# Global Health Cast 41

## July 12th, 2023

Dr. Melvin Sanicas
@Vaccinologist

Prof. Dr. Joe Schmitt
@Prof_Schmitt

## Every Week

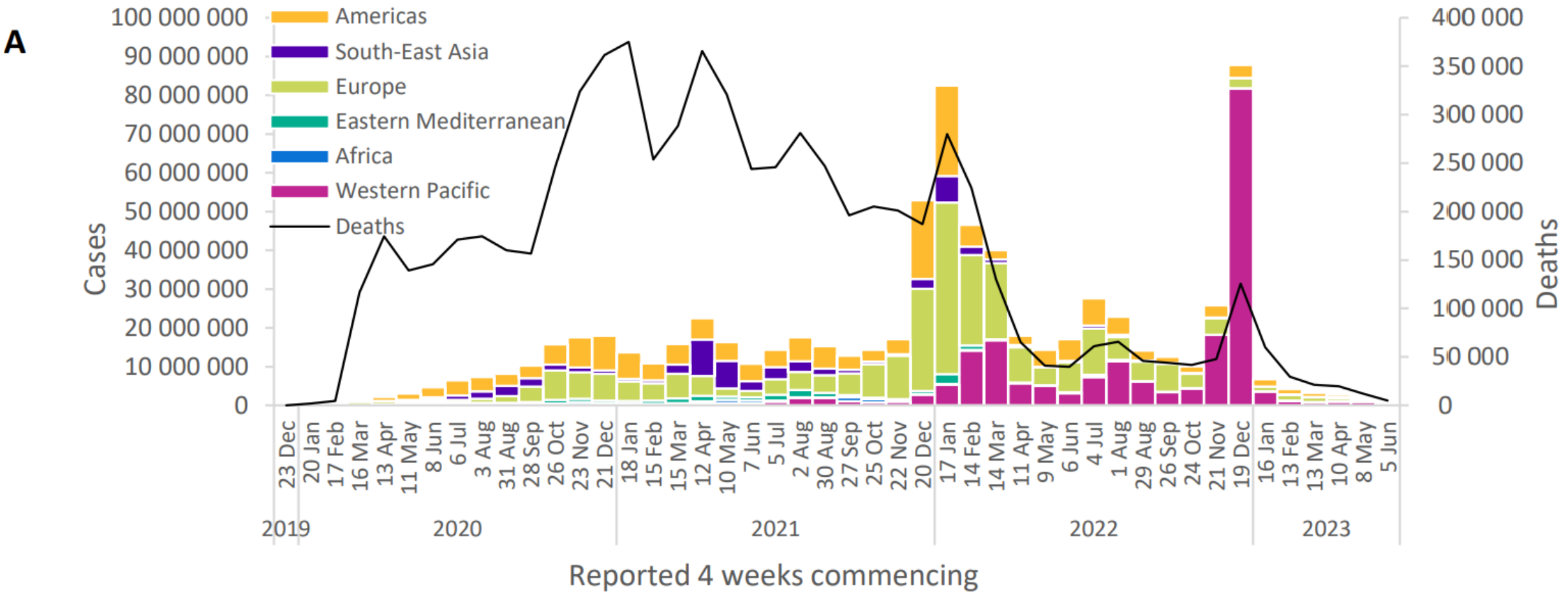
**12.00 noon - CET**

GLOBAL HEALTH PRESS

# What we talk about today

- COVID-19 global epidemiology
- “Most Infectious Diseases” – DISEASE X
- Blood Group A and SARS-CoV-2 infection
- The next Pandemic will be caused by …. ?

