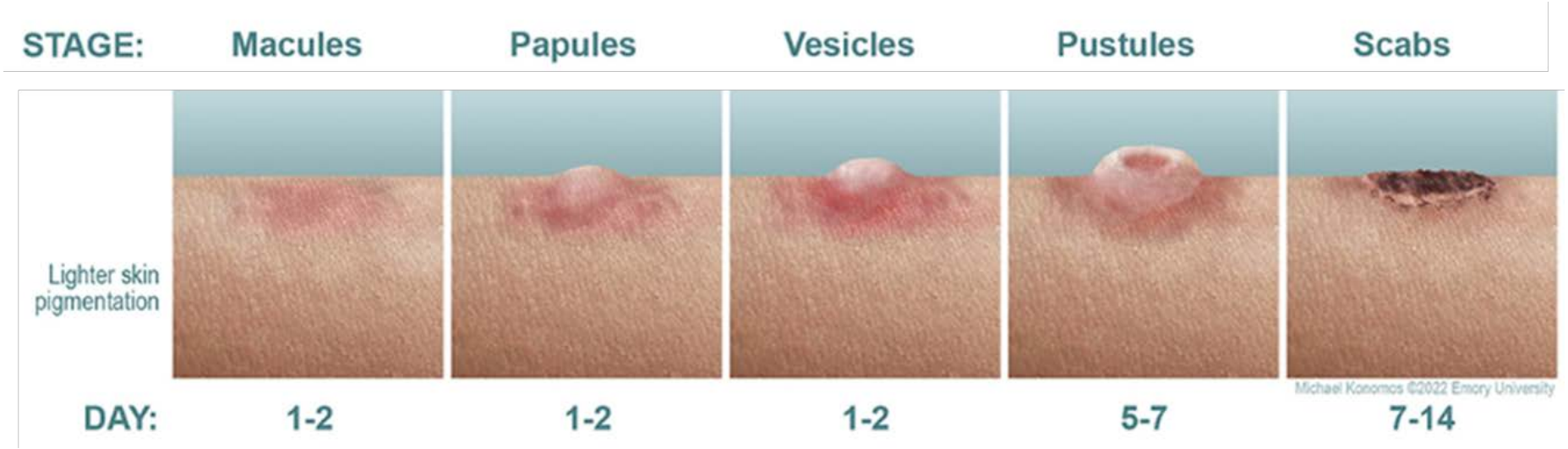

Insights into the emergence and evolution of monkeypox virus

Krishna S, *et al (*2024). Infectious Medicine (IF 1.4, H-Index 6, Q3)
Presented on November 22, 2024

BSc. Montserrat Villegas Preciado
Dr. CA García Sepúlveda

Laboratorio de Genómica Viral y Humana
Facultad de Medicina
Universidad Autónoma de San Luis Potosí

Introduction

Monkeypox, or "mpox", is caused by the monkeypox virus (MPXV), a member of the subfamily *Chordopoxvirinae* and genus *Orthopoxvirus* within the family *Poxviridae*.

In 1958, the virus was initially recognized in Denmark within research monkeys.

The first human infection documented in 1970 in the Democratic Republic of Congo (DRC).

In recent years, an increase in incidence of monkeypox cases has been documented in countries where the disease is not endemic.

Cynomolgus macaque, Crab-eating macaque or Long-tailed macaque (*Macaca fascicularis*)

