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Predicting the next pandemic: VACCELERATE ranking of the World Health Organization's Blueprint for Action to Prevent Epidemics

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# **Journal Club**



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### • R&D BLUEPRINT (WHO)



#### WHO R&D Blueprint for Epidemics

Updating the WHO list of pathogens with epidemic and PHEIC potential

Concept Note

- Published by the WHO in 2016, this document identifies several infections as high priorities for prevention: including:
  - Crimean-Congo haemorrhagic fever
  - Ebola
  - Marburg
  - Lassa fever
  - MERS
  - SARS
  - Nipah virus
  - Rift Valley disease
  - Zika disease
  - X disease
  - Last update: COVID-19

#### Available here





#### WHO R&D Blueprint for Epidemics

Updating the WHO list of pathogens with epidemic and PHEIC potential

Concept Note

- This list considers:
  - Human to human transmission
  - Severity or fatality of each case
  - Interaction between humans and animals
  - Potential societal impacts
  - Evolutionary potential of pathogens



This list do not prioritize the pathogens based on the risk of causing a new pandemic.

Available here



#### Table 1

Pathogens identified as potential pandemic generators by Africa CDC, CEPI, WHO, and the current analysis.

Pathogens	Africa CDC [6]	CEPI [7]	WHO [1]	Current analysis
Anthrax	x			-
CCHE virus	X		v	v
Chikungunya virus	X	v	л	А
Dengue fever virus	v	~		
Deligue level virus	X X	v	v	v
Ebola virus	v	A V	N V	A V
Hantavirus	Λ	A	А	X
Henipovirus				A V
Influenza viruese				A V
Innuenza viruses	v			X
Lassa virus	A V	х	х	х
Lyssaviruses	A V			
Marburg virus	Λ		х	Х
MERS-CoV		х	х	х
Monkeypox virus	X			
Morbillivirus	X			
Neisseria-meningitis	Х			
Nipah virus		х	х	Х
Poliovirus	Х			
Rift Valley fever virus	Х	х	х	х
SARS-CoV			х	х
SARS-CoV-2	Х		х	х
Vibrio cholerae	Х			
Yellow fever virus	Х			
Yersinia pestis	Х			
Zika virus			х	х

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#### VACCELERATE Network Sites



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The purpose of this survey was to classify the diseases listed in the *WHO R&D Blueprint for Action to Prevent Epidemics* based on the perceived risk of pandemic potential, with input from infectious disease experts from the VACCELERATE Site Network



## Methods

- A survey was uploaded from February to June 2023, at https://www.clinicalsurveys.net/uc/Next\_pandemic/.
- All the members from the VACCELERATTE Site Network were invited to participate. Other relevant experts from outside Europe were also contacted to provide their opinion.
- The survey was shared also by social media (LinkedIn and Twitter).
- Each participant could rank the pathogens responsible for the diseases listed in the WHO R&D Blueprint for Action to Prevent Epidemics, as it follows:





## Results

- A total of 187 responses were obtained from individuals representing 57 different countries.
  - Germany, 27 replies (14.4 %), Spain, 20 replies (10.7 %), and Italy, 14 replies (7.5 %).

#### Results obtained after disease experts answered the survey.

#### Table 3

Overall ranking of analysed pathogens.

	Overall ranking	Points	% of points	Times voted	Maximum points	Minimum points	Highest ranked position	Lowest ranked position	Voted by x % of the participants
Influenza	1	2154	31.0 %	147	15	12	1	4	79 %
Disease X	2	1282	18.5 %	92	15	7	1	9	49 %
SARS-CoV-2	3	1076	15.5 %	81	15	2	1	14	43 %
SARS-CoV	4	532	7.7 %	41	15	3	1	13	22 %
Ebola virus	5	439	6.3 %	36	15	7	1	9	19 %
MERS-CoV	6	319	4.6 %	27	15	5	1	11	14 %
Zika virus	7	235	3.4 %	22	15	2	1	14	12 %
CCHF virus	8	201	2.9 %	18	15	6	1	10	10 %
Marburg virus	9	170	2.4 %	17	14	3	2	13	9 %
Hantavirus	10	144	2.1 %	15	15	4	1	12	8 %
Lassa virus	10	144	2.1 %	14	15	4	1	12	7 %
Nipah virus	12	122	1.8 %	13	15	3	1	13	7 %
Henipavirus	13	65	0.9 %	9	11	2	5	14	5 %
Rift Valley fever virus	14	57	0.8 %	8	13	2	3	14	4 %



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#### Results obtained after disease experts answered the survey.