# Figure 1. COVID-19 cases reported by WHO Region, and global deaths by 28-day intervals, as of 2 July 2023 (A); and last six reporting periods, 16 January to 2 July 2023 (B)**



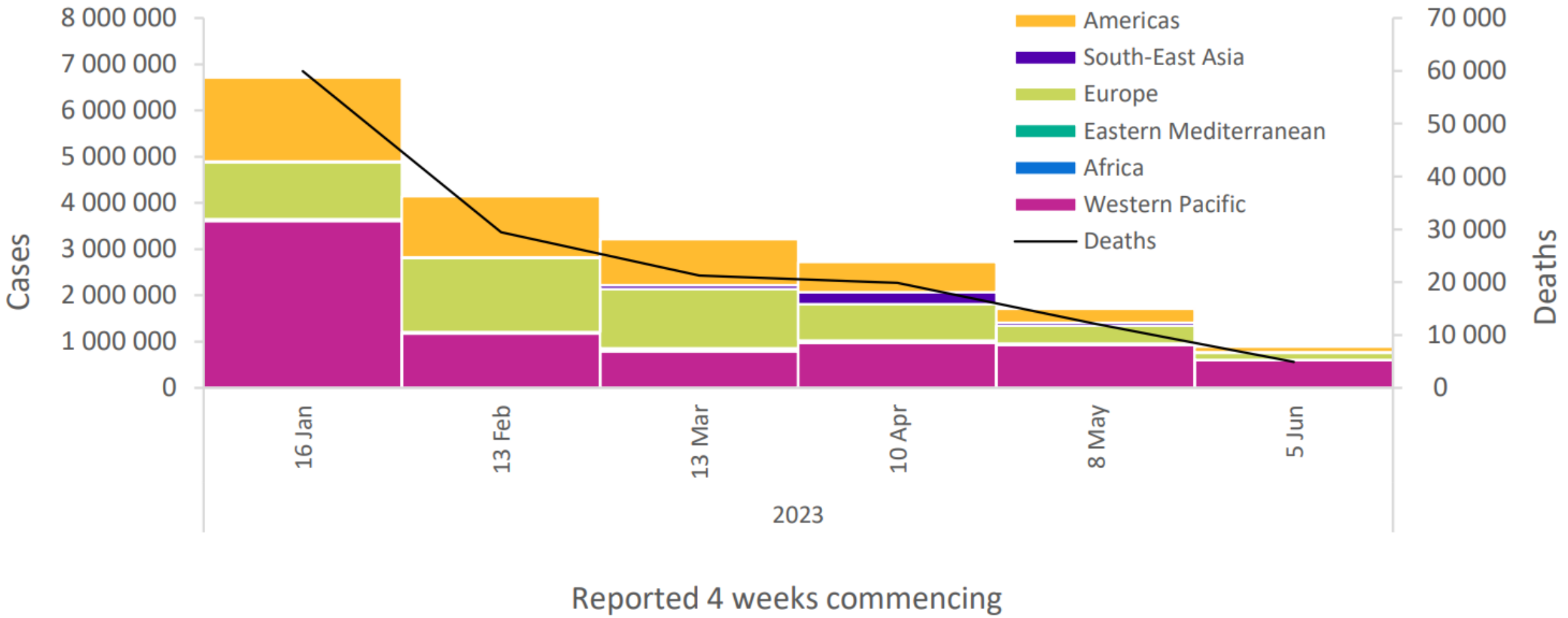


**Figure 2. Percentage change in confirmed COVID-19 cases over the last 28 days relative to the previous 28 days, as of 2 July 2023****

