Building Resilience Against Outbreaks & Pandemics

Research to identify sustainable solutions

The 3rd Global Research and Innovation Forum

World Health Organization

R&D Blueprint
Powering research to prevent epidemics

Building Resilience Against Outbreaks& Pandemics

Epidemics, pandemics and how research can help to control them

Ana Maria Henao-Restrepo MD MSc
Lead WHO R&D Blueprint for Epidemics
WHO Health Emergencies Department

World Health Organization

R&DBlueprint
Powering research to prevent epidemics

The Constitution of WHO states that one of WHO's key roles is to promote, conduct, and coordinate research in the field of health.

In May 2015, the 68th World Health Assembly welcomed the development of an R&D Blueprint for Epidemics, in consultation with Member States and relevant stakeholders, for accelerating research and development (R&D) in epidemics or health emergency situations where there are no, or insufficient, preventive and therapeutic medical countermeasures.

World Health Organization

HEALTH EMERGENCIES programme

R&DBlueprint
Powering research to prevent epidemics

> We cannot make the world safer without investments in science, research and innovation.

Tedros Adhanom
Director-General
World Health Organization

Today, we stand at a crossroads in **shaping global resilience**, preparedness, and response strategies for the next major epidemic or pandemic.

It is critical that we assimilate the lessons learned from the pandemic and **harness the wealth of research knowledge, platforms and collaborative frameworks** forged during the COVID-19 crisis to help protect the world from future threats.

Coordinating and accelerating global research must promote universal values

Regarding a collaborative effort to ensure access to MCMs, some have emphasized the importance of **speed** and sometimes **cost** in responding to future pandemics.

It is equally important to take a broader view that recognizes the primary importance of **quality**, **equity** in availability, and **trust** in the products safety and efficacy.

World Health Organization

HEALTH EMERGENCIES programme

R&DBlueprint
Powering research to prevent epidemics

Sometimes dreams become reality…

News of Ebola vaccine reaches a rural village in Liberia in 2015

Local photographer Alphanso Appleton #thankyouscience

In 2014-16, an unprecedented and collaborative WHO-led effort built on a number of candidate Ebola vaccines that could enter clinical trials

A series of international consultations and activities were led by WHO as a contribution to the unprecedented global efforts to develop and assess an Ebola vaccine.


World Health Organization

MEETING SUMMARY
OF THE
WHO CONSULTATION ON
POTENTIAL EBOLA THERAPIES AND VACCINES

GENEVA, SWITZERLAND
4–5 SEPTEMBER 2014


Panel discussion on ethical considerations for use of unregistered interventions for Ebola virus disease

Summary of the panel discussion

8 August 2014 | Departmental news (Reading time: Less than a minute (217 words)

The recent treatment of two health workers infected with the Ebola virus with experimental medicine has raised questions about whether medicine that has never been tested and shown to be safe in people should be used in the outbreak, and, given the extremely limited amount of medicine available, if it is used, who should receive it.

A number of interventions have been through the laboratory and animal study phases of development. It is likely that 'first in man' studies will be conducted over the next 2-4 months. It is also likely that the number of doses available for further study and/or deployment from end 2014 onwards will remain insufficient to meet demand.

On Monday, August 11, WHO is convening a panel discussion of medical ethicists, scientific experts and lay people from affected countries to assess the role of experimental therapies in the Ebola outbreak response.

Issues to be considered include:

- Whether it is ethical to use unregistered interventions with unknown adverse effects for possible treatment or prophylaxis. If it is, what criteria and conditions need to be satisfied before they can be used?


Ebola Vaccine — An Urgent International Priority

Rupa Kanapathipillai, M.D., Ana Maria Henao Restrepo, M.D., Patricia Fast, M.D., Ph.D., David Wood, Ph.D., Christopher Dye, D.Phil., Marie-Paule Kieny, Ph.D., and Vasee Moorthy, B.M., B.Ch., Ph.D.

With the Ebola epidemic in West Africa continuing to grow, the World Health Organization (WHO) convened an urgent meeting on September 29 and 30 to assess the efforts underway to evaluate and produce safe and effective Ebola vaccines as soon as possible.[1] The 70 scientists, public health officials, and representatives from industry and regulatory bodies who gathered in Geneva discussed two vaccine candidates at length — cAd3-EBOV (cAd3), from GlaxoSmithKline (GSK) and the U.S. National Institute of Allergy and Infectious Diseases (NIAID), and rVSVΔG-EBOV-GP (rVSV), from NewLink Genetics and the Public Health Agency of Canada. Several other vaccine candidates are at earlier, preclinical stages in the development pipeline.

Phase 1 studies of cAd3 have begun in the United States and the United Kingdom, and researchers plan to begin enrollment for trials of rVSV soon. Both vaccine candidates have demonstrated 100% efficacy in studies in nonhuman primates,[2,3] but how that will translate to human subjects remains unknown. The phase 1 trials of both vaccines use dose–response designs structured to determine the level of humoral and cellular immunity that can be induced. The minimum antibody titer needed to confer protection in humans is unknown. Because of the small numbers of participants in these trials, they will provide data only on common adverse events.

