# Health Threats Spur Vaccine Hunt

## Ebola and Zika virus have catapulted the threat of infectious-disease epidemics to a top spot at Davos

A specialist fumigates a graveyard on the outskirts of Lima, Peru, on Jan. 15 to prevent the spread of Chikunguya and Zika viruses. Photo: ernesto benavides/Agence France-Presse/Getty Images

By
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Ebola, Zika virus and other infectious diseases have catapulted the threat of infectious-disease epidemics to a top spot at the World Economic Forum as world leaders meet in Davos this week.

The WEF said last week that it had added the "future of health" to its list of 10 global challenges, issues on which it urges public and private entities to collaborate on solutions. The forum also listed infectious-disease outbreaks among the top threats in its Global Risks report released last week.

Government, international and pharmaceutical industry officials will gather in a high-level meeting Thursday to debate how to finance the development of vaccines for infectious diseases that spark epidemics, according to people familiar with the plans.

There are no vaccines for many of the infectious diseases threatening the world today, such as Middle East respiratory syndrome and Zika virus, because they cost far more to develop than their manufacturers can reap in revenue.

The annual gathering in Davos is taking place as health officials, researchers and pharmaceutical companies are working on ways to overhaul global health governance in the wake of the Ebola crisis, the biggest global health disaster in years.

## Emerging Infectious-Disease Dangers

The World Health Organization recently released a list of pathogens that are most likely to cause severe outbreaks but lack vaccines or drugs.

| Disease | Main regions affected | Approximate mortality rate |
|---|---|---|
| Marburg virus | Europe, Africa | 24–88% |
| Nipah virus | South and Southeast Asia | 40–75 |
| Ebola virus | Africa | 50 |
| MERS | Middle East, Asia | 36 |
| Crimean-Congo hemorrhagic fever | Africa, Balkans, Middle East, Asia | 30 |
| SARS | Global outbreak in 2002-03 | 10 |
| Lassa fever | Africa | 1 |
| Rift Valley fever | Africa, Middle East | Less than 1% |

Sources: WHO; CDC

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The World Health Organization, governments and other health leaders are developing new ways to conduct research during outbreaks and to incentivize pharmaceutical companies to develop vaccines and drugs for which there is only sporadic demand, instead of waiting until there is a crisis to respond.

**How Ebola Was Discovered**

Microbiologist Peter Piot brought Ebola to the world's attention nearly four decades ago. With rarely seen footage from his visit to Zaire in 1976, he describes how his team solved the mystery of the virus. Photo: Institute of Tropical Medicine Antwerp

The West African epidemic, which still isn't over after more than two years, exposed gaping holes in the world's ability to prepare for and respond to outbreaks. At least 28,637 people were infected in 10 countries, including at least 11,315 who died.

"I do think there's a sense we can never allow this to happen again," said Jeremy Farrar, director of the Wellcome Trust, a charitable foundation in the U.K. that has funded studies on medications for malaria, Ebola and other neglected diseases. "The horror of Ebola has galvanized everyone."

One of the biggest holes in global epidemic preparedness, health experts say, is a plodding process for developing medical technologies. At least a dozen Ebola vaccine and drug candidates were under development when the virus began to spread in West Africa. Yet there is still no licensed treatment or vaccine. Tests on their effectiveness in humans didn't get under way until the epidemic was tapering off.

Only one Ebola vaccine, developed by Merck & Co. and NewLink Genetics Corp., has been shown in a clinical trial to be effective. On Wednesday, Merck and GAVI, an international funder of vaccines, struck an advance purchasing deal under which Merck will make 300,000 doses of the vaccine by May for clinical trials or possible emergency use. GAVI agreed to invest $5 million toward development of the vaccine, with Merck agreeing to apply for licensure by the end of 2017.

"We need to find a model where we utilize the competitive advantage of different actors—academia, small startups and big pharmaceutical companies," said John-Arne Rottingen, executive director of infection control and environmental health at the Norwegian Institute of Public Health.

Among the new research and development efforts under way is the expansion of "platform technologies"—building blocks for drugs and vaccines, such as virus vectors that deliver vaccines, that could be shared instead of having to be built from scratch each time.

The U.S. government has received several proposals from companies requesting funding, said Robin Robinson, director of the Biomedical Advanced Research and Development Authority, which funds medical countermeasures for disease threats.

Other possible incentives include contracts through which governments or other funders agree in advance to purchase new drugs or vaccines for stockpiles, and prizes to companies for developing certain new medications, said Dr. Rottingen.

Such measures are meant to help offset the losses manufacturers can incur. Glaxo SmithKline PLC put work on hepatitis B and dengue vaccines temporarily on a back burner in 2014 to speed its Ebola vaccine into clinical trials, said Moncef Slaoui, chairman of the company's vaccines business.

As a result, he said, "we probably have lost a year or year-and-a-half in development for each one of these programs."

GSK invested about $117.5 million of its own funds on its Ebola program, Dr. Slaoui said. "This cannot be the model," he said. "Industry has to be, frankly, incentivized to invest in these technologies from day one."

Scientists in Washington, Geneva and elsewhere are also hashing out potential designs for clinical trials that can be conducted quickly and ethically during an outbreak, when there are patients on whom to test therapies. Researchers heatedly argued during the Ebola crisis over how to do that without depriving patients of potentially lifesaving treatments. Some argued for

randomized controlled trials, in which some patients don't get the medicine being tested, while others said that such a trial was unethical given the high mortality rate of Ebola.

Now they are scouring clinical trial designs in oncology and other diseases to try to agree on protocols that could be used in the future.

"This is an ongoing discussion," said Luciana Borio, the FDA's acting chief scientist. "I don't know that there will be one size fits all."

All these efforts will be focused on the diseases that are most likely to cause severe outbreaks and that have no vaccines or medicines to stop them, say public-health experts. The WHO has pinpointed eight, including Ebola and MERS, which alone has killed 586 since it emerged in 2012.

The WHO says it is also keeping a close eye on Zika virus, which is spreading throughout the Americas and has been linked to thousands of cases of infant brain damage in Brazil. The U.S. government has warned pregnant women to avoid travel to 14 countries and territories in Latin America where Zika is circulating. Six U.S. residents, including at least two pregnant women, recently tested positive for Zika following trips to those areas.

The WHO is also developing an epidemic R&D "blueprint" by May that will lay out research priorities and other issues, said Marie-Paule Kieny, the WHO assistant director-general overseeing the effort.

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