdom of Great Britain and Northern Ireland	207
WPRO	Australia	3
Cumulative	**27 countries**	**780**

Table 1. Cases of monkeypox in non-endemic countries reported to or identified by WHO from official public sources between 13 May and 2 June 2022, 5 PM CEST.

Country	Confirmed cases	Suspected cases	Deaths
Cameroon	3	28	2
Central African Republic	8	17	2
Republic of Congo	2	7	3
Democratic Republic of the Congo	10	1 284	58
Liberia	0	4	0
Nigeria	21	66	1
Sierra Leone	0	2	0
Cumulative	**44**	**1 408**	**66**

Table 2. Cases of monkeypox in the WHO African Region reported to WHO from 1 January 2022 to 1 June 2022

References

1. https://www.who.int/
2. https://www.ecdc.europa.eu/en
3. https://www.scopus.com