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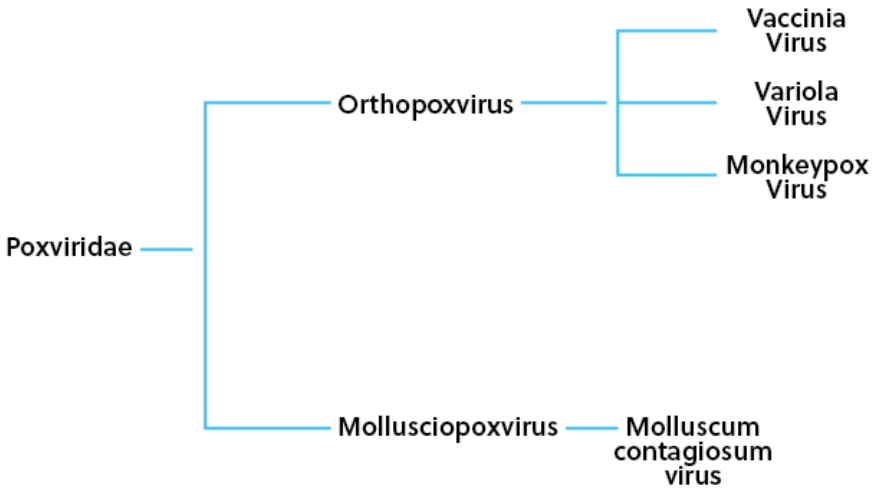
Epidemiology

72% of cases attributed to zoonotic transmission.

A 20-fold increase in number of cases in DRC documented from 1980s to mid-2000s.

Monkeypox is endemic to Africa but has spread to the UK, USA & India.

This led the World Health Organization to declare a Public Health Emergency of International Concern in May 2022.



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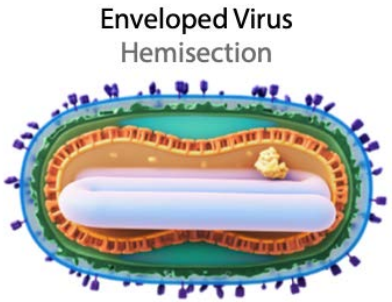
Virus structure

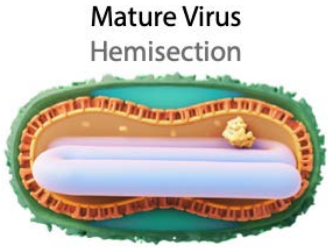
Typically brick shaped

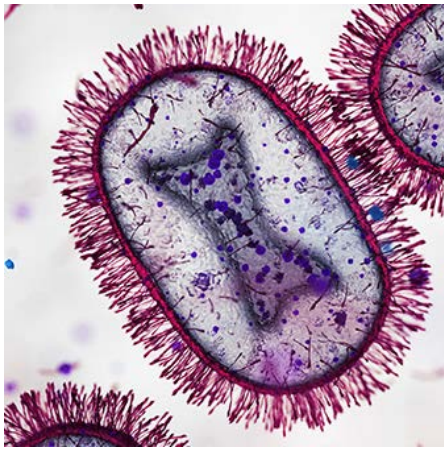
Outer envelope derived from the host cell plasma membrane

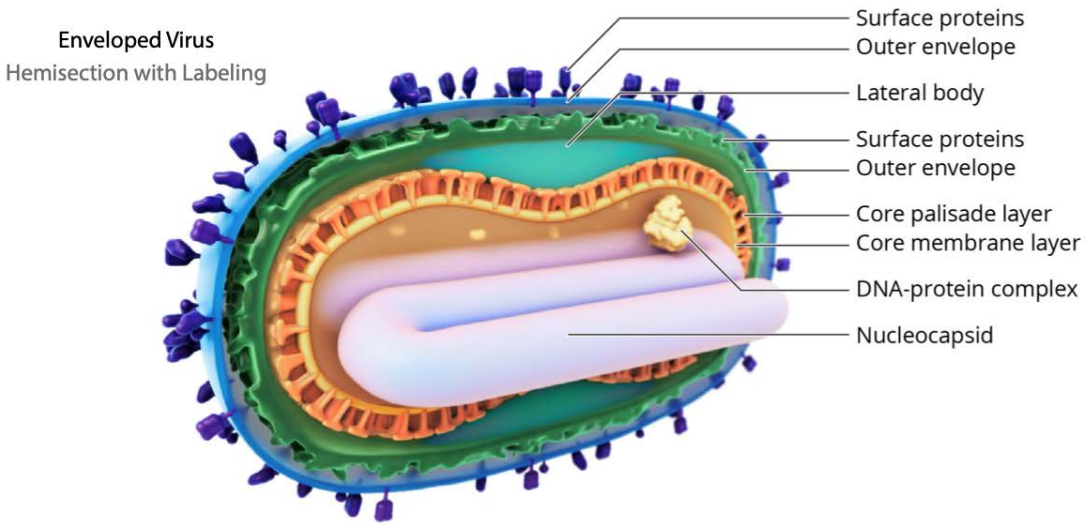
Core containing viral genome, enzymes and structural proteins

