WEEKLY SCIENTIFIC REVIEW ON MPOX OUTBREAK

EDITION 15 OCTOBER 2024
No. 36

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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General information

This section details the history and latest developments of the outbreak, with updates on its current status and risk assessment.

During summer 2022, an unprecedented mpox outbreak affecting multiple regions outside the African continent, with no previous history of sustained community transmission, has led to the WHO declaring a **Public Health Emergency of International Concern (PHEIC) on 23rd July 2022**. This outbreak, caused by **clade IIb MPXV strains from B.1 lineage**, resulted in nearly **97,000 cases** and **186 deaths** in more than 100 countries. The spread of this epidemic was mainly driven by local, in-country transmission via sexual contact among men who have sex with men (MSM), rather than at the animal-human interface as seen previously during zoonotic outbreaks observed in Africa. Timely and concerted public health responses from governments, international health organizations and affected communities - primarily MSM – yielded a significant decline of the disease burden throughout the following months, leading the WHO to end the mpox emergency status on 10th May 2023. While progress has been made in tackling the epidemic, human mpox cases and clusters are still being reported widely, notably in endemic countries, and concerted efforts must be pursued to ensure long-term management of the disease.

Since the beginning of 2023, the increasing frequency of outbreaks with **clade Ia MPXV** in African regions, particularly in the Democratic Republic of the Congo (DRC), has become a major concern. In 2023, health authorities in DRC have reported 14,626 suspected cases and 654 deaths, the **highest incidence ever recorded in the country**. This year, and as of 6 October 2024, there have been **30,766 suspected cases** and **990 deaths** (CFR: 3.1%), representing a **two-fold increase compared to the same period last year**. Additionally, case reports have been expanding into previously unaffected regions, with 25 of the 26 provincial health departments reporting active mpox circulation as the current epidemic unfolds, including three new provinces notifying cases this year. The provinces reporting the highest numbers of suspected cases are Equateur (North-West), Sud Unbangi (North-West), Sankuru (Central), Tshopo (North-Central) and South Kivu (East). **Children under the age of 15** are the most affected group, accounting for **66% of mpox reported cases** and **82% of fatalities**. Disease contraction and spreading are likely attributable to zoonotic transmission and interactions during playtime. In 2024, the number of reported cases has continued to rise in certain settings in Africa where the disease is endemic, such as the Central Africain Republic, the Republic of the Congo, Cameroon, Côte d'Ivoire, Liberia and Nigeria.

Between April and September 2023, the Ministry of Health of the DRC informed the WHO of outbreaks in previously unaffected provinces, linked to **sustained human-to-human transmission**, without suspected animal exposure. In April, a cluster of six confirmed mpox cases was reported in Kwango province among locals – five men and a woman – who had engaged in sexual relations with a Belgian resident presenting with genital and anal lesions. **This is the first formally documented sexual transmission of clade I MPXV viruses**. In August, four independent mpox clusters were recorded in Kinshasa, each originating from individuals who had been exposed in other provinces and subsequently traveled to the capital. In September, epidemiological reports from Kamituga identified a cluster of patients among adults, many of whom identified as sex workers, further supporting the shift towards sexual tranmission patterns. Since then, the local outbreak of Kamituga has been expanding geographically in the rest of South Kivu province (East) and recently to neighbouring North Kivu, with 373 confirmed mpox cases as of 2 June 2024. The majority of the cases are among **persons aged over 15 years**, who have reported both sexual and non-sexual direct contacts. No evidence of zoonotic transmission have been reported in the province since the start of the outbreak.

Phylogenetic analyses revealed **a novel variant of clade I MPXV (sublineage Ib)**, which is estimated to have emerged around mid-September 2023 in Kamituga, and have been responsible for the local outbreaks found in South and North Kivu via sustained human-to-human transmission. This variant exhibits **APOBEC-3 type mutations**, indicative of viral adaptation to human hosts. Although clade Ib MPXV currently accounts for a minority of reported mpox cases in the country, the rapid evolution of the outbreak in South and North Kivu, particularly among sex workers, raises significant concern about further expansion in the eastern mining provinces and other countries which share national borders or high cultural identities with DRC. The introduction of clade Ib MPXV into various and possibly intersecting sexual networks could facilitate and amplify the spread of this historically more virulent clade, although it remains unknown if this variant is more transmissible or causes more severe disease than other circulating strains. Furthermore, the potential for human-to-human transmission is enhanced in urban settings such as Kinshasa, the capital home of 17 million inhabitants, where the implementation of containment measures is more challenging.

Between 25th July and 22nd of August 2024, human mpox infections were reported for the first time in **Rwanda**, **Burundi**, **Kenya** and **Uganda**, all four neighbouring countries of the DRC. Several patients had recently traveled to the DRC or other regions with suspected MPXV circulation. Sequencing confirmed the **clade 1b sublineage** in cases detected in Rwanda, Kenya, and Uganda and Burundi. Several countries — Gabon, Guinea, Ghana, Zambia and Zimbabwe — recently reported its first mpox cases, lifting the **number of affected African countries to 17**. Burundi has the second-highest number of mpox cases after the DRC, with 987 positive cases out of 2508 detected as of 12 October 2024. In August and September 2024, travelers returning from high-risk regions have been detected with clade 1b mpox in some countries outside Africa, including Sweden, Thailand, and India, marking the first documented cases of clade 1 outside the African continent.

