

# Mpox Outbreak in DRC 2023 - General informations

The « General informations » section presents a detailed overview of the outbreak, including case definitions and guidelines by health authorities  
The content of this document are subject to change as the health situation evolves. All informations comes from a valid and credible source.

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<https://anrs.fr/en/emergence-units/cellule-emergence-mpox-drc-2023/>

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## Overview

Source : Mpox (monkeypox) - Democratic Republic of the Congo | Disease Outbreak News. World Health Organization. 23 November 2023.

### TIMELINE

- **Since January 2023**, a nationwide resurgence of MPXV infections has been experienced in Democratic Republic of the Congo (DRC), along with an expansion to new geographical areas that were previously unaffected (including urban areas such as Kinshasa, the capital home to 17 million inhabitants).

- **As of 6 December 2023**, a total of **12,569 suspected cases** and **581 deaths** have been reported across 23 of the 26 provinces. The provinces who reported the highest number of suspected cases are Equateur (North-West), Maindombe (West), Sankuru (Central) and Tshopo (North-Central). Of the 1,106 suspected cases (8.8%) that were tested for mpox by PCR assay, **65% were confirmed positive for clade 1 MPXV**. The annual incidence of cases is now the highest ever recorded in DRC. This upsurge appears to be unrelated to the multi-country outbreak of Monkeypox caused by clade II viruses declared in May 2022, as only clade 1 viruses are currently circulating in DRC.

- **On 21 November 2023**, the Ministry of Health of DRC informed the World Health Organization (WHO) of five confirmed cases of Monkeypox viruses (MPXV) among locals - four men and one woman - who had engaged sexual relations with a Belgian resident exhibiting genital and anal lesions. The National Institute for Biomedical Research (NIBR) shortly confirmed that the Monkeypox strains identified belong to phylogenetic clade 1. **This is the first documented instance of sexual transmission of clade 1 Monkeypox viruses.**

- **On 29 January 2024**, the WHO released an update on the epidemiological situation of mpox in Central African nations, disclosing **14,600 infections** and **901 recorded deaths** throughout the entire year of 2023. These numbers are likely underestimated due to limited availability and access to healthcare facilities and financial constraints in seeking medical attention. **Children under the age of 15** constituted the most affected group, accounting for **65% of mpox reported cases** and **75% of fatalities**. Disease contraction and spreading was frequently occurring during playtime interactions. As of April 2023, only 34 cases have been reported among sex workers in the DRC, leaving the full extent of clade 1 MPXV sexual transmission yet to be determined.

- **On 17 March 2024**, the Ministry of Health of DRC notified the WHO of an update regarding the number of MPXV human cases in the country. Health authorities reported **14,626 suspected cases** and **654 deaths** in the full year of 2023, resulting in a case-fatality rate (CFR) of 4.5%.

- **As of 28 April 2024**, a total of **4,965 suspected cases** of mpox, **319 confirmed cases** and **322 associated deaths** (CRF 6.5%) has been recorded in the DRC according to the latest Africa CDC Surveillance Report. Children account for two thirds of the reported mpox cases.

EPIDEMIOLOGY

- Mpox is a **sylvatic zoonosis** with incidental human infections that usually occur sporadically in forested parts of Central and West Africa, where it is considered endemic. It is caused by the monkeypox virus (Orthopoxvirus genus). The animal reservoir remains unknown, although is likely to be among rodents.
- **There are two known clades of MPXV** : clade I, previously known as the Congo Basin clade, and clade II, previously called the West African clade. Clade II further divides in two subclades : clade IIa and clade IIb. **The case fatality ratio (CFR)** for MPXV has been documented to be around 3-6% for past outbreaks in Africa, with mortality mostly affecting young children. During the 2022 multi-country outbreak, the CFR was approximately 0.03%.
- The virus is **transmitted from animals to humans** through contact with live and dead animals through hunting or consumption of contaminated bushmeat. **Human-to-human transmission** of MPXV mainly occurred through direct contact with lesions, body fluids, respiratory droplets or contaminated materials, such as clothing or linens. However, the spread of the multi-country outbreak of clade IIb MPXV in 2022 was mainly driven by transmission via sexual contact among men who have sex with men, changing the paradigm in the way MPXV can be transmitted. Prior to November 2023 in DRC, no formally documented cases of sexual transmission of clade I MPXV were registered.
- Rural areas, where the animal reservoir may reside, are at higher risk of zoonotic transmission of MPXV. Small household or community who are in close contact with an infected individual are at higher risk of infection. The new features of modes of transmission for clade I MPXV now categorize sex workers and men who have sex with men as a population at risk.
- The **incubation period of MPXV** ranges from 2 to 21 days, although some people can acquire infection without developing symptoms. Patients are considered infectious from the time of symptom onset until skin lesions have crusted and a fresh layer of skin has formed underneath.
- The **disease** is often self-limiting with symptoms usually resolving spontaneously in **two to four weeks**. A febrile prodrome with fever, muscle aches, sore throat and lymphadenopathy (swollen lymph nodes) appear first and last for 1 to 4 days, followed by skin and/or mucosal rash. Typically, the lesions evolve through macules, papules, vesicles and pustules, before crusting over and desquamating. Lesions mainly affect the palms of the hands and the soles of the feet but can also manifest in the conjunctival, urethral, penile, vaginal, ano-genital and ano-rectal areas. Symptoms can be mild or severe, and patients may develop single or multiple lesions which can be very itchy or painful. Complications may occur, such as secondary skin infections, septicemia, encephalitis or corneal ulceration. Children and immunocompromised individuals are particularly at risk for severe forms of the disease. Monkeypox during pregnancy may lead to complications, such as congenital mpox or stillbirth.
- **Therapeutic management** relies mainly on supportive care, managing pain and preventing further complications. Several antivirals, such as tecovirimat, originally developed to treat smallpox, have been used to treat mpox and several studies are underway.
- There are currently **three vaccines** approved in different jurisdictions for the prevention of mpox. These third-generation smallpox vaccines contain non-replicating or minimally-replicating strains of vaccinia virus such as MVA-BN (Bavarian Nordic, Denmark), LC16 (KMB Biologics, Japan) and OrthopoxVac (Russia). The most commonly administered vaccine has been the MVA-BN, for which a favourable safety profile with mild side effects has been documented. MVA-BN is approved by U.S. Food and Drug Administration (FDA) and European Medicines Agency (EMA) for use in high-risk adult populations against mpox in U.S. (JYNNEOS®), Canada (IMVAMUNE®) and EU/EEA countries (IMVANEX®). 1<sup>st</sup> and 2<sup>nd</sup> generation smallpox vaccines widely used in the 1950-1970s, such as the replication-competent vaccine ACAM2000®, also provides cross-protection against mpox, although populations under the age of 40 or 50 years do not benefit from prior smallpox vaccination programmes. ACAM2000® is currently approved by the FDA for emergency use in U.S., but is not authorised in EU/EEA countries owing to significant side effects. To date, vaccines have been provided to their most vulnerable populations in 83 countries. However, they are not yet widely available, particularly in countries where the disease is endemic.
- MPXV is classified as a **risk group 3 (RG-3) pathogen** and requires stringent containment and appropriate safety measures to minimise risk to laboratory personnel. Standard operating procedures must be ensured for specimen collection, storage, packaging and transport. All specimens collected for laboratory investigations should be regarded as potentially infectious and handled with caution. Primary preventive vaccination is recommended for health workers, including laboratory personnel at risk for repeated exposure.
- WHO assesses the risk posed by the outbreak as **high** at the international level. WHO evaluated a significant risk of further mpox spread to **neighbouring countries** (Central African Republic, Angola, Zambia, Tanzania, Burundi, Rwanda, Uganda and South Sudan) or to those sharing a high cultural identity with DRC.