The cAd3 vaccine is being tested in both bivalent (ClinicalTrials.gov number, NCT02231866) and monovalent (NCT02240875) forms; the monovalent form is based on the Zaire strain of Ebola virus, which is the cause of the current West African epidemic, and the bivalent form includes the Sudan strain of the virus as well (see Fig. 1). The monovalent form will be evaluated in a nonrandomized, open-label study involving 60 adult volunteers who will receive the vaccine at three different doses (1×10^{10} vp, 2.5×10^{10} vp, and 5×10^{10} vp). The bivalent form will be evaluated in a nonrandomized, open-label study involving 20 adult volunteers who will receive the vaccine at two different doses (2×10^{10} [VG] and 2×10^{10} [VG]). Both studies will assess safety, side effects, and immunogenicity, including antibody responses as measured by enzyme-linked immunosorbent assay (ELISA) and neutralization assays and T-cell immune responses as measured by intracellular cytokine staining. Investigators anticipate that preliminary immunogenicity and safety data will be available by November.

The New England Journal of Medicine


Emergency use listing procedure

Version 9 August 2022

8 January 2020 | Publication

Overview

The World Health Organization (WHO) developed the Emergency Use Assessment and Listing (EUAL) mechanism in response to the 2014 – 2016 Ebola Virus Disease (EVD) outbreak. The EUAL is a risk-based procedure for assessing and listing unlicensed vaccines, therapeutics and in vitro diagnostics (IVDs) for use primarily during public health emergencies of international concern (PHEIC) but also in other public health emergencies if appropriate.

Two submissions for Ebola vaccines were received but none was listed. No therapeutic products that were in development were submitted during the 2014-2016 Ebola outbreak. Twenty-five applications for IVDs were received for Ebola assays of which seven were listed. Also, three out of thirty-three applications received for Zika assays were listed.

Download (1.7 MB)

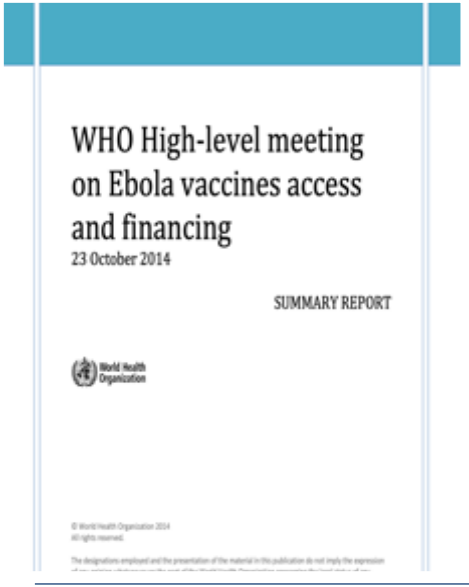
Based on the above experience, vaccine developers and national regulators identified the need to revise and simplify the procedure, in order to improve clarity on procedural aspects, and to avoid overlap or gaps in their respective functions.

World Health Organization

R&DBlueprint
Powering research
to prevent epidemics

WHO consulted widely and immediately fostered interactions

With the international scientific, ethics, regulatory, vaccine development, public health partners, industry, and funders' communities. WHO participated in consortia to facilitate Ebola vaccine assessments. WHO also fostered key activities to ensure the optimal policy and deployment of Ebola vaccines.