On 14th August 2024, in response to these alarming developments, **the WHO declared a second PHEIC related to mpox outbreak**, based on the recommendations of an IHR Emergency Committee. This decision came a day after the Africa CDC had designated the escalating outbreak in DRC and in a growing number of countries in Africa as **a Public Health Emergency of Continental Security (PHECS)** on August 13, 2024. The WHO is reviewing the risk assessment for mpox for the general population and is developing a new regional response plan to support surveillance, preparedness and response efforts. This plan will be implemented in collaboration with the governments of the affected countries, the Africa CDC, NGOs, and civil society. Additionnally, in collaboration with international partners and manufacturers, the WHO has activated the emergency process to accelerate vaccine access and donations for both MVA-BN and LC16, particularly for lower-income countries that have not yet issued their own national regulatory approval for the vaccines.

The Africa CDC assesses the risk of mpox in African countries as **high** due to the higher case fatality rate on the continent, despite the disease being moderately transmissible and usually self-limiting. In the EU/EEA, the risk from clade 1, including the novel variant 1b, is considered **very low**, as there is no evidence of its circulation outside Central Africa, and current vaccines and treatments are expected to remain effective. The risk of infection from mpox clade 2b, remains low for the general population and moderate among higher risk groups such as MSM or other individuals who have multiple sexual partners.

Sources :

i. Mpox - Democratic Republic of the Congo | Disease Outbreak News. World Health Organization. 14 June 2024.
ii. Mpox – African Region | Disease Outbreak News. World Health Organization. 22 August 2024.
iii. Africa CDC Epidemic Intelligence Weekly Report, 12 October 2024.
iv. Africa CDC Declares Mpox A Public Health Emergency of Continental Security. Africa CDC. 13 August 2024.
v. WHO Director-General declares mpox outbreak a public health emergency of international concern. World Health Organization. 14 August 2024.
vi. Risk to EU/EEA from variant mpox virus 'very low' | News. ECDC. 29 July 2024.

Timeline of events

This section presents a detailed chronology of the outbreak, with significant events related to public health strategies.

First Mpox Outbreak Reported in Zimbabwe

13 October 2024

Zimbabwe reported its first mpox cases, a 11-year-old child and an adult from two separate towns who recently traveled to South Africa and Tanzania, respectively. The report did not give information on clades involved.

Source : Zimbabwe Records First Mpox Cases - Ministry of Health On High Alert Amid Response Plan Roll Out. 13 October 2024.

First Mpox Outbreak Reported in Zambia

10 October 2024

Zambia's Ministry of Health confirmed the country's first mpox case in a 32-year-old Tanzanian truck driver. The patient presented with a body rash, joint pain, sore throat, and general malaise. The report did not give information on the clade involved.

Source : Africa CDC Epidemic Intelligence Weekly Report, 12 October 2024

Launch of mpox vaccination campaign in DRC

5 October 2024

The Democratic Republic of the Congo has launched a mpox vaccination campaign in North Kivu province, prioritizing health workers, frontline responders, and high-risk groups. The campaign will expand to 11 heavily affected health zones across several provinces, including Equateur and South Kivu. A total of 265,000 MVA-BN vaccine doses, donated by international partners like Gavi and the U.S. government, will be administered. This vaccination effort is part of a broader response that includes surveillance, community engagement, and case management.

Source : The Democratic Republic of the Congo kicks off mpox vaccination. 5 October 2024.

First case of Mpox clade Ib in India

23 September 2024

A 38-year-old Indian man living in Kerala has been diagnosed with clade Ib MPXV, after travelling from the United Arab Emirates. The patient is currently hospitalized for isolation purposes. No related infections were found in the 57 contacts, including airline passengers. India is the third country outside of Africa to report the novel clade.

Source : India reports imported clade 1b mpox case. 23 September 2024.

First Mpox Case Reported in Gabon

22 August 2024

Since the surveillance system was alerted, 6 suspected cases meeting the definition of mpox cases have been notified, placed in isolation, treated and sampled. Of the 6 samples collected, one tested positive for Mpox. The patient was a 30-year-old man who spent the last 2 weeks in Uganda, a country currently affected by the epidemic.

Source : Ministère de la santé et des affaires sociales. 22 August 2024.

First case of Mpox clade Ib in Thailand

21 August 2024

A 66-year-old European man, who arrived in Thailand last week from an undisclosed African country, has been diagnosed with clade Ib MPXV. Authorities are monitoring 43 close contacts, none of whom have shown symptoms thus far.

Source : The ministry of public health of Thailand. 21 August 2024.

First case of Mpox reported in the Philippines in 2024

19 August 2024

A 33-year-old Filipino man, with no history of travel outside the country, has been identified as the 10th mpox case reported since the outbreak began, with the previous case detected in December 2023.

Source : The Department of Health of the Philippines, 19 August 2024

First case of Mpox clade Ib in Sweden

15 August 2024

A person who sought medical care in Stockholm has been diagnosed with mpox after returning from a region in Africa currently experiencing a major clade I outbreak. This marks the first detection of clade Ib mpox outside the African continent.

Source : The Public Health Agengy of Sweden,. 15 August 2024.

Ivory Coast Records Four New Mpox Cases

2nd August 2024

Four new non-lethal mpox cases were confirmed in Abidjan, Ivory Coast. All new and previous patients are under treatment and showing favorable progress.

Source : Mpox update (30): Côte d'Ivoire (AB) confirmed cases. | ProMED. 7 August 2024.

First Mpox Outbreak Reported in Uganda

1st August 2024

Uganda's Ministry of Health confirmed two new mpox cases in Kasese District, both imported from the DRC. The cases include a 37-year-old Ugandan woman married to a Congolese man and a 22-year-old Congolese woman, both presenting with skin rash, swollen lymph nodes, and general malaise.

Source : Mpox update (29): Uganda (KS) conf. | ProMED. 4 August 2024.

First Mpox Case Reported in Kenya

31 July 2024

Kenya has confirmed a case of mpox at a Taita Taveta border point with Tanzania. The virus was detected in an individual, reportedly a long-distance truck driver, who was travelling from Uganda to Rwanda through Kenya.