## Case definition

Source : Surveillance, case investigation and contact tracing for mpox (monkeypox): interim guidance, 20 March 2024.

<b>CONFIRMED</b>	Any person, alive or dead, meeting the case definition for a suspected or probable case and is laboratory confirmed for MPXV by detection of unique sequences of viral DNA by real-time polymerase chain reaction (PCR) assay and/or sequencing – from lesion fluids, skin specimens or crusts.
<b>PROBABLE</b>	<p>Any person, alive or dead, presenting with an unexplained acute skin rash, mucosal lesions or lymphadenopathy (swollen lymph nodes) in the oral, conjunctival, urethral, penile, vaginal, ano-rectal regions or elsewhere on the body.</p> <p>AND one or more of the following :</p> <ul style="list-style-type: none"> <li>- has an epidemiological link with a probable or confirmed case : face-to-face exposure, including health workers without eye and respiratory protection, direct physical contact with rash or skin lesions or contact with contaminated materials such as clothing, bedding or utensils within 21 days before symptoms onset.</li> <li>- Reported multiple and/or casual sexual partners in the 21 days before symptoms onset.</li> <li>- Has detectable levels of anti-orthopoxvirus (OPXV) IgM antibodies (during the period of 4 to 56 days after rash onset); or a four-fold rise in IgG antibody titer based on acute and convalescent samples ; in the absence of a recent smallpox/mpox vaccination or other known exposure to OPXV.</li> <li>- Has a positive test result for orthopoxviral infection (e.g., OPXV-specific PCR without MPXV-specific PCR or sequencing).</li> </ul>
<b>SUSPECTED</b>	<p>Any person who is a contact of a probably or confirmed monkeypox case in the 21 days before the onset of signs or symptoms, and who presents with any of the following : acute onset of fever (&gt; 38.5°C), headache, myalgia, back pain, profound weakness or fatigue.</p> <p>Any person presenting with an unexplained acute skin rash, single or multiple mucosal lesions or lymphadenopathy (swollen lymph nodes). Single or multiple lesions can manifest in the oral, conjunctival, urethral, penile, vaginal, ano-rectal region or elsewhere on the body.</p> <p>AND for which common causes of disseminated rash or discrete skin lesions do not fully explain the clinical picture :</p> <ul style="list-style-type: none"> <li>- varicella zoster (VZV, chickenpox)</li> <li>- herpes simplex (HSV)</li> <li>- primary or secondary syphilis (treponema pallidum)</li> <li>- disseminated gonococcus infection</li> <li>- measles</li> <li>- bacterial skin and soft tissue infections</li> <li>- chancroid</li> <li>- medication, food, household chemicals or other types of allergies (e.g. plants)</li> </ul>
<b>CONTACT</b>	<p>Any person who has been exposed to a probable, suspected or confirmed case during the period from the onset of the first symptoms to its recovery phase through :</p> <ul style="list-style-type: none"> <li>- direct skin-to-skin and skin-to-mucosal or mouth-to-mucosal contact (such as touching, hugging, kissing, sexual contact)</li> <li>- contact with contaminated materials such as clothing, bedding or surfaces during handling of laundry or cleaning of contaminated rooms</li> <li>- prolonged face-to-face respiratory exposure in close proximity (inhalation of respiratory droplets and possibly short-range aerosols)</li> <li>- respiratory or mucosal exposure to lesion material (e.g. scabs, crusts, fluids) from an infected person</li> <li>- The above also apply for health workers potentially exposed in the absence of proper use of personal protective equipment</li> </ul>
<b>DISCARDED</b>	A suspected or probable case for which laboratory testing of lesion fluid, skins specimens or crusts by PCR and/or sequencing is negative for MPXV. A probable case for which lesion testing can no longer be adequately performed (i.e., after the crusts have fallen off) and does not yield a positive PCR result from any other specimen, would remain classified as a probable case. A suspected or probable case should not be discarded based on a negative result from an oropharyngeal, anal or rectal swab or from a blood test alone.



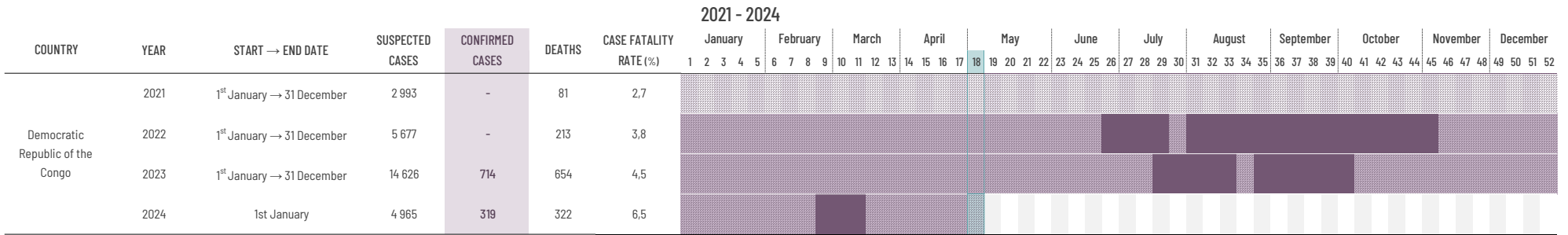
## Guidelines and practical informations

March 20, 2024	Surveillance, case investigation and contact tracing for mpox (monkeypox): Interim guidance, 20 March 2024 (WHO)
November 9, 2023	Diagnostic testing for the monkeypox virus (MPXV): interim guidance, 9 November 2023 (WHO)
May 13, 2023	Infection au Monkeypox virus : procédure opérationnelle de prélèvement (COREB)
April 27, 2023	Infection par le Monkeypox virus : repérer et prendre en charge un patient en France (COREB)
April 20, 2023	Définition de cas et contacts et conduite à tenir pour la recherche des contacts (SPF)
April 14, 2023	Public health considerations for mpox in EU/EEA countries (ECDC)
March 20, 2023	Public health advice on mpox and congregate settings: settings in which people live, stay or work in proximity (WHO)
March 9, 2023	Public health advice for gay, bisexual and other men who have sex with men on the recent outbreak of mpox (WHO)
December 16, 2022	Révision du plan de lutte contre la variole (HCSP)
November 20, 2022	Monkeypox strategic preparedness, readiness, and response: Operational planning guidelines (WHO)
November 16, 2022	Vaccines and immunization for monkeypox: interim guidance (WHO)
October 5, 2022	Monkeypox Strategic Preparedness, Readiness, and Response Plan (WHO)
September 30, 2022	Public health advice for sex workers on mpox (WHO)
September 1, 2022	Risk communication and community engagement public health advice on understanding, preventing and addressing stigma and discrimination related to mpox (WHO)
August 16, 2022	Monkeypox infection prevention and control guidance for primary and acute care settings (ECDC)
June 30, 2022	Risk communication and community engagement approaches during the monkeypox outbreak in Europe, 2022 (ECDC/WHO)
June 28, 2022	Considerations for contact tracing during the monkeypox outbreak in Europe, 2022 (ECDC)
June 10, 2022	Clinical characterization of mpox including monitoring the use of therapeutic interventions (WHO)
June 10, 2022	Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance (WHO)
June 10, 2022	Navigating monkeypox: considerations for gay and bisexual men and other men who have sex with men (ECDC)
June 9, 2022	Monkeypox - Aide au diagnostic dermatologique et au traitement symptomatique (COREB)
June 09, 2022	avis relatif à la conduite à tenir pour les cas confirmés d'infection à Monkeypox virus (MPXV) à risque de forme grave et pour les personnes contacts à risque d'infection par MPXV (HCSP)
July 09, 2022	Mesures de prévention vis-à-vis de l'infection à Monkeypox virus (HCSP)
May 24, 2022	avis relatif à la conduite à tenir autour d'un cas suspect, probable ou confirmé d'infection à Monkeypox virus (HCSP)

# Mpox Outbreak in DRC 2023 - Current status

The « Current status » section shows the outbreak chronology and the reported cases by geographical location  
 The content of this document are subject to change as the health situation evolves. All informations comes from a valid and credible source.

