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 occuring 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 26 May 2024**, a total of **6,397 suspected cases** of mpox, **884 confirmed cases** and **374 associated deaths** (CRF 6.0%) has been recorded in the DRC according to the latest Africa CDC Surveillance Report. Children account for two thirds of the reported mpox cases.

Source : Mpox (monkeypox)| Fact Sheets. World Health Organization. 18 April 2023.

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, belonging to the *Poxviridae* family and Orthopoxvirus genus, similarly to variola virus (the causative agent of smallpox). The animal reservoir remains unknown, although is likely to be among rodents. - **There are two known clades of MPXV :** clade I (previously referred to as Congo Basin) and clade II (formerly West African clade). Clade II is further subdivided into two distinct subclades IIa and IIb. Clade I MPXV infections are at greater risk of severe disease, with an estimated **case fatality rate (CFR)** of 10-15%, whereas clade II MPXV generally causes milder symptoms and lower viremia levels. During the clade IIb 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. Secondary **human-to-human transmission** of MPXV occasionnally occured among family relatives through respiratory droplets, direct contact with body fluids or skin abrasions or through contamined objects and household linen. However, the spread of the multi-country outbreak of clade IIb MPXV in 2022 was mainly driven by transmission via **sexual contacts**, changing the paradigm in the way MPXV can be transmitted. Since 2023, human cases of sexual transmission of clade 1 MPXV are being documented. - Rural areas, where the animal reservoir may resides, are at higher risk of zoonotic transmission of MPXV. Small households or communities who are in close contact with infected animals are at higher risk of infection. High risk populations also include sex workers, gay, bisexual, or other men who have sex with men (MSM) with multiple sexual partners; or other individuals with multiple casual sexual partners. - The **incubation period of MPXV** ranges from 2 to 21 days, although some people may contract the 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 mild, 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 cutaneous and/or mucosal rash. Typically, the lesions evolve through macules, papules, vesicles and pustules, before crusting over and desquamating. Lesions can manifest in the face, trunk, limbs, palms, conjunctival, urethral, penile, vaginal, 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. Although rarely fatal, severe systemic forms with multi-organ involvement and higher case fatalities have been observed in vulnerable groups, such as young children or individuals with advanced HIV infection. Monkeypox during pregnancy may lead to complications, such as congenital mpox or stillbirth. - 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 speciments 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.

DIAGNOSIS AND CARE	- Real-time PCR is the gold standard technique for **MPXV diagnosis** but its implementation requires dedicated research infrastructure and trained health personnel. **Point-of-care (POC)** and **antigen rapid diagnostic test (AgRDT)** are rapid, cost-effective and easily interpretable diagnostic tools for use by health workers with minimal laboratory training to conduct MPXV diagnosis effectively in the field. POC tests such as GeneXPert (Cepheid, U.S.) and Standard M10 MPX/OPX® (SD Biosensor, South Korea) show promising clinical sensitivity on lesion samples and oropharyngeal swabs for clade I MPXV diagnosis. AgRDT shows high specificity but low sensitivity and their clinical efficacy for clade I MPXV screening remains to be investigated. - **Therapeutic management** relies mainly on supportive care, managing pain and preventing further complications. One antiviral, tecovirimat, originally developed to treat smallpox, have been approved by FDA as a compassionate use for the treatment of mpox in U.S. and EU/EEA countries. Several clinical studies (UNITY, EPOXI, PALM007) are underway to evaluate the clinical efficacy of tecovirimat in treating mpox. - 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®). 1st and 2nd generation smallpox vaccines widely used in the 1950-1970s, such as the replication-competent vaccines Dryvax and 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. - The WHO Strategic Advisory Group of Experts (SAGE) on Immunization **recommended vaccination for the following population groups**: residents of high-risk areas (e.g. rural communities); sex workers, gays, bisexuals, MSM or other individuals with multiple casual sexual partners ; health workers repeatedly exposed to mpox (such as those performing diagnostic tests or providing care) ; and contacts of mpox patients, including children, household members or in congregate settings.

