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MPOX: CURRENT CHALLENGES IN DIAGNOSIS, TREATMENT, PREVENTION, AND PUBLIC HEALTH – A NARRATIVE REVIEW

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ABSTRACT

Mpox (monkeypox) has emerged as a major global public health concern following the unprecedented multinational outbreaks that began in 2022. Although historically considered a neglected zoonotic disease confined mainly to endemic regions of Central and West Africa, recent epidemiological changes, international spread, and the emergence of new viral clades have highlighted significant gaps in preparedness, surveillance, and access to medical countermeasures. The clinical spectrum of mpox has also evolved, with atypical presentations increasingly reported during recent outbreaks, creating additional diagnostic challenges for clinicians.

This narrative review summarizes current evidence regarding the epidemiology, transmission, pathogenesis, clinical manifestations, diagnosis, treatment, prevention, and public health implications of mpox. Particular attention is given to limitations of existing diagnostic methods, the evolving evidence surrounding antiviral therapy, challenges associated with vaccine availability and effectiveness, and the importance of risk communication and stigma reduction strategies. The review also discusses the role of genomic surveillance, point-of-care diagnostics, and the One Health approach in strengthening future outbreak preparedness and response.

Despite substantial progress in understanding mpox since 2022, important uncertainties remain regarding long-term control strategies, equitable access to vaccines and therapeutics, and the management of emerging viral variants. Continued international collaboration, investment in surveillance infrastructure, and improved global health equity will be essential for reducing the impact of future mpox outbreaks.

KEYWORDS

Mpox, Monkeypox, MPXV, Epidemiology, Diagnosis, Treatment, Vaccination, Public Health

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Introduction

Mpox, formerly called monkeypox, is a zoonotic disease caused by the mpox virus (MPXV), a double-stranded DNA virus of the genus *Orthopoxvirus* within the family *Poxviridae.* [1] The first human case was reported in the Democratic Republic of the Congo in 1970, and for decades the disease remained largely confined to endemic regions of Central and West Africa, with sporadic outbreaks mostly associated with animal exposure and limited human-to-human transmission. [2]

The epidemiological landscape of mpox changed dramatically in 2022, when an unprecedented multinational outbreak led to sustained transmission in non-endemic countries across Europe, North America, Asia, and Oceania. [3] Transmission during the 2022 epidemic was driven primarily by close physical and sexual contact, resulting in clinical and epidemiological characteristics that differed markedly from historically reported cases. [3,4] The outbreak exposed major shortcomings in surveillance systems, diagnostic capacity, clinical recognition, and public health preparedness worldwide. [5]

Although the global incidence decreased after the first epidemic wave, mpox remains an important international public health concern. The emergence and spread of clade Ib in several African countries, together with cases reported in other regions, demonstrated the continued potential for international spread and highlighted the necessity for sustained vigilance and surveillance. [5,6] Furthermore, uncertainties about the best antiviral treatment, vaccine efficacy, the duration of post-infection immunity, and equitable access to preventive measures continue to represent major challenges for healthcare systems and policymakers. [1,5]

Apart from the clinical aspects, mpox has significant psychological, social, and public health implications, including stigma, misinformation, and inequities in access to diagnostics, treatment, and vaccination. [5,6] These challenges emphasize the necessity of multidisciplinary approaches that integrate clinical medicine, epidemiology, behavioral sciences, and public health strategies.

This narrative review aims to present the current understanding of the epidemiology, transmission, clinical manifestations, diagnosis, treatment, prevention, and public health implications of mpox, with a focus on the challenges encountered during the 2022–2026 outbreaks and the priorities for future preparedness and response.

Methodology

This study was conducted as a narrative review of the current literature on mpox, with a particular focus on challenges related to diagnosis, treatment, prevention, and public health response. The primary source of scientific evidence was the PubMed/MEDLINE database. In addition, official reports and recommendations issued by the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), the European Centre for Disease Prevention and Control (ECDC), and Africa CDC were reviewed to incorporate the most recent epidemiological and public health data.

The literature review included publications from January 1, 2022 to July 2026, the duration of the recent global mpox outbreaks. Previous landmark studies were selectively included where necessary to provide historical context or to describe basic epidemiological concepts.