## Outbreak timeline and reported cases



Source : Weekly Event Based Surveillance Report. Africa Centres for Disease Control and Prevention. 28 April 2024

Current week : 18

REPORTED CASES EPIDEMIC PEAK NO DATA

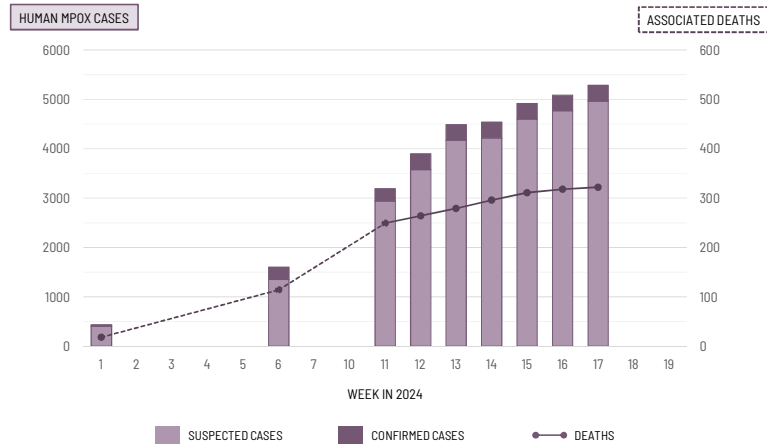


Fig. 1. Reported cases and deaths of human mpox in DRC in 2024 - As of 28<sup>th</sup> April.

# Mpox Outbreak in DRC 2023 - Relevant news

The « Relevant news » section presents official reports from health agencies and press releases with reliable sources

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Date	Source	Type of publication	Title	Key facts
01/05/2024	CIDRAP	News	Global mpox trends reveal hot spots in Africa, Europe, Americas	The WHO's latest monthly update highlights ongoing mpox transmission, particularly in Africa, Europe, and the Americas, with 466 new cases reported in March 2024. The Democratic Republic of the Congo (DRC) leads in case numbers, notably with a novel clade 1 virus outbreak. Ten countries, including the Republic of Congo and the UK, reported rises. Risk levels vary, with high risks in the DRC and moderate risks in historically affected countries and certain population groups. Despite fluctuations, monthly cases have ranged from 400 to 1,000, with sexual encounters as the primary mode of transmission, though Africa shows diverse transmission patterns. WHO advisers raise the importance of targeted vaccination efforts for at-risk populations and emphasize the need for robust research and vaccine access, with final recommendations expected in May.
01/05/2024	CIDRAP	News	Jynneos estimate shows strong protection against mpox	A recent meta-analysis of 16 studies assesses the effectiveness of Jynneos, a two-dose vaccine, against mpox. Published on medRxiv, the analysis indicates a VE of 35% to 86% for one dose in pre-exposure prophylactic vaccination (PrEP) and 78% to 89% for post-exposure prophylactic vaccination. With over 94,000 confirmed cases across 117 countries by February 2024, the findings are significant. Administered prophylactically in two doses, 28 days apart, Jynneos shows varied effectiveness across different administration routes, with comparable protection levels observed for intradermal and subcutaneous injections. The authors emphasize the vaccine's effectiveness in mitigating symptomatic mpox infections during outbreaks.
27/04/2024	NIH	News Releases	Lower dose of mpox vaccine is safe and generates six-week antibody response equivalent to standard regimen	A study reveals that an intradermal dose-sparing mpox vaccination regimen using JYNNEOS is safe and elicits an antibody response comparable to the standard regimen at six weeks post-second dose. This regimen, studied amid the 2022 U.S. outbreak, aimed to extend limited vaccine supplies. The study, sponsored by the NIAID, enrolled 225 adults aged 18 to 50, comparing standard and dose-sparing regimens. Two weeks post-second dose, participants receiving one-fifth of the standard dose showed equivalent antibody levels to the standard regimen, though lower levels were observed by day 57. Adverse events were mild and consistent across all trial arms. However, without established correlates of protection, the efficacy of dose-sparing regimens remains uncertain, though real-world data suggest similar effectiveness to the standard regimen. Ongoing research on adolescents using the standard regimen may provide further insights.
23/04/2024	Nature	News	Monkeypox virus: dangerous strain gains ability to spread through sex, new data suggest	A virulent strain of monkeypox, clade I, has gained the ability to spread through sexual contact, sparking concerns of a resurgence akin to the 2022 outbreak. The Democratic Republic of the Congo faces a cluster of infections, particularly affecting sex workers, exacerbated by a humanitarian crisis and limited testing capacity. Genetic analysis reveal adaptive mutations, leading to the proposal of naming the active strain clade Ib. Efforts to curb the outbreak include heightened surveillance and vaccination campaigns, though challenges persist in vaccine distribution and effectiveness against clade I. Antiviral trials are ongoing, with hopes for results within a year. Rapid diagnosis equipment are being procured to aid control efforts, emphasizing the crucial role of swift action by African health officials to prevent further spread.
19/04/2024	CIDRAP	News	Mpox rates steady year-round in Africa, vary by season in Northern Hemisphere tropics	An analysis spanning from 1970 to 2021 reveals that mpox cases were detected year-round in equatorial Africa but seasonally in tropical regions in the Northern Hemisphere. Conducted by Institut Pasteur researchers, the study examined 133 zoonotic index cases, relying on both peer-reviewed literature and meteorological and environmental data. The majority of cases occurred after 2000, with the clade 1 strain predominating, particularly in the Democratic Republic of the Congo and the Central African Republic. Despite a poorly understood epidemiology and an unknown animal reservoir, the study indicate that climate change could exacerbate seasonal patterns.