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 themonkeypox 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 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

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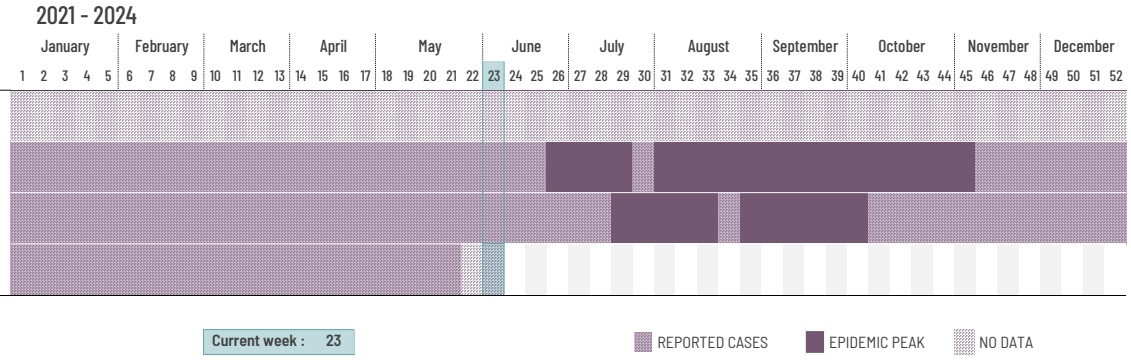
Outbreak timeline and reported cases

COUNTRY	YEAR	START → END DATE	SUSPECTED CASES	CONFIRMED CASES	DEATHS	CASE FATALITY RATE (%)
Democratic Republic of the Congo	2021	1 January → 31 December	2 993	-	81	2,7
	2022	1 January → 31 December	5 677	-	213	3,8
	2023	1 January → 31 December	14 626	714	654	4,5
	2024	1 January	5 581	319	335	6,0



Source : Weekly Event Based Surveillance Report. Africa Centres for Disease Control and Prevention. 26 May 2024

Fig. 1. Reported cumulated cases and deaths of human mpox in DRC in 2024 - As of 26th May.

Mpox Outbreak in DRC 2023 - Technological landscape

This section presents drug development, trials and cutting-edge technologies for prevention and treatment

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Research pipeline

Source : Clinical Trials | National Institute of Health.

VACCINES	**IMVAMUNE®/JYNNEOS® IMVANEX®**	Viral attenuated, non-replicating vector (MVA-BN strain)	Phase 4	Third-generation smallpox vaccine authorised in EU/EEA countries, U.S. and Canada for protection against MPXV in adults. Case-control studies estimated the vaccine effectiveness at 66-86% in high-risk cohorts, with favorable safety profile and mild side effects. Limited data on use in children.
	VACΔ6 (OrthoPoxVac®)	Live-cell based vaccine	Phase 3	Licensed in the Russian Federation. Currently being evaluated for safety and protection against smallpox, mpox and other orthopoxviruses.
	LC16m8	Viral attenuated, low replicating vector	Phase 3	Authorized for active immunization against smallpox in Japan since 1975. This vaccine has been licensed by Japan to provide protection against MPXV in adults and children. Currently being evaluated for safety and protection against mpox in high-risk populations.
	BNT166a, BNT166c	multivalent mRNA vaccine	Phase 1/2	Developed by BioNTech. Two mRNA based-multivalent vaccines developed for active immunization against mpox. Provides protection against MPXV clade I/IIb in mice and macaques. BNT166a is currently being evaluated for safety, tolerability and immunogenicity.
	mRNA-1769	mRNA vaccine	Phase 1/2	Developed by Moderna. Currently being evaluated for safety, tolerability and immunogenicity in adults.
	ACAM2000®	live vaccinia virus (NYCBH strain)	Restricted use	Second-generation smallpox vaccine. Currently approved by FDA for emergency use in U.S. Not authorised in EU/EEA countries due to significant side effects.
	VACV Tian Tan	live vaccinia virus (Tian tan strain)	Restricted use	First-generation smallpox vaccine used routinely in China and discontinued in 1981. Half of vaccinated individuals maintain neutralized antibodies and long-lasting humoral immunity even after 40 years, which provides cross-protection against MPXV.
	Dryvax	live vaccinia virus (NYCBH strain)	Restricted use	First-generation smallpox vaccines which made significant contribution to smallpox eradication campaigns. Associated with serious side effects.
TREATMENTS	**Tecovirimat (TPOXX®)**	Antiviral	Phase 2/3/4	The first FDA-licensed drug for the treatment of smallpox. Approved in 2022 for the treatment of mpox in U.S. and EU/EEA countries. Demonstrated therapeutic effects against mpox in animal models. Safe and well-tolerated in healthy volunteers. A Swiss-Brazilian collaborative phase III study (UNITY) is currently underway to assess its efficacy in adults and adolescents. In RDC, a phase II randomized study (PALM007) to treat adults and children with MPXV is ongoing, with complection expected by September 2024. A EU-funded phase IV clinical trial (EPOXI) is expected to start at the end of 2024.
	NIOCH-14	Antiviral	Phase 1	Analogue of tecovirimat licensed in the Russian Federation for the treatment of mpox. Has demonstrated similar effectiveness than tecovirimat in mice models. Clinical efficacy against mpox is still uncertain.
	Cidofovir / Brincidofovir	Antiviral	Restricted use	Approved by FDA for the treatment of smallpox. Showed *in vivo* and *in vitro* antiviral activities against several orthopoxviruses. No clear benefit in three treated mpox patients in a recent observational study.
	Intravenous Vaccinia Immune Globulin (VIGIV)	Human anti-vaccinia antibodies	Restricted use	Considered for emergency use in mpox patients with severe complications or unable to mount an immune response in the U.S. Data on the effectiveness of VIGIV for mpox are lacking.

