

COMMENTARY



Lessons learned from Ebola Vaccine R&D during a public health emergency

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ABSTRACT

In spite of a complete lack of Research and Development (R&D) preparedness, the 2013–2016 West-Africa Ebola experience demonstrated that it is possible to compress R&D timelines to less than a single year, from a more usual decade or longer. This is mostly to be credited to an unprecedented collaborative effort building on the availability of a small number of candidate diagnostic tests, drugs and vaccines that could be moved rapidly into the clinical phase evaluation. The World Health Organization (WHO) led international consultations and activities – including the organization of a successful Ebola vaccine efficacy trial in Guinea – as a contribution to the unprecedented global efforts to control the Ebola epidemic.

Since 2015, WHO expert teams and partners are implementing a novel R&D model for emerging infectious pathogens which are the most likely to cause severe outbreaks in the future, and for which no or only few medical countermeasures are available: the WHO R&D Blueprint. The objective for the Blueprint is the fostering of a R&D environment which is prepared for quickly and effectively responding to outbreaks due to emerging infectious disease.

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At the onset in late 2013 of the Ebola outbreak in West Africa, the global community was ill-prepared to cope.¹ At the beginning of the epidemic there were insufficient medical teams and trained responders, and few experimental or research-based diagnostics to diagnose patients or confirm suspect cases of the disease. Although the virus had already been identified four decades ago, despite the previous occurrence of several outbreaks in sub-Saharan Africa, and in spite of many years of academic or military-led research into Ebola and other filoviruses, there were no proven preventive² or therapeutic products for Ebola virus disease (EVD), and research efforts had essentially stalled at the preclinical level.

In a transparent, collaborative and inclusive effort, the World Health Organization (WHO) coordinated international consultations and activities contributing to the unprecedented global efforts to facilitate R&D as well as hopefully to accelerate access to research interventions for affected communities.³ From all continents, scientific, ethics, regulatory, industry and funders' groups collaborated with West-African scientists and authorities, and participated in consortiums to review and agree on research priorities and to foster the evaluation of the most promising candidate medical products (diagnostics, treatments, vaccines, blood products and protection equipments). As an example, WHO collaborated with scientists, clinicians, regulators, ethicists, manufacturers and charitable foundations to facilitate the development and evaluation of several vaccines candidates in Phase 1^{4,6} to Phase 3⁷ clinical trials. In Guinea, WHO sponsored and coordinated the implementation of Phase 3 clinical trial based on an innovative protocol, and hired and trained national staff to

conduct the study with full compliance to Good Clinical Practices (GCP). Preliminary results on efficacy were obtained and swiftly disseminated as early as four months later after the initiation of the trial, which was subsequently transformed into a public health intervention to interrupt virus transmission and ultimately control the disease.

Nevertheless, emergency development of experimental medical countermeasures came too late to benefit the large majority of affected people. There is broad consensus⁸ that national and global research efforts were hampered by insufficient transparency and collaboration, that often led to a slow and uncoordinated research response in affected countries. Moreover, the research response suffered from lack of local scientific and technical capacity, as well as by a lack of understanding by international partners of the culture and fundamental needs of the West-African affected communities.

To summarize, the 2013–2016 Ebola epidemic demonstrated that acceleration of R&D during emergencies is possible, and that it is feasible to safely and effectively implement research interventions in affected countries. It also underlined the need to advance R&D preparedness and effective collaboration frameworks before new epidemics occur. Indeed, with more frequent travel, globalised trade and greater interconnectedness between countries and regions, infectious disease outbreaks of international concern are becoming as inevitable as they remain unpredictable. When the world is faced with diseases for which there are few or no medical countermeasures and weak health systems, as was the case during the West-African Ebola epidemic, a humanitarian crisis with massive loss of life can rapidly arise.

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While public health control measures such as surveillance, contact tracing, containment and community engagement will remain a cornerstone of any health emergency response, effective medical technologies are likely to change dramatically the response to outbreaks. Such products could be the key to preventing an epidemic from spiralling out of control, thus avoiding or limiting human, social and economic losses. Moreover, the information that is generated through high quality research implemented in preparation for, in the middle of, and after an emergency will be critical to our capacity to better achieve the overarching goals of outbreak preparedness and response.

At the request of its 194 Member States, WHO convened a broad global coalition of experts to develop an R&D Blueprint⁹ for global infectious disease threats and epidemics: a design for R&D preparedness and rapid R&D response.

The actions proposed in the WHO Blueprint were designed to ensure that R&D is a continuous effort aiming to accelerate results but also adapt to the scientific, logistical and social challenges that are specific to epidemics. Many partners, governments and institutions have developed approaches, networks and platforms for collaboration, funding or implementation of research priorities. The Blueprint does not attempt to recreate them but builds on their progress and aims to potentiate their impact.

Three approaches¹⁰ are being implemented since 2015 to improve R&D preparedness under the WHO Blueprint. The first one, “Coordination and establishing an enabling environment”, includes a set of interrelated actions that will impact on the global capacity to promptly conduct research in the context of epidemics: – Building an effective governance and coordination framework; – Outlining innovative transparent and aligned funding processes, and; – Encouraging effective communication. The second approach, “Accelerating R&D processes”, concentrates on actions needed to plan and timely implement safe and effective critical research actions, such as: – Assessing epidemic threat and defining priority pathogens; – Developing R&D roadmaps and Target Product Profiles to accelerate evaluation of diagnostics, therapeutics and vaccines, and – Outlining appropriate regulatory and ethical pathways. Finally, the third approach supports the development of new norms and standards adapted to the epidemic context, as a way to overcoming the scientific and coordination barriers faced by R&D during epidemics. Specific activities include the following: – Supporting expansion of local capacity to implement adequate clinical trial study designs; – Developing guidance and tools to frame collaborations¹¹ and exchanges, and; – Anticipating evidence needs to inform regulatory review and policy development.

Concrete benefits expected from the implementation of the R&D blueprint will be better R&D preparedness for diseases which might lead to epidemics, as well as better readiness to promptly conduct R&D during an emergency.

Disclosure statement

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Disclosure of interest

The author reports no conflict of interest.

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