WHO High-level meeting on Ebola vaccines access and financing

23 October 2014

SUMMARY REPORT

World Health Organization


Health Topics Countries Newsroom Emergencies

Financing of R&D Preparedness and Response to Epidemic Emergencies


ORIGINAL ARTICLE

Phase 1 Trials of rVSV Ebola Vaccine in Africa and Europe

ABSTRACT


Gavi commits to purchasing Ebola vaccine for affected countries

RELATED DOWNLOADS

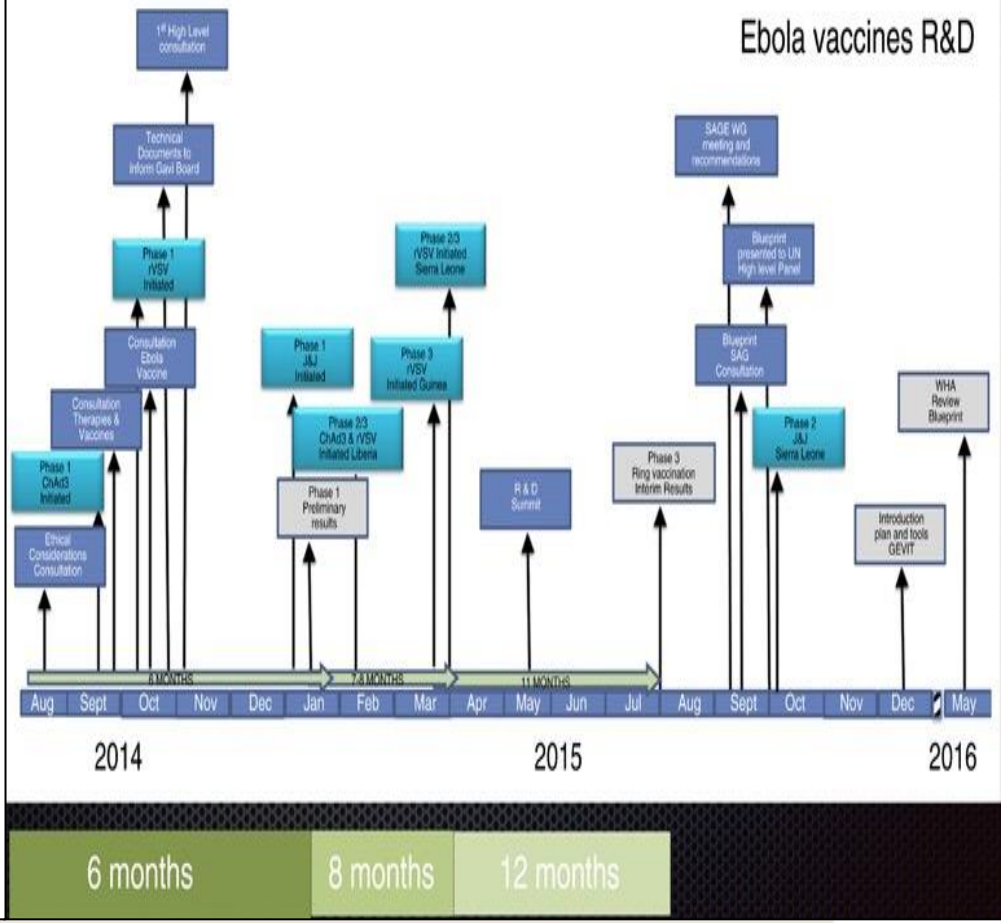
World Health Organization

R&D Blueprint
Powering research to prevent epidemics

Current Opinion in Virology
Volume 17, April 2016, Pages 138-144

On a path to accelerate access to Ebola vaccines: The WHO's research and development efforts during the 2014–2016 Ebola epidemic in West Africa

Ana Maria Henao-Restrepo [1], Marie-Pierre Preziosi [1], David Wood [2], Vasee Moorthy [1], Marie Paule Kieny [3] ✉,
the WHO Ebola Research, Development Team



World Health Organization

R&D Blueprint
Powering research to prevent epidemics

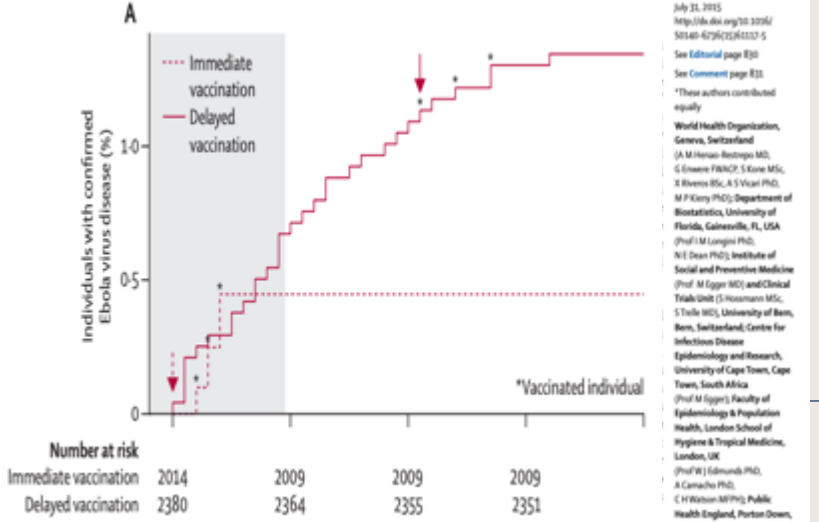
A novel trial design with the country in the driving seat and 26 global institutions collaborating

Efficacy and effectiveness of an rVSV-vectored vaccine expressing Ebola surface glycoprotein: interim results from the Guinea ring vaccination cluster-randomised trial

Ana Maria Henao-Restrepo, Ira M Longini, Matthias Egger, Natalie E Dean, W John Edmunds, Anton Camacho, Miles W Carroll, Moussa Doumbia, Bertrand Draguez, Sophie Duraffour, Godwin Enwere, Rebecca Grais, Stephan Gunther, Stefanie Hossmann, Mandy Kader Kondé, Souleymane Kone, Eeva Kuisma, Myron M Levine, Sema Mandal, Gunnstein Norheim, Ximena Riveros, Aboubacar Soumah, Sven Trelle, Andrea S Vicari, Conall H Watson, Sakoba Kéïta, Marie Paule Kieny*, John-Arne Røttingen*

Summary

Background A recombinant, replication-competent vesicular stomatitis virus-based vaccine expressing a surface glycoprotein of Zaire Ebolavirus (rVSV-ZEBOV) is a promising Ebola vaccine candidate. We report the results of an