Genome contains inverted terminal repetitions (ITRs) .









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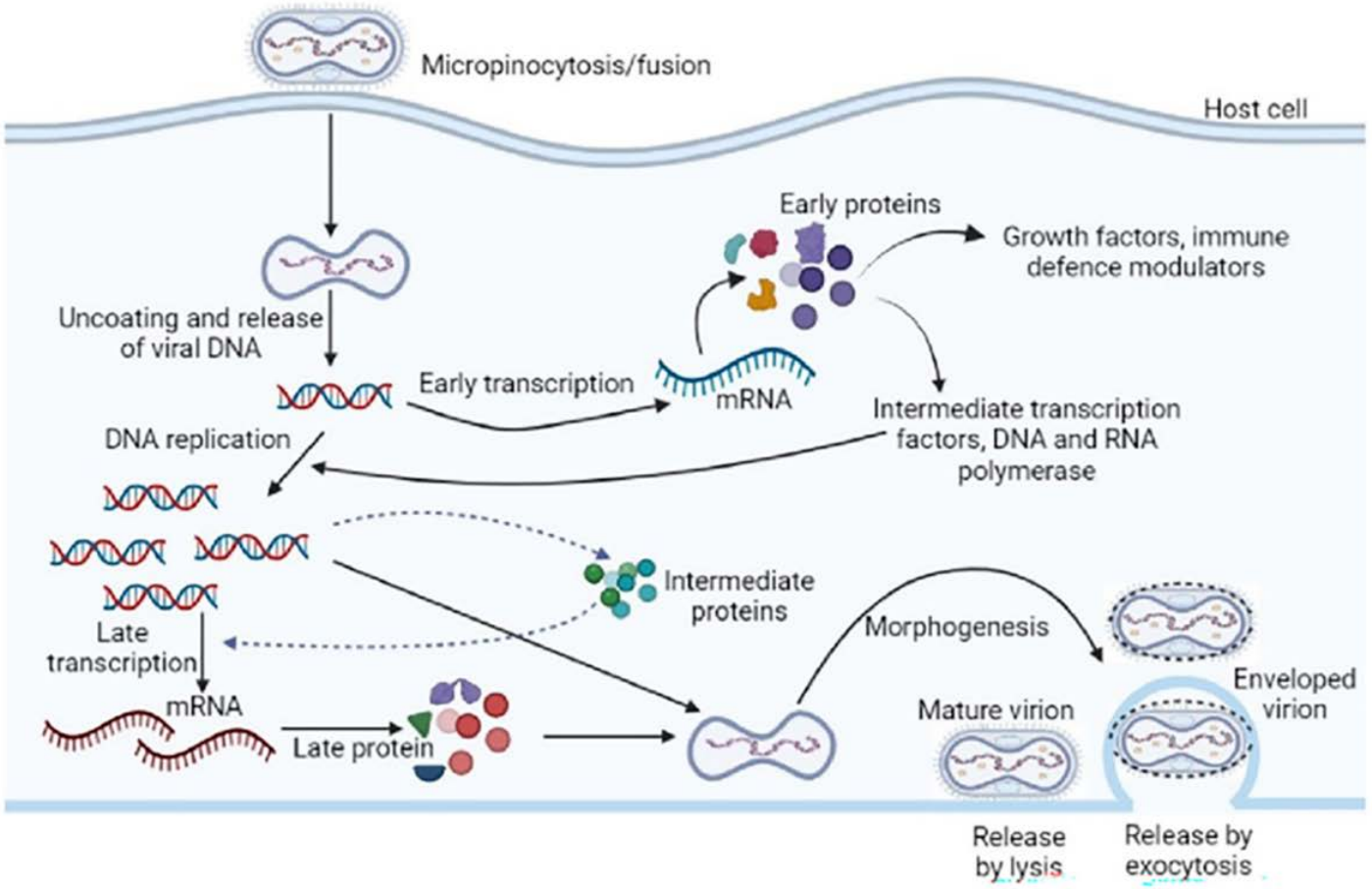
Life cycle



