

MONKEYPOX MONDAY

Infection Prevention and Control

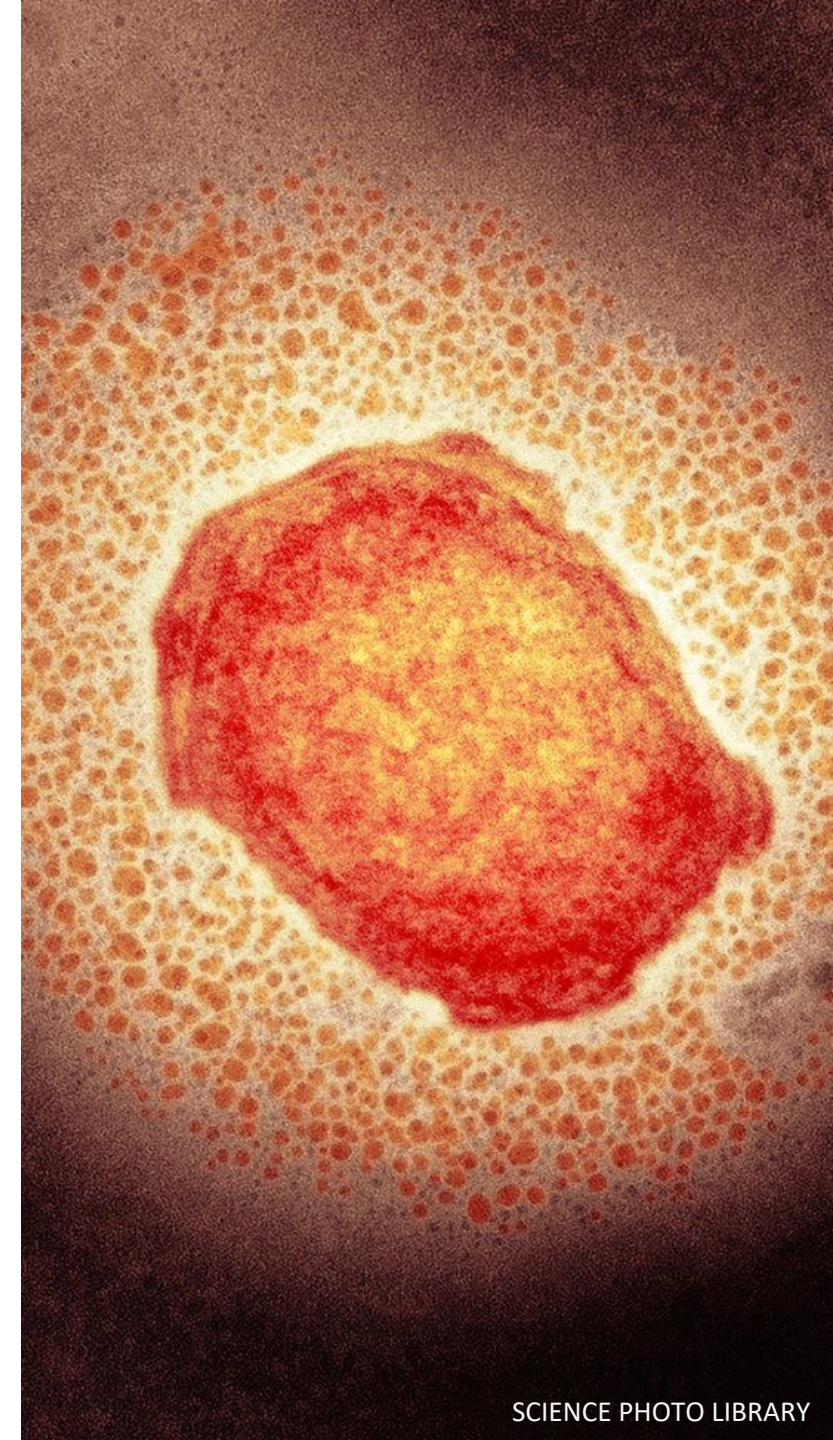
