

# Pandemic—the Looming Peril?

Fear is circling the globe faster than the virus itself. Pandemic—the word alone evokes a feeling of helplessness. **RATIONAL ANALYSIS AND CAREFUL PREPARATION** help to minimize risks.

**DISEASES ARE AS OLD AS** mankind itself. In one of the earliest recorded reports, the Greek historian Thucydides described the outbreak of a plague in the besieged city of Athens. The city’s residents suffered from high fever, excruciating coughing and painful diarrhea. “The dead lay as they had fallen, one upon another, while others scarcely alive wallowed in the streets and crawled about every fountain craving for water,” wrote Thucydides.

The Athenians turned away from the helpless doctors, who couldn’t even prevent themselves from becoming infected, and streamed in droves to the temples. However, when the people’s prayers also failed to help, the city descended into chaos. “Neither the fear of the gods, nor laws of men, awed any man,” recalled Thucydides in horror. It remains unclear to this day what disease ravaged the city in the year 431 B.C.

### Companions of humanity

From the dawn of time, mankind has been struck repeatedly by epidemics. Fear of disease is deeply ingrained into our collective memory.

In the 14<sup>th</sup> century, the bubonic plague may have claimed the lives of more than a third of the population of Europe. Nobody had any idea what was going on. The people’s own sins, a catastrophic constellation of the stars or sim-



Masks provide protection in a crowd.

ply contagious vapors were sometimes thought to be the causes.

People tried to save themselves by smoking or inhaling the scent of roses. The preferred medication was a mixture of viper flesh, opium, garlic and other ingredients.

It was not until the end of the 19<sup>th</sup> century that bacteria were identified as the true cause of “Black Death.” Shortly afterward, it became clear that fleas transmitted the disease from rats to humans. When the plague broke out in 1907 following the San Francisco earthquake, the disease was brought under control by systematically poisoning rats.

Infectious diseases were a mystery for thousands of years. When cholera was sweeping through Europe in the 19<sup>th</sup> century, people thought that bad

odors, dirt or an immoral lifestyle were the reasons for the illness. Thanks to modern science, we now know that a short, comma-shaped bacteria in drinking water causes the deadly diarrhea.

Bacterial infections can be cured with the help of antibiotics. Viral diseases such as polio can be prevented with vaccines. Smallpox has even been eradicated worldwide, thanks to vaccines.

However, some viruses continuously alter their surface structure, posing a serious challenge even for 21<sup>st</sup> century medicine. That’s why there is still no effective vaccine for HIV, for example.

Another special case is that of the influenza virus. “The influenza virus is currently the only pathogen that we expect to cause epidemics that sweep round the entire world,” says Marlen Suckau, Infection Protection Officer of the city of Berlin.

### A sneezing illness

The influenza virus is spread with each sneeze and cough. Both cause invisibly tiny droplets to float through the air, possibly infecting people nearby. Because the virus sticks to people’s hands, it can be passed on when people shake hands or touch door handles, making it almost impossible to totally prevent the disease from spreading.

The illness can be very serious in some cases. The seasonal flu, for exam-

PHOTOGRAPHY: GETTY IMAGES (GROSS), BPK

A sneeze can produce roughly 40,000 droplets at a speed of at least 150 kilometers per hour.

### Epidemics and pandemics—a never-ending story

**Around 3000 BC**  
Measles spreads out from the cities of Mesopotamia

**431 BC** “Athenian Plague” between the bubonic plague and Ebola

**541–544 AD**  
The plague spreads from Egypt to Europe

**14<sup>th</sup>–18<sup>th</sup> century**  
Severe outbreaks of plague in Europe



**Late 15<sup>th</sup> century**  
Syphilis spreads through Europe

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A particle measuring 10 micrometers in size floats in the air for 17 minutes before reaching the ground.