Lancet 2015; 386: 857–66
Published Online July 31, 2015
http://dx.doi.org/10.1016/S0140-6736(15)61117-5
See Editorial page 830
See Comment page 831
*These authors contributed equally

World Health Organization, Geneva, Switzerland (A M Henao-Restrepo MD, G Enwere FWACP, S Kone MSc, X Riveros BSc, A S Vicari PhD, M P Kieny PhD); Department of Biostatistics, University of Florida, Gainesville, FL, USA (Prof I M Longini PhD, N E Dean PhD); Institute of Social and Preventive Medicine (Prof M Egger MD) and Clinical Trials Unit (S Hossmann MSc, S Trelle MD), University of Bern, Bern, Switzerland; Centre for Infectious Disease Epidemiology and Research, University of Cape Town, Cape Town, South Africa (Prof M Egger); Faculty of Epidemiology & Population Health, London School of Hygiene & Tropical Medicine, London, UK (Prof W J Edmunds PhD, A Camacho PhD, C H Watson MFPH); Public Health England, Porton Down, Wiltshire, UK (M W Carroll PhD, E Kuisma PhD); The European

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

Day 1
Aug 2014
PHEIC declared

DAY 60
Oct 2014
VEBCON P1 Starts

DAY 150
Jan 2015
VEBCON results

Day 210
March 2015
Ça suffit P3 Starts

DAY 330
July 2015
Ça suffit results

Day 365
Aug 2015
Non randomized
Deployment starts

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

Day 1
Outbreak declared

Day 7 - 15
Expanded Access
Vaccination starts

SUDV - RCT
Uganda
2022

Day 1
Outbreak declared

Day 79
Dec 2022
1st vaccine doses
arrived

AIM
RCT or Expanded Access
NEXT OUTBREAK

Day 1
Outbreak declared

Day 7 - 15
RCT or Expanded Access
Vaccination starts

Since 2016 all STUDIES STARTED PROMPTLY

✓ Previously agreed prioritization of candidate vaccines

✓ Phase1 (and 2 data)

✓ Funded investigational vaccines already in vials (internationally transferable)

✓ Previously established trial platforms

✓ Previously agreed simple protocol

Previously agreed:

✓ LEGAL collaboration,
✓ **I**nsurance and
✓ **L**iability frameworks

✓ Previously agreed funding

R&DBlueprint
Powering research to prevent epidemics

Expanded Access with rVSV ZEBOV GP
(unlicensed doses), for outbreaks reported between 2016 - 2022

12 EVD (Zaire) outbreaks and **3,721** EVD confirmed cases reported

Over **350,000 people at risk vaccinated**

(contacts and contacts of contacts) including **>100,000** HCWs/FLWs

Informed consent for all and individual data collection from 250,000

World Health Organization

A COORDINATED GLOBAL RESEARCH ROADMAP: 2019 NOVEL CORONAVIRUS

MARCH 2020

There is broad consensus on the need for research to: focus on actions that can save lives now; facilitate actions so that those affected are promptly diagnosed and receive optimal care; and catalyse the full integration of all innovations within each research area.

Moreover, there is an imperative to support research priorities in a way that leads to the development of sustainable global research platforms pre-prepared for the next disease X epidemic. This will allow for accelerated research, innovative solutions and R&D of diagnostics, therapeutics and vaccines, as well as the timely and equitable access to these life-saving tools for those at highest risk.

R&DBlueprint
Powering research to prevent epidemics

COVID-19 RESEARCH AND INNOVATION ACHIEVEMENTS

APRIL 2021

World Health Organization R&DBlueprint

COVID-19 Research and Innovation

Powering the world's pandemic response – now and in the future

February 2022

World Health Organization R&DBlueprint

Global Research and Innovation for Health Emergencies

Building the world's resilience against future outbreaks and pandemics

October 2023

World Health Organization R&DBlueprint Powering research to prevent epidemics

New strategic components steering future global research agenda

World Health Organization

HEALTH EMERGENCIES programme

R&DBlueprint
Powering research to prevent epidemics

Core activities of the WHO R&D Blueprint for Epidemics toward a robust and coordinated global research response to emerging disease threats

- Viral and Bacterial famillies prioritization
- R&D Roadmaps and Target Product Profiles (TPPs) for each prioritized viral and bacterial family
- Pipeline monitoring and prioritization for evaluation.
- Research in the context of outbreaks and pandemics
- Promotion of building capacities to conduct clinical trials and research in accordance with international standards.