Source : Mpox Update (27): Kenya (Taita Taveta) | ProMED. 2 August 2024.

First Mpox Outbreak Reported in Burundi

28 July 2024

Burundi's Ministry of Public Health declared eight confirmed mpox cases, with no deaths, in Bujumbura Nord, Gitega, and Isare districts, following initial alerts and positive lab results. Patients presented with fever and rash. Sequencing to determine the viral clade are pending. This is the first cases of mpox reported in Burundi.

Source : Outbreak Report, 30 July 2024: Mpox Situation in Africa | Africa CDC. 30 July 2024.

First Mpox Outbreak Reported in Rwanda

25 July 2024

Rwanda's Ministry of Health reported its first mpox outbreak with two confirmed cases in Gasabo and Rusizi districts. The cases, a 33-year-old female and a 34-year-old male, had traveled to DRC and tested positive for mpox Clade Ia sublineage. This is the first cases of mpox reported in Rwanda.

Source : Outbreak Report, 30 July 2024: Mpox Situation in Africa | Africa CDC. 30 July 2024.

DRC granted approval for MVA-BN and LC16 vaccines

27 June 2024

The DRC has approved the emergency use of two smallpox vaccines - MVA-BN (Bavarian Nordic, Denmark) and LC16 (KM Biologics, Japan) - to address the escalating mpox outbreak, involving a novel clade Ib variant.

Source : DR Congo grants emergency use for 2 mpox vaccines | News Brief. CIDRAP. 27 June 2024.

First Mpox Outbreak Reported in South Africa since 2022

May - July 2024

South Africa reported 20 confirmed mpox cases, including three deaths, across three provinces (Gauteng, KwaZulu-Natal, and Western Cape). All cases were symptomatic males aged 17 to 43, mostly self-identifying as MSM and living with advanced HIV disease. None had a history of international travel or attendance at high-risk events, and sexual contact was the reported exposure. Sequencing identified clade IIb sublineage. These are the first mpox cases in South Africa since 2022.

Source : Mpox - South Africa | Disease Outbreak News. World Health Organization. 9 July 2024.

High-level Emergency Regional Meeting on mpox in Africa

11 - 13 April 2024

Health Ministers from several Central and West African countries, along with international partners, convened in Kinshasa to address the ongoing mpox epidemic in the region. They expressed serious concern over the changing transmission dynamics, high mortality rates, and the lack of access to countermeasures. The ministers emphasized the urgent need for a coordinated regional approach, including strengthening surveillance, preparedness, and response efforts at national and cross-border levels. The meeting concluded with the creation of an Africa Taskforce for Mpox Coordination, supported by Africa CDC, WHO, and other partners, to bolster epidemic response and ensure harmonized efforts across the continent.

Source : Communiqué "United in the fight against mpox in Africa" | High-level emergency regional meeting. 13 April 2024.

Mpox Outbreak in DRC : Shifting Patterns and Geographical Expansion

April – September 2023

While the DRC is experiencing his worst mpox outbreak since the beginning of the year, with thousands of cases and hundreds of deaths, three previously unaffected provinces in the southern and eastern parts of the country (Kwango, Kinshasa and South Kivu) have reported outbreaks linked with sustained human-to-human transmission for the first time, without animal exposure. Clusters of patients included adult women and men presenting with anal and genital lesions and who reported sexual contacts prior to symptoms onset. This is the first documented instances of sexual transmission of clade I MPXV viruses.

Source : Mpox (monkeypox) - Democratic Republic of the Congo | Disease Outbreaks News. WHO. 23 November 2023.

WHO declared the escalating global mpox outbreak a PHEIC

23 July 2022

WHO declared a Public Health Emergency of International Concern (PHEIC) in response to the escalating mpox outbreak affecting multiple non-endemic countries, who reported for the first time sustained community transmission through sexual contacts, particularly among men who have sex with men (MSM) with multiple sexual partners.

Source : WHO Director-General's statement at the press conference following IHR Emergency Committee regarding the multi-country outbreak of monkeypox. 23 July 2022.

WHO lifted PHEIC status for global mpox outbreak

10 May 2023

The WHO announced that the global mpox outbreak no longer constitutes a PHEIC, following the recommendation of the International Health Regulations (IHR) Emergencies Committee, in response to the significant and sustained decline in mpox cases. The Committee recommended transitioning to a long-term strategy to manage the ongoing public health risks posed by mpox.

Source : Fifth Meeting of the International Health Regulations (2005) (IHR) Emergency Committee on the Multi-Country Outbreak of mpox (monkeypox). 11 May 2023.

Events linked with clade Ia / Ib MPXV outbreaks - Africa

Events linked with clade IIb lineage B.1 MPXV outbreaks - Global

Fact sheets

This section provides a short overview of of the epidemiology, virology, clinical features and risk assessment related with the disease.

Mpox is a **zoonotic infectious disease** caused by the monkeypox virus (MPXV), belonging to the *Poxviridae* family and Orthopoxvirus genus, similarly to variola virus (the causative agent of smallpox), cowpox virus and vaccinia virus. The animal reservoir remains unknown, but African rodents such as tree squirrels and Gambian pouch rats (*Cricetomys gambianus*) are currently considered to be strong candidates, as they were implicated in international spread.