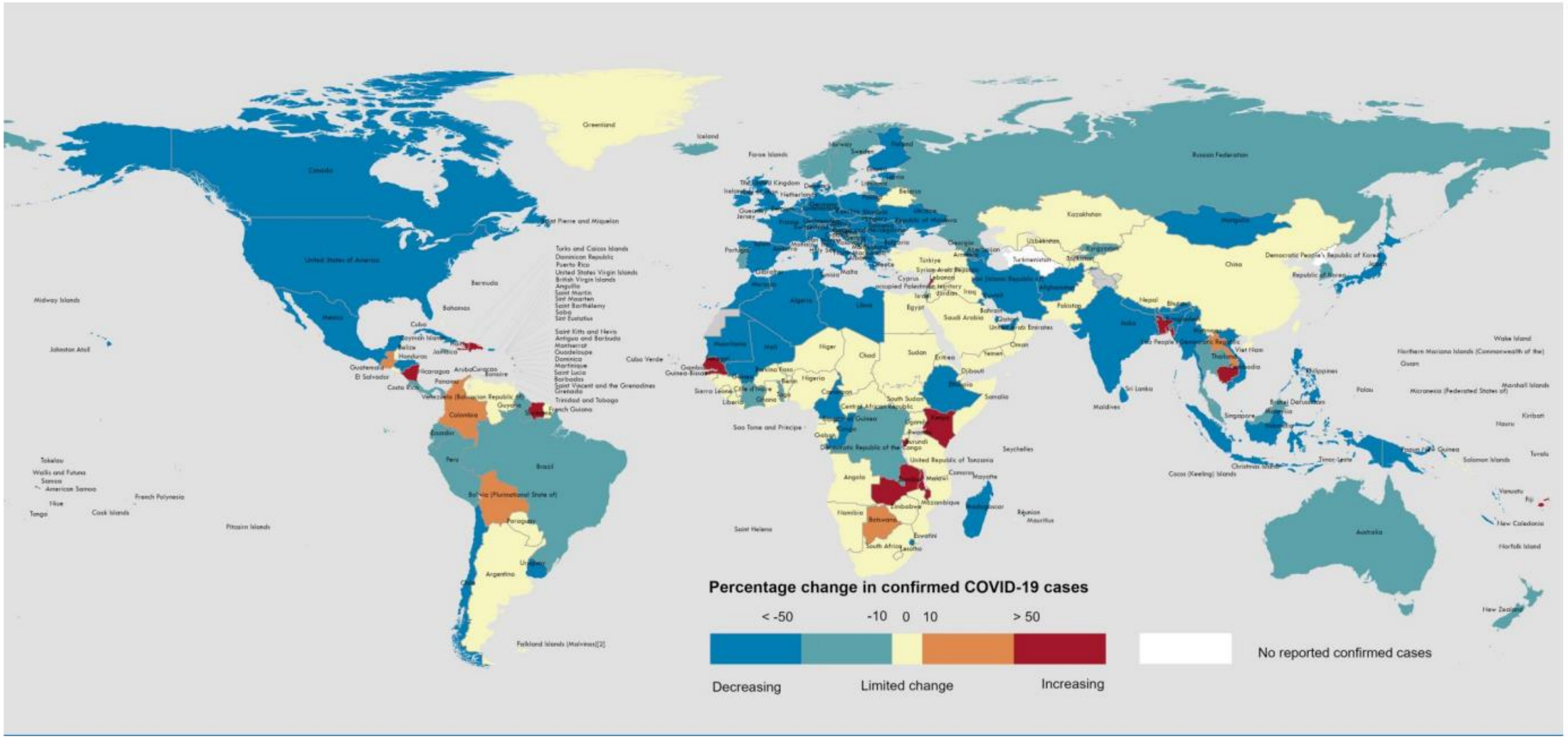
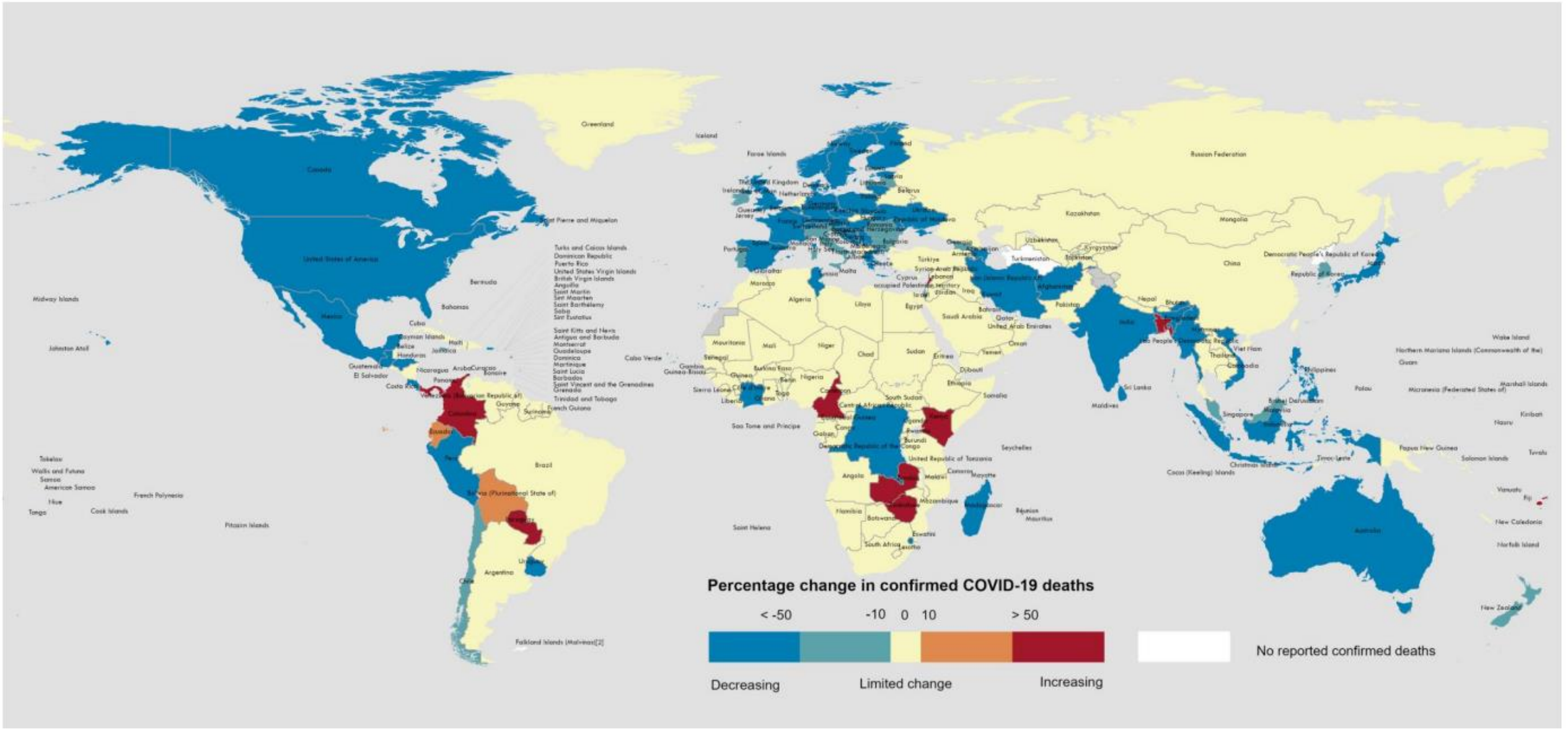


