MONTHLY SCIENTIFIC REVIEW ON **MPOX VIRUS**

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Situation at a glance

- Since the beginning of 2024, the increasing frequency of outbreaks with clade I MPXV in the Democratic Republic of Congo (DRC) and now in non-endemic African regions has raised major public health concerns.
- Between January 1, 2024, and March 30, 2025, 28,380 confirmed cases of monkeypox and 101 deaths were reported in the African region.
- A novel clade I MPXV variant (1b) linked with sexual and non-sexual human-to-human transmission is spreading rapidly in Eastern DRC and neighboring countries.
- Travelers returning from high-risk regions have been tested positive for clade 1b in some countries outside Africa, including in Europe.

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Scientific articles

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

This week, discover breakthroughs in mpox physiopathology, clinical, vaccination, therapeutic, and public health.

Physiopathology

T cell memory response to MPXV infection exhibits greater effector function and migratory potential compared to MVA-BN vaccination. Chen JL, Wang B, Lu Y, Antoun E, Bird O, Drennan PG, Yin Z, Liu G, Yao X, Pidoux M, Bates A, Jayathilaka D, Wang J, Angus B, Beer S, Espinosa A, Baillie JK, Semple MG; ISARIC4C Investigators; Rostron T, Waugh C, Sopp P, Knight JC, Fullerton JN, Coles M, Smith GL, Mentzer AJ, Peng Y, Dong T.

Published in Nat Commun, on May 2025.

In this study, the authors develop a T cell assay to evaluate ex vivo T cell responses in convalescent and MVA-BN (Modified Vaccinia Ankara - Bavarian Nordic) vaccinated individuals using VACV-infected cells. Strong CD8+ and CD4+ T cell responses were observed, and T cell responses are biased towards viral early expressed proteins. Seven immunodominant HLA-A*02:01 restricted MPXV-specific epitopes were identified and they focus a detailed phenotypic and scRNAseq analysis on the immunodominant HLA-A*02:01-G5R18-26-specific CD8+ T cell response. While tetramer+CD8+ T cells share similar differentiation and activation phenotypes, T cells from convalescent individuals show greater cytotoxicity, migratory potential to site of infection and TCR clonal expansion. These findings suggest that effective functional profiles of MPXV-specific memory T cells induced by Mpox infection may have an implication on the long-term protective responses to future infection.

Substrate recognition and cleavage mechanism of the monkeypox protease, Core protease. Gao Y, Xie X, Zhang X, Cao J, Lan W, You T, Li D, Dong X, Dai W, Xiang Y, Hu S, Shang W, Wu B, Zhang Y, Xu J, Liu X, Wang H, Hu W, Zhang M, Duan Y, Cui W, Zhou H, Mao S, Jia H, Sun Z, Jia M, Yin Y, Nguyen HC, Yang K, Yang B, Yang X, Ji X, Xiao G, Wang W, Zhang L, Rao Z, Liu H, Yang H.

Published in Nature, on April 2025.

In this study, the authors determined the structures of mpox virus (MPXV) core protease (CorePro) apo-CorePro and its complex with an inhibitor aloxistatin, which is a drug candidate for muscular dystrophy. These structures show that CorePro forms a homodimer featuring a unique “dancing-couple” fold. The catalytic intermediate state of CorePro was characterized by an aldehyde derivative from a natural substrate (I-G18). This derivative covalently binds to the catalytic cysteine 328 (Cys328), making the active site of viral protease shift from a closed conformation in the apo-form to a favorable open conformation upon substrate binding. Based on the CorePro-I-G18 complex, the authors then designed a series of peptidomimetic inhibitors with a nitrile warhead, which could covalently anchor with the catalytic Cys328. These compounds inhibit the CorePro with IC50 values of 44.9-100.3 nM, exhibiting potent and broad anti-poxvirus activity as well. These findings provide the basis for designing wide-spectrum inhibitors against poxvirus infections.

Strong and early monkeypox virus-specific immunity associated with mild disease after intradermal clade-IIb-infection in CAST/EiJ-mice. Meyer Zu Natrup C, Clever S, Schünemann LM, Tuchel T, Ohrnberger S, Volz A.

Published in Nat Commun, on February 2025.