17/04/2024	CIDRAP	News	<a href="#">New mpox clade 1 lineage identified in DR Congo outbreak</a>	In a recent preprint study, scientists identified a new monkeypox clade, clade 1b, driving a severe outbreak in the DRC. Unlike the global clade 2, clade 1b is more virulent and spreading through sexual transmission. Analysis from October 2023 to January 2024 traced rapid spread from Kamituga's mining area, where sex workers accounted for nearly 30% of confirmed cases. This context poses a risk of further spread, especially given the region's limited healthcare and frequent travel to neighboring countries. Urgent action is needed to avert another global monkeypox outbreak, emphasizing the importance of decisive measures by both local and international authorities.
13/04/2024	WHO AFRO	Communiqué de presse	<a href="#">High-level emergency regional meeting : United in the fight against mpox in Africa</a>	On April 13th, Africa CDC organized an emergency regional meeting to address the ongoing monkeypox outbreak in Central and West African nations, emphasizing the critical need for unified action. Concerns were raised regarding the shift of transmission patterns, high mortality rates, and limited access to medical countermeasures. Participants highlighted the importance of a 'One Health' approach and coordinated responses to strengthen surveillance and laboratory capabilities. Proposals were made for establishing an Africa Taskforce to facilitate regional cooperation and support among African Union Member States, including real-time data sharing and cross-border collaboration, to enhance preparedness and response efforts.
10/04/2024	CIDRAP	News	<a href="#">Study shows offering mpox vaccine leads to high uptake</a>	An online survey of UK men who have sex with men (MSM) in late 2022 found that 69% of eligible respondents received the mpox vaccine, with 53% reporting behavior changes to avoid mpox. Although the vaccine became available in 2022, only 42% of those starting the series completed the second dose. Factors influencing vaccination rates included sexual orientation, education level, and employment status. The authors emphasize the urgent need to prioritize completing the vaccination course to prevent future outbreaks.
10/04/2024	PR Newswire	News	<a href="#">Labcorp Receives FDA Emergency Use Authorization for Mpox PCR Test Home Collection Kit</a>	A home-testing PCR kit for mpox developed by Labcorp were recently granted Emergency Use Authorization by the FDA, providing patients with a convenient and private way to diagnose the condition. Physicians can prescribe the kit for patients with suspected mpox infection, who can then collect samples at home following detailed instructions. The collected samples undergo PCR testing in authorized laboratories, with results shared electronically with both the physician and patient. This approval comes amidst rising mpox cases in the US, aiming to make the test quickly available and contributing to early detection of cases.
05/04/2024	ECDC	Epidemiological update	<a href="#">Outbreak of mpox caused by Monkeypox virus clade I in the Democratic Republic of the Congo</a>	The ongoing monkeypox outbreak in the DRC primarily affects the central and northern regions, with most cases caused by the clade I MPXV, although only 10% have been confirmed. Various transmission routes, including human-to-human sexual transmission, have been observed, notably documented in a 2023 cluster in Kwango province. Children under 15 constitute 70% of cases, associated with high mortality rates. However, the risk of importation into Europe remains low due to limited direct travel connections, although local spread to neighboring countries is possible. Despite the rising in cases, the overall risk to the EU/EEA population, including men who have sex with men (MSM), is low, given factors like the absence of zoonotic reservoirs and existing immunity. Continued preparedness efforts, including surveillance, testing, and risk communication, are recommended to respond promptly to potential introductions at the EU level.
04/04/2024	CIDRAP	News	<a href="#">DR Congo mpox outbreak tops 4,500 cases so far this year</a>	The monkeypox outbreak in the DRC is accelerating, with cases in the first quarter of 2024 tripling compared to the same period last year, according to WHO. The outbreak involves a different clade than the global spread, with the clade 1 virus proving more virulent and showing an unexpected pattern of spread, including sexual transmission. Over 4,500 cases and nearly 300 deaths have been reported this year, emphasizing the urgency for financial support and vaccine access. The WHO and partners are aiding the DRC's response, but more funding is needed to prevent further spread and ensure vaccine availability.
02/04/2024	Bavarian Nordic	Announcement	<a href="#">Bavarian Nordic Announces Commercial Launch of Mpox Vaccine in the U.S.</a>	Bavarian Nordic has announced that JYNNEOS®, the only FDA-approved mpox vaccine, is now commercially available in the U.S. Since 2022, JYNNEOS has been accessible through public health clinics and interim guidance from CDC. Updated recommendations in October 2023 now include routine use of JYNNEOS for at-risk individuals aged 18 and older. Leveraging existing distribution networks beyond public health channels is marking a significant expansion in access to smallpox vaccine, now available for order by healthcare providers through wholesalers, local pharmacies and physician offices.

01/04/2024	CIDRAP	News	Studies highlight waning antibodies after mpox vaccination	Two new studies shed light on the durability of antibody levels produced after vaccination with JYNNEOS®. The first study, conducted in Sweden, examined 100 men who have sex with men (MSM), revealed that less than half of the participants without prior smallpox vaccination had any detectable neutralizing antibodies 28 days after the second dose, while individuals who had previously received a smallpox vaccine exhibited significantly higher antibody levels. The second study, conducted in the Netherlands, corroborated these findings, demonstrating a notable decline in antibody levels among individuals without pre-existing immunity one year after the second vaccination. Consequently, participants with childhood smallpox vaccination exhibited a prolonged humoral response over time, indicating the potential importance of prior smallpox vaccination in building immunity against mpox.
22/03/2024	CIDRAP	News	DR Congo mpox outbreak expands, becomes deadlier	The overall proportion of deaths associated with mpox disease in the DRC is rising according to the WHO, with a higher case-fatality rate (CFR) of 7% compared to the global CFR of less than 0.2%. So far, the DRC has reported 3,941 suspected mpox cases this year, 271 of them fatal. Children make up two-thirds of reported cases, with infants and young children at higher risk of complications and death. Diagnostic challenges have led to only a fraction of cases being lab-confirmed in the country.
15/03/2024	Associated Press News	News	Republic of Congo reports its first mpox virus cases, in several regions	The Republic of Congo has reported its first cases of mpox in several regions. According to the ministry, a total of 43 cases have been recorded, across nine out of the country's 12 departments. Currently, no information regarding the circulating clade and its potential connection to the ongoing outbreak in the DRC since November 2023 have been disclosed.
15/03/2024	CIDRAP	News	More than 600 dead in spreading DR Congo mpox outbreak as Republic of Congo reports its first cases	The country's health ministry and the DRC office of the World Health Organization declared that 14,626 suspected cases were reported, with 654 deaths, for a case-fatality rate (CFR) of 4.5% in the full year of 2023. Within the first nine weeks of 2024, 3,576 suspected mpox cases and 265 deaths have been reported in the DRC, for an estimated CFR of 7.4%. Furthermore, an international research team sequenced mpox viral genomes from 10 hospitalized patients in the Kamituga health zone in South Kivu and found that the South Kivu outbreak resulted from a separate viral introduction, most likely of animal origin.
07/03/2024	CIDRAP	News	Heterosexual transmission found in DR Congo mpox outbreak	Researchers interviewed 51 of 164 patients who were admitted to Kamituga hospital on September 2023. Of that group, 24 were professional sex workers. Heterosexual partners were mainly affected, suggesting that heterosexual contact may be the main form of transmission. The investigators wrote that professional sex workers—primarily young women—were the dominant occupational group, suggesting that they and their clients may be at higher risk for contracting mpox.
18/01/2024	CIDRAP	News	Wastewater testing helpful in tracking mpox outbreaks	A new study published in <i>Morbidity and Mortality Weekly Report</i> shared findings regarding the routine surveillance of mpox in wastewater. Samples were collected from August 2022 until May 2023, representing thousands to millions of individuals. The probability that at least one person was shedding virus when a wastewater detection occurred was 72.6% per day, and 61.9% per week.
17/01/2024	CIDRAP	News	Europe's mpox activity continues at low level	Mpox cases persist at a relatively low level in the European region, as reported by the ECDC and WHO European regional office. Over the past month, 138 cases have been documented across 11 countries, all sequenced samples belonged to clade 2. Spain, Portugal, the United Kingdom, and Germany remain the countries with the highest reported cases.
10/01/2024	CIDRAP	News	Study shows safety of MVA-BN vaccine for mpox	A new study, published in <i>Vaccine</i> demonstrated the safety and tolerability of the smallpox MVA-BN vaccine, which provides protection against other orthopoxviruses. Two doses were administered to 1 173 participants at high risk of contracting mpox and few reported adverse effects were reported during a 8-month monitoring period. 60% of vaccinated experienced mild symptoms, such as localized injection-site pain, and no cases of severe neurological disease, skin conditions or myocarditis were documented.
03/01/2024	CIDRAP	News	2016 mpox outbreak in chimps at Cameroon sanctuary had 87% attack rate	A new study described a mpox outbreak occurring in a sanctuary housing approximately 300 captive chimpanzees, gorillas and monkeys. The outbreak affected 20 out of 23 adult and younger chimpanzees but showed no sign of propagation to other groups over the last six months. The most common signs included rash, lethargy and facial or peri-laryngeal swelling. The lethality rate stood at 10%, with two fatalities among the affected animals, while the remaining chimpanzees successfully recovered.