Figure 1 shows progress on the delivery of key activities within the R&D Blueprint up to May 2023

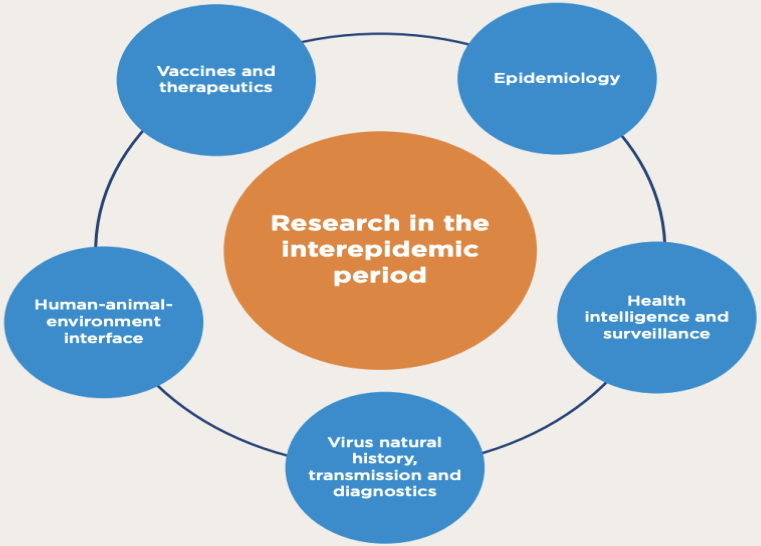
Pathogen	R&D Roadmap	Vaccines						Therapeutics					Diagnostics					Research priorities for other areas of research and innovation.
		Landscape Candidate Vaccines	TPP Vaccines	Trial design Vaccines	Simple protocol available	Regulatory pathway consultations		Landscape Candidate Therapeutics	TPP Therapeutics	Trial design Therapeutics	Simple protocol available	Regulatory pathway consultations	Landscape Candidate Diagnostics	TPP Diagnostics	Trial design Diagnostics	Simple protocol available	Regulatory consultations	
COVID-19	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
MERS-CoV	✓	✓	✓	✓		✓		✓		✓			✓	✓				✓
Zika	✓	✓	✓	✓	✓	✓		✓	✓				✓	✓	✓		✓	✓
Nipah	✓	✓	✓	✓						✓	✓							✓
Lassa fever	✓	✓	✓	✓		✓		✓	✓	✓		✓	✓	✓	✓		✓	✓
Ebola ZEBOV	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓
Ebola SUDV	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓
Marburg	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓
Crimean-Congo hemorrhagic fever	✓	✓	✓	✓		✓		✓	✓	✓		✓	✓	✓			✓	✓
Rift Valley fever	✓	✓	✓	✓		✓		✓		✓		✓	✓	✓				✓
Chikungunya	✓	✓	✓	✓				✓		✓								✓
Plague	✓	✓	✓	✓		✓		✓		✓		✓					✓	
Mpox	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓
Pathogen X	✓			✓						✓								

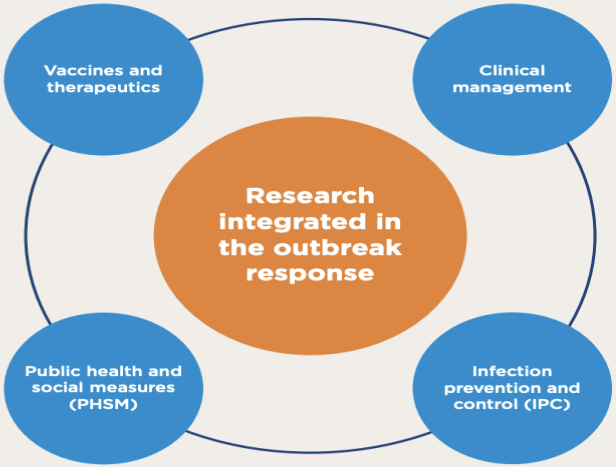
World Health Organization

HEALTH EMERGENCIES programme

R&D Blueprint
Powering research to prevent epidemics

Global collaborative research approach to prevent and tackle outbreaks, epidemics and pandemics





Tackling infodemics

Trust

Good participatory practice (GPP-EP)

Community-centred readiness and response

Regulatory science

Biological standardization

Ethics

Enabling research

World Health Organization

HEALTH EMERGENCIES programme

R&D Blueprint
Powering research to prevent epidemics

Many countries across the globe participated in WHO-coordinated research activities between May 22 and May 2023. Activities have been diverse and include a range of countries that took part in large global clinical trials to test vaccines and treatments for COVID-19.

Activities and outputs of the global research community to prevent and combat outbreaks and pandemics

