

# Research & innovation

## Outbreaks preparedness & response

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# R&D Blueprint for Epidemics

Powering research  
to prevent epidemics

## Our Vision

Created by a WHA resolution in **2015**, our vision is a world where diagnostics, medicines, and vaccines are available to prevent and respond to epidemics across the world

## Our Mission

We aim to achieve our vision by coordinating and accelerating global research work to:

**Target** diseases that threaten humanity

**Develop** diagnostics, medicines and vaccines fast

**Respond** to outbreaks, preventing epidemics



# WHO R&D Blueprint for Epidemics – progress summary

March 2023

PATHOGEN	R&D ROADMAP	VACCINES					THERAPEUTICS					DIAGNOSTICS					RESEARCH PRIORITIES FOR OTHER AREAS OF RESEARCH AND INNOVATION
		Landscape Candidate Vaccines	TPP Vaccines	Trial design Vaccines	Simple protocol available	Regulatory pathway consultations	Landscape Candidate Therapeutics	TPP Therapeutics	Trial design Therapeutics	Simple protocol available	Regulatory pathway consultations	Landscape Candidate Diagnostics	TPP Diagnostics	Study design Diagnostics	Simple protocol available	Regulatory consultations	
COVID-19	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
MERS-CoV	YES	YES	YES	YES		YES	YES	YES				YES	YES			YES	
ZIKA	YES	YES	YES	YES	YES	YES	YES	YES				YES	YES	YES	YES	YES	
NIPAH	YES	YES	YES	YES				YES	YES							YES	
LASSA FEVER	YES	YES	YES	YES		YES	YES	YES		YES		YES	YES	YES		YES	
EBOLA ZEBOV	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES		YES	YES	
EBOLA SUDV	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES		YES	YES	
MARBURG	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES		YES	YES	
CRIMEAN CONGO HEMORRAGIC FEVER	YES	YES	YES	YES		YES	YES	YES	YES		YES	YES	YES		YES	YES	
RIFT VALLEY FEVER	YES	YES	YES	YES		YES	YES	YES		YES		YES	YES			YES	
CHIKUNGUYA	YES	YES	YES	YES			YES									YES	
PLAGUE	YES	YES	YES	YES		YES	YES	YES									
MONKEYPOX	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES				
PATHOGEN X	YES			YES					YES								

YES = available



# Global prioritization exercise

## 25 Viral Family Review Groups (VFRG) and a Bacterial Review Group (BRG)

were constituted to undertake an independent screening exercise

These groups include expertise in:

- Microbiology of severe diseases including virology and bacteriology
- Clinical management of severe infections
- Epidemiology during outbreaks
- Animal health including veterinarians, expert in zoonoses from both livestock and wildlife

## A Prioritization Advisory Committee (PAC) composed of the chairs for each family review group

- The committee includes additional expertise: social scientists, vaccine developers, decision scientists, donors, country representation