03/01/2024	JAMA	Medical News In Brief	More Virulent Mpox Clade Can Be Sexually Associated, WHO and CDC Warn	As of December 7, there were no reported cases of clade I mpox in the US, the Centers for Disease Control and Prevention (CDC) announced. Still, the CDC warned that clinicians need to be aware of the possibility of clade I mpox infection in their patients who have recently traveled to the DRC. Medications as well as vaccines to prevent infection are expected to be effective against both mpox subtypes.
22/12/2023	WHO	Report	Multi-country outbreak of mpox	The African region shows a relatively low case count of laboratory-confirmed cases. The section of the report focusing on the Democratic Republic of the Congo illustrates the high level of transmission occurring in the country as reflected by the high number of suspected (clinically compatible) cases reported.
15/12/2023	UN	News	L'épidémie de mpox s'étend en République démocratique du Congo, prévient l'OMS	The UN health agency recently carried out a mission to the DRC to assess the situation and support the national authorities in their response to the epidemic. WHO is collaborating with the Congolese Ministry of Health to support the distribution of sample collection and transport kits to referral hospitals from suspected cases in Kinshasa, South Kivu and other affected areas. At present, only 9% of mpox cases have been laboratory confirmed. It is also essential to close the gaps in access to vaccines and therapeutic products.
07/12/2023	CDC	Travel Notices	Level 2 - Practice Enhanced Precautions Mpox in the Democratic Republic of the Congo (DRC)	Travelers should: Avoid close contact with sick people, including those with skin lesions or genital lesions. Avoid contact with contaminated materials used by sick people (such as clothing, bedding, or materials used in healthcare settings) or that came into contact with infected animals. Avoid contact with dead or live wild animals, such as small mammals including rodents (rats, squirrels) and non-human primates (monkeys, apes). Avoid eating or preparing meat from wild game (bushmeat) or using products derived from wild animals from endemic countries throughout Central and West Africa (creams, lotions, powders).
07/12/2023	CDC	Health Alert Network	Mpox Caused by Human-to-Human Transmission of Monkeypox Virus with Geographic Spread in the Democratic Republic of the Congo	The Centers for Disease Control and Prevention (CDC) is issuing this Health Alert to notify clinicians and health departments about the occurrence, geographic spread, and sexually associated human-to-human transmission of Clade I MPXV in the DRC. Clinicians should be aware of the possibility of Clade I MPXV in travelers who have been in DRC and CDC recommends that clinicians encourage vaccination for patients who are eligible.
05/12/2023	ECDC	Threat Assessment Brief	Implications for the EU/EEA of the outbreak of mpox caused by Monkeypox virus clade I in the Democratic Republic of the Congo	Currently, there is no evidence that MPXV clade I is circulating outside certain central African countries and available MPXV sequences do not suggest circulation in the EU/EEA. The likelihood of infection from the ongoing epidemic mpox due to MPXV clade I is assessed as very low for the general EU population. The likelihood of infection with clade I virus for the population of men who have sex with men (MSM) with multiple sexual partners in the EU/EEA is considered higher than that of the general population.
05/12/2023	CIDRAP	News Brief	ECDC weighs in on wider risk from DRC mpox outbreak clade	The European Centre for Disease Prevention and Control (ECDC) said there's no evidence that clade 1 is spreading outside of central Africa. So far, genetic sequencing of viruses doesn't reflect any spread in EU/EEA. The current overall threat to the region is low. However, the risk from clade 1 infections is higher in MSM who have multiple sexual partners than for the general population.
30/11/2023	CIDRAP	News Brief	Details emerge on initial cases in latest DRC mpox outbreak	In March of 2023, a man from the DRC (case patient 1) in his late 20s reported having two sexual encounters with a man in Europe (suspected primary case) 1 week before returning to the DRC. The DRC man then reported having sexual contact with 9 more people, 6 men and 3 women. After case patient 1 developed penile lesions and fever and was seen in a health clinic, health officials contacted the 9 sexual contacts. Viral genome sequencing showed tight clustering among 3 PCR-positive samples, suggesting they belong to the same chain of transmission. The closest related sequence beyond this cluster was a 2022 clade 1 MPXV sequence from RDC. An additional 120 contacts from the initial cases were monitored and none of these contacts developed clinical symptoms of mpox over the 21-day monitoring period.

29/11/2023	Science	News	Amid Congo's deadliest mpox outbreak, a new worry: virus has become sexually transmissible	The WHO report and a study out today explore a worrisome possibility: that the strain of virus found in DRC, far deadlier than the one that drove the global outbreak, is in some cases spreading between sexual partners. Researchers are now rushing to analyze the latest DRC cases to see whether the local virus has changed genetically or whether the description pattern of transmission has been missing for the last decades, due to lack of resources to investigate. For the clade IIb virus that spread globally, genetic analyses showed that several mutations likely explained how it had changed to transmit more readily through sex. But there's no evidence yet that the viruses isolated from the DRC cases have undergone the same changes.
27/11/2023	CIDRAP	Special Edition	Mpox hits DR Congo hard as officials note sexual spread, 581 deaths	The outbreak likely began with a Belgian man who traveled to the DRC in March and tested positive for the disease shortly after arriving in the country. The man reported visiting several underground sex clubs for men who have sex with men (MSM) during his trip, even when he was symptomatic. A total of 27 contacts of the man were identified, and 6 were tested for mpox, with 5 sexual contacts testing positive. The initial cluster of cases is the first documented sexual transmission of mpox clade 1.
23/11/2023	WHO	News	Mpox (monkeypox)- Democratic Republic of the Congo	Before April 2023, no formally documented cases of sexual transmission of clade I MPXV were registered globally. The first known cases were reported when a man, resident in Belgium and with connections to the Democratic Republic of the Congo (DRC), tested positive for clade I in Kenge, Kwango province, during a visit to the DRC. Thereafter, sexual contacts of this case in the DRC also tested positive for clade I MPXV, with closely related viral sequences. This is the first time that reported clade I MPXV infection is linked to sexual transmission within a cluster. Another outbreak in the country is also being reported with multiple cases of mpox among sex workers.
16/11/2023	MSF	News	MSF responds to Mpox outbreak in Bolomba, DR Congo	From the end of August to mid-October 2023, an MSF emergency team was present in Equateur, a western province in Democratic Republic of Congo (DRC) highly affected by an outbreak of Mpox over the past months, to support the Ministry of Health in its response. The field humanitarians of MSF reinforced epidemiological monitoring at the community level and provided medical care in health centers as well as in the Bolomba general referral hospital, where an isolation circuit and a dedicated treatment unit were set up.
10/10/2023	NIAID	News	The STOMP trial evaluates an antiviral for mpox	The National Institute of Allergy and Infectious Diseases (NIAID) launched the STOMP trial to determine whether the antiviral drug tecovirimat can safely and effectively treat mpox. Tecovirimat was initially developed to treat smallpox—a species of virus closely related to mpox—but the drug's safety and efficacy as an mpox treatment has not been established. The STOMP trial is a phase 3 study that aims to enroll about 500 people—a process that may require considerable time while mpox burden is low in study countries. NIAID continues to prioritize this study even while case counts are low.
12/05/2023	Nature	News	Scientists fear Mpox support will wane as emergency ends	The World Health Organization (WHO) announced on 11 May that mpox is no longer a public-health emergency of international concern – but researchers fear that the decision will draw crucial resources away from curbing the disease, which is still prevalent in regions including Africa.
14/02/2023	NIH	News	NIH scientists develop mouse model to study mpox virulence	Scientists from the National Institute of Allergy and Infectious Diseases (NIAID) have developed an inbred mouse model of mpox disease (CAST/EiJ) and used it to demonstrate clear differences in virulence among the major genetic groups (clades) of mpox virus (MPXV). As in people, clade I was the most virulent in CAST mice, followed by clade IIa, then clade IIb. Unexpectedly, clade IIb virus was 100 times less virulent than clade IIa virus in mice and led to very little viral replication and much lower virulence than either of the historic clades. No mice died of Clade IIb infection, despite exposure to extremely large doses of virus. Together, the results suggest that clade IIb is evolving diminished virulence or adapting to other species.
23/06/2022	Nature	News	Monkeypox in Africa: the science the world ignored	In recent weeks, the WHO has recognized the inequity in the global attention that monkeypox is receiving. After monkeypox cases exploded last year in countries where outbreaks don't usually occur – a rapid, global response followed, including the distribution of vaccines in some non-endemic countries. But monkeypox outbreaks have been occurring in parts of Central and West Africa for years, leaving African researchers there disheartened that such resources have not been made available in their countries, where the disease's toll has been highest. Member nations of the World Health Organization (WHO) have pledged more than 31 million smallpox-vaccine doses to the agency for smallpox emergencies – but these have never been distributed to Africa for use against monkeypox.