**Figure 3. Percentage change in confirmed COVID-19 deaths over the last 28 days relative to the previous 28 days, as of 2 July 2023****



BRIEF REPORT | JUNE 27, 2023

# Blood Group A Enhances SARS-CoV-2 Infection

Shang-Chuen Wu, Connie M Arthur, Hau-MIng Jan, Wilfredo F Garcia-Beltran, Kashyap R Patel, Matthew Rathgeber, Hans Verkerke, Narayanaiah Cheedarla, Ryan Philip Jajosky, Anu Paul, Andrew S Neish, John D Roback, Cassandra Josephson, Duane Wesemann, DANIEL KALMAN, Seth Rakoff-Nahoum, Richard D. Cummings, Sean R Stowell



*Blood* blood.2022018903.

https://doi.org/10.1182/blood.2022018903

Article history



## Key Points

- The receptor binding domain (RBD) of SARS-CoV-2 bears sequence and overall ABO blood binding similarity with human galectins.
- SARS-CoV-2 preferentially infects blood group A cells, providing a direct link between blood group A expression and increased infection.

## The most infectious diseases the WHO has identified to date:

- ✓ **Nipah virus Check out GHC 33**
- ✓ **Crimean-Congo hemorrhagic fever Check out GHC 34**
- ✓ **Lassa fever Check out GHC 35**
- ✓ **Rift Valley fever Check out GHC 36**
- ✓ **Zika Check out GHC 37**
- ✓ **Ebola and Marburg Check out GHC 38**
- ✓ **Middle East respiratory syndrome (MERS) Check out GHC 39**
- ✓ **Severe acute respiratory syndrome (SARS) Check out GHC 40**

Disease X (any unknown pathogen that could cause future outbreak)

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**Disease X (any unknown pathogen that could cause future outbreak)**


So WHAT IS
DISEASE X?


What could be the nature of
DISEASE X?