1. Epidemiology and Transmission of Mpox

1.1. Global Epidemiology

Before 2022, mpox was regarded as a very rare zoonotic disease, mostly occurring in endemic areas of Central and West Africa, with the majority of human cases being connected to exposure to animals or limited transmission within households. [2,7]

The epidemiological situation changed dramatically in 2022, when an unprecedented multinational outbreak led to sustained transmission in more than 100 non-endemic countries and prompted the World Health Organization to declare a Public Health Emergency of International Concern (PHEIC) in July 2022. [3,8] The epidemic differed from earlier outbreaks in terms of widespread person-to-person transmission and a distinctly different geographical distribution. [3,4]

The most recent available surveillance statistics indicate that more than 181,000 laboratory-confirmed illnesses and approximately 500 deaths were documented globally from January 2022 to May 2026. [5] Most of the cases during the first epidemic wave were in Europe and the Americas. However, the emergence of clade Ib in Central Africa brought the focus back to endemic areas and showed that the risk of international spread is still there. [5,6]

These trends imply that mpox should not be considered as a geographically isolated zoonosis but as a developing worldwide public health problem that requires persistent surveillance and preparedness measures. [5,8]

1.2. Reservoirs and Zoonotic Transmission

The natural reservoir of MPXV has not been conclusively established despite decades of research. The first recognized occurrence of mpox in the Western hemisphere was in 2003 in 11 humans in the United States who had been in close contact with sick prairie dogs. The animals had been relocated with a Giant Gambian rat believed to be the cause of the infection. According to current evidence, several species of African rodents, particularly arboreal squirrels and dormice, may play a significant role in viral maintenance within endemic ecosystems. [9,10,11]

Historically, the predominant route of human infection was zoonotic transmission, driven by direct contact with diseased animals, contaminated objects, or bushmeat handling techniques in endemic regions. [11] The 2022 global outbreak was primarily driven by human-to-human transmission, but repeated animal-to-human spillover episodes continue to maintain endemic circulation in Central Africa and remain a crucial source of virus persistence. [12]

These results underscore the increasing importance of the One Health concept, incorporating surveillance of humans, animals, and the environment in future mpox prevention efforts. [12]

1.3. Human-to-Human Transmission

In humans, mpox is mostly transmitted by direct contact with infectious skin lesions, mucosal surfaces, bodily fluids, and contaminated objects such as clothing or bedding. [13] Transmission by the pulmonary route is feasible in continuous close contact, but recent research suggests that direct physical exposure is much more important in the transmission of the disease. [14]

The 2022 global outbreak demonstrated a major shift in transmission patterns, with most infections occurring during close intimate contact within sexual networks. [3,4,13] However, mpox should not be

regarded as a sexually transmitted infection (STI) alone, as household and community transmission continue to occur and remain epidemiologically important. [13,15]

The emergence of clade Ib further highlighted the dynamic nature of mpox epidemiology, with increasing evidence of sustained transmission in household and community settings in endemic regions. [6] Such discoveries underline the necessity for adaptable surveillance and preventive approaches that can respond to shifting patterns of transmission.

2. Pathogenesis and Clinical Manifestations

2.1. Virology and Immune Response

Mpox virus (MPXV) is an enveloped double-stranded DNA virus belonging to the genus *Orthopoxvirus* within the family *Poxviridae* [1]. Historically, two major phylogenetic groups have been recognized, although recent outbreaks have drawn particular attention to the emergence and epidemiological significance of clade Ib. [6]

After inoculation through the skin or mucosal surfaces, MPXV replicates initially at the site of inoculation and then spreads to regional lymph nodes and distant tissues by lymphatic and hematogenous dissemination. This leads to the development of the systemic signs and the distinctive mucocutaneous lesions during infection. [16]

Both innate and adaptive immune responses are involved in viral elimination. Cellular immunity, particularly T-cell responses, appears to play a central role in controlling infection, whereas impaired immune function has been associated with prolonged viral replication and more severe illness. [17,18] This may explain the unfavorable clinical outcomes observed in patients with advanced HIV infection and other kinds of immunosuppression. [18]

2.2. Clinical Presentation

The incubation period of mpox typically ranges from 5 to 21 days, with most patients developing symptoms approximately 7–10 days after exposure. [14] Initial manifestations are usually nonspecific and include fever, headache, myalgia, fatigue, and lymphadenopathy, the latter representing an important feature distinguishing mpox from several other vesiculopustular diseases. [1,15]