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
31/05/2024	JAMA	Medical News In Brief	WHO: As Mpox Outbreaks Continue, Cases May Be Underestimated	The WHO released an updated situation report on mpox cases, indicating over 95,200 infections and 185 deaths globally from 2022 to March 2024. Ten countries, including the US, Brazil, and Spain, account for 81% of cases. While most countries report low transmission rates, surveillance decline suggests actual cases may surpass reported numbers. Males comprise 96% of cases, mostly transmitted through sexual contacts. WHO advises preexposure vaccination for adults and children in high-risk areas and healthcare workers with repeated exposure.
30/05/2024	CEPI	News	Bavarian Nordic and CEPI partner to advance Mpox vaccination in Africa	Bavarian Nordic A/S and the CEPI have partnered to develop access of mpox vaccine for children in Africa. CEPI has awarded USD 6.5 million to support a Phase 2 clinical study evaluating the safety and effectiveness of the MVA-BN® vaccine in children aged 2 to less than 12 years compared to adults aged 18-50 years. The trial, sponsored by Bavarian Nordic, plans to enroll approximately 460 healthy individuals in endemic African regions. Results from the study could support regulatory approvals for the vaccine's use in children, providing crucial data for mpox vaccine strategies. The partnership aims to ensure equitable access to the vaccine for vulnerable populations, particularly children disproportionately affected by mpox.
28/05/2024	CIDRAP	News	Infection- plus vaccine-induced immunity led to decline of mpox in Netherlands, data reveal	New research suggests that in the Netherlands in 2022, reduced mpox transmission was mainly due to immunity from infections and post-exposure vaccination, rather than preventive vaccination alone. The study, published in Eurosurveillance, found that behavior change likely also played a role. Despite the launch of the primary preventive vaccination (PPV) program in July 2022, cases among MSM were already declining. By December 31, 2023, the Netherlands reported 1,294 mpox cases, with 94% among 99% among males and 94% among MSM. The PPV program began when the incidence was already decreasing, suggesting its limited impact on curbing the outbreak, while infection-acquired immunity was a significant factor in reducing cases, particularly among high-risk populations.
24/05/2024	JAMA	Medical News In Brief	Lower Dose of Mpox Vaccine Was Safe, Effective	A study on 225 US adults aged 18 to 50 years found that intradermal injections of one-fifth the standard mpox vaccine dose produced equivalent antibody responses to subcutaneous injections of the standard dose at 6 weeks, with no serious adverse events reported. This research aimed to assess dose-sparing strategies to extend the US supply of the MVA-BN vaccine during the global mpox outbreak. While antibody responses were similar initially, those receiving the lower dose showed decreased levels by day 57 compared with those who received the usual dose. However, the study couldn't determine the efficacy of dose-sparing regimens due to uncertain antibody protection levels required against mpox.
23/05/2024	CDC	Weekly	Monkeypox Virus Infections After 2 Preexposure Doses of JYNNEOS Vaccine	Public perception of recent increase in MPXV infections among fully vaccinated individuals receiving Bavarian Nordic's Jynneos vaccine has raised worries regarding the efficacy of the 2-dose regimen. However, a recent report by CDC confirms that two doses of Jynneos offer almost complete protection against mpox. Analyzing health records from May 2022 to May 2024, a study found that 75% of 32,819 mpox cases were in unvaccinated individuals, while only 0.8% occurred in fully vaccinated people. Despite concerns that mpox cases are rising among the vaccinated, the study revealed a persistent immunologic response in those who completed the vaccination series, resulting in a low overall infection rate of 0.1%.
16/05/2024	CDC	Weekly	U.S. Preparedness and Response to Increasing Clade I Mpox Cases in the Democratic Republic of the Congo	The CDC issued a Health Alert on December 7, 2023, advising U.S. clinicians to consider clade I MPXV infection in patients with mpox symptoms who have recently been in the DRC. Despite no reported cases of clade I mpox in the U.S., the CDC warns that sexual transmission in the DRC poses a potential risk if the outbreak is not contained. The CDC has updated mpox case reporting forms to include clade-specific results and published new guidelines for handling diagnostic specimens. The CDC emphasizes the importance of diagnosing and reporting clade I MPXV to limit transmission and calls for increased vaccination and surveillance support for the DRC to prevent global spread.