# Frequency of diseases in families (1948–1950)

| | 1948 | 1949 | 1950 |
|---|---|---|---|
| Total | 9.7% | 9.9% | 10.0% |
| ARI | 6.3% | 6.3% | 6.1% |
| Diarrhea | 1.5% | 1.7% | 1.3% |

ARI: Acute respiratory infection. Dingle JH, et al. *Am J Hyg*. 1953;58(1):16-30.

# Classification of ARI pathogens

In patients with no underlying diseases, no unusual exposure

## Colonizers

### Bacteria: beta-lactam+

- Regularly changing surface epitopes
- High frequency person-to-person spread
- Animal reservoir

- *Moraxella spp.*
- *Staphylococcus aureus*
- *Neisseria meningitidis*

## Non-colonizers

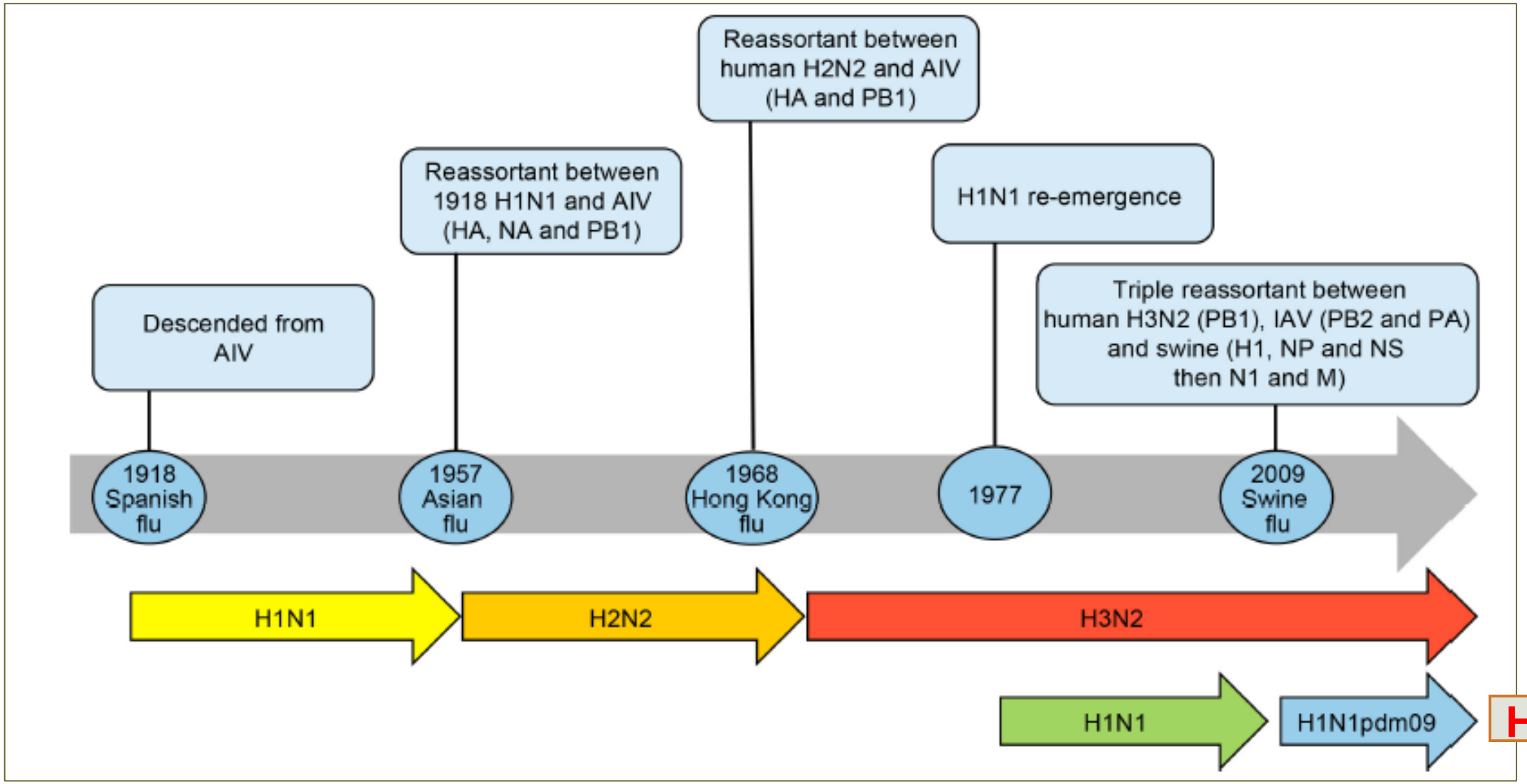
### Epidemic bacteria (5): macrolide+

- *Chlamydia, Legionella, Mycoplasma, Bordetella*

### Epidemic viruses (>14):

- SARS-CoV2, **RSV**, **parainfluenza viruses 1–4**, enterovirus, **human metapneumovirus**, influenza A and B, rhinovirus, CV, reovirus, adenovirus

# Evolution of Influenza Pandemics – Antigen Shift; Antigen Drift

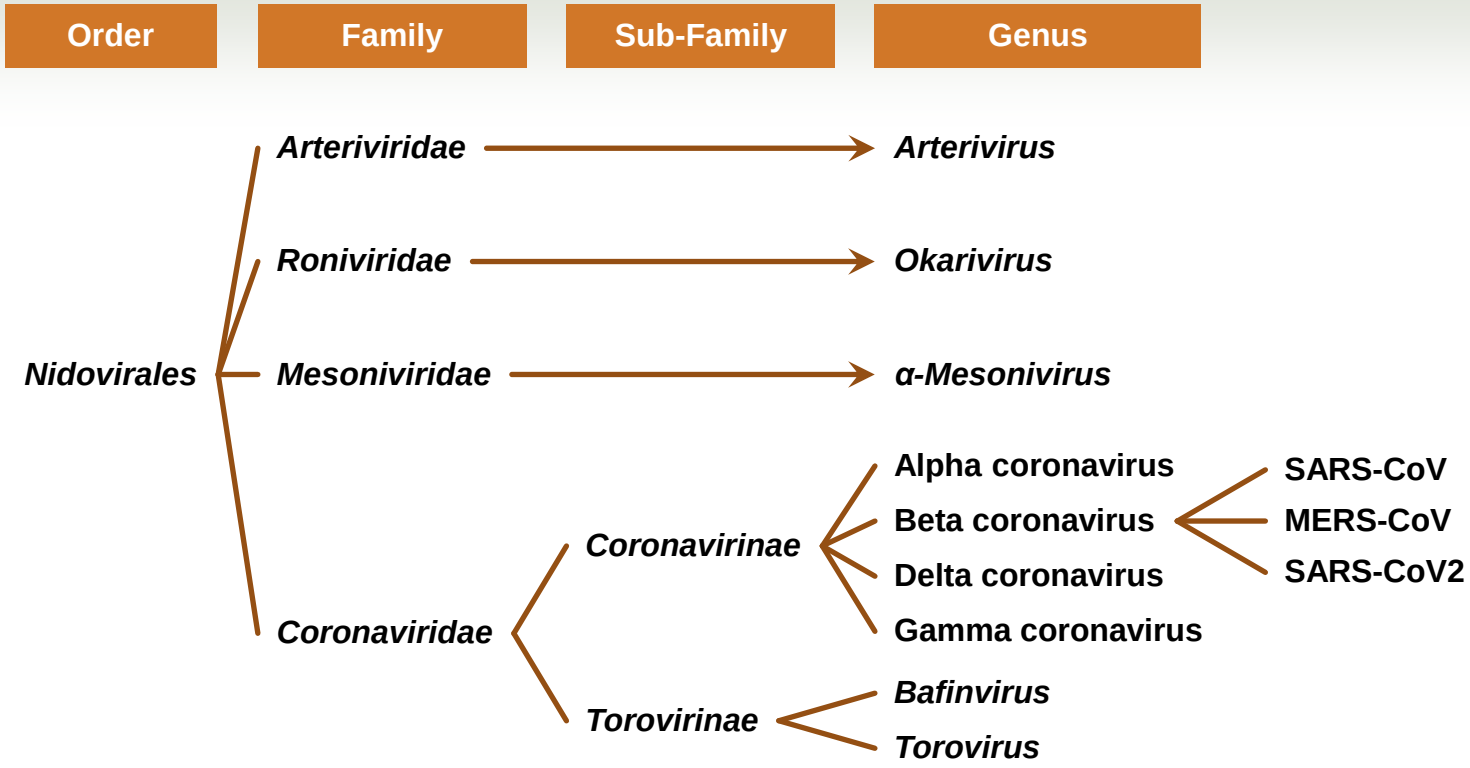



Piret J and Boivin G (2021) Pandemics Throughout History. Front. Microbiol. 11:631736. doi: 10.3389/fmicb.2020.631736