There are two known clades of MPXV : clade 1 (previously referred to as Congo Basin), originating from eastern regions in Central Africa, and clade 2 (formerly West African clade) prevalent in West Africa. Clades 1 and 2 are further subdivided into four distinct subclades : 1a, 1b, 2a, and 2b. Variants 1b and 2b which emerged in recent years exhibit **APOBEC-3 type mutations**, indicative of viral adaptation to human hosts. Clade I MPXV infections are at greater risk of severe disease, with a **case fatality rate (CFR)** ranging from 3 - 10%, while clade II MPXV generally causes milder symptoms, lower viremia and a reduced lethality rate of 1 - 3%. The global mpox outbreak caused by the clade IIb in 2022-2023 showed a CFR of less than 0.1%. Some factors, beyond virological aspects, such as limited access to medical care or co-existing health conditions, might confound the case fatality rates. In many African countries, a significant proportion of the population is living with untreated or undiagnosed HIV, leading to a mortality rate from mpox that is twice as high in immunocompromised individuals compared to those with healthy immune systems. The higher death rate among children under five years old may also be partly due to malnutrition and limited access to healthcare, particularly in rural regions of DRC.

Clades Ia and IIa are **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 these clades occasionally occurs via respiratory droplets, direct close contacts with body fluids or skin abrasions, or through contamined objects and household linens, though such transmission is usually limited to household members. Clades Ib and IIb have demonstrated sustained human-to-human transmission without the need for reintroduction from animal reservoirs. Notably, the 2022-2023 global outbreak was mainly driven by local, in-country transmission through **sexual contacts** among men who have sex with men (MSM), rather than at the animal-to-human interface seen in previous zoonotic outbreaks. Populations at higher risk of zoonotic transmission include small households or communities living in rural areas adjacent to or within tropical forests of Central and West Africa, where animal reservoirs may reside. High-risk groups for community transmissions also include sex workers, gay, bisexual, MSM with multiple sexual partners, or any 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**, but may last longer in immunocompromised individuals. 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. Infected individuals remain contagious until all sores are healed and a new layer of skin has formed. 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, individuals with a weakened immune system or with advanced HIV infection. Contracting mpox during pregnancy may lead to complications, such as congenital mpox, stillbirth or even death of the newborn.

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.

Source : Mpox (monkeypox) | Fact Sheets. World Health Organization. 26 August 2024.

Diagnosis and care

This section offers a short overview of currently available countermeasures and recommendations for diagnosis, prevention and care.

Due to the range of health conditions that cause similar-appearing skin lesions, clinical differenciation of mpox is difficult without laboratory diagnosis. Detecting viral nucleic acids using **polymerase chain reaction (PCR)** is the gold standard technique for confirming **MPXV diagnosis,** but its implementation requires dedicated research infrastructure and trained health personnel. The reliability of results depends on the type of biological specimen, with optimal samples obtained directly from skin lesions — whether crusts or exudates — via swabbing. In the absence of visible epidermal wounds, testing can be conducted on mucosal specimens using oropharyngeal or rectal swabs. Blood samples are not recommended for molecular testing since detectable viremia occurs in the early clinical course of infection. In areas with active circulation of multiple orthopoxviruses, diagnostic tests for other conditions should be considered if feasible. **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 potency 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, developed in 2002 to treat smallpox, has been approved by the Food and Drug Administration (FDA) and European Medicines Agency (EMA) as a compassionate use for the treatment of mpox in U.S. and EU/EEA countries. Several clinical studies (UNITY, EPOXI, MOSA, STOMP, PALM007, PLATINUM/PLATINUM-CAN) are underway in different regions of the world to evaluate the clinical efficacy of tecovirimat in treating mpox in adults and children.

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.

On 27th June 2024, **the DRC has granted emergency use approval for two smallpox vaccines**, MVA-BN (Bavarian Nordic, Denmark) and LC16 (KMB Biologics, Japan), in response to the escalating outbreak in the country.

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.

Source : Mpox (monkeypox) | Fact Sheets. World Health Organization. 26 August 2024.

Scientific articles

This section presents relevant articles published on peer-reviewed scientific journals or pre-print platforms.

Pathogenic BALB/c mice infection model for evaluation of mpox countermeasures. Cheng, L., Huang, W., Duan, M. et *al*.

Published in *Cell Discov* on 14 October 2024
https://doi.org/10.1038/s41421-024-00739-z

This study discusses the development of a new BALB/c mice model for evaluating mpox countermeasures. Previous models, like CAST/EiJ mice, were limited in availability, prompting the use of cheaper and more accessible BALB/c mice. Contrary to prior assumptions that BALB/c mice were not susceptible to mpox, this study found that intranasal infection with a clade IIb mpox virus strain (MPXV/SZTH42) led to significant symptoms, including weight loss of over 30%, ruffled fur, and lung pathology. Increasing the inoculum volume and using deeper anesthesia were key factors in causing pathogenic infections in BALB/c mice. The model was then tested with the antiviral drug tecovirimat, which significantly reduced viral replication, improved lung pathology, and allowed weight recovery. This new model provides a practical alternative for testing mpox therapeutics and vaccines and is expected to advance mpox research and drug development.

Mpox in People With Human Immunodeficiency Virus: Predictors of Diagnosis, Outcomes, and Vaccine Effectiveness in a Multisite Cohort. Montaño M., Shapiro A. E., Whitney B. M., Bamford L., Burkholder G., Cachay E. R., Christopoulos K. A., Crane H. M., Delaney J. A. C., Eron J. J., Fredericksen R. J., Hunt P. W., Jacobson J. M., Keruly J. C., Kim H. N., Mayer K. H., Moore R. D., Napravnik S., Pettit A., Saag M. S., Yendewa G. A., Kitahata M. M., Bender Ignacio R. A.

Published in *Clin Infect Dis* on 8 October 2024
https://doi.org/10.1093/cid/ciae464

This study investigates predictors of mpox diagnosis, outcomes, and vaccine effectiveness in people with HIV (PWH) during the 2022-2023 outbreak in the U.S. Among 19,777 PWH, 413 cases of mpox were identified. PWH not on antiretroviral therapy or with unsuppressed HIV, younger than 40, of hispanic/latine ethnicity, and with a recent bacterial sexually transmitted infection were more likely to be diagnosed with mpox. Hospitalization risk was highest for those with CD4 counts between 200-349 cells/mm³, while individuals with CD4 counts below 200 were half as likely to get hospitalized. Mpox vaccination was highly effective, with a single dose reducing the risk of mpox infection by 71% in PWH with low CD4 count and HIV viremia. Effectiveness increased to 86% or higher in individuals with higher CD4 counts or viral suppression. These findings underscore the critical role of both mpox vaccination and HIV management in reducing mpox risk and improving outcomes for PWH.