16/05/2024	CIDRAP	News	Study suggests mpox patients with no symptoms partly fueled 2022 outbreak in New York City	A recent study reveals that approximately 1 in 15 unvaccinated adults visiting New York City sexual health clinics during the peak of the 2022 mpox outbreak had mpox antibodies,despite no known history of vaccination or previous infection. This suggests that asymptomatic infections significantly contributed to transmission. The study included 419 participants, mostly cisgender men, with 59.1% reporting having sex with men since April 2022. Seroprevalence was 7.0% among cis men with only cis women partners and 7.8% among MSM. Notably, 19% of participants with recent rashes, sores, or lesions had mpox antibodies. These findings indicate that relying solely on testing patients with visible lesions and contact tracing may be insufficient to fully curb future mpox outbreaks, emphasizing the need for broader surveillance and case investigation strategies.
15/05/2024	CIDRAP	News	Shorter infection-to-infection interval observed in 2022 mpox outbreak	A recent study in Emerging Infectious Diseases suggests that while the mean infection-to-symptom-onset incubation period of the 2022 mpox outbreak resembled previous outbreaks, the onset-to-onset serial interval was notably shorter by about 5 days. This shift could be attributed to the predominant sexually associated mode of transmission in 2022, alongside heightened public health awareness and surveillance during the global outbreak. Comparison with pre-2022 outbreaks revealed an 8.1-day incubation period in 2022, similar to previous outbreaks, but a significantly shorter serial interval of 8.7 days compared to 14.2 days in earlier years. The study underscores the importance of monitoring temporal changes in transmission and disease progression to inform effective interventions against pathogens.
13/05/2024	CIDRAP	News	Sex work in bars linked to rapid mpox spread in DR Congo hot spot	Researchers studying mpox transmission in the DRC identified bars as key hotspots, with 88.4% of cases linked to professional sexual interactions, driving rapid virus spread in densely populated areas. Among hospitalized 371 patients registered from September 2023 to April 2024, slightly over half were women, with cases reported across 15 health areas; four fatalities and fetal loss in pregnant women were observed. Three healthcare workers were infected, highlighting occupational risks. The findings underscore the urgency for cross-border surveillance, vaccination, and health education to contain the outbreak.
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 adapative 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	New mpox clade 1 lineage identified in DR Congo outbreak	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	ACDC	Press Release	Communiqué: United in the Fight Against Mpox in Africa – High-Level Emergency Regional Meeting	Health ministers from several African countries convened in Kinshasa on April 13, 2024, expressing concern over the prolonged Mpox epidemic in Central and West Africa and its potential cross-border transmission. They highlighted challenges in accessing medical countermeasures and emphasized the need for a coordinated regional response. Commitments were made to promote a 'One Health' approach, strengthen surveillance, enhance laboratory capabilities, and facilitate cross-border cooperation. The establishment of an Africa Taskforce for Mpox Coordination was proposed to prioritize research, capacity building, and evidence-based decision-making. Collaboration with partners like Africa CDC and WHO was urged to harmonize support efforts across affected regions.
13/04/2024	WHO AFRO	Communiqué de presse	High-level emergency regional meeting : United in the fight against mpox in Africa	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	Study shows offering mpox vaccine leads to high uptake	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	Labcorp Receives FDA Emergency Use Authorization for Mpox PCR Test Home Collection Kit	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	Outbreak of mpox caused by Monkeypox virus clade I in the Democratic Republic of the Congo	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	DR Congo mpox outbreak tops 4,500 cases so far this year	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	Bavarian Nordic Announces Commercial Launch of Mpox Vaccine in the U.S.	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 inthe 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 *Morbidity and Mortality Weekly Report* 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 occured 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 *Vaccine* 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 occuring in a sanctuary housing approximately 300 captive chimpanzees, gorillas and monkeys. The outbreak affected 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 commons 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 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
01/08/2024	Biosens Bioelectron	Research article	Development of a CRISPR/Cas12a-mediated aptasensor for Mpox virus antigen detection	The authors describe a pair of aptamers through the systematic evolution of ligands by exponential enrichment (SELEX) that exhibit high affinity and bind to different sites towards the A29 protein of the Mpox virus. A facile, sensitive, convenient CRISPR/Cas12a-mediated aptasensor for detecting the A29 antigen is developed. The procedure employs the bivalent aptamers recognition, which induces the formation of a proximity switch probe and initiates subsequent cascade strand displacement reactions, then triggers CRISPR/Cas12a DNA trans-cleavage to achieve the sensitive detection of Mpox. This method enables selective and ultrasensitive evaluation of the A29 protein within the range of 1 ng mL−1 to 1 μg mL−1, with a limit of detection at 0.28 ng mL−1. Spiked A29 protein recovery exceeds 96.9%, while the detection activity remains above 91.9% after six months of storage at 4 °C. This aptasensor provides a novel avenue for exploring clinical diagnosis in cases involving Mpox as facilitating development in various analyte sensors.
31/05/2024	Nat Commun	Research article	Two noncompeting human neutralizing antibodies targeting MPXV B6 show protective effects against orthopoxvirus infections	This study initially assessed the preexisting antibody level to the MPXV B6 protein in vaccinia vaccinees born before the end of the immunization program and then identified two monoclonal antibodies (MAbs), hMB621 and hMB668, targeting distinct epitopes on B6, from one vaccinee. Binding assays demonstrate that both MAbs exhibit broad binding abilities to B6 and its orthologs in vaccinia (VACV), variola (VARV) and cowpox viruses (CPXV). Neutralizing assays reveal that the two MAbs showed potent neutralization against VACV. Animal experiments using a BALB/c female mouse model indicate that the two MAbs showed effective protection against VACV via intraperitoneal injection. Additionally, we determined the complex structure of B6 and hMB668, revealing the structural feature of B6 and the epitope of hMB668. Collectively, our study provides two promising antibody candidates for the treatment of orthopoxvirus infections, including mpox.
30/05/2024	MedRxiv	Pre-print	Evaluation of a Multiplexed Immunoassay for Assessing Long-Term Humoral Immunity to Monkeypox virus infection and Orthopoxvirus Vaccination	This study assessed the performance of a multiplexed solid-phase electrochemiluminescence (Meso Scale Discovery (MSD)) immunoassay for simultaneous detection of antibodies against MPXV (A29, A35, B6, E8, and M1 antigens) and corresponding VACV homologues (A27, A33, B5, D8, and L1). Sensitivity and specificity were evaluated with paediatric negatives (n=215), pre- and post-IMVANEX vaccinated (n=80) and MPXV (2022 Clade IIb outbreak, n=39) infected serum samples. The overall Orthopoxvirus multiplex assay demonstrated high specificity [75.68% (CI: 69.01-81.29) - 95.98% (CI:92.54-97.87)] and sensitivity [62.11% (CI:52.06-71.21) - 98.59% (CI:92.44% - 99.93%)] depending on the Orthopoxvirus antigen, either used singularly or combined. Preferential binding was observed between Mpox-infected individuals and MPXV antigens, whilst vaccinated individuals exhibited increased binding to VACV antigens, highlighting the differential binding patterns between antigen homologues in closely related viruses. Orthopoxvirus MSD assay is highly sensitive in detecting IgG titres for vaccinated sera ≥24-days post dose one and ≥14-days post dose two for all antigens within the assay except for MPXV A29 and VACV A27. In conclusion, this assay has the capability to accurately assess antibody titres for multiple relevant MPXV and VACV antigens post infection and post vaccination.