PHOTOGRAPHY: GETTY IMAGES (2), BPK

> ple, kills an average of 8,000 to 11,000 people in Germany each year (refer to Arbeitsgemeinschaft Influenza, Season Report 2007/2008). Although vaccines can be developed relatively simply and quickly against influenza viruses, new vaccines have to be developed all the time because the virus continuously changes. At irregular intervals, a new virus appears that is not only slightly different, but instead a completely new strain. This has happened four times over the past hundred years. Nobody has natural immunity to

### It's so easy...

#### ...to protect yourself

- ▶ Avoid large gatherings of people
- ▶ Avoid unnecessary travel
- ▶ Avoid shaking hands
- ▶ Avoid contact with the eyes, nose, mouth
- ▶ Wash your hands thoroughly after touching other people, using the restroom and before eating
- ▶ Thoroughly ventilate closed rooms
- ▶ (Perhaps) wear a respirator

#### ...to protect others:

- ▶ Stay home if you are sick
- ▶ Cough or sneeze into a disposable tissue or your elbow
- ▶ Wear a respirator

such a virus, which is why many people suddenly fall prey to the disease at the same time. In the case of the “new influenza”, the WHO issued its highest alarm level on June 11, 2009, when it declared the disease to be a pandemic.

### Tamiflu: A muzzle for viruses

“By the end of the year, one-third of the world’s population will have been infected,” forecasts Peter Wutzler, President of the German Association for Combating Viral Diseases (DVG), about the “new influenza,” which is mistakenly also called swine flu.

However, unlike the situation with previous epidemics, the world is prepared this time for the disease. “We were able to study the development of the pandemic as though we were observing it under a microscope,” says Suckau. “We knew what the virus was at a very early stage of the pandemic. At this stage, the Spanish influenza of 1919 had not even attracted any notice.”

Never before have we had such a wide scope of pre-prepared scenarios and emergency plans on how to act in the event of a pandemic. The WHO creates the framework, on the basis of which the individual countries draw up their plans for the pandemic. In Germany, overall responsibility is in the hands of the control center of the Robert Koch Institute (RKI). All new cases are reported to the center,

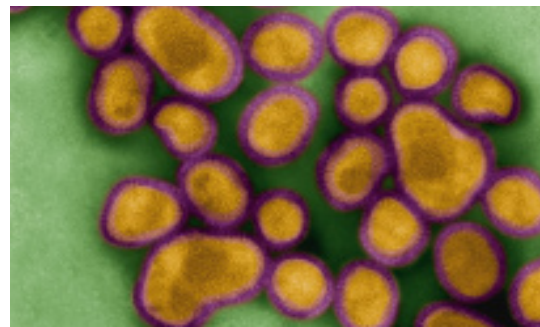
which also makes the decisions regarding specific measures. A key element of the emergency plan involves new kinds of antiviral drugs such as Tamiflu.

Viruses consist of little more than genetic information that invades the body’s cells and forces them to produce new viruses. The genetic nucleus of the influenza virus is surrounded by proteins, whose shape continuously changes. These surface molecules help to camouflage the virus against the body’s immune system and also serve as the “crowbar” that enables the virus to penetrate the cells.

The active ingredient in Tamiflu blocks one of these molecules and acts like a muzzle for the flu virus. If the drug is taken early on, the course of the disease becomes less severe and its duration is shortened. Simulations of possible pandemics have shown that it is sufficient to store antiviral drugs for 20 to 25 percent of the population. Many countries have therefore stored a correspondingly large supply.

Much more effective than treatment with antiviral drugs is vaccination, which is why wealthy countries have signed preliminary agreements with vaccine manufacturers as part of their plans for dealing with the pandemic. They have also set priorities according to which people are vaccinated as long as the vaccine is available in limited amounts. Because it takes at least six months to develop a new vaccine,

Magnified 70,000 times and artificially colored, flu viruses look almost beautiful. Small though they are, their rate of reproduction and their hazard potential is enormous.



it is crucial that the infection rate be kept as low as possible during this time.

“Information on how a disease spreads can already save lives,” says Dr. Frank Ensslen, the company physician at Dräger. Suckau agrees with his assessment: “It’s best that flu victims stay at home. Everybody should accustom themselves to sneeze into their sleeves instead of their hands.”

However, experience has shown her that not all precautionary measures are easy to implement. “It’s almost impossible to keep people from shaking hands,” she says. “I even have great difficulty in preventing it from happening in my own agency.”