Lesions of the skin and mucous membranes develop usually within days of the onset of symptoms and can affect the face, trunk, extremities, anogenital region, and oral mucosa. [3,4] Lesions tend to progress through macular, papular, vesicular, pustular, and crusting stages, although asynchronous lesion development has frequently been observed during recent outbreaks. [15]

The 2022 outbreak was characterized by a significant rise in unusual presentations such as isolated vaginal lesions, proctitis, pharyngitis, and moderate or absent prodromal symptoms. [4,9] Such unusual presentations resulted in diagnostic ambiguity and increased the chance of delayed diagnosis or misclassification as other STIs. [9,15]

2.3. Complications and High-Risk Groups

Even though most cases of mpox are self-limiting, severe disease and serious complications may occur in selected patient populations. [15] Reported complications include severe mucosal involvement, secondary bacterial infections, ocular disease, pneumonia, and neurological symptoms. [15]

The highest risk of severe disease has consistently been observed among individuals with advanced HIV infection and profound immunosuppression, in whom prolonged viral replication, extensive lesions, and increased mortality have been reported. [18,19] Pregnant women, children, and patients receiving immunosuppressive therapy may also experience less favorable outcomes, although the currently available evidence remains more limited than for HIV-associated disease. [20]

Recent observations have also suggested differences in disease severity between viral clades. Clade I viruses have historically been associated with higher mortality rates and more severe systemic manifestations than clade II viruses, although direct comparisons remain limited by differences in surveillance systems and healthcare access across affected regions. The emergence of clade Ib has renewed concerns regarding the potential for increased transmissibility and disease severity, particularly in vulnerable populations mentioned above. [15,18,20]

Identification of high-risk groups is essential for prioritization of antiviral therapy, vaccination strategies, and public health interventions during future outbreaks.

3. Current Diagnostic Challenges

3.1. Clinical Diagnosis and Its Limitations

Clinical diagnosis of mpox remains challenging because of the considerable variability of disease presentation and the increasing frequency of atypical manifestations observed during recent outbreaks. [21] During the 2022 epidemic, many patients presented with isolated genital lesions, proctitis, pharyngitis, or minimal systemic symptoms, frequently mimicking common STIs and resulting in delayed recognition. [4,9,21]

The differential diagnosis of mpox includes herpes simplex infection, varicella-zoster virus infection, syphilis, molluscum contagiosum, and other vesiculopustular diseases. [22,23] The diagnostic significance of lymphadenopathy, which has historically been considered a differentiating characteristic of mpox, may however be limited in individuals with atypical or confined illness. [22]

These results indicate the limits of clinical diagnosis alone and the necessity of test confirmation in suspected cases. [23]

3.2. Laboratory Diagnosis

Laboratory confirmation is essential for mpox diagnosis, especially in patients presenting with atypical clinical manifestations or limited skin involvement. [23] Currently, due to its excellent sensitivity and specificity, the diagnostic gold standard is real-time polymerase chain reaction (PCR) using material derived directly from skin lesions. [24]

Samples collected from vesicular fluid, pustules, crusts, or lesion swabs provide the highest diagnostic yield, whereas blood testing has limited utility because viremia is often transient and occurs early during infection. [25]

Serological approaches are of much lesser importance in routine diagnosis since MPXV-specific antibodies might cross-react with other orthopoxviruses (including vaccinia virus) and hence reduce the diagnostic specificity. [1,23] Therefore, serological assays are currently employed mostly for epidemiological studies and research rather than for clinical decision-making. [23]

Despite major advances in molecular diagnostics, access to laboratory testing remains uneven in many endemic and resource-limited settings, contributing to delayed diagnosis and underreporting during outbreaks. [26]

3.3. Challenges During Outbreaks

The 2022 multi-country outbreak revealed significant shortcomings of current diagnostic and surveillance techniques. Limited clinical expertise with mpox in many non-endemic countries resulted in delayed detection of cases and increased risk of misdiagnosis, especially in the early phase of the epidemic. [3,7,21]

The increasing number of atypical clinical manifestations further complicated case recognition and often resulted in initial diagnoses of STIs or other dermatological conditions. [9,21] In addition, delays in laboratory confirmation and limited access to molecular testing in some areas contributed to underdiagnosis and underreporting. [23,26]