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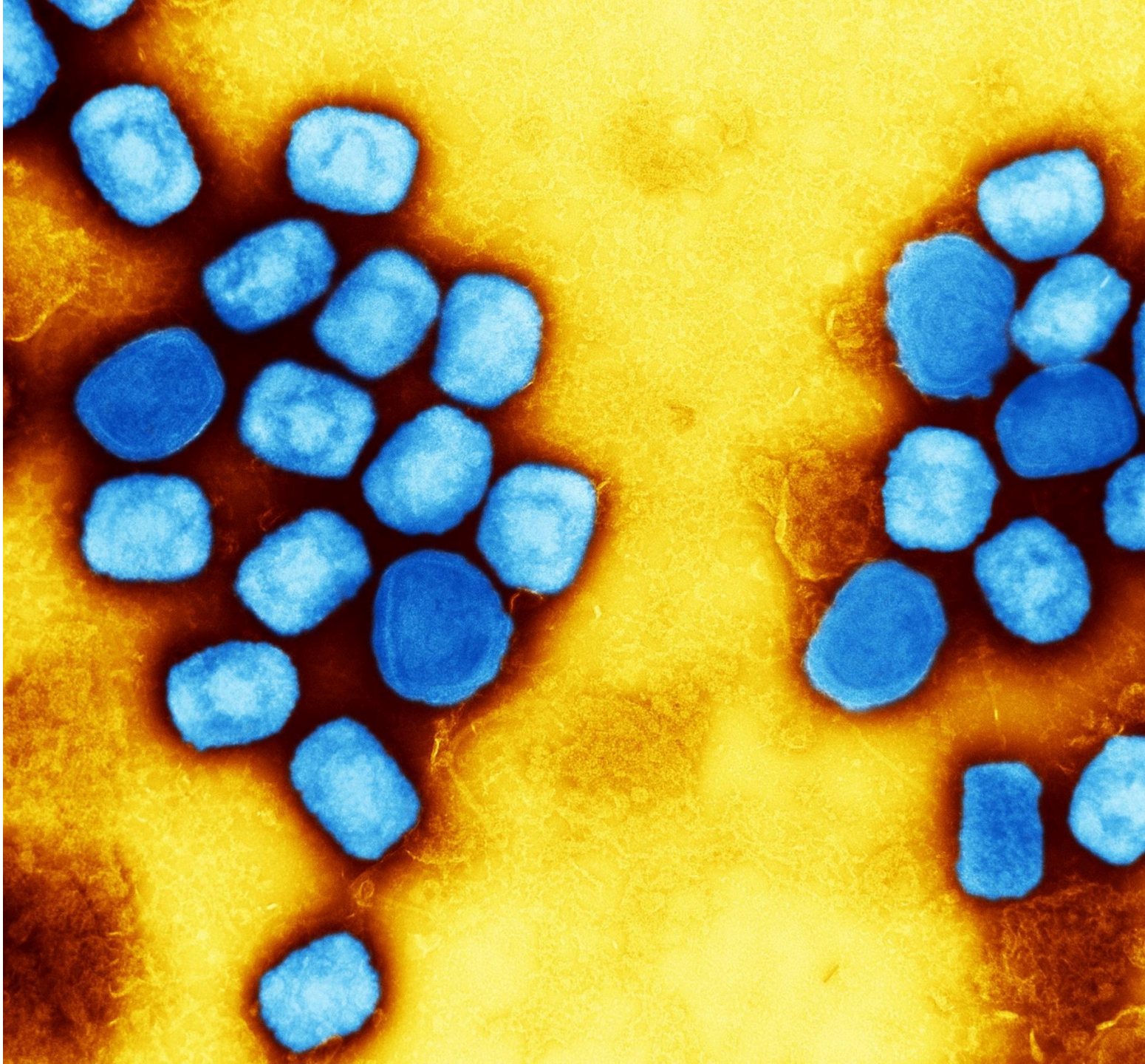
Disclosures