Modelling vaccination approaches for mpox containment and mitigation in the Democratic Republic of the Congo. Savinkina A., Kindrachuk J., Bogoch I. I., Rimoin A. W., Hoff N. A., Shaw S. Y., Pitzer V. E., Mbala-Kingebeni P., Gonsalves G. S.

Published in *Lancet Global Health* on 8 October 2024
https://doi.org/10.1016/s2214-109x(24)00384-x

This study aimed to inform policymakers in the Democratic Republic of the Congo on the potential benefits of mpox vaccination strategies during the 2023–24 outbreak. Using a dynamic transmission model, the study simulated mpox spread by age group (<5, 5–15, and >15 years) and by province, and evaluated different vaccination strategies targeting children. The model predicted that, without vaccination, the outbreak would lead to 14,700 cases and 700 deaths over a year. The findings showed that vaccinating 80% of children younger than 5 in endemic provinces could reduce cases by 27% and deaths by 43%, requiring 10.5 million doses. Expanding this to all provinces would reduce cases by 29%, but still yield the same 43% death reduction, requiring 33.1 million doses. Vaccinating 80% of children aged 15 years or younger in endemic regions would lead to a 54% drop in cases and a 71% reduction in deaths, using 26.6 million doses. The study concludes that vaccinating children in endemic areas is the most efficient strategy, especially when resources are limited. Further research is recommended to assess the long-term benefits of periodic vaccination campaigns.

Do breastfeeding mothers in DR Congo have access to the mpox vaccine?

Ververs M., Imani-Musimwa P., Gribble K., Schwartz D. A.

Published in *Lancet Global Health* on 7 October 2024
https://doi.org/10.1016/s2214-109x(24)00423-6

The WHO prequalified the MVA-BN vaccine for mpox in 2024, recommending its use for high-risk groups, including pregnant and immunocompromised individuals. However, the guidance lacks clear recommendations for breastfeeding women, despite previous WHO statements in 2022 supporting its use in this group. This has caused confusion among healthcare workers, with some countries recommending the vaccine for breastfeeding women while others hesitate. As mpox vaccination begins in the Democratic Republic of the Congo, where breastfeeding is essential for maternal and child health and is an important part of maternal identity in this country, urgent clarification is needed. Breastfeeding women must be considered for vaccination, but they should not be forced to choose between protecting themselves and receiving the vaccine, or protecting their child's well-being by continuing to breastfeed while risking their own health.

This section provides a digested list of new articles published since the last review. The complete repository in Excel format can be found here.

Technological landscape

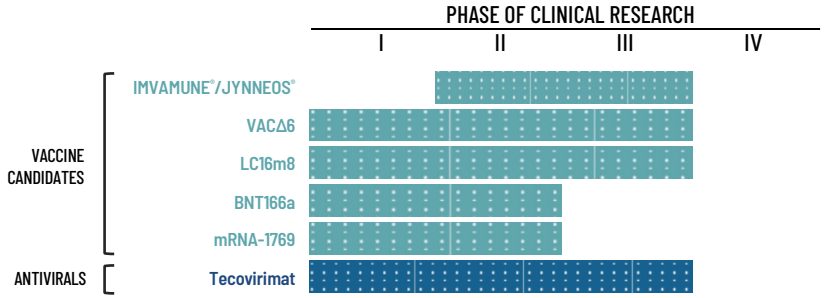
This section outlines the current pipeline of drug development, clinical trials and technologies aimed at preventing and treating the disease.