These experiences highlighted the importance of clinician education, standardized diagnostic protocols, and rapid access to laboratory testing. [26] Strengthened global monitoring systems and improved reporting procedures will continue to be important for early detection of outbreaks and effective public health response in future epidemics. [5,12]

4. Current Treatment Strategies

4.1. Supportive Care

Most cases of mpox are self-limiting and can be managed with supportive treatment alone. [15,27] Symptomatic care comprises appropriate hydration, nutritional support, antipyretic medication, and pain control, especially in individuals with severe mucosal or anogenital involvement. [15,28]

Pain management emerged as an especially important aspect of care during the 2022 outbreak, as severe anorectal pain, odynophagia, and genital lesions frequently required escalation of analgesic therapy and, in some cases, hospitalization. [4,28]

Supportive treatment should also include prevention and management of secondary bacterial infections, ocular complications, and other organ-specific manifestations when present. [27] Early recognition of patients at risk of severe disease remains essential for timely initiation of antiviral therapy and specialist care.

4.2. Antiviral Therapies

Supportive care alone can handle most instances of mpox, however antiviral therapy may be considered for those with severe disease or increased risk of complications. [29] Tecovirimat, an inhibitor of the orthopoxvirus VP37 protein involved in viral egress, is currently regarded as the preferred antiviral agent for severe mpox infections. [30]

Despite its widespread use during recent outbreaks, robust clinical evidence supporting the effectiveness of tecovirimat remains limited. Results from recent randomized clinical trials, including STOMP and PALM007, failed to present significant reductions in lesion healing time or symptom duration compared with placebo, although the drug demonstrated a favorable safety profile. [31,32]

Brincidofovir and cidofovir have demonstrated activity against orthopoxviruses and may be considered in selected cases when tecovirimat is not accessible or is contraindicated. [27] However, their clinical application is limited by absence of efficacy data and concerns surrounding adverse effects, especially the nephrotoxicity of cidofovir. [27,30]

Current treatment recommendations therefore support individualized decision-making, considering the severity of the disease, the presence of underlying comorbidities, and the risk of a poor clinical outcome. [29]

4.3. Use Of Smallpox Vaccines and Their Efficacy

Because of the close genetic link between MPXV and the variola virus, vaccines designed for smallpox have proven to have a cross-protective effect against mpox. [33] Historical data suggested that prior smallpox vaccination provided approximately 85% protection against mpox infection, although the durability of this protection remains uncertain decades after immunization. [34]

The non-replicating modified vaccinia Ankara vaccine (MVA-BN) was the most frequently used vaccine in recent epidemics for pre-exposure and post-exposure prophylaxis. [35] Observational studies have suggested that vaccination may reduce the likelihood of infection and severe disease, although estimates of the real-world efficiency differ depending on the population investigated and the circulating viral clade. [36]

Current evidence supports the use of vaccination as an important component of outbreak control strategies, particularly among high-risk populations and close contacts of confirmed cases. [35,36]

4.4. Management of Severe Disease

Patients with severe mpox often require multidisciplinary management involving infectious disease specialists, dermatologists, intensivists, and other specialists depending on organ involvement. [29] Hospitalization may be necessary in cases of extensive mucocutaneous disease, severe pain, secondary bacterial infections, encephalitis, ocular involvement, or respiratory complications. [27]

Patients with advanced HIV infection and profound immunosuppression represent the most vulnerable group to severe outcomes and prolonged viral replication. [18,19] In these individuals, early initiation of antiviral therapy and close clinical monitoring are particularly important. [29,31]

Supportive care remains the mainstay of treatments and should include adequate analgesia, nutritional support, treatment of secondary infections, and organ-specific measures when required. [27,28] These findings underscore the significance of early risk stratification and individualized treatment strategies in patients with severe disease.