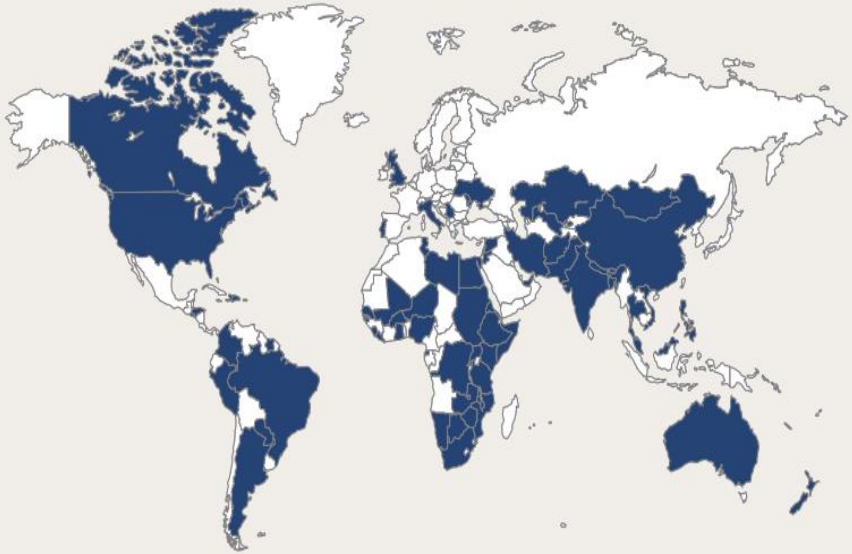
Delivered between May 2022 and May 2023 and coordinated by the WHO R&D Blueprint

144
The number of peer reviewed publications generated

775
(estimate)
The number of global conferences, meetings and training sessions held

96
The number of WHO publications, reviews and assets produced

56,212
(estimate)
The number of global scientists, researchers and policy, engagement and regulatory experts that have participated in the events outlined above

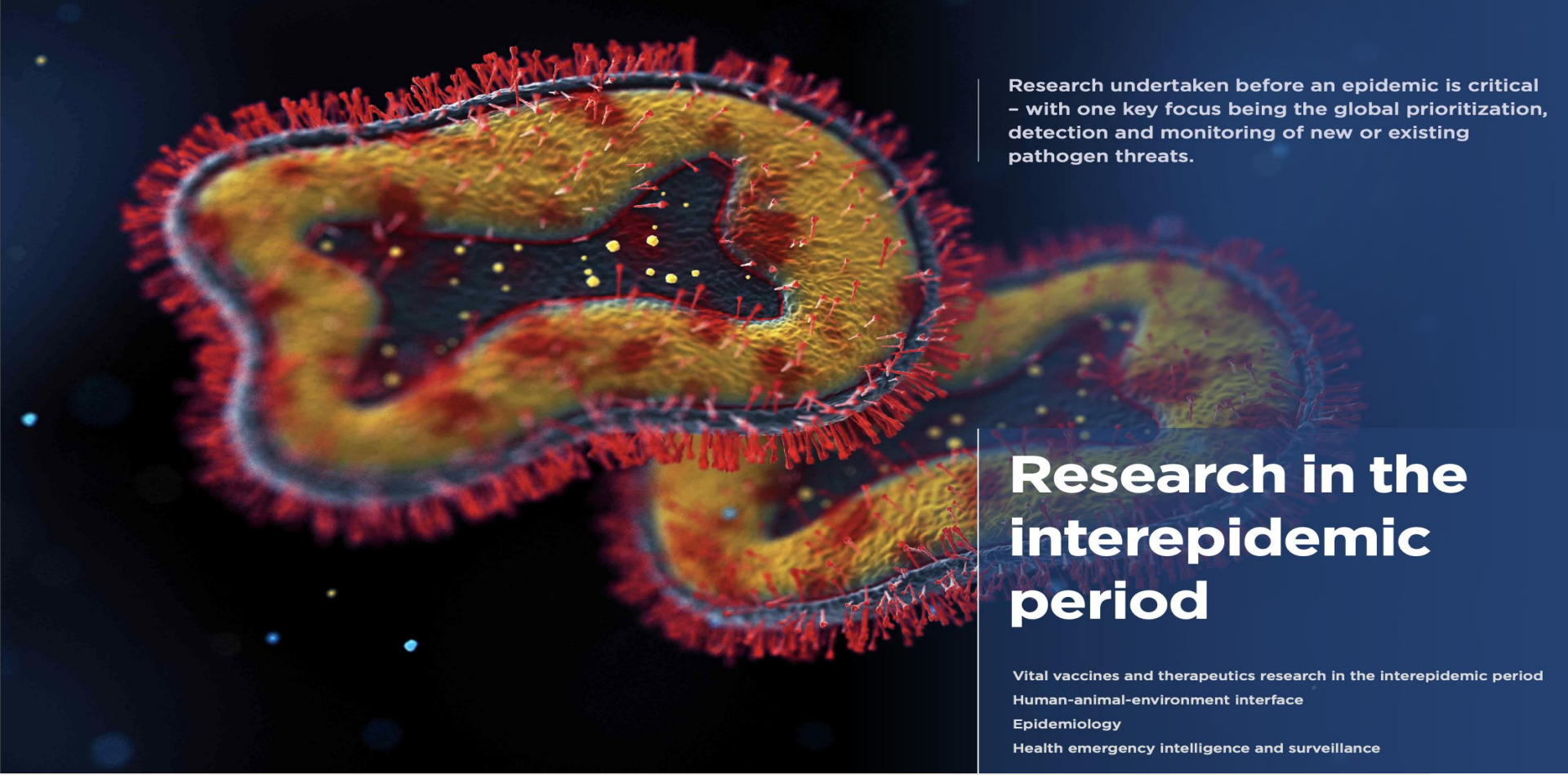


Countries that participated in research activities, coordinated by WHO, to prevent or combat outbreaks and pandemics between May 2022 and May 2023

World Health Organization

HEALTH EMERGENCIES programme

R&DBlueprint
Powering research to prevent epidemics



Research undertaken before an epidemic is critical – with one key focus being the global prioritization, detection and monitoring of new or existing pathogen threats.