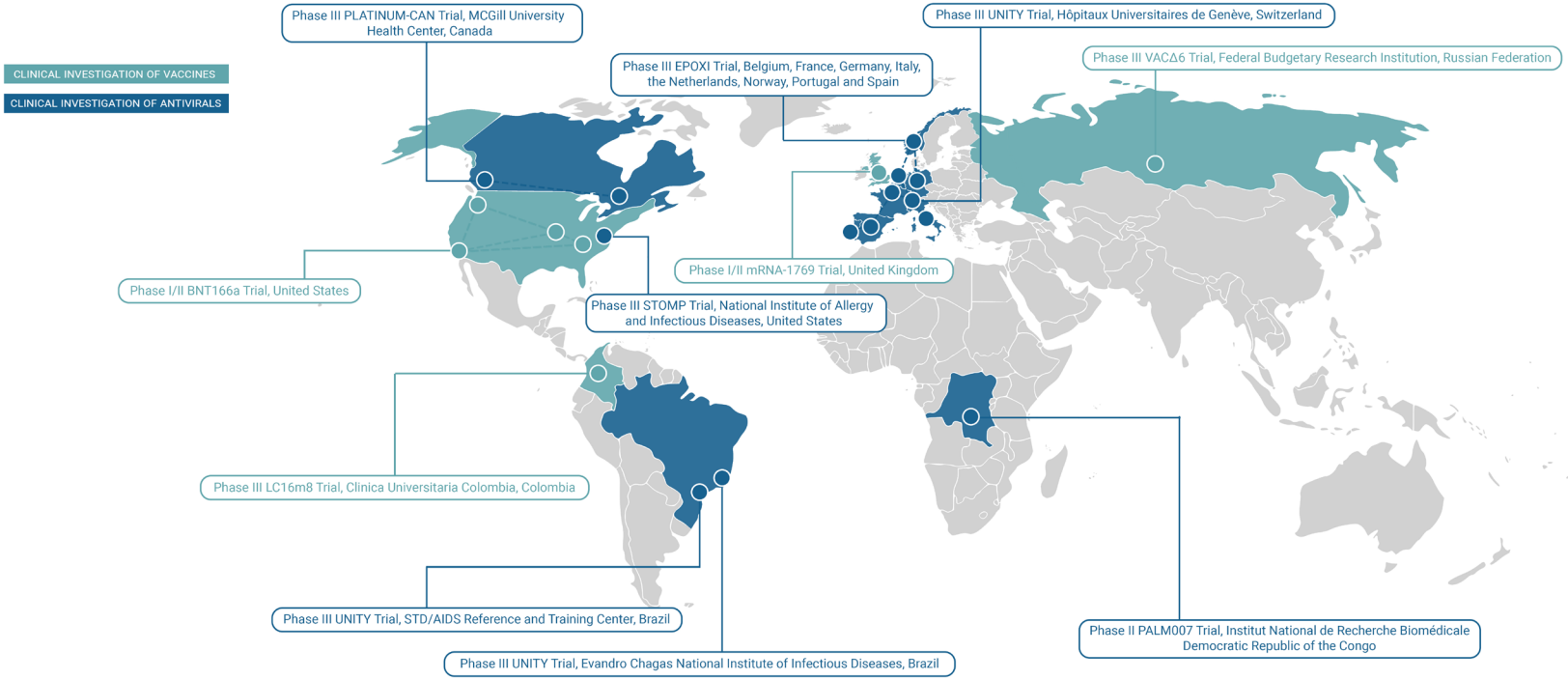
VACCINES	**IMVAMUNE®/JYNNEOS® IMVANEX®**	Viral attenuated, non-replicating vector (MVA-BN strain)	Phase 3	Third-generation smallpox vaccine authorised in EU/EEA countries, U.S. and Canada for protection against MPXV in adults. Case-control studies estimated the vaccine effectiveness at 66-86% in high-risk cohorts, with favorable safety profile and mild side effects. Limited data on use in children. Have been approved for emergency use in DRC on 27 June 2024.
	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. Have been approved for emergency use in DRC on 27 June 2024.
	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	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. The MPX-RESPONSE consortium, funded by European Commission and participating countries, includes three phase III clinical trials covering different geographic regions : UNITY in Argentina, Brazil and Switzerland, launched in March 2023 ; EPOXI in Europe which started recruiting in August 2024 ; MOSA in 3 to 10 African countries and expected to launch end of October 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.

Source : Clinical Trials | National Institute of Health.

Ongoing clinical studies and sites of investigation

This section provides an overview of clinical trials in progress. Further details regarding ongoing interventional studies can be found here.





Relevant news

This section presents official reports from health agencies, manufacturers and press releases with reliable sources.

Two-Dose Strategy and Targeted Interventions Drive Mpox Campaign.

Published by Africa CDC on 11 October 2024
https://africacdc.org/news-item/two-dose-strategy-and-targeted-interventions-drive-mpox-campaign

The mpox vaccination campaign in the Democratic Republic of the Congo (DRC) began on October 4, 2024, with a focus on administering two doses for full protection. The campaign was launched in Goma, a city heavily impacted by the outbreak, as mpox cases continue to rise across Africa. Africa CDC stressed that gaps in testing and surveillance remain a major challenge, with only 4% of contacts traced, far below the target of 90%. The DRC is prioritizing high-risk groups, including healthcare workers, sex workers, truck drivers, and children, emphasizing the need for enhanced border surveillance. Africa CDC also underscored the urgency of controlling the outbreak swiftly to prevent further viral mutations and complications, particularly in vulnerable populations that are disproportionately impacted by the outbreak.

Africa CDC Strengthens Laboratory Capacity for Mpox and Other Outbreaks in Burundi.

Published by Africa CDC on 10 October 2024
https://africacdc.org/news-item/africa-cdc-strengthens-laboratory-capacity-for-mpox-and-other-outbreaks-in-burundi

Africa CDC is strengthening Burundi's response to the mpox outbreak by enhancing laboratory capacity. In partnership with the Institut National de Santé Publique (INSP), Africa CDC conducted trainings in Bujumbura from September 30 to October 4, 2024, focusing on sample management, biosafety, and biosecurity. The training, attended by participants from 17 provinces, emphasized safe handling, collection, and transport of biological samples, as well as protecting healthcare workers from infectious agents like mpox. This initiative also aligns with Africa CDC's goal of building multi-disease detection and sequencing capacity across Africa. Additionally, Africa CDC provided critical diagnostic equipment to Burundi, including an Illumina MiniSeq sequencing system and Mpox qPCR kits, to improve the country's testing and detection capabilities.

The Democratic Republic of the Congo kicks off mpox vaccination.

Published by WHO Regional Office for Africa on 5 October 2024
https://www.afro.who.int/countries/democratic-republic-of-congo/news/democratic-republic-congo-kicks-mpox-vaccination

The Democratic Republic of the Congo has launched a mpox vaccination campaign in North Kivu province, prioritizing health workers, frontline responders, and high-risk groups. The campaign will expand to 11 heavily affected health zones across several provinces, including Equateur and South Kivu. A total of 265,000 MVA-BN vaccine doses, donated by international partners like Gavi and the US government, will be administered. This vaccination effort is part of a broader response that includes surveillance, community engagement, and case management, supported by over 300 WHO experts. The aim is to curb the virus's spread amid ongoing challenges with vaccine shortages in Africa.

Statement of the WHO Global Advisory Committee on Vaccine Safety (GACVS) on the safety of the mpox vaccines for use in high-risk groups.