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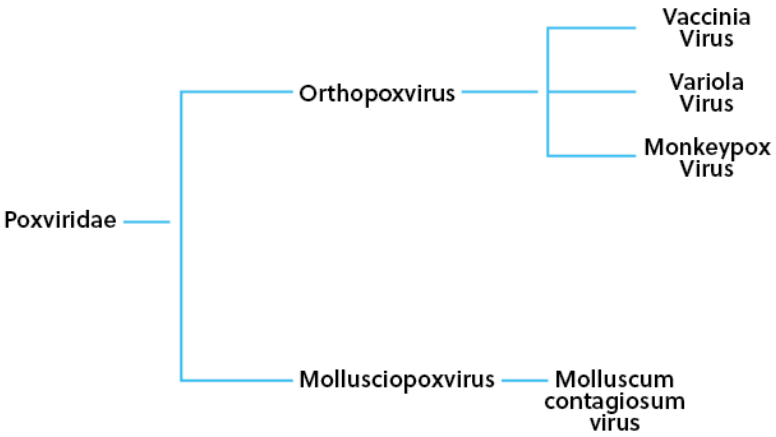
Evolution

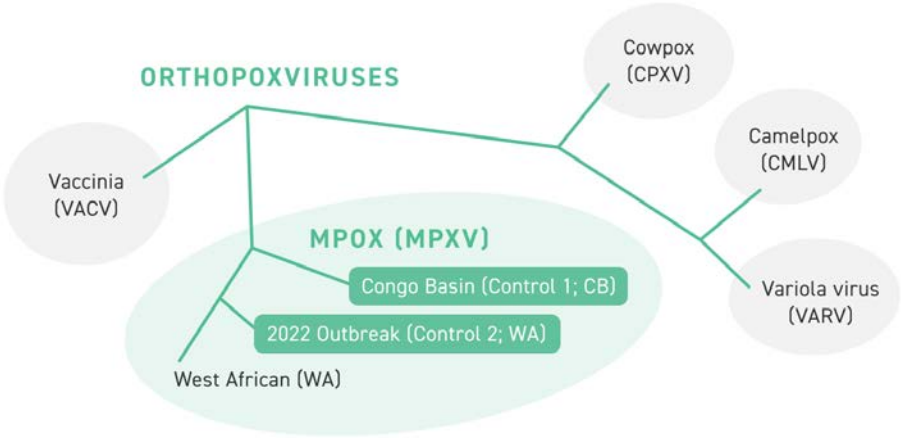
MPXV has evolved into two clades.

Clade I (Congo Basin Clade)
- Case-fatality rate of 10%.

Clade II (West African Clade)
- Case-fatality rate of 10%.
- Responsible for > 6000 cases worldwide (2022).
- Possess APOBEC3-type mutations.

Monkeypox exhibit microevolution, involving amino acid point mutations to adapt to human hosts.