5. Prevention Strategies and Vaccination

5.1. Vaccination Strategies (Pre- and Post-Exposure)

Vaccination remains one of the most important tools for the prevention and control of mpox outbreaks. [35] Current recommendations support pre-exposure prophylaxis (PrEP) for individuals at increased risk of infection, including selected healthcare workers, laboratory personnel, and populations with increased exposure risk during outbreaks. [35,37] Post-exposure prophylaxis (PEP) is recommended for close contacts of confirmed cases, ideally within four days of exposure, although administration up to 14 days after contact may still reduce disease severity. [35,38]

The non-replicating modified vaccinia Ankara vaccine (MVA-BN) has become the preferred vaccine in most countries because of its favorable safety profile and suitability for immunocompromised individuals. [35,36] Nevertheless, substantial disparities in vaccine availability between high-income and endemic countries remain an important public health concern. [39]

Despite encouraging effectiveness estimates for third-generation vaccines, important uncertainties remain regarding the duration of vaccine-induced protection and the potential need for booster doses in populations at continued risk of exposure. Long-term immunogenicity data remain limited, particularly in relation to emerging viral clades and vulnerable populations such as immunocompromised individuals. [35,39]

5.2. Public Health Interventions

In addition to vaccination, effective control of mpox outbreaks requires a combination of public health interventions, including case isolation, contact tracing, and rapid identification of exposed individuals. [38,40] Early implementation of these measures played an important role in limiting transmission during the multinational outbreak of 2022. [5,8]

Public education and awareness campaigns are equally important, particularly in populations at increased risk of exposure. Accurate communication can improve health-seeking behavior, facilitate earlier diagnosis, and reduce stigma associated with infection. [41]

The recent resurgence of mpox has also highlighted the importance of international surveillance systems and coordinated public health responses. Strengthening reporting mechanisms and improving preparedness capacities will be essential for effective management of future outbreaks. [12,39]

6. Impact of Mpox on Patient Well-Being and Public Health

6.1. Psychological Impact

The psychological burden of mpox can be significant for those infected, particularly when confronted with protracted seclusion, visible skin lesions, and concerns about transmission to close contacts. [42] Anxiety, depression, social isolation, and fear of stigmatization have been regularly observed during recent epidemics. [42,43] Psychological discomfort may be further worsened by pain, prolonged recovery, and uncertainty regarding illness progression. [28] Visible lesions and post-inflammatory scarring may contribute to body image problems and decreased quality of life in some patients. [42]

These findings highlight the importance of integrating psychological support and mental health services into comprehensive mpox management strategies. [42,43]

6.2. Social Consequences

The 2022 outbreak demonstrated significant societal effects of mpox infection, especially in communities disproportionately affected during the early phases of the epidemic. [43,44] Stigma can impact access to health services, disclosure of symptoms, and involvement with contact tracing programs, thereby complicating outbreak control efforts. [44] Discrimination and social exclusion have been experienced in the workplace, in family environments, and in hospital settings, adversely impacting quality of life and faith in healthcare systems. [45] Media narratives concentrating on selected social groups also led to the misunderstanding of transmission and risk. [41,43]

Therefore, reducing stigma and increasing inclusive risk communication should remain essential components of future outbreak responses. [41, 43]

6.3. Healthcare System Challenges

The recent resurgence of mpox has exposed important inadequacies in healthcare systems worldwide, particularly in terms of diagnostic capacity, outbreak preparedness, and equal access to medical resources. [26,39] During large outbreaks, delays in laboratory confirmation and limitations in surveillance infrastructure contributed to underdiagnosis and delayed public health responses. [26,40]

In endemic regions, especially in Central and West Africa, access to vaccinations, antivirals, and diagnostics was much more limited than in high-income countries. [39,46] Such inequities presented significant ethical and public health challenges in relation to global epidemic preparedness and the distribution of resources. [46,47]

The experience gained during recent epidemics highlights the need for strengthened international collaboration, investment in surveillance systems, and improved access to diagnostics, therapeutics, and vaccines in resource-limited settings. [12,40,47]

7. Future Perspectives

7.1. Novel Diagnostics and Therapeutics in Development

Emerging outbreaks have underlined the critical need for rapid and more accessible diagnostic techniques and more effective antiviral therapies. [23,47] PCR is still the gold standard for diagnosis, but its use is limited in many endemic and resource-poor settings due to the requirement of laboratory infrastructure. [26]

Consequently, a weighty amount of research is being concentrated on the development of point-of-care molecular diagnostics and quick antigen testing that are able to provide results in minutes or hours instead of days. [48,49] Such technologies may greatly improve early case detection, help in outbreak control, and eliminate diagnostic inequities between high-income and endemic areas. [48,49]

Advances in portable molecular platforms, CRISPR-based diagnostics, and integrated field-deployable testing systems may further improve access to laboratory confirmation outside specialized centers. These approaches appear particularly promising for rural regions with limited laboratory capacity. [48]

The recent unsatisfactory results of tecovirimat studies indicated the necessity of new antiviral medicines and combination treatment techniques that target several phases of virus replication. [31,32] Future work on therapeutics should be focused on randomized clinical trials in endemic areas with the highest burden of disease and the least evidence for treatment.

