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The next pandemic – when could it be?

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The next pandemic

This article explains how a new pandemic might occur, what it could be, and what measures might prevent such an event. First, to explain the issue, it's useful to understand some key terminology:

An epidemic is an outbreak of a

disease in a particular location.

A pandemic is an outbreak of a disease which spreads to and occurs in many different geographic areas at the same time.

Endemic diseases are established and circulating regularly in populations. Some endemic diseases such as influenza can have surges in transmission or have epidemics at certain times.

A pathogen is an organism which causes a disease to its host, including but not limited to viruses.

When could the next pandemic happen?

It is impossible to predict when the next pandemic will occur as they are random events. They can begin anywhere in the world where animals and humans are in close proximity as pandemics most often originate when a pathogen transfers from an animal in which it lives to a human never before infected with that pathogen.

When emergence in humans occurs, one of three outcomes are the result: the pathogen causes an illness in a single person, as with rabies; it causes a wider outbreak, such as the Ebola virus disease in the Democratic Republic of Congo in 2018 and 2020; or it causes a pandemic with the

potential to become endemic, such as HIV.

The large influenza pandemic in 1918 is a major historical point of reference but there have been several less lethal influenza pandemics since then. Some experts call HIV a pandemic which has become endemic.

Infectious disease outbreaks are most likely to occur when a series of risk factors happen together. An El Niño weather event in 1998 caused flooding in Kenya, Somalia, Sudan, and Tanzania which meant cattle and humans were forced to live closer together on the remaining dry land. This increased the risk of cross-

species pathogen transmission. Due to a shortage of vaccines, the cattle were unvaccinated against the Rift Valley Fever virus, a common infection among ruminant animals in the region.

The flooding created more breeding sites for mosquitoes, leading to a rapid increase in the mosquito population. Mosquitoes are one means of transmission of the Rift Valley Fever virus from animals to humans, and from human to human. This facilitated emergence of the virus in human populations which was then transmitted from human to human.

Alignment of all these risk factors resulted in a major outbreak of Rift

Valley Fever among the region's human population.

Where could the next outbreaks occur?

Efforts have been made to predict where pandemics may originate by identifying sites of emergence in the past, such as mapping all known emerging-infection incidents from the 1940s to the early 2000s and predicting that emergence would occur at one of those sites. But emergence is a random event both in time and place and mapping has not been a reliable predictor.

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Influenza pandemics historically emerged in southern China so that area was the focus of attention as a possible source of new strains of the influenza virus. But the 2009 H1N1 ‘swine flu’ pandemic is thought to have originated in Mexico and/or the southern US rather than in China.

Even if there was a genetic-sequencing library of all organisms carried by wild

animals linked to the animals in which they are found, such a database would be difficult to keep updated. At best, it could give an idea of the origin of a newly identified pathogen but scientists cannot predict an outbreak using such databases. A new pandemic could begin anywhere where there is close interaction of people and either domesticated or wild animals.

What could be the next pandemic?

There are a few known pathogens – either viruses or bacteria – that can cause pandemic- or epidemic-prone diseases.

Most influenza viruses originate in wild waterfowl. The H1N1 swine flu virus had its origins in bird populations thought to have then transferred infection to pigs where it mutated in such a way that it could transmit easily from human to human – once humans had been infected directly by pigs.

Respiratory infections represent one of the highest risks of an epidemic or pandemic after emergence and human-to-human spread, as infected humans often create aerosols when they cough, sneeze, or speak loudly.

Influenza

The influenza virus is an unstable virus

which originates in wild waterfowl which transmit infection to domestic birds and poultry, and they then pass it on to animals and/or humans. Sometimes, the influenza virus mutates into a form which can spread easily in humans. In those circumstances a pandemic can occur.

Before the COVID-19 pandemic, advance plans in most countries anticipated a pandemic strain of influenza virus. But countries in Asia which had experienced outbreaks of SARS coronavirus in 2003 tended also to take coronaviruses into consideration.

Coronavirus

There have been three outbreaks caused by coronaviruses in humans during the past 20 years. Each originated among wild animals and one of these viruses – SARS-CoV-2 – is the cause of the COVID-19 pandemic.

In addition, there are four coronavirus strains that are endemic in humans, causing the common cold. These are thought to have emerged from animals at some time in the past. SARS-CoV-2 will most likely become the fifth endemic strain.

Ebola

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They cause severe illness early in infection that incapacitates and kills those infected, giving the virus little time to be transmitted to others.

By contrast, HIV has a long period when it does not cause signs and symptoms but can transmit from human to human, making it well-

adapted to becoming endemic.