# Mpox Outbreak in DRC 2023 - Scientific articles

The « Scientific articles » section presents relevant articles published on peer-reviewed scientific journals or pre-print platforms

The content of this document are subject to change as the health situation evolves. All informations comes from a valid and credible source.

This table provides a condensed summary of a more extensive content accessible in Excel format here.

Date	Source	Type of publication	Title	Key facts
08/05/2024	Analytica Chimica Acta	Research article	<a href="#">A rapid and sensitive fluorescent chromatography with cloud system for MPXV point-of-care diagnosis</a>	In this study, a rapid and sensitive fluorescent chromatography assisted with cloud system was developed for point-of-care diagnosis of mpox. To screen high affinity antibodies, nanoparticle antigen AaLS-A29 was generated by conjugating A29 onto scaffold AaLS. Monoclonal antibodies (mAb) were generated with the immunized mice, and the mAb MXV 14 and MXV 15, were selected for fluorescence chromatography development. After optimization of the label and concentration of antibodies, a sensitive Time-Resolved Fluorescence Immunoassay (TRFIA) assay with detection limit of 20 pg/mL and good repeatability was developed. The detection of the surrogate Vaccinia virus (VACA) strain Tian Tan showed that the TRFIA assay was more sensitive than the SYBR green I based quantitative PCR. In real samples, the detection result of this assay were highly consistent with the judgement of qRT-PCR (Concordance Rate = 90.48%) as well as the clinical diagnosis (Kappa Value = 0.844, P < 0.001). By combining the portable detection and online cloud system, the detection results could be uploaded and shared, making this system ideal for point-of-care diagnosis of mpox both in field laboratory and outbreak investigation.
30/04/2024	Emerging Infectious Diseases	Research article	<a href="#">Health Belief Model to Assess Mpox Knowledge, Attitudes, and Practices among Residents and Staff, Cook County Jail, Illinois, USA, July-August 2022</a>	In summer 2022, a case of mpox was confirmed in a resident at the Cook County Jail (CCJ) in Chicago, Illinois, USA. Some in-depth interviews were conducted with CCJ residents and staff to assess mpox knowledge, attitudes, and practices; hygiene and cleaning practices; and risk behaviors. CCJ residents and staff perceived increased mpox susceptibility but were unsure about infection severity; they were motivated to protect themselves but reported limited mpox knowledge as a barrier and desired clear communication to inform preventive actions. Residents expressed low self-efficacy to protect themselves because of contextual factors (limited access to cleaning, disinfecting, and hygiene items, etc.). These findings suggest correctional facilities can support disease prevention by providing actionable and tailored messages; educating residents and staff about risk and vaccination options; and ensuring access to and training for hygiene, cleaning, and disinfecting supplies.
30/04/2024	Viruses	Research article	<a href="#">Fast and Ultrasensitive Detection of Monkeypox by a Pyrococcus furiosus Argonaute System Coupled with a Short Amplification</a>	This study describes an innovative detection system for mpox, targeting the MPXV specific F3L gene, based on Pyrococcus furiosus Argonaute (PfAgo), an artificial DNA-guided restriction cleavage enzyme programmable with 5'-phosphorylated ssDNA sequences. A short amplicon of 79 bp could be obtained through a fast PCR procedure. Two 5'-phosphorylation guide DNAs were designed to guide PfAgo to cleave the amplicon to obtain an 18 bp 5'-phosphorylation sequence specific to MPXV, not to other orthopoxviruses. The 18 bp sequence guided PfAgo to cleave a designed probe specific to MPXV to emit fluorescence. With optimized conditions for the PfAgo-MPXV system, it could be completed in 60 min for the detection of the extracted MPXV DNA with the limit of detection (LOD) of 1.1 copies/reaction and did not depend on expensive instruments. Successful application of the PfAgo-MPXV system in sensitively detecting MPXV in simulated throat swabs, skin swabs, sera, and wastewater demonstrated the system's good performance, high sensitivity and specificity.