- Research Funding
 - Canadian Institute for Health Research
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- Not affiliated with *Public Health Agency of Canada*

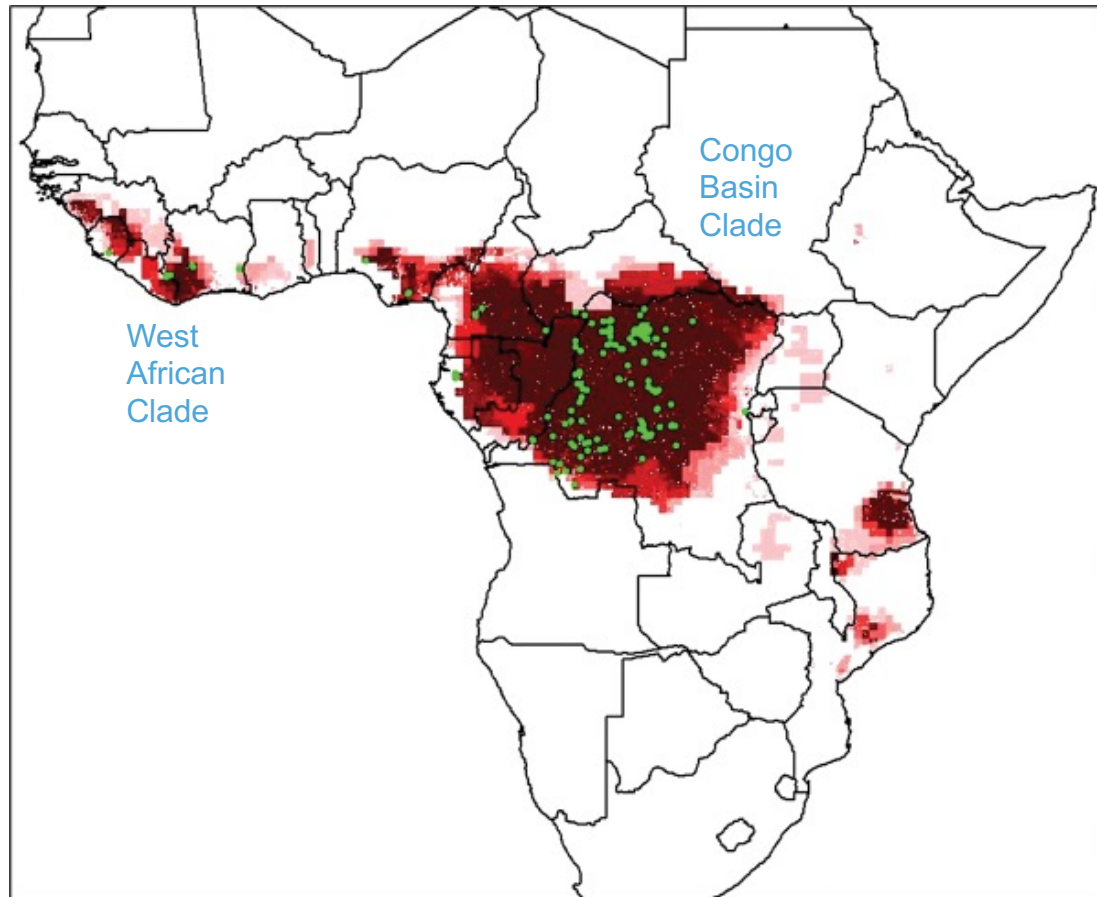
Objectives

- What **clinicians need to know** to prevent transmission of Monkeypox
 - In healthcare setting
 - At home
- Review interim **guidance** for clinicians, health facility managers, HCWs and IPC practitioners from PHAC, CDC and WHO

BACKGROUND



Background



- **Monkeypox**

- Rare infectious disease first identified 1958
- Caused by the monkeypox virus (MPXV)
 - Orthopox virus related to smallpox and cowpox
- Double stranded DNA enveloped virus
 - With low lipid content
- Endemic in central and western Africa
 - Sporadic cases
 - Occasional limited outbreaks outside of endemic areas

New cases in Non-endemic countries

- May 13th 2022: WHO notification of MPX cases in the U.K. (West African clade – lower case fatality 1%)
- May 19th, 2022
 - First case reported in Canada
- Most (but not all) cases among men who identify as: gay, bisexual, or men who have sex with men

Province/ Territory	Confirmed cases
British Columbia	18
Alberta	8
Ontario	101
Quebec	248
Total	375

July 8th, 2022

Signs and Symptoms

- “Classic” presentation
 - Prodomal symptoms (fever, lymphadenopathy [98%], sore throat [79%], flu-like symptoms) lasting 1 to 4 days
 - Followed by characteristic rash

Rash

- Progresses from macule, papule, pustule, crusting
- Centrifugal: starts on face and spreads to palms and soles
- Can involve the mucosae (oral ulcers), conjunctiva and cornea
- Can last 2-4 weeks!