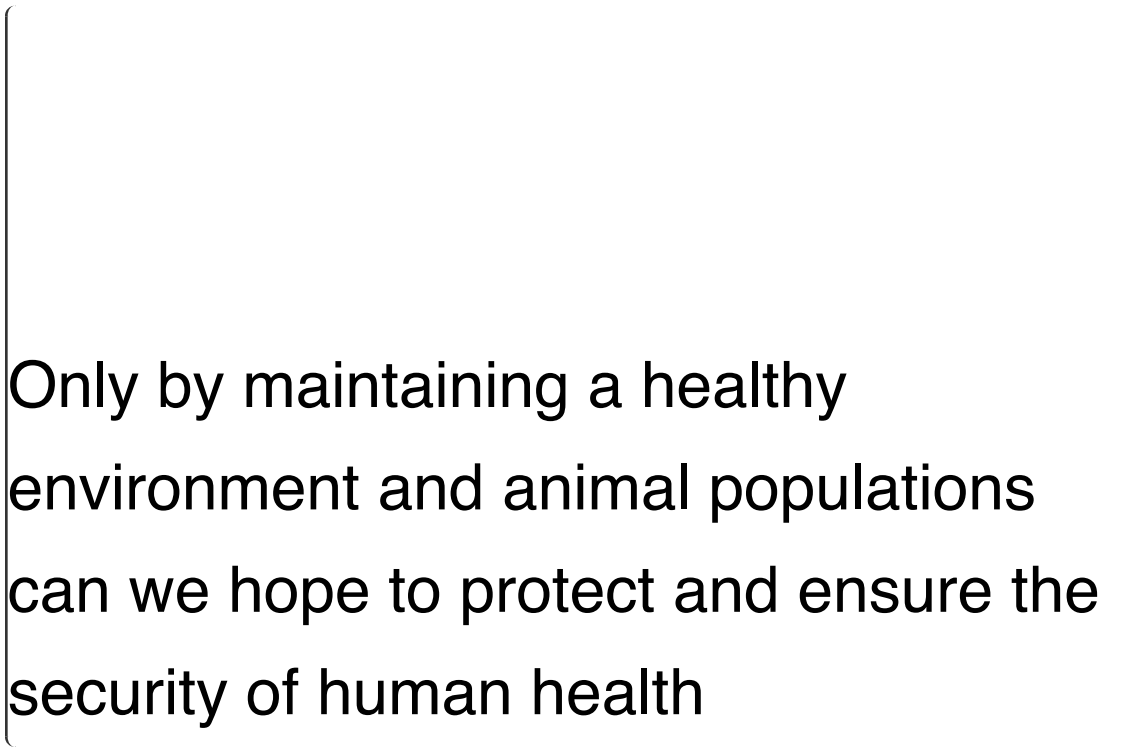
SARS-CoV-2 has a relatively low level of mortality compared to the Ebola virus. In the future it is possible, but not predictable, that a more lethal coronavirus strain could emerge.

What role does climate change play in the next pandemic?

The leading causes of climate change can also increase the risk of pandemics occurring. Deforestation, urbanization, and the enormous livestock husbandry required for a growing meat-production industry all bring more and more animals into

closer contact with humans. This in turn increases the likelihood of pathogens ‘jumping’ from animal to human.

It is generally accepted there will be another pandemic and that, through many of the same activities that fuel climate change, humans are giving pandemics more opportunities to occur.



Only by maintaining a healthy environment and animal populations can we hope to protect and ensure the security of human health

That is why a ‘one health’ approach is

so important – the animal health, human health, and environmental sectors must work together to rapidly detect and respond to pandemic risks.

Pandemic prevention and preparedness must be considered in the context of the ecosystem and animal health as much as in that of human health.

Only by maintaining a healthy environment and animal populations can we hope to protect and ensure the security of human health.

How do we monitor for the next outbreak?

The most important task for all

countries is to strengthen their capacity to identify and respond to outbreaks where and when they occur. This includes genetic sequencing of pathogens and sharing of sequence data in global databases.

To ensure the best possible health security for the human population, industrialized nations should support lower- and middle-income countries as they strengthen their public health capacity.

The COVID-19 pandemic exposed weaknesses in laboratory capacity in many parts of the world. A major effort by the World Health Organization (WHO) and partners is helping

strengthen that capacity, essential for detecting the spread of future pathogens.

To do that requires more than a one-size-fits-all approach – laboratories can only be sustained if they are adapted to suit the environments and societies hosting them.

Another major factor in monitoring is the need to shift the emphasis from detecting pathogens in humans to detecting them in animal populations early and preventing them from becoming established long before they spread to humans.

What is the current pandemic

prevention strategy?

Individual countries have their own plans for managing pandemics. There is also a global governance mechanism – the International Health Regulations (IHR) – which attempts to bring countries together with common strategies and policies during major outbreaks and pandemics. The regulations are currently being assessed to identify weaknesses exposed during the COVID-19 pandemic.

At the same time, efforts are underway to develop a pandemic preparedness treaty, which is considered by the World Health Assembly (WHA) to be

especially urgent as the COVID-19 pandemic exposed serious deficiencies in the world's ability to respond.