29/05/2024	Eurosurveillance	Research article	Mpox in children and adolescents and contact follow-up in school settings in greater Paris, France, May 2022 to July 2023	The study investigates the clinical characteristics and infection control measures for Mpox cases among children and adolescents in the Île-de-France during Mai 2022 to July 2023. The research was conducted in response to the 2022-2023 European outbreak of Mpox, which primarily affected men who have sex with men, but also included a small number of cases in children and adolescents. Symptomatic presentations included vesicular lesions on the hands, arms, and legs, with some cases involving genitoanal lesions. Despite attending school during their infectious period, only one secondary case emerged from the identified 160 at-risk contacts. Post-exposure vaccination was offered but saw low uptake, with only five at-risk contacts being vaccinated. The findings highlight the rarity of Mpox among children and adolescents but emphasize the importance of identifying the infection source and implementing appropriate control measures in schools. The study advocates for a "contact warning" strategy rather than extensive contact tracing to avoid stigma and unnecessary alarm, underscoring the need for effective communication in managing public health responses to such outbreaks.
23/05/2024	Cell Report	Research article	Polyvalent mpox mRNA vaccines elicit robust immune responses and confer potent protection against vaccinia virus	In the present study, the authors construct two bivalent MPXV mRNA vaccines, designated LBA (B6R-A29L) and LAM (A35R-M1R), and a quadrivalent mRNA vaccine, LBAAM (B6R-A35R-A29L-M1R). Both the bivalent and quadrivalent mRNA vaccines were designed in tandem in one molecule and delivered by lipid nanoparticles. The immunogenicity and protective efficacy of these vaccines alone or in combination were evaluated in a lethal mouse model. All mRNA vaccine candidates could elicit potential antigen-specific humoral and cellular immune responses and provide protection against vaccinia virus infection. The protective effect of the combination of two bivalent mRNA vaccines and the quadrivalent vaccine was superior to that of the individual bivalent mRNA vaccine. This study provides valuable insights for the development of more efficient and safer mRNA vaccines against mpox.
20/05/2024	PLoS Path	Research article	Structure and flexibility of the DNA polymerase holoenzyme of vaccinia virus	In this study, the authors present a system for the production of the VACV E9-A20-D4 holoenzyme and its 3.8 Å structure obtained by cryo-electron microscopy. As the model disagrees with data obtained in solution by small-angle X-ray scattering (SAXS), they predict the existence of open forms of the complex. In addition, they further study the importance of the E9-D4 contact in the absence of DNA and put the VACV polymerase holoenzyme structure in the context of recently determined MPXV structures.
17/05/2024	PLoS One	Research article	In-silico formulation of a next-generation polyvalent vaccine against multiple strains of monkeypox virus and other related poxviruses	In this study, a reverse vaccinology approach was used to retrieve conserved epitopes for mpox virus and construct a cross-protective vaccine against mpox and related viruses. Two mpox virulent proteins, MPXVgp165 and Virion core protein P4a, were mapped for epitopes for vaccine construction. Two vaccines were constructed using selected T cell epitopes and B cell epitopes with PADRE and human beta-defensins adjuvants conjugated in the vaccine sequence. Both constructs were found to be highly antigenic, non-allergenic, nontoxic, and soluble, suggesting their potential to generate an adequate immune response and be safe for humans. Vaccine construct 1 was selected for molecular dynamic simulation studies. The simulation studies revealed that the TLR8-vaccine complex was more stable than the TLR3-vaccine complex. The lower RMSD and RMSF values of the TLR8 bound vaccine compared to the TLR3 bound vaccine suggested better stability and consistency of hydrogen bonds. The Rg values of the vaccine chain bound to TLR8 indicated overall stability, whereas the vaccine chain bound to TLR3 showed deviations throughout the simulation. These results suggest that the constructed vaccine could be an interesting candidate to be further evaluated.