MONKEYPOX

VISUAL EXAMPLES OF MONKEYPOX RASH



Photo Credit: UK Health Security Agency



CS328947-EK

Signs and Symptoms

- “Current” presentation
 - Rash still characteristic but more **genital and perianal** involvement
 - Often lesions starting in genital area
 - Rash may be **localized** to a specific region
 - **Prodrome** may be **mild** or absent
 - Can be confused with STI

Monkeypox lesions, United States 2022



From Basgoz N, Brown CM, Smole SC, et al. Case 24-2022: A 31-Year-Old Man with Perianal and Penile Ulcers, Rectal Pain, and Rash. Epub ahead of print. Copyright © Jun 15 2022. Massachusetts Medical Society. Reprinted with permission from Massachusetts Medical Society

Shared with permission from patients, CDC 2022

Infectivity

- Incubation period: 6-13 days (range, 5 to 21 days)
- Period of contagiousness:
 - **FROM:**
 - onset of symptoms (including prodrome)
 - **UNTIL:**
 - Lesions scab and heal completely (fall off) with new healthy skin forming underneath
 - Contagiousness may last up to 2 to 4 weeks!



a) Early vesicle, 3mm diameter



b) Small pustule, 2mm diameter



c) Umbilicated pustule, 3-4mm diameter



d) Ulcerated lesion 5mm diameter



e) Crusting of mature lesions



f) Partially removed scab

Transmission

- When **person-to-person transmission** occurs:
 - Direct and indirect contact with skin lesions or body fluids
 - Broken skin or mucosae
 - Contact with fomites (e.g. sharing clothing, bedding or other common items)
 - Exposure to respiratory droplets
- **Sexual transmission?** not documented so far
 - But sexual partners have close direct contact

Transmission

- Person-to-person transmission is **uncommon**
- R_0 : 0.3 to 0.6²
 - Household contact secondary attack rate, DRC: 40/431 (9%)¹
 - Non-household close contact: 9/196 (4.5%)¹



Smallpox
2nd attack rate: 37%-80%
 R_0 : 5³

Transmission

- Airborne transmission?
 - Unknown if airborne transmission occurs with MPXV
 - No evidence of long-range aerosols
 - Neighboring houses, no direct face-to-face contact: 0% attack rate ¹
 - Concern for possible airborne transmission stems from evidence of airborne transmission of smallpox
 - From aerial convection (up to 0.5 to 1 mile distance)
 - If it occurs: not the primary mode of transmission



Fomites

- Few data with MPXV, more with other pox viruses
- Pox viruses are:
 - Very resistant to drying (e.g. dried skin crusts, dried serum, dried blood)
 - Generally resistant in the environment
 - Vaccinia virus can survive >7 months at 4°C without any loss of infectivity
 - Vaccinia virus can survive >3 months on wool
- Historically, smallpox could remain contagious on fomites and dried crusts for several months to several years



Fomites

Table 1 Quantitative recovery of vaccinia virus by test condition and material

Environmental condition/test duration	Mean recovered vaccinia virus (PFU) ± SD			
	Glass	Galvanized steel	Painted cinder block	Industrial carpet
Room temperature, low RH				
14-Day	$2.43 \pm 0.64 \times 10^7$	$1.90 \pm 0.49 \times 10^7$	$2.57 \pm 0.30 \times 10^7$	$4.34 \pm 0.34 \times 10^6$
21-Day	$2.33 \pm 2.34 \times 10^4$	$1.49 \pm 1.86 \times 10^4$	$5.46 \pm 5.6 \times 10^0$	ND
28-Day	$2.45 \pm 0.74 \times 10^1$	$1.11 \pm 0.64 \times 10^4$	$5.81 \pm 8.0 \times 10^3$	ND
42-Day	$4.22 \pm 5.83 \times 10^3$	$5.30 \pm 7.22 \times 10^3$	ND	ND

Inoculum: $2.5 \pm 1.82 \times 10^7$ PFU

Infection Prevention and control: in healthcare setting

- Little is known about transmission and IPAC of the current outbreak
 - Rarely seen in high income countries
 - Atypical clinical presentation: has the virus mutated that could influence transmission?
- Most recommendations = expert opinion
 - Guiding principles: precautionary approach to **protect HCWs and prevent establishment of endemicity** in Canada