In December 2021, WHA members agreed to begin drafting an international instrument to strengthen pandemic prevention, preparedness, and response.

It is vital to learn from history. After the 2003 SARS outbreak, studies of one farm selling to wild animal markets in China showed 80 per cent of its animals had antibody evidence of prior coronavirus infection. And 13 per cent of the workers in the market had antibody evidence, compared to 1-3 per cent of the population served by

the market.

These studies provide clear lessons about the need to improve education in the farming and market industry, to develop vaccines for animals and humans, and to protect animal husbandry from potential carriers of coronaviruses such as bats. But the policy response was to ban the selling of wild animals in Chinese markets, potentially driving the trade underground and increasing the risks of emergence.

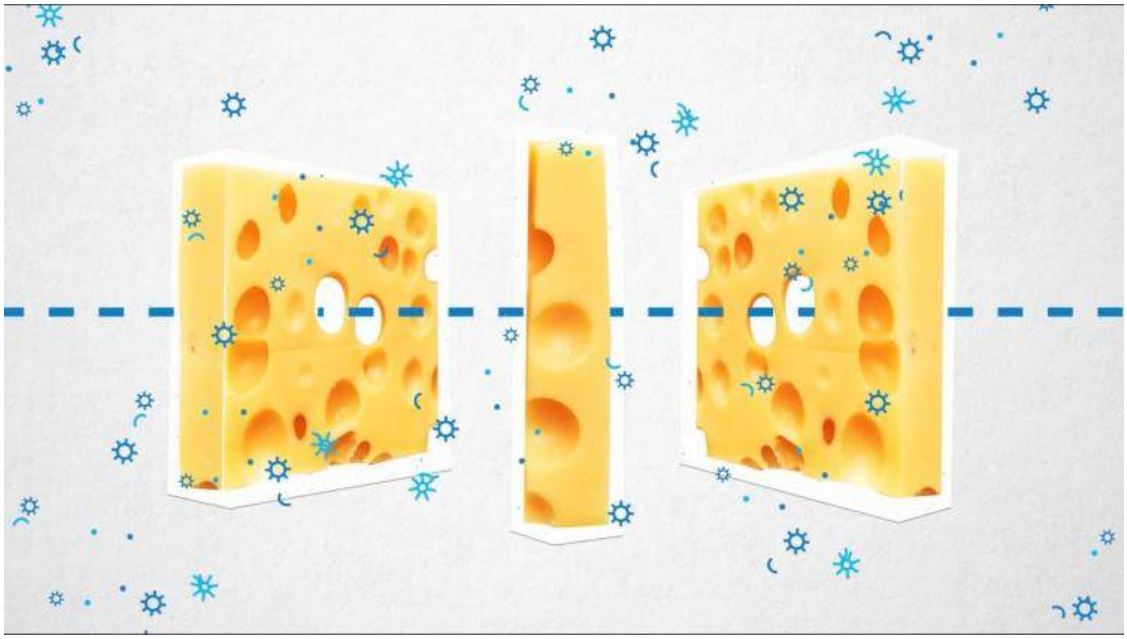
There is also a need to establish global standards for maximum-security laboratories which handle dangerous pathogens, whether operated by public

institutes or by private industry.

The last recorded human cases of smallpox were caused by a laboratory accident in the UK, and the last human infections of SARS were the result of laboratory accidents in China, Singapore, and Taiwan. The origin of the COVID-19 pandemic is uncertain but one hypothesis is it was caused by a leak from a laboratory working with coronaviruses.

There is therefore a need for a robust consensus on biosafety in laboratories – one developed by scientists to ensure they buy into the concept and countries understand their responsibilities for safe laboratory

operations. This is tremendously challenging because different countries have different needs.



How do we prepare for the next pandemic?

The success of any preparations for the next pandemic relies on the strength of countries' systems for detecting and responding to outbreaks. But at the same time countries must

better cooperate to ensure more equitable distribution of the tools needed for preparedness and response.

COVID-19 saw wealthy nations prioritize their own populations over a more equitable global response, arguably prolonging and extending the effects of the pandemic in the process. Some developing nations struggled to access the diagnostics, vaccines, and treatments they needed to respond effectively.

The ACT-A (Access to COVID Tools Accelerator) was set up by WHO and partner organizations early in the COVID-19 pandemic. The intention

was to more equitably distribute COVID diagnostics, treatments, and vaccines and to help countries use them efficiently. COVAX, part of the ACT-A, was created to ensure that all nations could access vaccines at a favourable cost regardless of their wealth.

But by the time the ACT-A had been established, many countries – including the UK and the US – had pre-purchased billions of dollars-worth of vaccines at considerable risk, hoping that this upfront funding would enable vaccines to be developed, licensed, and produced rapidly.

Arguably, if it had been established

before these pre-purchases occurred, the ACT-A mechanism could have better realised the vision of providing an equitable marketplace for all countries.