17/05/2024	Microbiol Spectr	Research article	Applying improved ddPCR to reliable quantification of MPXV in clinical settings	In this study, the clinical features of patients with MPXV during the initial outbreak in China in June 2023 were reviewed, and an optimized Droplet digital PCR (ddPCR) method with dilution and/or inhibitor removal was developed to enhance MPXV detection efficiency. Eighty-two MPXV samples were tested from nine different clinical specimen types (feces, urine, pharyngeal swabs, anal swabs, saliva, herpes fluid, crust, semen), and the viral load of each specimen was quantified. A comparative analysis was performed with qPCR to assess sensitivity and specificity and to investigate the characteristics of MPXV infection by analyzing viral loads in different clinical specimens. The optimized ddPCR method demonstrated relatively high sensitivity for MPXV quantification in the clinical materials, with a limit of detection of 0.1 copies/µL. The optimized ddPCR demonstrated greater detection accuracy compared with normal ddPCR and qPCR, with an area under the curve (AUC) of 0.939. Except for crust samples, viral loads in the specimens gradually decreased as the disease progressed. Virus levels in feces and anal swabs kept a high detection rate at each stage of post-symptom onset, making these samplessuitable for clinical diagnosis and continuous monitoring of MPXV.
17/05/2024	Int J Biol Macrobiol	Research article	Network-based approach for drug repurposing against mpox	In this study, a network medicine framework was used to investigate poxviruses-human interactions to identify potential drugs effective against the MPXV. Poxviruses were shown to preferentially target hubs on the human interactome, and that these virally-targeted proteins (VTPs) tend to aggregate together within specific modules. Comorbidity analysis revealed that mpox is closely related to immune system diseases. Based on predicted drug-target interactions, 268 drugs were identified using the network proximity approach, among which 23 drugs displaying the least side-effects and significant proximity to MPXV were selected as the final candidates. In contrast to experimentally confirmed drug-target interactions (DTIs), drug candidates identified by ystematically predicted DTIs present more potential side-effects, rendering thisapproach more effective in identifying potential drugs. Lastly, specific drugs were explored based on VTPs, differentially expressed proteins, and intermediate nodes, corresponding to different categories. In summary, network-based approaches enable rapid understanding of the pathogenesis of MPXV and identification of potential repurposable drugs for mpox.
15/05/2024	Heliyon	Research article	A bioinformatics approach to systematically analyze the molecular patterns of monkeypox virus-host cell interactions	In this study, the authors implemented a transcriptome analysis to identify signaling pathways and biomarkers in mpox-infected cells to understand mpox-host cell interactions. Datasets GSE36854 & GSE11234 were obtained from Gene Expression Omnibus. Of these, 84 significantly different genes were identified in the dataset GSE36854, followed by KEGG, GO analysis protein-protein interaction construction, and Hub gene extraction. They also analyzed the expression regulation of hub genes and screened for drugs targeting hub genes. The results showed that mpox-infected cells significantly activated the cellular immune response. The top 10 hub genes are IER3, IFIT2, IL11, ZC3H12A, EREG, IER2, NFKBIE, FST, IFIT1 & AREG. AP-26113 and itraconazole can be used to counteract the inhibitory effect of mpox on IFIT1 and IFIT2 and serve as candidate drugs for the treatment of monkeypox virus infection. These results provide a new entry point for understanding how mpox virus interacts with its host.