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Transmission

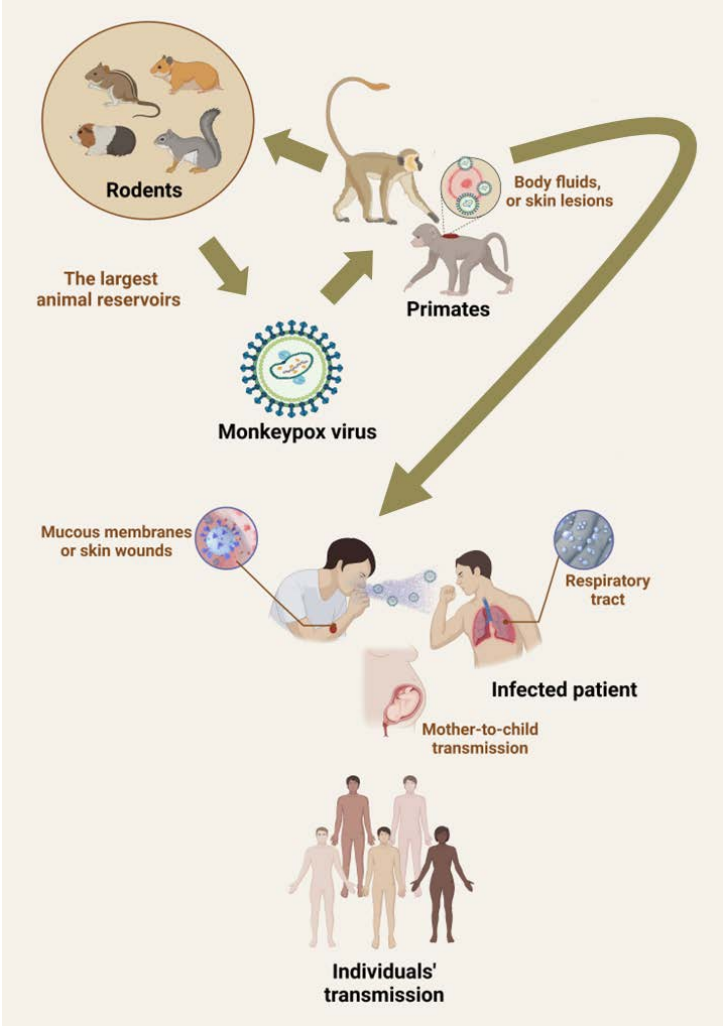
Human-to-human transmission of monkeypox can occur through close contact with infected individuals.

Humans can become infected through direct contact with infected animals or their body fluids.

Consuming/handling their meat.

Contact with contaminated materials or surfaces.

Broken skin
Respiratory tract
Mucous membranes (eyes, nose or mouth).