Family Name	Representative Viruses <sup>a</sup>
Adenoviridae	Human adenovirus types 1 to 57 in seven species (human adenovirus species A to G) <sup>(1)(2)</sup>
Anelloviridae <sup>b</sup>	Torque teno virus 1 (TTV1); Torque teno mini virus 1, Torque teno mid virus 1 <sup>b</sup> (type species for numerous viruses in 3 genera)
Arenaviridae	Lassa virus, lymphocytic choriomeningitis virus, Junin virus, Machupo virus, Guanarito virus, Sabia virus, Whitewater Arroyo virus, <sup>(3)</sup> Chapare virus, <sup>(4)</sup> Lupo virus
Astroviridae	Human astroviruses (eight serotypes)
Bornaviridae	Mammalian 1 bornavirus (formerly Borna disease virus [BDV]) <sup>(5)</sup>
Bunyaviridae	California encephalitis virus, Sin Nombre virus, La Crosse virus, Hartland virus, Muaró Canyon virus, Crimean-Congo hemorrhagic fever virus, Sandfly fever viruses, Rift Valley fever virus, Heartland virus, and many others
Caliciviridae	Noroviruses, sapoviruses
Coronaviridae	SARS coronavirus, MERS coronavirus <sup>(6)</sup> , human coronavirus OC43, <sup>(7)</sup> 229E, NL63, <sup>(8)</sup> and HKU1 <sup>(9)</sup> ; human torovirus and other human enteric coronaviruses
Flaviviridae	Ebola viruses (e.g., Zaire ebolavirus, Bundibugyo ebolavirus, Reston ebolavirus, Sudan ebolavirus, Taï Forest ebolavirus), <sup>(10)</sup> Marburg virus
Flaviviridae	Genus <i>Aedes</i> : dengue virus, yellow fever virus, Japanese encephalitis virus, West Nile virus, Murray Valley encephalitis virus, Kyasanur encephalitis virus, Iki-Borna encephalitis virus, Zika virus, and others Genus <i>Hepatitis</i> : hepatitis C virus (HCV) Genus <i>Flavivirus</i> : GB virus-C (GBV-C) (formerly hepatitis G virus [HGV]) <sup>(11)</sup>
Hepadnaviridae	Hepatitis B virus (HBV)
Herpesviridae <sup>c</sup>	Hepatitis E virus (HEV)
Herpesviridae	Herpes simplex virus type 1, herpes simplex virus type 2, varicella-zoster virus, cytomegalovirus, Epstein-Barr virus, human herpesvirus 6, human herpesvirus 7, human herpesvirus 8 (i.e., Kaposi sarcoma-associated herpesvirus), herpes simian B virus
Orthomyxoviridae	Influenza A virus (e.g., subtype H1N1), influenza B virus, influenza C virus, Thogoto virus, Dhorí virus, <sup>(12)</sup> Bourbon virus
Papillomaviridae	Human papilloma virus (>150 types with various degrees of oncogenicity) <sup>(13)</sup>
Paramyxoviridae	Meslin (rubeola) virus, mumps virus, paramyxoviruses, Hendra virus, Nipah virus, Menangle virus <sup>(14)</sup>
Parvoviridae	Human parvovirus B19, human bocavirus, <sup>(15)</sup> adeno-associated viruses <sup>(16)</sup>
Picornaviridae	Human picornaviruses
Picornaviridae <sup>d</sup>	Genus <i>Enterovirus</i> : human rhinoviruses (>100 serotypes), enteroviruses (>100 serotypes, including poliovirus 1–3, coxsackievirus A and B, echoviruses, and other human enteroviruses) Genus <i>Hepatitis</i> : hepatitis A virus (HAV) Genus <i>Parvovirus</i> : human parvoviruses Genus <i>Kobuvirus</i> : Acici virus Genus <i>Cosavirus</i> : human cosaviruses <sup>(17)</sup> Genus <i>Cardiovirus</i> : Myxliak human encephalomyelitis virus, Sebitid viruses <sup>(18)</sup> Genus <i>Salivirus</i> : human Ross River virus, <sup>(19)</sup> salivirus A Genus <i>Sarbecovirus</i> : Sarbeco Valley virus <sup>(20)</sup> Unassigned: Syr Ganga Valley fever virus
Pneumoviridae	Respiratory syncytial virus, human metapneumovirus
Polyomaviridae	JC virus, BK virus, KI virus, WU virus, Merkel cell polyomavirus, lymphotropic polyomavirus, human polyomavirus 6, human polyomavirus 7, hidradenoma-associated polyomavirus, human polyomavirus 9 <sup>(21)</sup>
Povoviridae	Moluscum contagiosum virus, variola (smallpox) virus, monkeypox virus, vaccinia virus, orf virus, pseudocowpox virus, Tanapox virus, Yaba monkey tumor virus <sup>(22)</sup>
Reoviridae	Human rotavirus, Colorado tick fever virus, human reovirus, <sup>(23)</sup> Kemerovo virus
Reoviridae	Human immunodeficiency viruses types 1 and 2, human T-lymphotropic lymphotropic viruses, <sup>(24)</sup> xenotropic murine leukemia virus-related virus, <sup>(25)</sup> human endogenous retroviruses (HERVs), simian foamy virus
Rhabdoviridae	Rabies virus, vesicular stomatitis virus
Togaviridae	Rubella virus, Chikungunya virus, eastern equine encephalomyelitis virus, Semliki Forest virus