Published by WHO on 4 October 2024
https://www.who.int/news/item/04-10-2024-statement-gacvs-safety-mpox-vaccines-for-use-in-high-risk-groups

The WHO Global Advisory Committee on Vaccine Safety (GACVS) has reviewed the safety of mpox vaccines, particularly the non-replicating MVA-BN and minimally replicating LC16m8, for high-risk groups, including pregnant women, children, and immunocompromised individuals. MVA-BN is deemed safe for pregnant women and immunocompromised patients, though additional clinical studies are planned to assess its use in infants and children. Post-approval data shows a favorable safety profile in adults, but close monitoring remains essential. LC16m8, however, is not recommended for pregnant or immunocompromised

individuals. Special training for vaccine administration, particularly for LC16m8, is emphasized to avoid adverse events. WHO has developed a cohort event monitoring protocol to capture potential safety signals, and tools like Vigiflow and Med Safety App are encouraged for reporting adverse events. Vigilant safety monitoring is especially crucial in populations with high HIV prevalence, given diagnostic limitations.

Decentralizing testing for rapid mpox detection in the Democratic Republic of the Congo.

Published by WHO Regional Office for Africa on 4 October 2024
https://www.afro.who.int/countries/democratic-republic-of-congo/news/decentralizing-testing-rapid-mpox-detection-democratic-republic-congo

In August 2024, the Democratic Republic of the Congo decentralized mpox diagnosis by establishing eight additional laboratories in five provinces, supported by WHO and partners. This strategy, funded by USAID, provided critical diagnostic tools such as 3,500 GeneXpert cartridges and other essential supplies to improve testing capacity. The move resulted in increased sample analysis, rising from 9,700 to over 11,400 between 8-17 September 2024. Decentralization has enhanced access to diagnostics, reduced processing times, and enabled quicker outbreak responses, crucial in combating the ongoing mpox epidemic in the country, which accounts for 90% of cases across African continent.

WHO approves first mpox diagnostic test for emergency use, boosting global access.

Published by WHO on 3 October 2024
https://www.who.int/news/item/03-10-2024-who-approves-first-mpox-diagnostic-test-for-emergency-use--boosting-global-access

The WHO has approved the first mpox diagnostic test, the Alinity m MPXV assay by Abbott Molecular Inc., under its Emergency Use Listing (EUL) procedure, boosting global testing capacity for mpox. This real-time PCR test detects the virus from human skin lesion swabs, enabling quick and accurate diagnosis, essential for timely treatment and containment of the outbreak. Testing limitations, especially in Africa, have contributed to the spread of mpox, with only 37% of suspected cases tested in the Democratic Republic of the Congo. The EUL process ensures the quality, safety, and performance of the test, accelerating its availability in countries lacking adequate diagnostic tools. WHO is working with manufacturers to expand the range of approved tests to enhance global diagnostic capabilities amidst ongoing outbreaks.

Mpox is accelerating antimicrobial resistance in Africa, officials warn.

Published by BMJ on 27 September 2024
https://www.bmj.com/content/386/bmj.q2124/

The spread of mpox is accelerating antimicrobial resistance (AMR) in Africa, according to Jean Kaseya, Director of the Africa CDC. The rise in mpox cases has led to increased, unregulated antibiotic use, particularly among vulnerable groups such as sex workers. The lack of access to effective antibiotics and insufficient laboratory infrastructure exacerbates this issue, as many African labs are not equipped to analyze AMR. At a symposium in New York, global health leaders warned that AMR could become the leading cause of death by 2050 and called for urgent global efforts, including improved surveillance and enhanced vaccination programs.

UNICEF signs mpox vaccine deal at lowest market price for 77 low- and lower-middle-income countries.

Published by UNICEF on 26 September 2024
https://www.unicef.org/press-releases/unicef-signs-mpox-vaccine-deal-lowest-market-price-77-low-and-lower-middle-income/

UNICEF has secured an agreement for the supply of the MVA-BN mpox vaccine at the lowest market price, benefiting 77 low- and lower-middle-income countries, including the Democratic Republic of the Congo (DRC). This agreement, a result of an emergency tender following the mpox public health emergency declaration, guarantees up to 1 million vaccine doses in 2024, with 500,000 doses funded by Gavi. The vaccine, priced at up to $65 per dose, aims to address the rising mpox crisis. UNICEF is also supporting prevention efforts through infection control, risk communication, and community engagement. Additionally, UNICEF launched a $58.8 million appeal to aid the most affected African countries.

Statement on the Pandemic Fund's Decision to Fast-Track US$128.89 million to Combat Mpox in 10 Countries.

Published by The Pandemic Fund on 18 September 2024
https://www.thepandemicfund.org/news/statement/decision-to-fast-track-us128_89-million-to-combat-mpox-in-10-countries/

The Pandemic Fund has approved US$128.89 million to support 10 African countries battling mpox, under its second Call for Proposals. The approved funding prioritizes countries experiencing active circulation of clade 1 such as the Democratic Republic of Congo, Burundi Uganda, Rwanda, Kenya, and others countries facing acute emerging threats. The support will bolster country and regional capacity in critical areas, like disease surveillance, diagnostics, laboratory networks, and health workforce. It also focuses on enhancing national and cross-border surveillance and early warning systems. This fast-tracked funding supports WHO and Africa CDC's Mpox Continental Preparedness Plan and aligns with the Fund's mission to build resilient health systems, ensuring low- and middle-income countries are prepared for future health emergencies.

Global Fund Provides Nearly US$10 Million for DRC's Mpox Response.