Healthcare worker acquisition

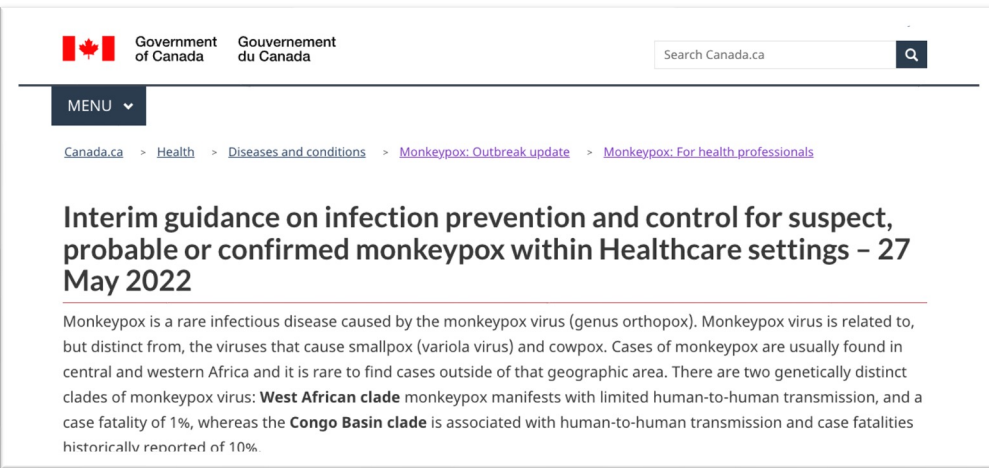
- Healthcare acquisition documented in **endemic areas**
 - Mainly transmission:
 - Before MPXV was suspected
 - Lack of PPE
 - Non-healthcare-related exposure (e.g. during playtime or lunch breaks)
- One HCW acquired MPX in **U.K.**
 - HCW who changed bedsheets with gloves and apron, but without a medical mask or a N95 respirator while patient had active lesions¹



Public Health
Agency of Canada

“Transmission risk to HCWs is
considered low at the time”

Guidelines



Government of Canada / Gouvernement du Canada

Search Canada.ca

MENU

Canada.ca > Health > Diseases and conditions > Monkeypox: Outbreak update > Monkeypox: For health professionals

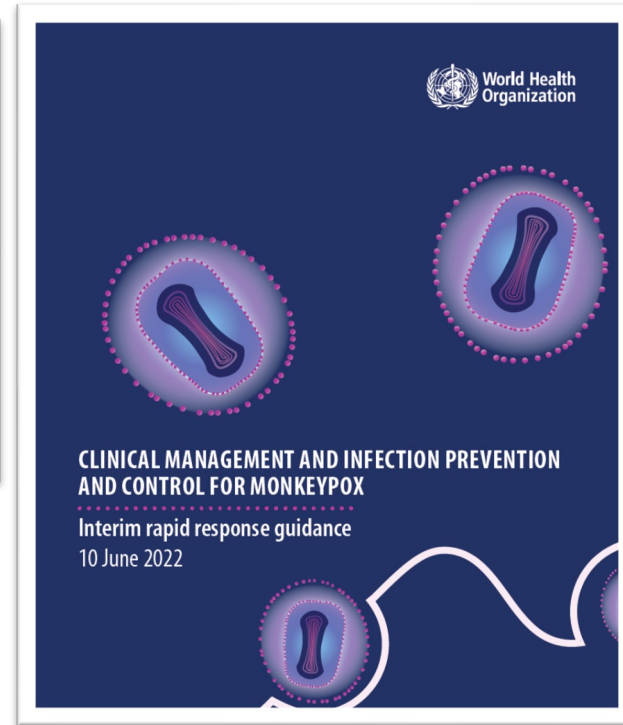
Interim guidance on infection prevention and control for suspect, probable or confirmed monkeypox within Healthcare settings – 27 May 2022

Monkeypox is a rare infectious disease caused by the monkeypox virus (genus orthopox). Monkeypox virus is related to, but distinct from, the viruses that cause smallpox (variola virus) and cowpox. Cases of monkeypox are usually found in central and western Africa and it is rare to find cases outside of that geographic area. There are two genetically distinct clades of monkeypox virus: **West African clade** monkeypox manifests with limited human-to-human transmission, and a case fatality of 1%, whereas the **Congo Basin clade** is associated with human-to-human transmission and case fatalities historically reported of 10%.