Robert D Seigel. Classification of Human Viruses. Principles of Virology, Fifth Edition. Elsevier 2018. pp. 1044-1049 (Table 201.3)



Please also note that we have a number of **methodological deliberations and full guidance on how to conduct trials (and observational studies) and how to analyze them and interpret the results.**

Some selected examples are in the links below:

<https://pubmed.ncbi.nlm.nih.gov/31270270/>

<https://pubmed.ncbi.nlm.nih.gov/31242963/>

<https://pubmed.ncbi.nlm.nih.gov/32284269/>

<https://pubmed.ncbi.nlm.nih.gov/32242365/>

<https://pubmed.ncbi.nlm.nih.gov/34218667/>

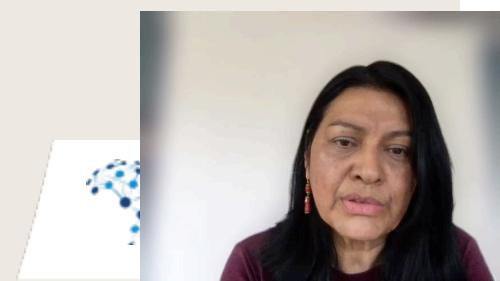
<https://pubmed.ncbi.nlm.nih.gov/35866633/>

<https://pubmed.ncbi.nlm.nih.gov/32861315/>

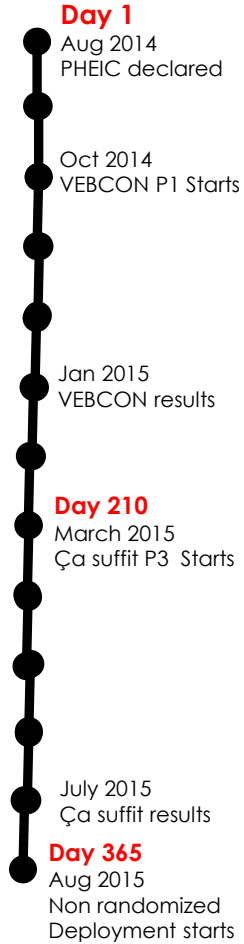
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<https://pubmed.ncbi.nlm.nih.gov/34041932/>

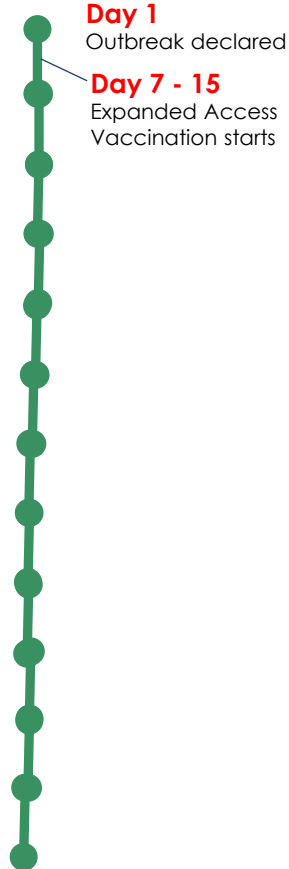
<https://pubmed.ncbi.nlm.nih.gov/33535811/>



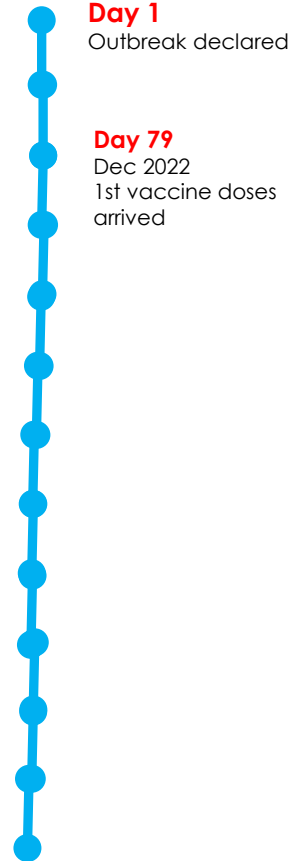
**ZEBOV- RCT**  
**VEBCON & Ça Suffit**  
Guinea 2014-2016



