Epidemics: What Does the Future Hold?

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An outbreak of acute hepatitis of unknown origin last spring, recent pneumonia cases in Argentina since the start of the COVID-19 pandemic, followed by the monkeypox outbreak — a string of public health warnings has led some to question whether the threat of infectious disease is greater than it had been. The French Agency for Research in AIDS and Viral Hepatitis (ANRS) provided some answers and food for thought during a recent briefing.

Emerging and Reemerging Diseases

To understand the current dynamics of epidemics, it is important to remember that all potential threats, past, current, or future, are not alike. Distinctions must be made between truly emerging infections and those infections whose pathogen is known and that has reappeared.

New vectors include SARS-CoV-1, SARS-CoV-2, and H1N1. Transmitted from animals to humans, these viruses initially appear in populations in which there is no specific immunity. It is difficult to predict to what extent they will spread in the population, and it is difficult to predict the potentially considerable risk of an epidemic that requires close monitoring. The emergence of viruses is not limited to those that have been identified or are being monitored.

Other risks come from viruses that caused epidemics in the past and that are reemerging. These reemerging infectious diseases are transmitted from human to human via mosquitoes (dengue fever, Zika virus, Chikungunya fever), through mixed transmission from animals and then human to human (monkeypox, Ebola), or through animal reservoirs alone (West Nile virus).

The reemergence of poliomyelitis in underprotected populations is peculiar. It results from the spread of a serotype used as a vaccine strain in live virus vaccines in developing countries that do not have access to the more costly live attenuated vaccines. New and improved live virus vaccines are in development to combat this complication.

Is Risk Increasing?

The emergence of new epidemics is a never-ending and mostly cyclical phenomenon. It involves the occurrence of an epidemic in a naive population, the development of herd immunity, followed by the disappearance of the epidemic, the gradual loss of immunity, and then reemergence.

We must be wary of the magnifying effect caused by the COVID-19 pandemic and of the media frenzy that has subsequently ensued in the face of new, potentially troubling signs. Identifying epidemic phenomena is a subjective task. Fears concerning a new pathogen are not always justified, as has been shown by the recent cases of pneumonia in Argentina that were ultimately attributed to *Legionella* bacteria.

The World Health Organization (WHO) has collected data over a sufficiently long period to prevent the magnifying effect. These data confirm that the risk of epidemics is increasing. This increase can be explained by parameters that promote the spread of disease to humans and then between humans: an explosion of the global population and of the mobility of people, animals, and plants; an increase in urban density; pressure on natural systems (deforestation leading to humans encroaching on the natural world, changes to the ecosystems of certain species); and the impact of climate change, which remains uncertain.

Preventive Actions

Between 50% and 60% of infectious diseases in humans come from animals. Considering emerging infections alone, 75% come from animals.

The prevention of these outbreaks is complex and is in part dependent on measures to preserve the environment. Organizations are now calling for the One Health approach, which seeks to protect human and animal health via a global and transdisciplinary strategy involving interconnections of humans, animals, and their shared environment. It links the issues of vaccination of humans and animal reservoirs, the prevention and management of risks, and animal and human monitoring to promptly identify a potential epidemic or emerging/reemerging infectious disease.

It is within this context that avian influenza is monitored so closely. Avian influenza follows a pattern of regular reemergence and has a potentially zoonotic structure.

As part of this strategy, an emerging infectious diseases priority research program and equipment project, piloted by the French Institute of Health and Medical Research (Inserm) and implemented by ANRS, will enable a call for proposals on this topic. PREZODE (Preventing Zoonotic Disease Emergence) is another international program in which France plays a part. Its aim is to improve early epidemic and pandemic monitoring, as well as systems for alerting healthcare organizations and for preventing outbreaks in all healthcare fields (human, environmental, animal).

Staying Informed

The WHO regularly publishes a list of emerging risks, and real-time information for all alerts and regions around the world can be found on the International Society for Infectious Diseases ProMED site.

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