Another rapidly developing field is genomic surveillance. Whole-genome sequencing has already become an important tool for monitoring viral evolution, identifying transmission chains, and detecting the emergence of novel variants such as clade Ib. [6,50] The integration of genomic epidemiology into routine surveillance systems may significantly improve preparedness for future outbreaks and facilitate earlier public health interventions. [50]

7.2. Vaccine Development and Distribution Equity

While the efficacy of currently existing vaccinations and their safety profiles are encouraging, numerous key obstacles remain unresolved. [35,36,51] Available evidence suggests that two doses of MVA-BN provide substantial protection against mpox infection and severe disease; however, uncertainties remain regarding the duration of immunity, the potential need for booster doses, and vaccine effectiveness against emerging viral clades. [51,52]

The resurgence of mpox in Africa exposed major inequalities in access to vaccines, with endemic countries frequently experiencing substantial delays in obtaining vaccine supplies compared with high-income regions. [39,46] These disparities highlighted broader concerns regarding global health equity and the concentration of vaccine production capacity in a limited number of countries and manufacturers. [46,47]

Future preparedness strategies should therefore focus not only on the development of next-generation vaccines but also on strengthening regional manufacturing capabilities and improving technology transfer to endemic regions. [39,47] Expanding local production capacity may reduce dependence on external supply chains as well as improve global outbreak preparedness. [39]

Further research is also needed to optimize vaccination schedules and evaluate long-term protection in immunocompromised individuals, children, and pregnant women, who remain underrepresented in current effectiveness studies. [52]

7.3. One Health Approach

The re-emergence of mpox has strengthened the relevance of the One Health concept, which acknowledges the close interdependence of human, animal, and environmental health. [12] The ongoing presence of animal reservoirs and the possibility of many spillover events from zoonotic sources mean that control of outbreaks cannot rely on human vaccination and surveillance techniques alone. [11, 12]

Enhancing veterinary surveillance, monitoring wildlife reservoirs, and improving collaboration between medical, veterinary, and environmental sectors can lower the risk of future outbreaks and facilitate earlier detection of emerging transmission events. [12,40] The mpox epidemic has shown that sustainable control of zoonotic diseases requires coordinated work across different disciplines and sectors rather than isolated public health measures. [12]

7.4. Recommendations for Future Outbreaks

Future outbreak preparedness should prioritize rapid diagnostic capacity, equitable access to vaccines and antiviral therapies, and strengthened surveillance systems in both endemic and non-endemic regions. [26,40,47] Effective epidemic control will continue to depend on early international collaboration and transparent data exchange. [50]

Particular attention should be directed toward improving healthcare infrastructure in endemic countries, where disease burden remains highest and access to medical resources is often limited. [39,46] Continued investment in clinical research, vaccine development, and public health preparedness may substantially improve responses to future mpox epidemics. [51,52]

8. Conclusions

Recent outbreaks have demonstrated that mpox is no longer a neglected zoonotic disease confined to endemic regions but an emerging major worldwide public health concern requiring sustained international attention. [5,46] Although there has been significant progress in diagnostics, antiviral treatments, and vaccine methods, critical problems remain in terms of early diagnosis, access to treatment, vaccine availability, and readiness for outbreaks. [23,31,39]

The emergence of clade Ib and the return of cases in Africa have reinforced the ongoing disparities in access to healthcare resources and the need for enhanced surveillance systems and international cooperation. [6,47] Future preparedness efforts should prioritize equitable access to diagnostics, vaccines, and therapeutics while simultaneously developing healthcare infrastructure in endemic regions. [39,46]

The recent mpox epidemics have also highlighted the need for interdisciplinary collaboration between clinicians, microbiologists, epidemiologists, veterinarians, and public health specialists within a One Health framework. [12] Continued investment in research, surveillance, and global preparedness will be crucial to improve responses to future outbreaks and decrease the impact of this re-emerging disease.

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