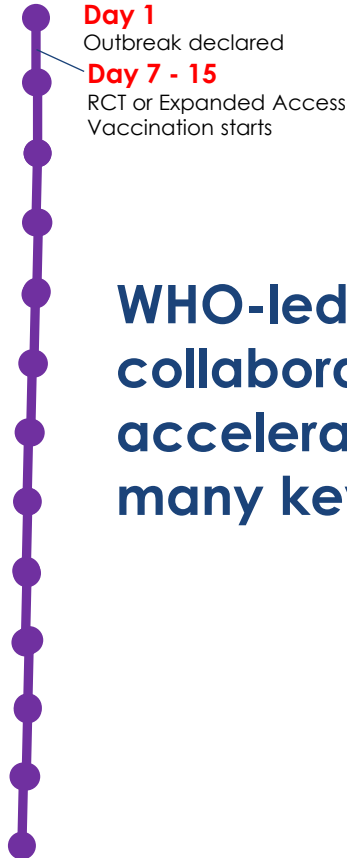
**ZEBOV - Expanded Access**  
Guinea, Sierra Leone, DRC  
2016 - 2020



**SUDV - RCT**  
Uganda  
2022



**AIM**  
RCT or Expanded Access  
NEXT OUTBREAK



**WHO-led global  
collaborative efforts have  
accelerated  
many key actions**



# SUDV – Uganda: A WHO-led global collaborative effort accelerated many key actions

## **0** Outbreak declared

**1** Open scientific consultation process initiated/ Preparation of GMP doses initiated

**3** Ugandan PI and team initiate preparations for the trial, with support from WHO trial RCT experts

**13** Protocol and SOPs ready and submission for approval initiated

**23** Vaccine prioritization data submission initiated and review process started

**51** Trial team trained on GCP and on protocol SOPs - 200 field researchers; DSMC and TSC established

**66** Protocol approval process completed at WHO and in Uganda

## **68** Onset of last SUDV confirmed case

**74** Contributors met and confirmed their pledges to collaborate and support the trial

**79** First candidate vaccine doses arrive in Uganda. The remaining two arrived within



# The aim is:

To contribute to the **rapid start of studies** integrated into initial outbreak response

## 1. Clinical trials

AND / OR

**2. Expanded Access** with appropriate monitoring and data collection, if existing or emerging evidence indicates that the candidate vaccine(s) are efficacious

By supporting key actions including a **Global Virtual Pooled Inventory (GVPI) of candidate vaccines\***, ensuring that in the case of an outbreak caused by a pathogen for which licensed vaccines are not available, access to doses for studies would

\* Selection of candidate vaccines for inclusion in a trial as part of the research response to an outbreak would be based on ongoing independent scientific review of available evidence about the product (timeframe TBD; agnostic of funder) and informed by their public health suitability as defined by a WHO Target Product Profile (TPP) when one is available. For a candidate to be considered for inclusion in such an effort, developers affirm their commitment to making vaccine candidates readily available for trials and expanded access, such as by manufacturing and maintaining a reserve of readily available candidate vaccines as part of the development effort.