# Introduction to Coronaviruses

**Enveloped, nonsegmental, positive-sense single-stranded RNA virus, size from 29.9 kb**

## Classification of Coronaviruses




- **RNA-virus infecting birds and mammals** (zoonotic)

1. **"Endemic" Human** CoVs since 1960ies: ARI; mild, 15-29% of human ARI:[1]
   KHU1, OC43, NL63, 229E

2. **Pandemic** human potential
   - SARS-CoV (**2002**) (Guangdong)
   - MERS-CoV (**2012**)[1,2] (Dromedar reservoir; occasional spillover-cases)
   - COVID-19 (**2019**; SARS-CoV-2): Wuhan - Ongoing Pandemic

**- CoV3 – 2026/2029 ?**


1. Su, S. et al. Epidemiology, Genetic Recombination, and Pathogenesis of Coronaviruses. *Trends Microbiol*. 24, 490–502 (2016)
2. Rasmussen SA, Watson AK, Swerdlow DL. 2016. *Microbiol Spectrum* 4(3):EI10-0020-2016

# Updating the WHO List of Pathogens With Epidemic And PHEIC Potential

## Priority diseases Plus „Disease X“

Communicable diseases

**Ebola virus disease**

Communicable diseases

**Lassa fever**

Communicable diseases

**Crimean-Congo haemorrhagic fever**

Communicable diseases

**Middle East respiratory syndrome coronavirus (MERS-CoV)**

Communicable diseases

**Nipah virus infection**

Communicable diseases

**Rift valley fever**

Other

**Zika virus disease**

Communicable diseases

**Coronavirus disease (COVID-19)**

This list is a political - not a scientific - agenda

# WHO Initiative to Improve Pandemic Peparedness

## April 23, 2023

1. **Update preparedness plans that affirm priority actions** and that have considered learnings from past events. Recognizing the risk posed by respiratory pathogens, planning for a respiratory pathogen pandemic based on the themes identified in the *PRET Module #1: Planning for Respiratory Pathogen Pandemics* is a priority.

2. **Increase connectivity among stakeholders in pandemic preparedness planning through systematic coordination and cooperation**. This includes building equitable systems; conducting joint exercises; and sharing information on good practices, challenges, and opportunities.

3. **Dedicate sustained investments, financing and monitoring of pandemic preparedness** with a particular focus on addressing the gaps identified during past pandemics and epidemics.

# 10. Orthopoxviruses as Biothreat agents and Biorisks

- According to Ken Alibek, a former deputy director of the former Soviet Union's bioweapons program, the former **Soviet Union expanded its bioweapons research program during the 1980s and was eventually able to weaponise smallpox** [57]. However, very little information is available about the extent and outcome of these activities. Today, a **concern remains that somewhere, somehow, VARV might be kept illegitimately in clandestine stocks**. In a rapidly changing world, the impact of an intentional release of VARV would result in a **public health emergency of global concern**. This concern stems from the facts that smallpox vaccination programmes were stopped decades ago and so an increasing proportion of the world's population is immunologically naïve for orthopoxviruses, that the percentage of immunosuppressed individuals has increased, and intercontinental air travel allows rapid viral spread around the world. Shedding the virus from the oropharynx and skin before a smallpox diagnosis is confirmed is a real concern, even in countries with highly development medical healthcare systems.

VARV: Variola Virus

# 100 Days

What if it took 100 days to make a safe and effective vaccine against any virus?

CEPI and the UK Government recently hosted the Global Pandemic Preparedness Summit to explore how we can respond to the next “Disease X”, by making safe, effective vaccines within 100 days.

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