<https://www.canada.ca/en/public-health/services/diseases/monkeypox/health-professionals/interim-guidance-infection-prevention-control-healthcare-settings.html>



Unless indicated otherwise, recommendations in this webinar are PHAC's

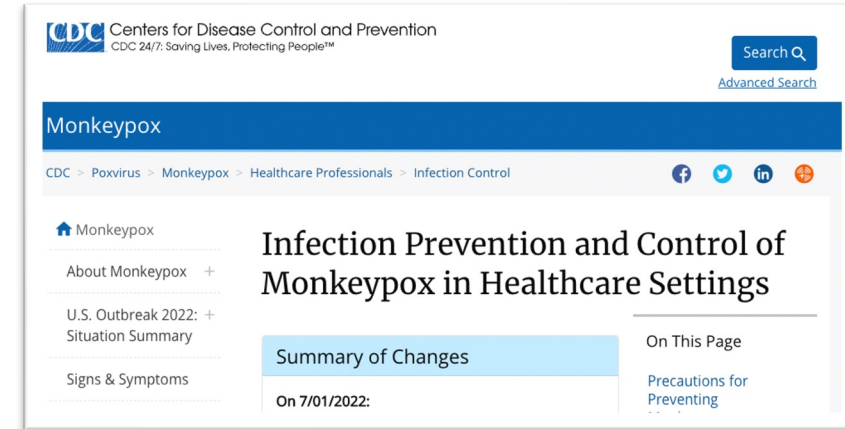


World Health Organization

CLINICAL MANAGEMENT AND INFECTION PREVENTION AND CONTROL FOR MONKEYPOX

Interim rapid response guidance
10 June 2022

<https://www.who.int/publications/i/item/WHO-MPX-Clinical-and-IPC-2022.1>



Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People™

Search Q

Monkeypox

CDC > Poxvirus > Monkeypox > Healthcare Professionals > Infection Control

Infection Prevention and Control of Monkeypox in Healthcare Settings

Summary of Changes
On 7/01/2022:

On This Page
Precautions for Preventing

<https://www.cdc.gov/poxvirus/monkeypox/index.html>



IPAC measures

- For all suspected probable or confirmed cases:
 - **Contact Precautions**
 - Gloves
 - Gown (cuffed with long sleeves)
 - **Droplet precautions**
 - Eye protection (face shield or goggles)
 - **Airborne precautions**
 - Fit-tested and seal-checked N95
 - In addition to **routine practices** (hand hygiene, point of care risk assessment, respiratory hygiene, injection safety, cleaning and disinfection procedures)



WHO: Use dedicated footwear that can be decontaminated. Disposable shoe covers are not recommended

IPAC measures

- Donning and doffing
 - Don **prior to entering** the room
 - PPE removed **prior to leaving the room (except for respirator)**
 - Do NOT **re**use respirators
 - Perform **HH after PPE** removal

Hand hygiene



Soap and water or alcohol-based handrub sanitizers

Patient source control

- Ask to perform **hand hygiene**
- Ask to wear a well-fitting **procedure mask**
- Keep skin **lesions covered** with gown, clothes sheet or bandages except during examination
- Place in an **airborne infection isolation room (AIIR) if available, or a single room with door closed**
 - With dedicated bathroom if inpatient



WHO:

- Well-ventilated single room is sufficient
- AIIR for AGMP or if VZV is a possibility



CDC:

- Keep door closed, but special air handling is not required unless AGMP
- Avoid portable fans

Visitors



Restrict visitors to those necessary for care or compassionate grounds

Cleaning and disinfection

Table 1. Efficacy of common active ingredients of disinfectants against poxviruses tested exemplarily against *Vaccinia virus* as a representative for most other poxviruses [38–49]

Substance	Concentration/contact time	Test conditions
Sodium hypochlorite	200 ppm/10 min	Suspension test WPL
H ₂ O ₂	1%/5–10 min*	Suspension test WPL
KMnO ₄	0.02%/5–10 min*	Suspension test WPL
Peracetic acid	0.1%/5–10 min*	Suspension test WPL
Formaldehyde	2%/5 min*	Suspension test WPL
Glutaraldehyde	0.02%/10 min**	Suspension test WPL
Phenol	2%/10 min**	Suspension test WPL
o-Phenylphenol	0.12%/10 min**	Suspension test WPL
Ethanol	40%/10 min**	Suspension test WPL
2-Propanol	30%/10 min**	Suspension test WPL
HgCl ₂	0.02%/10 min**	Suspension test WPL
Formic acid	0.1%/30 min** 0.25%/15 min**	Suspension test WPL Suspension test with 0.2% BSA or 10% FCS
Propionic acid	1%/10 min** 1%/1 h**	Suspension test WPL Suspension test with 0.2% BSA or 10% FCS
Citric acid	1%/15 min** 1%/30 min**	Suspension test WPL Suspension test with 0.2% BSA or 10% FCS
Acetic acid	1%/30 min** 2%/15 min**	Suspension test with or WPL Suspension test with or WPL
Propionic acid Citric acid Acetic acid	0.5–2%/7.5–120 min**	Carrier test on wood and cotton (according to DVG)