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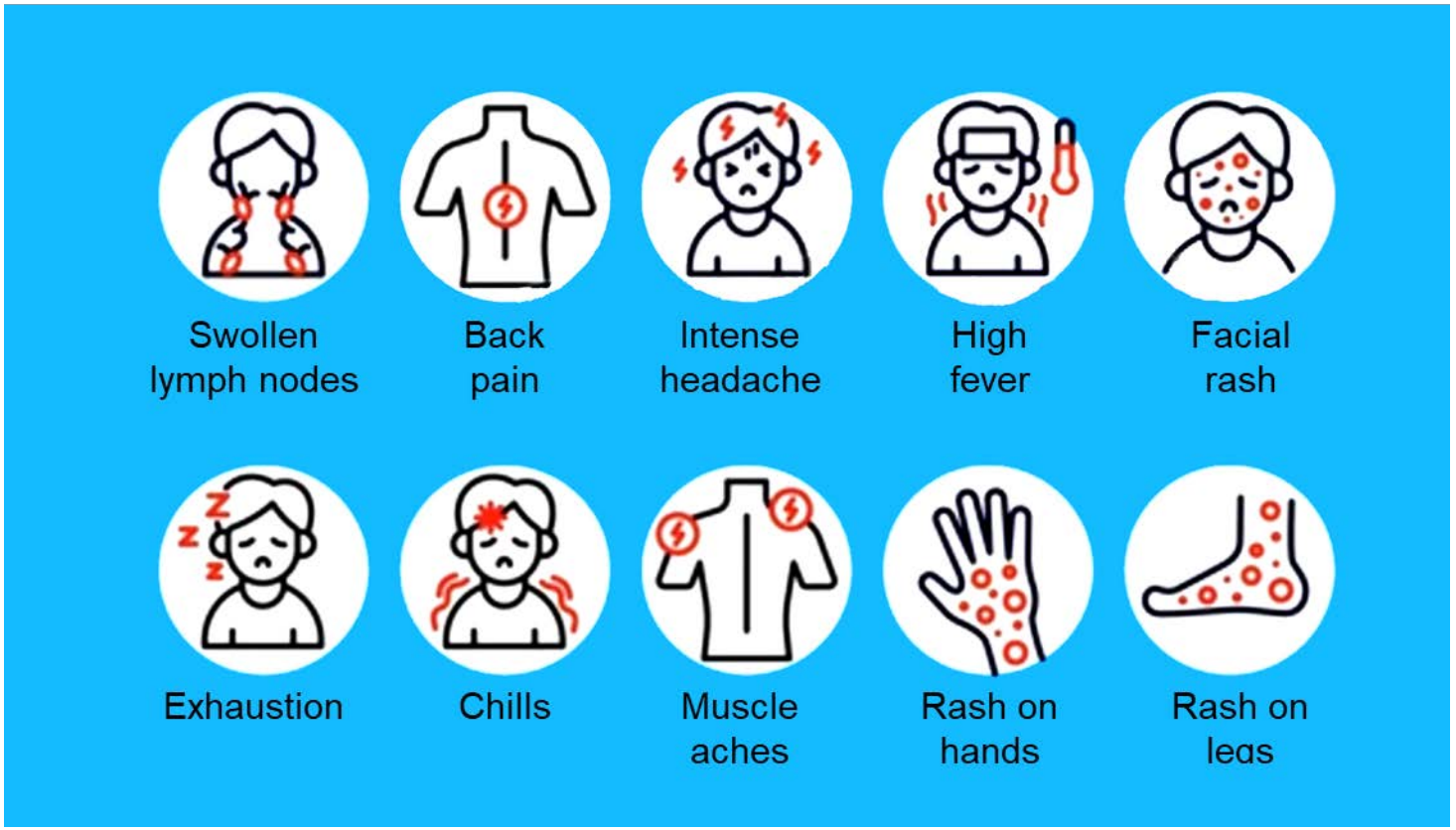
Monkeypox symptoms



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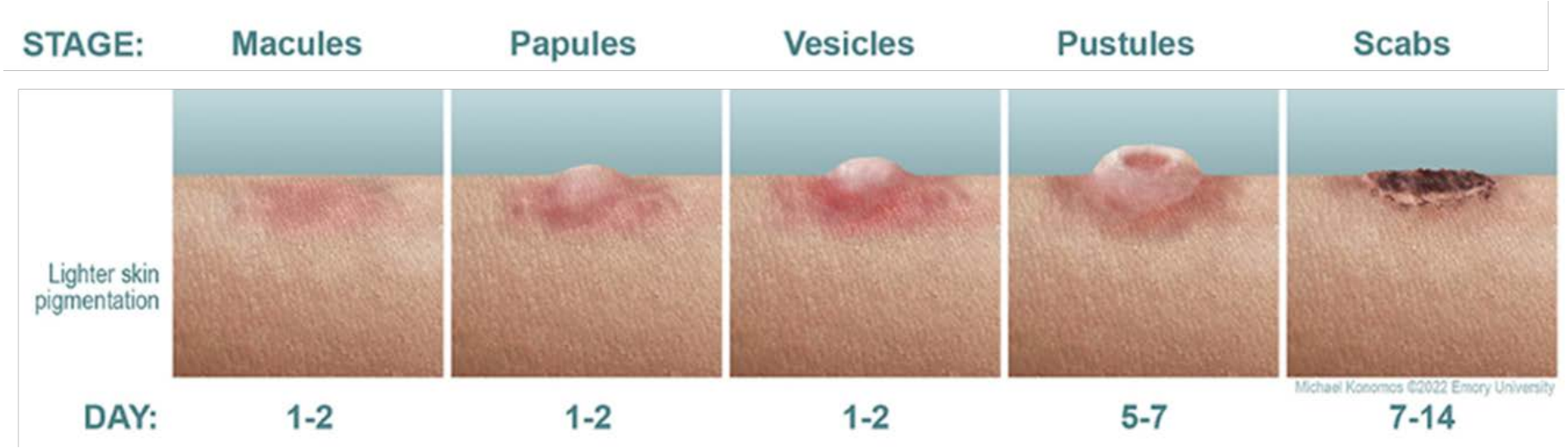
Sings and Symptoms