10/05/2024	MedRxiv	Pre-print	Mapping the distribution and describing the first cases from an ongoing outbreak of a New Strain of mpox in South Kivu, Eastern Democratic Republic of Congo between September 2023 to April 2024	This pre-print provides a detailed overview of the spatial distribution of human mpox cases in South Kivu, particularly in Kamituga, identified as the epicenter of the ongoing outbreak since September 2023. Data from 371 suspected mpox cases routinely admitted to Kamituga Hospital were examined between September 2023 and April 2024, revealing a demographic shift with adults aged 16-26 comprising the majority of patients, unlike other regions in DRC where children predominate. Notably, 88.4% (328/371) of cases reported recent sexual exposure in bars. The mapping of Kamituga outbreak showed a correlation with densely populated areas, bars maintaining professional sex workers activities, and the number of mpox cases. Their findings suggest that the outbreak in South Kivu is driven by a network of professional sex workers, working in bars. Additionally, among hospitalized patients, 8 pregnant women were admitted, 4 of whom suffered from fetal loss, providing evidence for potential intrauterine transmission of MPXV during pregnancy.
10/05/2024	BMC Infect Dis	Research article	Expression analysis and mapping of Viral-Host Protein interactions of Poxviridae suggests a lead candidate molecule targeting Mpox	In this study, the authors used Gene Expression Omnibus to characterize the mRNA profile host responses to poxviruses and built protein–protein interaction (PPI) maps. The viral gene expression datasets of Monkeypox virus (MPXV) & Vaccinia virus (VACV) were used to identify the significant viral genes and further investigated their binding of targeting molecules. Results showed that the infection with MPXV interferes with various cellular pathways, including interleukin & MAPK signaling. While most host differentially expressed genes (DEGs) are predominantly downregulated upon infection, marked enrichments in histone modifiers and immune-related genes were observed. The viral DEGs exhibited variable expression patterns in three studied cell types: primary human monocytes, primary human fibroblast, and HeLa, resulting in 118 commonly deregulated proteins. Poxvirus proteins C6R derived protein K7 and K7R of MPXV & VACV were prioritized as targets for potential therapeutic interventions based on their histone-regulating and immunosuppressive properties.
10/05/2024	Int J Biol Macromol	Research article	Structural basis of human mpox viral DNA replication inhibition by brincidofovir and cidofovir	In the present study, the authors report cryogenic electron microscopy structures of mpox viral F8-A22-E4 in complex with a DNA duplex, or dCTP and the DNA duplex, or cidofovir diphosphate and the DNA duplex at resolution of 3.22, 2.98 and 2.79 Å, respectively. Their structural work and DNA replication inhibition assays reveal that cidofovir diphosphate is located at the dCTP binding position with a different conformation to compete with dCTP to incorporate into the DNA & inhibit DNA synthesis. Conformation of both F8-A22-E4 & DNA is changed from the pre-dNTP binding state to DNA synthesizing state after dCTP or cidofovir diphosphate is bound, suggesting a coupling mechanism. This work provides the structural basis of DNA synthesis inhibition by brincidofovir and cidofovir, providing a rational strategy for new therapeutical development for mpox virus and other pox viruses.
09/05/2024	PLoS One	Research article	Expanded Access Programme for the use of tecovirimat for the treatment of monkeypox infection: A study protocol for an Expanded Access Programme	The objective of the expanded access programme (EAP) to be implemented in the Central African Rebublic is to provide patients with confirmed monkeypox with access to tecovirimat and collect data on clinical and virologicaloutcomes of patients to inform future research. The EAP also aims to bolster research capacity in the region in order for robust randomised controlled trials to take place for monkeypox and other diseases.This EAP is the first protocolised treatment programme in Clade I MPXV.