BSA, bovine serum albumin; DVG, Deutsche Veterinärmedizinische Gesellschaft (German Society of Veterinary Medicine); FCS, fetal calf serum; WPL, without protein load.

* Reduction factor ≥ 5, ** reduction factor ≥ 4.

0.2% N-cetylpyridium chloride (QAC): LR = 4 in 15 min

Cleaning and disinfection

- Use **standard hospital-grade** housekeeping cleaning and disinfection protocols
 - With approved hospital-grade DIN (Drug Identification Number)
- Clean all surfaces that could have been **touched**
 - Particular attention to high-touch areas such as doorknobs, light switches, call bells,
- **Dedicate** patient care equipment to a single patient
- Discard all **disposable** items
- If not disposable and **impossible to disinfect: discard**
- Change privacy **curtains**

Cleaning and disinfection

- Protective equipment while cleaning
 - Gloves gown eye protection and N95 respirator during cleaning and disinfection



WHO and CDC: use damp mopping (no dry dusting/sweeping)

Linens, towels, clothing, bedding

- **Wear appropriate PPE** when collecting and bagging all linens

- Gloves, gown, N95 respirator and eye protection
- Avoid contact with HCW's skin and clothes
- **Do not shake laundry** to prevent secondary aerosolization
 - Lift carefully and roll

- Place laundry material in sealed leak-proof bag
 - Clearly identify for transport to laundry services

- Washing

- **Standard medical laundry** is sufficient



WHO: Laundry service workers should wear PPE: gloves, gown, N95 and ocular protection

- Private practice

- Wash in a standard washing machine in hot water (70° celsius) with detergent
- Dry completely in a commercial drier



Medical waste

- Biomedical waste should be contained in **impervious waste-holding bags or double bagged** according to municipal/regional regulations
- Contaminated disposable items should be discarded according to jurisdictional protocols

Patient transportation

- All suspected, probable and confirmed cases
 - Cannot use public transportation
 - Wear a procedure mask
 - Cover all lesions
- Inform patient transport services and receiving healthcare setting of diagnosis

How to prevent acquisition

- Maintain a high level of suspicion
 - Know that MPXV is **present** in **Canada**
 - Be aware of **atypical** presentations
 - Elicit travel **history** and sexual history, history of contact with individuals with similar rash

dDx of Genital ulcers

Infectious:

Herpes simplex virus
Syphilis
LGV
Granuloma inguinale

Non-infectious

Behcet's Disease
Recurrent aphthous stomatitis?
Squamous cell carcinoma
Drug-induced

dDx of disseminate rash

Syphilis
Varicella/ Shingles
Disseminated herpes
Molluscum contagiosum
Foot and mouth disease
Measles
Scabies
Other pox viruses
Rickettsia pox
Disseminated fungal infections
Disseminated gonococcal infection

Management of exposed HCWs

- PHAC
 - Guidelines pending



WHO

- Definition of “exposure”
 - “not wearing appropriate PPE”
- Exposed HCWs
 - Do not need to be excluded from work if asymptomatic
 - Should notify Occ Health authorities of possible exposures
 - Should undergo active surveillance for symptoms for 21 days after last exposure that includes:
 - temperature measurement twice a day
 - Interviewed by Occ Health for symptoms prior to reporting to work
 - Should not work with vulnerable populations
- Post-exposure prophylaxis or vaccination?
 - In the context of research



IPAC: at home



Monkeypox: Public health management of cases and contacts in Canada

June 21, 2022

On this page

- [Introduction](#)
- [Background](#)
- [Public health management of cases](#)
- [Public health management of contacts](#)
- [Appendix 1: Recommendations for hand hygiene and respiratory etiquette](#)
- [Appendix 2: Recommendations for environmental hygiene](#)
- [Additional Resources](#)