Research in the interepidemic period

Vital vaccines and therapeutics research in the interepidemic period

Human-animal-environment interface

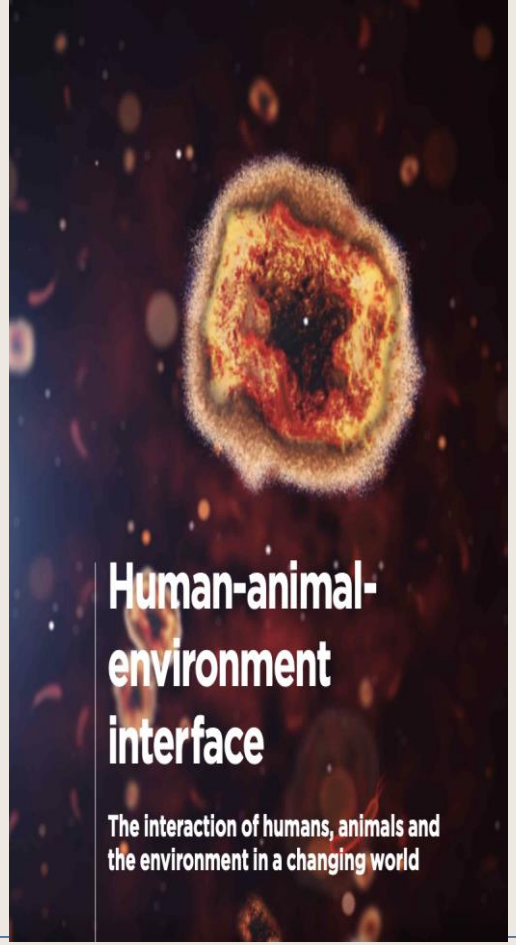
Epidemiology

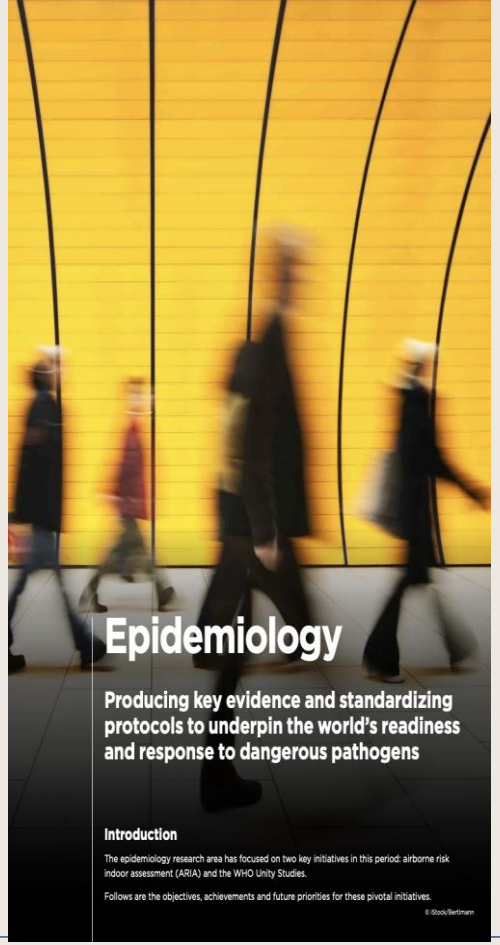
Health emergency intelligence and surveillance