# Core components for a rapid start of studies

## Previously agreed PRIORITIZATION of candidate vaccines & therapeutics

1. **Ensure the availability of critical data** on safety and immunogenicity
2. Independent regularly updated **expert group prioritization** which regularly review the evidence

## AVAILABILITY of investigational doses already in vials

1. With inputs from the expert group, agreement on **number of doses**
2. Funds for GMP vaccine doses already internationally transferable vials
3. **“Mechanism”** to fund, monitor & access invest. Doses - Global Virtual Pooled Inventory (GVPI) of candidate vaccines

## Previously agreed TRIAL platforms and simple protocols

1. **Scientific** discussions and simple protocols ready
2. NRAS and Ethics from **at risk countries pre-approval**
3. **Network** of networks of local researchers
4. Logistics and supplies **ready**

## Previously AGREED legal terms for collaboration, insurance & liability

1. **Signed agreements** with prioritized developers
2. Insurance & liability arrangements

## Previously agreed accessible FUNDING for selected protocols

1. Signed agreements with contributors
2. Simple process for access to funds for investigational doses and for studies

## INVESTIGATION AL VACCINES\*

Rapid start of studies  
integrated into initial  
outbreak response

Rapid deployment  
(as expanded access)  
if efficacious



# Importance of global partnership in addressing public health emergencies

**Research integrated into the initial outbreak response is essential** to assure ultimate availability of safe and effective diagnostics, drugs, and therapeutics for outbreaks

Achieving this requires a GLOBAL effort of prioritization, funding for vaccines available in vials, support for trial platforms/protocols, legal/insurance/liability framework, funding for studies and COLLABORATION



# Thank you

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# AN APPROACH TO FAST TRACK ASSESSMENT OF CANDIDATE VACCINES AND SUPPORT PANDEMIC PREVENTION AND CONTROL

1

## Prioritization

Independent expert process to prioritize candidate vaccines



Prior agreement on a process for prioritization of candidate vaccines by an independent the WHO Technical Advisory Group on candidate vaccine prioritization (TAG-CVP), including ongoing review of emerging information.

2

## Availability

Agreement on availability and access to candidate vaccines



Decisions will be informed by outcomes of the prioritization process; consensus on minimum number of candidate doses required for research during outbreaks and that need to be available at any time point.

3

## Clinical trials\*

**Standardized platforms** to scale clinical trials equitably  
\* *includes expanded access*



This will emerge from a collaborative multilateral approach in which the Ministries of Health are at the core of all research efforts.

4

## Agreements

Prior agreement on legal collaboration, insurance, indemnity and liability



This depends on having in place partnership models and signed agreements with Ministries of Health, independent prioritization system and on insurance and liability arrangements.

5

## Funding

Access to readily available funding through committed financing mechanism



This depends on signed agreements with contributors; and on a simple approval process for release of funds and financial reporting. .

6. To foster an open flexible mechanism that allows a variety of contributors (pathogen / outbreak) to contribute and to help adjust this blueprint as needed

Next steps include further consultation with interested stakeholders

# BEFORE EPIDEMIC

Prepare for the inevitable

1

Governance  
&  
Coordination



2

Knowledge  
sharing



3

Assess  
threat &  
define  
priority  
pathogens



4

R&D Roadmap



5

Funding



6

Set regulatory pathway



7

Collaboration  
&  
Partnerships



8

Expand local capacity



Regulatory  
review &  
Policy  
development

9



R&D Blueprint

Powering research  
to prevent epidemics

# Ambition for Approach to the next outbreak

**Day 0** = Outbreak declared.

**Day 1** = WHO urgent scientific meeting .

**Day 2** = Independent expert process to prioritize candidate vaccines.

**Days 3-7** = Research team and PI designation by MoH.

**Days 3-7** = Simplify/adjust clinical trial protocol

**Day 10** = Pre-approved protocol receives final approval by WHO and local authorities.

**Day 12** = Completion of GCP and SOP training by the research team.

**Day 14** = Arrival of vaccine doses.

**Day 15 = RCT starts**

Trial oversight by a single Steering Committee (SC) and a single data monitoring committee (DMC).

- ✓ Previously agreed prioritization of candidate vaccines
- ✓ Sabin: Ph I complete. IAVI: ready for Ph I. PHV: Ph I study pending. Janssen: No active program
- ✓ Funded investigational vaccines already in vials (internationally transferable)

Previously agreed:

- ✓ Established trial platforms
- ✓ Agreed simple protocol
- ✓ LEGAL collaboration
- ✓ Insurance and
- ✓ Liability frameworks
- ✓ Funding