09/05/2024	Lancet Glob Health	Comment	The surge of mpox in Africa: a call for action	The recent global Mpox outbreak from 2022 to 2023, caused by clade II monkeypox virus, highlighted the disease's potential for sustained transmission outside of Africa. More recently, the emergence of clade I in the Democratic Republic of the Congo has underscored the evolving epidemiology and transmission dynamics, including evidence of sexual transmission. Despite increased attention and responses from high-income countries, African researchers struggle to obtain funding for Mpox studies. To address this, the proposal for an African-led Mpox Research Consortium (MpoxReC) has been endorsed at a recent meeting in Kinshasa. MpoxReC advocates for equitable access to medical tools and supports WHO recommendations for vaccination strategies tailored to vulnerable populations. Urgent support is needed for vaccine distribution logistics and regulatory processes. MpoxReC's overarching goal is to halt mpox transmission, safeguarding global health security through collaborative, context-appropriate interventions led by African experts.
08/05/2024	Analytica Chimica Acta	Research article	A rapid and sensitive fluorescent chromatography with cloud system for MPXV point-of-care diagnosis	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.
08/05/2024	Nat Comm	Research article	Predicting vaccine effectiveness for mpox	The article describes a systematic review and meta-analysis of the available data to test whether vaccinia-binding ELISA endpoint titer is predictive of vaccine effectiveness against mpox, based on clinical data on MVA-BN vaccine. Authors observe a significant correlation between vaccine effectiveness and vaccinia-binding antibody titers. Combining this data with analysis of antibody kinetics after vaccination, the study predicts the durability of protection after vaccination and the impact of dose spacing. Delaying the second dose of MVA-BN vaccination will provide more durable protection and may be optimal in an outbreak with limited vaccine stock. This study provides a quantitative evidence-based approach for using antibody measurements to predict the effectiveness of mpox vaccination, although this correlate of protection should be further validated.