World Health Organization

HEALTH EMERGENCIES programme

R&D Blueprint
Powering research to prevent epidemics





World Health Organization

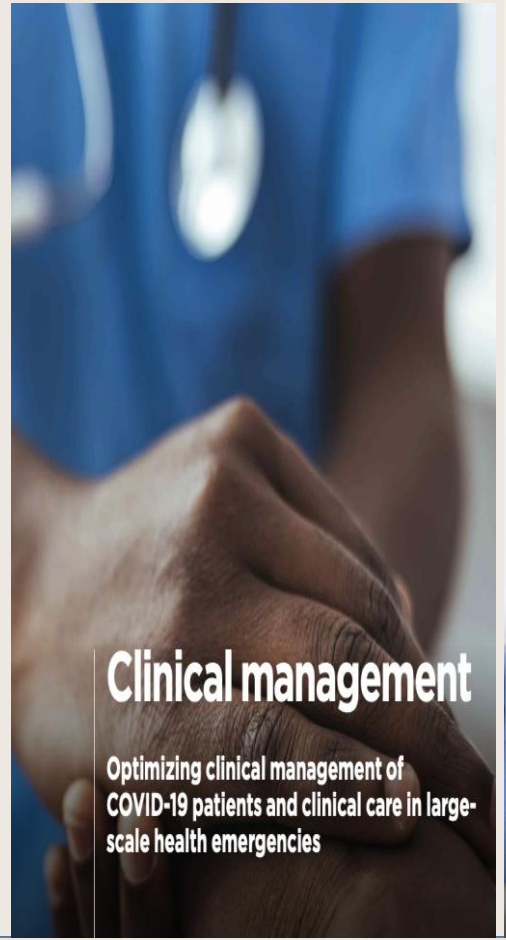
HEALTH EMERGENCIES programme

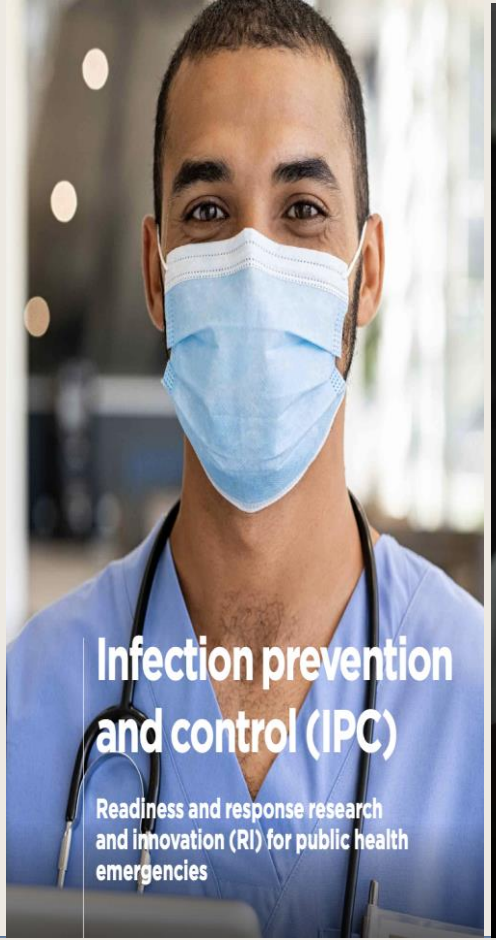
R&DBlueprint
Powering research to prevent epidemics

During a disease outbreak, different plans and strategies across all the research areas are rapidly enacted.

A core focus of this phase is delivering major clinical trials of promising vaccines and treatments quickly and robustly.

Research integrated in the outbreak response





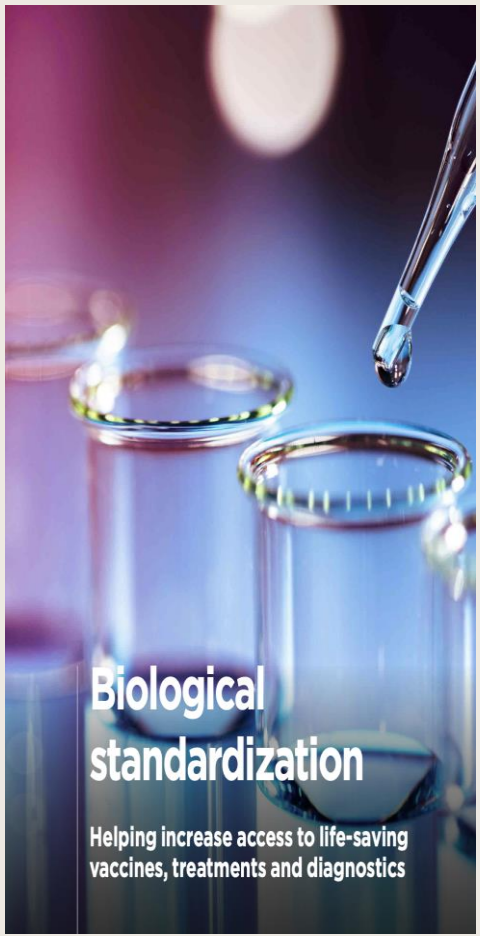
World Health Organization

HEALTH EMERGENCIES programme

R&D Blueprint
Powering research to prevent epidemics

The delivery of effective medical countermeasures and wider policies to combat a disease outbreak is underpinned by a wide range of research areas. They all coordinate and work together enabling the global research effort before and during an outbreak.

Enabling research



World Health Organization

HEALTH EMERGENCIES programme

R&D Blueprint
Powering research to prevent epidemics

WHO Initiative on Trust and Pandemic Preparedness

World Health Organization

HEALTH EMERGENCIES programme

R&D Blueprint
Powering research to prevent epidemics

On behalf of thousands of colleagues across the three levels of WHO, we would like to thank the over 50,000 researchers and Ministries of Health officials who have joined our efforts; the funders who have facilitated critical research; and the thousands of volunteers who have generously contributed to the studies worldwide.

World Health Organization

HEALTH EMERGENCIES programme

The current challenges of Research and innovation is a problem that can be solved.

Let’s solve it <u>together</u>.