In this study, the authors developed an appropriate animal model to mimic human mpox virus (MPXV) infection via tail scarification in CAST/EiJ mice. In this model, disease outcome is milder in clade IIb than clade IIa-infected mice, which is associated with enhanced immunogenicity early during infection. This suggests that clade IIb more efficiently activates host immune responses, highlighting how this animal model could facilitate studying new MPXV variants. Regarding the skin lesions and systemic disease outcome, the intradermal infection route in CAST/EiJ mice provides a suitable animal model to study the pathogenesis, virulence and efficacy of preventive, therapeutic and vaccination measures against MPXV.

Clinical

Clinical presentation and epidemiological assessment of confirmed human mpox cases in DR Congo: a surveillance-based observational study. Malembi E, Escrig-Sarreta R, Ntumba J, Beiras CG, Shongo R, Bengehya J, Nselaka C, Pukuta E, Mukadi-Bamuleka D, Mulopo-Mukanya N, Leng X, Pérez-Mañá C, Galván-Casas C, Muñoz S, Bilembo-Kitwanda S, Kitha P, Maketa V, Mitashi P, Abedi A, Nsio J, Ahuka-Mundeke S, Mbala-Kingebeni P, Muyembe JJ, Marks M, Muhindo-Mavoko H, Mitjà O; MOTION-DRC Working Group.

Published in Lancet, on May 2025.

This study aimed to provide a clinical comparison of mpox cases in DR Congo regions where clade 1a and clade 1b are prevalent. The authors conducted a retrospective observational study, analysing PCR-confirmed mpox cases reported from sentinel health zones in seven provinces between Oct 1, 2023, and Sept 31, 2024. Cases from the newly affected provinces were described along with those from four endemic provinces. Of 17 927 suspected cases identified, 10 986 were investigated, 5948 were PCR-positive, and 4895 met the inclusion criteria based on data completeness: 4436 in newly affected and 459 in endemic regions. In summary, study indicates concurrent mpox outbreaks in DR Congo, involving younger individuals, a higher proportion of women and girls, and distinct presentations with higher lesion counts and respiratory symptoms, compared with clade 2b lineage B.1 outbreaks. The authors insist that the high proportion of infectious complications and case-fatality rates, especially in endemic regions, emphasise the need for timely antibiotic therapy and targeted vaccination to reduce morbidity and mortality.

Vaccination

Safety and effectiveness of MVA-BN vaccination against mpox in at-risk individuals in Germany (SEMVAc and TEMVAc): a combined prospective and retrospective cohort study. Hillus D, Le NH, Tober-Lau P, Fietz AK, Hoffmann C, Stegherr R, Huang L, Baumgarten A, Voit F, Bickel M, Goldstein G, Wyen C, Stocker H, Wünsche T, Lee M, Schulbin H, Vallée M, Bohr U, Potthoff A, Cordes C, Isner C, Knox B, Carmona A, Stobäus N, Balicer R; SEMVAc Study Group; Kurth F, Sander LE.

Published in Lancet Infect Dis, on March 2025

Since the onset of the global mpox outbreak in 2022, over 115,000 cases have been confirmed. The spread of both clade II and recently clade I monkeypox virus has led to a Public Health Emergency of International Concern. The third-generation smallpox vaccine, MVA-BN, was recommended for at-risk populations in 2022, despite limited data on its safety and effectiveness against mpox. A prospective multicenter observational study was conducted in Germany, enrolling men who have sex with men and transgender individuals to assess the safety, reactogenicity, and effectiveness of MVA-BN. The findings showed that adverse reactions were infrequent, with local reactions being more common after the first dose. One dose of MVA-BN provided protection against mpox, although its effectiveness was reduced in individuals living with HIV. Breakthrough infections were associated with milder symptoms compared to infections in unvaccinated individuals. Overall, the study concluded that MVA-BN is safe, well-tolerated, and effective, particularly in preventing severe disease, while combining prospective and retrospective study designs can be useful in public health emergencies.

Immunogenicity of MVA-BN vaccine deployed as mpox prophylaxis: a prospective, single-centre, cohort study and analysis of transcriptomic predictors of response. Immunogenicity of MVA-BN vaccine deployed as mpox prophylaxis: a prospective, single-centre, cohort study and analysis of transcriptomic predictors of response.