Published by The Global Fund on 18 September 2024
https://www.theglobalfund.org/en/news/2024/2024-09-18-global-fund-provides-nearly-us-10-million-drc-mpox-response/

The Global Fund has committed $9.5 million to support the Democratic Republic of the Congo (DRC) in combating its mpox outbreak, the largest globally. The funding focuses on six high-risk provinces (Equateur, Sud-Ubangui, Sankuru, Tshopo, Sud-Kivu and Nord-Kivu) as well as in Kinshasa, addressing low testing rates and supporting the National Preparedness and Response Plan. Key initiatives include enhancing disease surveillance, boosting laboratory capacity, and conducting risk communication to reduce stigma. The Global Fund is also improving infection prevention for healthcare workers and strengthening health facilities to manage mpox and future emergencies. Additionally, the support targets vulnerable populations, including those affected by conflict, and addresses the connection between mpox and HIV/AIDS.

Africa CDC congratulates Japan and DRC on the Signing of Notes for a donation of Mpox Vaccines.

Published by Africa CDC on 18 September 2024
https://africacdc.org/news-item/africa-cdc-congratulates-japan-and-drc-on-the-signing-of-notes-for-a-donation-of-japanese-mpox-vaccines/

Africa CDC has congratulated the Government of Japan and the Government of the Democratic Republic of the Congo (DRC) for their agreement on donating Lc16 Mpox vaccines and specialized inoculation needles. The donation comes as the DRC faces a growing Mpox outbreak, with rising cases since November 2023. Japan's contribution is especially important, as the Lc16 vaccine is the only one currently approved for children, who account for 60% of cases. Dr. Jean Kaseya, Director General of Africa CDC, praised Japan's support, which will help mitigate the public health threat posed by Mpox across Africa.

Gavi Signs Agreement with Bavarian Nordic to Rapidly Secure 500,000 Doses of Mpox Vaccines for Africa.

Published by Gavi, the Vaccine Alliance on 18 September 2024
https://www.gavi.org/news/media-room/gavi-signs-agreement-bavarian-nordic-rapidly-secure-500000-doses-mpox-vaccines

Gavi, the Vaccine Alliance, has signed an advance purchase agreement (APA) with Bavarian Nordic to secure 500,000 doses of the MVA-BN® mpox vaccine for African countries affected by the mpox outbreak. These doses, to be delivered in 2024, are funded by Gavi's First Response Fund, a mechanism created after the COVID-19 pandemic to rapidly respond to health emergencies. This agreement follows WHO prequalification of the MVA-BN vaccine on September 13, 2024. Gavi, with UNICEF's assistance, aims to ensure quick vaccine rollouts in affected regions. Long-term efforts include building a global vaccine stockpile and supporting local vaccine manufacturing in Africa through the African Vaccine Manufacturing Accelerator, launched in June 2024.

NIH Releases Mpox Research Agenda.

Published by NIH/NIAID on 17 September 2024
https://www.niaid.nih.gov/news-events/nih-releases-mpox-research-agenda

The National Institutes of Health's (NIH) National Institute of Allergy and Infectious Diseases (NIAID) has outlined a research agenda to combat the ongoing mpox outbreak. Key objectives include studying the biology of all mpox clades, improving understanding of virus transmission and immune responses, optimizing vaccine dosing to extend supply, and developing new vaccines. NIAID also aims to advance treatments, including antivirals and monoclonal antibodies, and enhance virus detection for clinical and epidemiological purposes. NIAID collaborates with global partners, leveraging its research infrastructure to reduce mpox's impact and protect public health worldwide.

UNICEF appeals for US $58.8 million to address mpox crisis as cases among children rise.

Published by UNICEF on 16 September 2024
https://www.unicefusa.org/press/unicef-appeals-us-588-million-address-mpox-crisis-cases-among-children-rise

UNICEF has launched a US$58.8 million appeal to address the rising mpox crisis affecting children in six African countries. With nearly 22,000 cases reported in 2024, 60% of which are in children under 15, and 80% of mpox-related deaths occurring in children, particularly in underserved communities, the need for urgent action is clear. The appeal targets Burundi, the Democratic Republic of the Congo (DRC), Kenya, Rwanda, Uganda, and the Central African Republic, where the clade 1 variant is spreading. UNICEF's response focuses on coordinating with health and education authorities, enhancing infection control, supporting vaccine roll-out, providing mental health support, and ensuring access to essential services. The appeal emphasizes addressing the heightened vulnerabilities of children, exacerbated by poor healthcare, malnutrition, and displacement.

WHO and partners establish an access and allocation mechanism for mpox vaccines, treatments, tests.

Published by WHO on 13 September 2024
https://www.who.int/news/item/13-09-2024-who-and-partners-establish-an-access-and-allocation-mechanism-for-mpox-vaccines--treatments--tests/

The World Health Organization (WHO) and partners have launched the Access and Allocation Mechanism (AAM) to ensure equitable access to mpox vaccines, treatments, and tests, prioritizing those at highest risk. This initiative responds to the 2024 public health emergency in Africa, particularly in the Democratic Republic of the Congo. The AAM, part of the interim Medical Countermeasures Network (i-MCM-Net), aims to address limited global supplies by coordinating donations and efficient distribution. Over 3.6 million vaccine doses have been pledged by countries and manufacturers. The AAM focuses on transparency, equity, and preventing illness and death through targeted interventions.

Guidelines and practical information

This section lists official manuals of recommendations for clinical practice or public health policy published by leading health organizations.

17 September 2024	NIAID Research Agenda for 2024 Mpox – September 2024
12 September 2024	Mpox: scenarios and technical elements of preparedness and response for clade I (UKHSA)
August 29, 2024	Avis du collège de la Haute Autorité de santé relatif à la stratégie de vaccination contre le mpox (HAS)
August 19, 2024	Temporary recommendations issued by WHO to States Parties in relation to the public health emergency of international concern associated with the upsurge of mpox (WHO)
May 24, 2024	Strategic framework for enhancing prevention and control of mpox - 2024-2027 (WHO)
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)