Patients with mild/moderate disease without risk factors for complication can be sent home (providing no vulnerable individuals at home)

<https://www.canada.ca/en/public-health/services/diseases/monkeypox/health-professionals/management-cases-contacts.html>

Isolation at home



CDC: The appropriateness of implementing isolation and infection control measures in a home setting varies depending on :

- The presence of additional infected or **uninfected people** in the home
- The presence of young **children** (<8 years of age), people who are **pregnant** or **immunocompromised**, and individuals with a history of atopic **dermatitis** or eczema
- The ability of the person with monkeypox and other people in the home to **adhere** to recommended precautions



Isolation at home

- Isolate in a **separate space** (e.g., private room for sleeping and washroom) whenever possible
 - If a separate washroom is not possible, the case should clean and disinfect all surfaces and objects they have had contact with and immediately remove and launder used towels
- Wear a **well-fitting medical mask** when around others
 - If not possible: other household members should wear medical mask in presence of the case
- Maintain proper **hand hygiene and respiratory etiquette**
- **Cover all lesions** with clothing or bandages as much as possible
- **Do not share** clothes, bedding, towels, utensils, toothbrush, razors, sex toys, needles, or any other items that may be contaminated

Sexual contacts

- Avoid direct touching of other people, including through sexual contact while contagious
- After being deemed no longer contagious, cases should **use a condom during any sexual activity for 12 weeks**
 - Small case series reported MPXV DNA in bodily fluids after healing of skin lesions
 - Uncertainty about persistent infectivity of MPXV in semen and vaginal fluids



Pets and animals

- Risk of transmission mainly to rodents (e.g. mice, rabbits), but risk to other pets not well described
 - Dogs not known to acquire Poxviridae
 - Cats can acquire vaccinia virus
 - Squirrels?
- By precautions: Avoid contact with animals, including pets



CDC:

- Keep any potentially infectious bandages, textiles away from pets, other domestic animals, and wildlife.
- If an animal appears sick (such as lethargy, lack of appetite, coughing, bloating, nasal or eye secretions or crust, fever, rash) contact a veterinarian



Waste management at home



CDC:

- Use a **dedicated lined trash can** in the room where they are isolating
- Any gloves, bandages, or other waste and disposable items that have been in direct contact with skin should be placed in a **sealed plastic bag, then thrown away in the dedicated trash can**
- The person with monkeypox or other household members should **use gloves when removing garbage bags** and handling and disposing of trash.
- Waste disposal outside of home: as normal



Isolation at home

- Cleaning
 - Shared spaces disinfection:
 - Immediately clean and disinfect surfaces and appliances after use



CDC:

- Consider **disposable glove** use while cleaning if rash is present on the hands
- Even if isolating alone at home, suggest **regular cleaning and disinfection** of the space they occupy to **prevent MPXV buildup**

Furniture and carpets

- Vacuum upholstered furniture and carpeted floors using a vacuum cleaner equipped with a high-efficiency particulate air (HEPA) filter
 - Do not use vacuums without HEPA filters



CDC: Avoid contaminating **upholstered furniture** and other porous materials that cannot be laundered by placing **coversheets**, waterproof mattress covers, blankets, or tarps over these surfaces.



CDC: steam clean is acceptable



Terminal cleaning



At the end of period of contagiousness: perform a **thorough disinfection** of all they had been in contact with

- That Includes: Interior surfaces of refrigerator, freezer, other appliances, interior cabinet spaces, or drawers if they have been accessed by the person with monkeypox.



Uncertainties and research agenda

- Is there pre-symptomatic infectivity?
- Routes of transmission human-to-human
- Potential for reverse zoonosis
- Health worker exposure risk categories and PEP
- Stability of virus in the environment and on surfaces
- Understanding the susceptibility of the MPX virus to disinfectants and their virucidal properties (i.e. active ingredients and concentrations, contact time)
- Understand optimal ventilation to reduce disease transmission
- Duration of transmission-based precautions to maintain patients in isolation (when can transmission-based precautions be lifted)



References

- <https://www.canada.ca/en/public-health/services/diseases/monkeypox/health-professionals/interim-guidance-infection-prevention-control-healthcare-settings.html>
- <https://www.cdc.gov/poxvirus/monkeypox/clinicians/infection-control-healthcare.html>
- <https://www.who.int/publications/i/item/WHO-MPX-Clinical-and-IPC-2022.1>