Published in Lancet Microbe, on April 2025

Since 2022, mpox has become a global health concern, with two clades (I and II) causing outbreaks. The MVA-BN vaccine, a third-generation smallpox vaccine, has been key in preventing mpox. However, the immunogenicity of this vaccine, especially when administered in fractionated doses, is not fully understood. This study aimed to explore the immunogenicity of MVA-BN and the baseline factors influencing vaccine response. A cohort study was conducted in Oxford, UK, with blood samples taken at multiple timepoints to assess IgG and T-cell responses. The study found that 47% of participants seroconverted by day 28, and 89% did so by day 90 after the second dose. Baseline inflammatory states appeared to inhibit serological responses, suggesting that such states could reduce the effectiveness of the vaccine. These findings could help improve vaccination strategies and inform the use of dose-sparing approaches in future mpox outbreaks.

Therapeutic

Tecovirimat for Clade I MPXV Infection in the Democratic Republic of Congo. PALM007 Writing Group; Ali R, Alonga J, Biampata JL, Kombozi Basika M, Maljkovic Berry I, Bisento N, Blum E, Bonnett T, Cone K, Crozier I, Davey R, Dilu A, Dodd LE, Gulati I, Hruby D, Ibanda A, Isse F, Kasareka SS, Kayembe G, Kojan R, Luzolo EK, Lane HC, Lawanga L, Liesenborghs L, Shosongo Lunghe C, Lula Y, Lusakibanza M, Lutete GT, Mbala-Kingebeni P, Miranda A, Mukadi-Bamuleka D, Mukendi G, Lupola PM, Muyembe-Tamfum JJ, Ndungunu R, Nganga B, Ntamabyaliro N, Nussenblatt V, Omulepu I, Omalokoho Onosomba J, Proschan M, Rubenstein K, Saknite I, Schechner A, Shaw-Saliba K, Sivahera B, Smolskis M, Tillman A, Tkaczyk E, Tshimanga C, Tshiani Mbaya O, Tshomba A, Yemba Unda Tshomba F, Vallee D, Vogel S, Weyers S.

Published in N Engl J Med, on April 2025.

The authors conducted a double-blind, randomized, placebo-controlled trial of tecovirimat in patients with mpox in the Democratic Republic of Congo. Patients with at least one mpox skin lesion and positive polymerase-chain-reaction results for clade I MPXV were assigned in a 1:1 ratio to receive tecovirimat or placebo. The primary end point was resolution of mpox lesions, measured in number of days after randomization. Among the 597 randomized patients, the median time from randomization to lesion resolution was 7 days with tecovirimat and 8 days with placebo. Results were similar whether patients began the trial regimen within 7 days after the reported onset of symptoms or more than 7 days after onset. Adverse events occurred in 72.9% of the patients in the tecovirimat group and 70.5% of those in the placebo group, and serious adverse events were reported in 5.1% and 5.0%, respectively. In conclusion, tecovirimat did not reduce the number of days to lesion resolution in patients with mpox caused by clade I MPXV. No safety concerns were identified.

Epidemiology and disease surveillance

Effectiveness of different border control strategies for reducing mpox importation risk: a modelling study. Jin S, Guan T, Endo A, Gan G, Janhavi A, Hu G, Ejima K, Lim JT, Dickens BL.

Published in Lancet Reg Health Southeast Asia, on March 2025.

This study evaluates how different border control strategies could reduce the importation of Clade Ib mpox cases. Clade Ib is more transmissible through non-sexual routes than Clade IIb and has led to global concern after cases appeared outside Africa. Researchers used an agent-based model to simulate infection progression, testing, and quarantine outcomes for inbound travellers. They tested nine strategies, including pre-departure and on-arrival testing, and quarantines of varying durations. On-arrival PCR testing identified more cases than pre-departure testing, but combining both was more effective. A 7-day quarantine with post-quarantine testing was more effective than testing alone, reducing missed cases by over 70%. A 28-day quarantine alone reduced importation risk by over 90%, especially effective when testing resources are limited. At low disease prevalence (0.001%), even single on-arrival testing or 14-day quarantine sufficed to keep missed cases low. Higher prevalence (e.g., 0.01%) required more restrictive strategies like 7-day quarantine plus testing or 28-day isolation. The study highlights the need to adapt border control to the epidemiological context of the source country. It also notes the trade-offs between public health protection and the economic and psychological burdens of quarantine. Ultimately, tailored border policies can help prevent global spread while minimizing societal impact.

Development and validation of Mpox healthcare seeking barriers scale for MSM based on a multicenter study in China. Liu S, Gao Y, Xu H, Wang Y, Xu G, Cai Y, Zhang J.