30/04/2024	Emerging Infectious Diseases	Research article	<a href="#">Health Belief Model to Assess Mpox Knowledge, Attitudes, and Practices among Residents and Staff, Cook County Jail, Illinois, USA, July-August 2022</a>	In summer 2022, a case of mpox was confirmed in a resident at the Cook County Jail (CCJ) in Chicago, Illinois, USA. Some in-depth interviews were conducted with CCJ residents and staff to assess mpox knowledge, attitudes, and practices; hygiene and cleaning practices; and risk behaviors. CCJ residents and staff perceived increased mpox susceptibility but were unsure about infection severity; they were motivated to protect themselves but reported limited mpox knowledge as a barrier and desired clear communication to inform preventive actions. Residents expressed low self-efficacy to protect themselves because of contextual factors (limited access to cleaning, disinfecting, and hygiene items, etc.). These findings suggest correctional facilities can support disease prevention by providing actionable and tailored messages; educating residents and staff about risk and vaccination options; and ensuring access to and training for hygiene, cleaning, and disinfecting supplies.
29/04/2024	Eurosurveillance	Research article	<a href="#">Multiple introductions of monkeypox virus to Ireland during the international mpox outbreak, May 2022 to October 2023</a>	This article aim to elucidate the origins and molecular characteristics of MPXV circulating in Ireland between May 2022 and October 2023. Whole genome sequencing of MPXV from 75% of all Irish mpox cases (182/242) was performed and compared to sequences retrieved from public databases (n=3,362). All 182 analysed genomes were assigned to Clade IIb and, presence of 12 distinguishable subclades suggests multiple introductions into Ireland. 92% of nucleotide mutations were from cytosine to thymine (or from guanine to adenine), leading to a high number of non-synonymous mutations across subclades. The detailed viral phylogenetic analysis provides evidence for multiple introductions of the virus into Ireland, and underscores the potential for future importation events. These findings also highlight the need for ongoing vigilance (especially surveillance of viral genetic) as MPXV continues to circulate internationally.
27/04/2024	MedXriv	Preprint	<a href="#">MVA-BN Vaccine Effectiveness: A Systematic Review of Real-World Evidence in Outbreak Setting</a>	This systematic review examines the effectiveness of the Modified Vaccinia Ankara-Bavarian Nordic (MVA-BN) vaccine against symptomatic mpox infection. Out of 16 identified records, studies in high-income countries showed varied efficacy estimates for one or two doses of MVA-BN. Pre-exposure prophylactic vaccination yielded adjusted efficacy estimates ranging from 35% to 90%, while post-exposure prophylactic vaccination showed efficacy estimates of 78% to 89% for one dose. Moreover, MVA-BN demonstrated a reduction in mpox-related hospitalization risk and severity of clinical manifestations in select studies. Despite study heterogeneity, these findings support the deployment of MVA-BN for mpox outbreak control.
26/04/2024	Science of the Total Environment	Research article	<a href="#">The first detection of mpox virus DNA from wastewater in China</a>	This study in China aims to evaluate the effectiveness of wastewater monitoring for MPXV in detecting local hidden transmission of the 2022 epidemic in the early period. The Chinese Center for Disease Control and Prevention initiated a wastewater monitoring program for MPXV in China in July 2023. Three different concentration methods, PEG precipitation, ultrafiltration, and magnetic beads method were evaluated and compared. Due to its high recovery efficiency, low limit of detection, and high degree of automation, the magnetic beads method was selected for the daily surveillance of MPXV in wastewater. Wastewater monitoring is potentially an effective early surveillance tool for tracking the spread of MPXV in areas with high population density and very few mpox patients.
23/04/2024	Molecular Therapy	Research article	<a href="#">Circular RNA Vaccines against Monkeypox Virus Provide Potent Protection against Vaccinia Virus Infection in mice</a>	In this study, using an efficient and scalable circular RNA (circRNA) platform encapsulated in liponanoparticles, authors constructed four circRNA vaccines that could induce robust neutralizing antibodies as well as T-cell responses by expressing different surface proteins of mpox virus (MPXV), resulting in potent protection against vaccinia virus (VACV) in mice. The combination of the four circular RNA vaccines demonstrated the best protection against VACV challenge among all the tested vaccines. This study provides a favorable approach for developing MPXV-specific vaccines by using a circular mRNA platform.

22/04/2024	Nature Microbiology	Research article	<a href="#">Infection with mpox virus via the genital mucosae increases shedding and transmission in the multimammate rat (<i>Mastomys natalensis</i>)</a>	Data from studies in mouse models, suggest that transmission might be sustained by increased susceptibility of the anal and genital mucosae for infection and subsequent virus release. Mucosal inoculation (rectal, vaginal or aerosol) led to increased shedding, replication and a pro-inflammatory T cell profile compared with skin inoculation.
22/04/2024	J Med Virol	Research article	<a href="#">Pan-microscopic examination of monkeypox virus in trophoblasts cells reveals new insights into virions release through filopodia-like projections</a>	In the present study, the authors identify trophoblasts as a target cell for MPXV replication. In a pan-microscopy approach, they decipher the specific infectious cycle of MPXV and inner cellular structures in trophoblasts. They identified the formation of a specialized region for viral morphogenesis and replication in placental cells. In addition, the authors reported infection-induced cellular remodeling suggesting that MPXV stimulates cytoskeleton reorganization with intercellular extensions for MPXV cell spreading specifically to trophoblastic cells. Altogether, the specific infectious cycle of MPXV in trophoblast cells and these protrusions that were structurally and morphologically similar to filopodia reveal new insights into the infection of MPXV.
19/04/2024	J Clin Microbiol	Research article	<a href="#">Multi-center evaluation of the Research Use Only NeuMoDx monkeypox virus (MPXV) fully automated real-time PCR assay</a>	This study details the evaluation of the Research Use Only (RUO) NeuMoDx MPXV assay, designed and developed by Qiagen for the NeuMoDx Molecular Systems. Primers and probes were tested for specificity and inclusivity in silico. A total of 296 clinical samples were tested by three sites in the US and Europe. The analytical sensitivity of the assay, determined by testing dilutions of synthetic and genomic MPXV DNA, was 50 copies/mL for both clades I and II. The assay showed 100% in silico identity for 80 clade I and 99.98% for 5,162 clade II genomes. Clade II primers and probes showed 100% in silico specificity; however, identity of at least one of the two sets of clade I primers and probes with variola, cowpox, camelpox, and vaccinia viruses was noticed. The clinical validation showed sensitivity of 99.21% (95% CI: 95.66–99.98%) and specificity of 96.64% (95% CI: 91.62–99.08%) for lesion swab samples. The NeuMoDx MPXV Test shows acceptable analytical and clinical performance. The Test Strip can differentiate clades I and II.
18/04/2024	Nat Commun	Research article	<a href="#">Monkeypox virus genomic accordion strategies</a>	In this study, the authors determine a high-quality MPXV genome sequence with low-complexity regions (LCRs) using a combination of highly sensitive techniques. This reveals significant variation in short tandem repeats within LCRs. They demonstrate that LCR entropy in the MPXV genome is significantly higher than that of single-nucleotide polymorphisms (SNPs) and that LCRs are not randomly distributed. In silico analyses indicate that expression, translation, stability, or function of MPXV orthologous poxvirus genes (OPGs), including OPG153, OPG204, and OPG208, could be affected in a manner consistent with the established "genomic accordion" evolutionary strategies of orthopoxviruses.
17/04/2024	Emerging Infectious Diseases	Dispatch	<a href="#">Seasonal Patterns of Mpox Index Cases, Africa, 1970–2021</a>	The dispatch explores the epidemiological patterns and seasonal dynamics of mpox index cases in Africa from 1970 to 2021, revealing associations with latitude and distinct climates. Analyzing 133 index cases across 108 sites, researchers identified four climate profiles, with equatorial cool, northern cool wet-dry, and northern hot wet-dry regions showing the highest occurrence. Equatorial regions exhibited year-round variability, while northern climates showed seasonal fluctuations, with potential high-risk periods from August to March. These findings shed light on the complex ecological factors driving human-wildlife interactions and mpox transmission dynamics.