The onset of monkeypox infection is characterized by symptoms such as fever, chills, headache, muscle aches, and fatigue, progressing to a state of exhaustion.

The virus replicates in the epithelial cells of the skin and mucous membranes, leading to the development of characteristic skin lesions.

Lesions may appear as non-specific erythematous papules, resembling arthropod bite reactions.



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Laboratory Diagnosis

Molecular diagnostic methods such as PCR target:

- B6R (envelope protein)
- E9L (DNA polymerase)
- RP018 (DNA-dependent RNA polymerase subunit 18)
- C3L (complementary binding protein).

ELISA is also available for the detection of specific IgM and IgG antibodies in the serum of monkeypox patients after 5 and 8 days of infection, respectively.

However, the ELISA lacks specificity due to antigenic cross-reactivity between monkeypox and other poxviruses.

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Prevention

Avoid contact with infected animals

Hand hygiene

Vaccination

Self-solation and quarantine.

In United States there are currently three smallpox vaccines that provide cross-protection against monkeypox due to the similarities between the two viruses.

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Conclusion

Monkeypox has been declared a public health emergency because it has appeared in countries where it is not endemic.

In such situations, it is necessary to control the cases and, above all, isolate these patients since it is contagious from person to person, and the virus can even survive on surfaces for several hours.

Although there is no specific vaccine for the virus, it is important to administer smallpox vaccines because of the similarity between the two, as it provides protection against mpox.

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Take-away, Food for thought

Zoonotic Disease
Monkeypox is a viral disease primarily transmitted from animals to humans, with secondary human-to-human transmission through close contact.

Symptoms
It causes fever, swollen lymph nodes, and a rash that progresses from macules to pustules, similar to smallpox but less severe.

Global Concern
Once endemic to Central and West Africa, monkeypox has recently spread globally due to increased travel and close-contact transmission.

Prevention
Effective measures include avoiding contact with infected individuals or animals, maintaining hygiene, and vaccination with modified smallpox vaccines.

Treatment
While symptoms are generally self-limiting, antivirals like **tecovirimat** may be used for severe cases.

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Christian A. García-Sepúlveda — Laboratorio de Genómica Viral & Humana, Facultad de Medicina UASLP
Sandra E. Guerra-Palomares — Laboratorio de Genómica Viral & Humana, Facultad de Medicina UASLP
Juan Carlos Cuevas Tello — Grupo de Bioinformática, Facultad de Ingeniería UASLP
Ignacio Amezcua Osorio — Comité Estatal para el Fomento y Protección Pecuaria de San Luis Potosí (CEFPP)
Guillermo Espinosa Reyes — Centro de Investigación Aplicada en Ambiente y Salud (CIAAS), Facultad de Medicina UASLP
Fernando Díaz-Barriga Martínez — Centro Colaborador OMS/OPS CIAAS, Facultad de Medicina UASLP
Andreu Comas García — Epidemiología y virología molecular, Depto. Microbiología, Fac. de Medicina UASLP

Dulce Ma. Hernández Piña — Lab manager, LGVH UASLP
J. Manuel Mendoza Méndez — Hantavirus americanos en roedores silvestres, LGVH UASLP
Nidya Jurado-Sánchez — Vigilancia de vectores y arbovirus, LGVH UASLP
Mariel Pacheco-Cortez — Hantavirus SEOV en personal biomédico, LGVH UASLP
Samuel Mora-Andrade — Bat collection research, LGVH UASLP
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