Published in Sci Rep, on March 2025.

The study develops and validates a scale (MMHSBS) to measure barriers faced by men who have sex with men (MSM) in seeking healthcare for Mpox (monkeypox) symptoms in China. Conducted among 2,347 MSM across six Chinese cities, the survey identifies three main dimensions of reluctance: medical distrust, perceived costs, and interpersonal damage (such as social stigma). The 14-item scale demonstrated strong content validity and excellent internal consistency ($\alpha = 0.949$). MSM expressed significant concern about the impact of Mpox on their social image, more than about healthcare providers' competence. The study also found a generally good level of knowledge about Mpox, though awareness of certain disease features remains limited. The methodology relied on exploratory and confirmatory factor analyses. The three-factor model showed the best statistical fit. The MMHSBS scale can support better-targeted public health interventions. Finally, the study emphasizes the urgent need to reduce stigma to improve healthcare access.

Relevant news

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

Sierra Leone Fights Mpox

Published by Africa CDC, May 18, 2025.

Sierra Leone recorded its first case on January 10, 2025. Sierra Leone reported a rising number of confirmed mpox cases, with over 200 new confirmed cases reported in April, highlighting the increased transmission in the country. In early May, it had half of Africa's confirmed cases, with its outbreak expanding over the past six weeks and cases rising 71% last week compared to the week before. The country was averaging about 100 new cases a day.

Variole de singe : un cas détecté dans le Golfe, le gouvernement appelle à la vigilance

Published by the Ministry of Health Togo, May 16, 2025.

A case of monkeypox, also known as Mpox, was confirmed on Friday, May 16, in the Golfe health district (Greater Lomé Region), the Ministry of Health announced. The patient, a 22-year-old woman, is currently receiving care in an infectious disease treatment unit.

Africa CDC and WHO Update Mpox Strategy as Outbreaks Persist

Published by Africa CDC, April 17, 2025.

Africa CDC and WHO have updated their joint Continental Response Plan for the mpox emergency as the disease continues to affect new areas. The revised strategy focuses on controlling outbreaks, while expanding vaccination coverage and transitioning toward a longer-term, sustainable response.

How do mpox outbreaks start? Dead baby monkey provides important clue

Published by Science, April 8, 2025.

For the scientists who had been observing animals in the forest for years, the find presented a unique opportunity to investigate how an mpox outbreak starts, and where in nature the virus that causes it might lurk. In a preprint posted today on Research Square, the team ended up pinpointing one particular rodent species: the fire-footed rope squirrel (Funisciurus pyrropus).

Tanzania Confirms First Cases of Mpox Virus Disease

Published by WHO, March 10, 2025.

Tanzania has confirmed its first two cases of Mpox, following a laboratory report conducted on March 9th in Dar es Salaam. This marks the first time the disease has been reported in the country.

Ministério da Saúde envia equipe a São Paulo para monitorar 1º caso de mpox causado pela cepa 1b no Brasil

Published by the Ministry of Health of Brazil, March 10, 2025.

Brazil has reported its first clade 1b mpox case, per a notice from the national Health Ministry. The patient is a 29 year-old woman from Sao Paulo, whose relative had recently returned from travel to the Democratic Republic of the Congo (DRC).