17/04/2024	Viruses	Research article	Antibodies Induced by Smallpox Vaccination after at Least 45 Years Cross-React with and In Vitro Neutralize Mpox Virus: A Role for Polyclonal B Cell Activation?	In this study, authors evaluate the humoral immune response to smallpox after vaccination, and MPXV after infection. They analyzed VV-specific antibodies in individuals after at least 45 years from immunization and in those convalescing from an MPXV infection. The culture of VV and MPXV permitted to test the capacity of VV- or MPXV-specific antibodies to neutralize MPXV in vitro, as a possible surrogate of protection. Data confirm that a smallpox vaccination induces a long-lasting memory in terms of specific IgG and that antibodies raised against VV may neutralize MPXV in vitro. Additionally, to test a potential role of polyclonal non-specific activation in the maintenance of immunologic memory, they compared the VV-specific humoral and cellular immune response in vaccinated subjects with or without a latent tuberculosis infection (LTBI). Higher titers of VV-specific antibodies and higher frequency of VV-specific memory T cells in LTBI individuals suggest a role of polyclonal non-specific activation in the maintenance of immunologic memory.
16/04/2024	Nat Commun	Research article	Synergistic effect of two human-like monoclonal antibodies confers protection against orthopoxvirus infection	This study describes two recently developed human-like monoclonal antibodies (mAbs) from vaccinia virus-immunized non-human primates. MV33 and EV42, targeting the two infectious forms of the virus, were selected for in vivo evaluation, based on their in vitro neutralization potency. A single dose of either MV33 or EV42 administered 3 days post-infection (dpi) to BALB/c female mice provides full protection against lethal ectromelia virus challenge. Importantly, a combination of both mAbs confers full protection even when provided 5 dpi. Whole-body bioimaging and viral load analysis reveal that combination of the two mAbs allows for faster and more efficient clearance of the virus from target organs compared to either MV33 or EV42 separately. The combined mAbs treatment further confers post-exposure protection against the currently circulating Mpox virus in Cast/EiJ female mice, highlighting their therapeutic potential against other orthopoxviruses.
16/04/2024	Nat Commun	Research article	Ultrasensitive single-step CRISPR detection of monkeypox virus in minutes with a vest-pocket diagnostic device	This study describes the development of a single-step CRISPR-based diagnostic platform (SCOPE, Streamlined CRISPR On Pod Evaluation platform), for field-deployable ultrasensitive detection of MPXV in resource-limited settings. The viral nucleic acids are rapidly released (2 min) from the rash fluid swab, oral swab, saliva, and urine samples via a streamlined viral lysis protocol, followed by a 10-min single-step recombinase polymerase amplification (RPA)-CRISPR/Cas13a reaction. A pod-shaped vest-pocket analysis device achieves the whole process for reaction execution, signal acquisition, and result interpretation. SCOPE can detect as low as 0.5 copies/ $\mu$ L (2.5 copies/reaction) of MPXV within 15 min. The assay was validated on 102 clinical samples from male patients / volunteers, and the results were 100% concordant with the real-time PCR. SCOPE achieves a single-molecular level sensitivity in minutes with a simplified procedure performed on a miniaturized wireless device, adapted to point-of-care settings.
16/04/2024	Biosens Bioelectron	Research article	A rapid and sensitive one-pot platform integrating fluorogenic RNA aptamers and CRISPR-Cas13a for visual detection of monkeypox virus	In this study, the authors propose a comprehensive strategy integrating RNA aptamer, recombinase-aided amplification (RAA), and CRISPR-Cas13a systems for the molecular detection of MPXV target. They utilized a cost-effective and stable fluorogenic RNA aptamer (Mango III), specifically binding and illuminating the fluorophore TO3-3 PEG-Biotin Fluorophore (TO3), as a reporter for Cas13a trans-cleavage activity. Leveraging the inherent collateral cleavage properties of the Cas13a system, they established high-sensitivity and specificity assays to distinguish MPXV from other Orthopoxviruses. A streamlined one-pot protocol was developed to mitigate aerosol contamination risks. The aptamer-coupled RAA-Cas13a one-pot detection method achieved a Limit of Detection (LoD) of 4 copies of target MPXV DNA in just 40 min. Validation using clinical MPX specimens confirmed the rapid and reliable application of our RAA-Cas13a-Apt assays without nucleic acid purification procedure, highlighting its potential as a point-of-care testing solution.

15/04/2024	BMC Infectious Diseases	Research article	<a href="#">The global patent landscape of emerging infectious disease monkeypox</a>	In this paper, the mpox-related patents from 1989 to 2022 is reviewed, generating patent landscapes and mining. It includes the temporal trend, geographical distribution, partnership of patentees, patent transfer, influencing factors of patent citations and key points of patented technology. The most mpox-related patent inventors are by far in the US, followed by France, while in LMICs they are highly under-represented. American companies and universities, including SIGA Technologies and Chimerix, dominate the patent cooperation network, but the academic community has been more and more present. Drugs have attracted much attention, but studies of vaccine and virus testing lack sufficient patent support. Among treatments, the number of biological drugs and chemical drugs ranked at the top. The temporal trend shows that patent activity has followed the rapidly increasing trend of the mpox virus epidemic.
15/04/2024	BMC Infectious Diseases	Research article	<a href="#">The 5 C model and Mpox vaccination behavior in Germany: a cross-sectional survey</a>	During the 2022 Mpox outbreak, a cross-sectional online survey on Mpox was conducted in Germany in August, on risk factors, vaccination and treatment status. The survey were shared through snowball sampling with organizations that focus LGBTQIA persons. The survey included a long 5 C scale, consisting of 15 items in the five categories : confidence, complacency, constraints, calculation, and collective responsibility. The analyses were made among 3,250 participants who responded to the survey. Confidence and collective responsibility were positively associated with intention to get vaccinated, while complacency was negatively correlated. Fewer perceived constraints were associated with higher odds to be vaccinated. Future vaccination campaigns against Mpox should focus on decreasing barriers, for example by making the vaccines widely available in primary care institutions.
15/04/2024	medRxiv	Pre-print	<a href="#">Sustained Human Outbreak of a New MPXV Clade I Lineage in Eastern Democratic Republic of the Congo</a>	An outbreak in Kamituga province (South Kivu, Democratic Republic of the Congo), involving 241 suspected mpox cases was investigated by the National Institute of Biomedical Research (Kinshasa). Out of 119 hospitalized individuals from October 2023 to January 2024, 90.8% tested positive for MPXV, with 85% exhibiting genital lesions. Notably, 28.7% of confirmed cases were among professional sex workers, suggesting sexual contact as a significant mode of transmission, unlike previous outbreaks predominantly affecting children in the DRC. Genomic analysis of 22 MPXV-positive samples revealed a distinct lineage (clade Ib) unique to Kamituga, marked by APOBEC3-type mutations associated with efficient human-to-human transmission. The presence of APOBEC3-type mutations was substantially lower (15.3%) in samples from outside Kamituga province, suggesting limited spread beyond the region. Polymorphisms identified within sequences isolated from earlier zoonotic mpox cases (2011-2012) suggest that this lineage likely originated from a local, non-human animal reservoir. These findings indicate that the majority of cases likely stem from multiple independent spillover events from reservoir hosts. There is a need for further investigation to understand the underlying factors driving these events and the surge observed in Kamituga.
11/04/2024	PLoS One	Research article	<a href="#">Deployment of the National Notifiable Diseases Surveillance System during the 2022–23 mpox outbreak in the United States—Opportunities and challenges with case notifications during public health emergencies</a>	Current public health informatics infrastructure lacks the flexibility and scalability needed to meet the informational needs following the introduction of a novel disease or a rapidly evolving outbreak of a non-notifiable disease. To help address these limitations, CDC (US) launched the Data Modernization Initiative (DMI) in 2020 to protect the US population from any health threat, including the introduction of a novel or re-emerging pathogen such as mpox. Based on the experience of the 2022 Mpox outbreak, and the interim approaches that were established to capture case data, this article summarize lessons learned for future outbreaks.