• Influenza viruses received the highest rankings among the pathogens, with 79 % of participants including them in their top rankings.

The consideration of the previous epidemics caused by influenza viruses over the last 50 years period might be an argument in favour of the inclusion of influenza. Nevertheless, the absence of influenza from the WHO R&D Blueprint may be attributed to the existence of numerous influenza vaccines and the distinct research and development requirements.

 Regarding Hantavirus, Henipavirus and Rift Valley fever: although they are not included in the WHO R&D Blueprint, they are recognized as a disease of concern.





CDC Classification for Potential Agents for Use In Bioterrorism.

CDC classifies organisms related to bioterrorism on three categories:

#### Category A

Pathogens that are rarely seen in the United States:

can be easily disseminated or transmitted from person to person:

- result in high mortality rates and have the potential for major public health impact;
- might cause public panic and social disruption; and
- require special action for public health preparedness.

#### Category B

Second highest priority agents include those that

- are moderately easy to disseminate;
- · result in moderate morbidity rates and low mortality rates; and

• require specific enhancements of CDC's diagnostic capacity and enhanced disease surveillance.

#### Category C

Third highest priority agents include emerging pathogens that could be engineered for mass dissemination in the future because of

- availability;
- · ease of production and dissemination; and
- potential for high morbidity and mortality rates and major health impact.

Nipah virus Hantavirus

Available at: https://emergency.cdc.gov/agent/agentlist-category.asp



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Anthrax (Bacillus anthracis) Botulism (Clostridium botulinum toxin) Plague (Yersinia pestis) Smallpox (variola major) Filoviruses (Ebola, Marburg) Arenaviruses (Lassa, Machupo)

Brucellosis (Brucella species) Epsilon toxin of Clostridium perfringens Food safety threats (Salmonella species, Escherichia coli O157:H7, Shigella)



- Disease X
- A severe international epidemic could be caused by a pathogen that is currently unknown to cause human disease, without being associated with a specific pathogen.



Startseite » Volunteer-Registry

#### Volunteer-Registry

You can get more information on the Volunteer Registry on the **"Volunteer Registry Website"** or register directly using the **"Register Here"** button.

#### VOLUNTEER REGISTRY WEBSITE

**REGISTER HERE** 

We want to create an interface so that people interested in studies (e.g. for COVID-19 vaccine studies but also other studies) and study organisers can find each other more quickly. For this purpose, we have set up a database, the so-called "Volunteer Registry", where you can register if you are generally interested in participating in a clinical study. In addition to COVID-19 vaccine studies and studies on other issues related to SARS-CoV2, the studies can also be on other infectious diseases or studies in other medical fields, including non-clinical ones.

For further information, please visit the Volunteer Registry Website: <u>http://lts.impfstudien-corona.de/</u>



- SARS-CoV and SARS CoV-2
- 2002 and 2019 outbreaks. We know these guys.
- The fact that the data for this survey were collected during the final months of the COVID-19 pandemic might have influenced their high ranking.
- The relatively rapid <u>mutation</u> rate of the virus may also have contributed to its high ranking.
- It is expected that SARS-CoV-2 may continue to be a seasonal virus of interest just as influenza.

### • Ebola

- Of course, we know it.
- That's why it's here.



- Other pathogens.
- Their rankings below the mentioned pathogens might have been influenced by the fact that most of them require close contact with infected animals such as bats, rodents, and primates, which may not occur commonly in the countries where most of participating infectious disease experts come from.
- The ranking of each pathogen may have been significantly influenced by the personal clinical and research experience and expertise of the participating researchers.

Like us.



## Limitations and Conclussions

- Limitations.
- Only ¼ of the VACCELERATE Site Network members participated.
- Lack of participation from Africa and Asia.
- Germany, Spain and Italy: demographic composition may impact the results.
- Exclusion of several viruses.
- Limited Internet Access.

### • Conclusion.

 Infectious disease experts consulted from the VACCELERATE Site Network have identified influenza, SARS-CoV, SARS-CoV-2 and Ebola virus as the pathogens with the most worrisome and greatest potential to give rise to new pandemics.

# **RVPVE** Red de Vigilancia de Patógenos Virales Emergentes



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