Guidelines and practical information

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

COREB	Fiche pratique Mpox (2025)
WHO	Infection prevention and control and water, sanitation and hygiene measures for home care and isolation for mpox in resource-limited settings: interim operational guide (2025)
NIAID	NIAID Research Agenda for 2024 Mpox (2024)
UKHSA	Mpox: scenarios and technical elements of preparedness and response for clade I (2024)
HAS	Avis du collège de la Haute Autorité de santé relatif à la stratégie de vaccination contre le mpox (2024)
WHO	Temporary recommendations issued by WHO to States Parties in relation to the public health emergency of international concern associated with the upsurge of mpox (2024)
WHO	Strategic framework for enhancing prevention and control of mpox - 2024-2027 (2024)
WHO	Surveillance, case investigation and contact tracing for mpox (monkeypox): Interim guidance, 20 March 2024 (2024)
WHO	Diagnostic testing for the monkeypox virus (MPXV): interim guidance, (2023)
COREB	Infection au Monkeypox virus : procédure opérationnelle de prélèvement (2023)
COREB	Infection par le Monkeypox virus : repérer et prendre en charge un patient en France (2023)
SPF	Définition de cas et contacts et conduite à tenir pour la recherche des contacts (2023)
ECDC	Public health considerations for mpox in EU/EEA countries (2023)
WHO	Public health advice on mpox and congregate settings: settings in which people live, stay or work in proximity (WHO)
WHO	Public health advice for gay, bisexual and other men who have sex with men on the recent outbreak of mpox (WHO)
HCSP	Révision du plan de lutte contre la variole (2022)
WHO	Monkeypox strategic preparedness, readiness, and response: Operational planning guidelines (2022)
WHO	Vaccines and immunization for monkeypox: interim guidance (2022)
WHO	Monkeypox Strategic Preparedness, Readiness, and Response Plan (2022)
WHO	Public health advice for sex workers on mpox (2022)
WHO	Risk communication and community engagement public health advice on understanding, preventing and addressing stigma and discrimination related to mpox (2022)
ECDC	Monkeypox infection prevention and control guidance for primary and acute care settings (2022)
ECDC/WHO	Risk communication and community engagement approaches during the monkeypox outbreak in Europe, 2022 (2022)
ECDC	Considerations for contact tracing during the monkeypox outbreak in Europe, (2022)
WHO	Clinical characterization of mpox including monitoring the use of therapeutic interventions (2022)
WHO	Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance (2022)
ECDC	Navigating monkeypox: considerations for gay and bisexual men and other men who have sex with men (2022)
COREB	Monkeypox - Aide au diagnostic dermatologique et au traitement symptomatique (2022)
HCSP	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 (2022)
HCSP	Mesures de prévention vis-à-vis de l'infection à Monkeypox virus (2022)
HCSP	Avis relatif à la conduite à tenir autour d'un cas suspect, probable ou confirmé d'infection à Monkeypox virus (2022)

Fact sheets

Transmission

Mpox is a zoonotic infectious disease caused by the mpox virus (MPXV), belonging to the Poxviridae family and Orthopoxvirus genus, similarly to smallpox. There are two known clades of MPXV: clade I originate from eastern regions in Central Africa and clade II prevalent in West Africa. Clades I and II are further subdivided into four distinct subclades: Ia, Ib, IIa, and IIb. Variants Ib and IIb 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 CFR of 1 - 3%. The global mpox outbreak caused by the clade IIb in 2022-2023 showed a CFR of less than 0.1%.

Clades Ia and IIa are transmitted from animals to humans through contact with live and dead animals through hunting or consumption of contaminated bushmeat. The animal reservoir remains unknown but African rodents such as tree squirrels, and Gambian pouch rats are currently considered to be strong candidates. Secondary human-to-human transmission of these clades occasionally occurs via respiratory droplets, direct close contacts with body fluids or skin abrasions, or through contaminated. Clades Ib and IIb have demonstrated sustained human-to-human transmission. Populations at higher risk of zoonotic transmission include small households or communities living in rural areas, where animal reservoirs may reside. High-risk groups for community transmissions also include sex workers, MSM with multiple sexual partners, or any other individuals with multiple casual sexual partners.

Symptoms

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. Symptoms can be severe, and patients may develop multiple lesions. Complications may occur, such as septicemia, encephalitis. 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) pathogens and requires stringent containment and appropriate safety measures to minimize risk to laboratory personnel. Primary preventive vaccination is recommended for health workers, including laboratory personnel at risk for repeated exposure.

Diagnosis

Due to the range of health conditions that cause similar-appearing skin lesions, clinical differentiation 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. The reliability of results depends on the type of biological specimen, with optimal samples obtained directly from skin lesions. In the absence of visible epidermal wounds, testing can be conducted on mucosal specimens using oropharyngeal or rectal swabs. Point-of-care and antigen rapid diagnostic test are rapid, cost-effective and easily interpretable diagnostic tools for use by health workers. 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.

Treatment

Therapeutic management relies mainly on supportive care. One antiviral, tecovirimat, developed to treat smallpox, has been approved by the FDA and EMA as a compassionate use for the treatment of mpox. 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.

Vaccination

There are currently three vaccines approved 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 administered vaccine has been the MVA-BN, for which a favorable safety profile with mild side. The vaccination is recommended for the residents of high-risk areas, sex workers, MSM, health workers exposed to mpox, and contacts of mpox patients, including children. MVA-BN is not yet widely available in countries where the disease is endemic.

More information