### Face masks provide protection

If a pandemic becomes more dangerous, further measures have to be taken, such as closing schools or banning public events.

Face masks provide another means for preventing infections. Although hospitals have exact rules on who should wear what kind of mask, there are still no recommendations for the general population. “At the moment, it would be totally exaggerated to wear a mask,” says Suckau. The disease has to date been far less dangerous than expected. “People can buy masks now, but we don’t call on anyone to store up their own supply,” says Suckau. >

>>> **16<sup>th</sup> century** Smallpox and measles come to the New World with the Europeans and kill many native Americans

**1797** Edward Jenner reports on an experimental inoculation against smallpox



**1817–1823** The first cholera pandemic spreads from India to Europe

**1831–1835** First documented polio epidemic on the island of St. Helena

**1889–1890** Russian Flu is the first precisely documented pandemic >>>

Around 1,940,000 viruses are released with each sneeze; coughing releases around 90,000 viruses.

PHOTOGRAPHY: GETTY IMAGES (GROSS), PICTURE-ALLIANCE/DPA, BPK

> It's still impossible to tell if the use of face masks might delay the spread of the pandemic. Studies made during the SARS epidemic showed that the masks protect medical staff against infection.

Paper masks are insufficient for this task, however, because viruses expelled by coughing are encapsulated within water droplets. If the droplets are bigger than 10 micrometers, they quickly fall to the ground. But since the cloud of water droplets can quickly evaporate, the droplets often leave behind small cores that float for extended periods in the air and can infect people at a distance of three meters. Only tight-fitting face masks that are equipped with special filters can effectively remove the tiny particles from the inhaled air.

**Masks filter**

The European standard (EN 149) defines three levels of protection. FFP1 masks filter at least 80 percent of the particles out of the air (FFP stands for "filtering facepieces"). FFP2 masks achieve a filtering level of at least 94 percent, while FFP3 masks remove at least 99 percent of particles.

The European standard corresponds to the American NIOSH standard: An N95 mask filters at least 95 percent of the particles out of the air. These masks differ from simple face masks or surgical masks in that they typically fit much

more snugly around the mouth and nose. During inhalation, the particles are retained in the filter material instead of leaking through and entering the respiratory tract.

The New South Wales School of Public Health and Community Medicine in Sydney, Australia, recently studied 143 families to determine whether the parents of children ill with the flu can protect themselves against infection by wearing FFP2 masks.

The analysis shows that the masks do in fact provide substantial protection, but this hardly mattered in practice. A large portion of the parents had stopped wearing the masks after just a short time. This is hardly surprising as long as the general level of concern is low. "Many people find wearing a mask to be uncomfortable because they are not used to it. The masks cause breathing resistance and a moist feeling," says Alexander Grünke, an air purifying respirator expert at Dräger. Widespread use would only be conceivable if the flu pandemic was much more dangerous and there was much more concern.

After the bird flu scare, the industrialized nations used the intervening years to refine and increasingly harmonize their national pandemic plans. The differences remaining between the European countries lie primarily in the weighting of the measures, such as how

much money will be invested in antiviral medications.

However, it's a different story when it comes to corporate pandemic plans. What will happen when, if as many scenarios assume, 20 to 25 percent of the workforce falls ill? According to a survey by the forsa market research institute, just half of the medium to large-size companies in Germany had their own emergency plan in February 2009. Yet most of the companies feared severe economic damage in the event of a pandemic, and one in five believe that a pandemic would threaten the continued existence of the company.

**Manufacturers are prepared**

There are some general recommendations, but they always have to be adapted to the respective company. Dr. Frank Ensslen, the company physician who helped draft the emergency plan for Dräger, experienced the importance of such an approach at first hand: "I initially thought that I could just copy the existing plans."

Dräger has since stockpiled medications and respirators. A pandemic team will decide on the further course of action according to a defined procedure should the pandemic become more dangerous. Business travel could be cancelled, for example. Some employees would work from home, while oth-

Barrels instead of ampoules: Barrels of the medicine Oseltamivir are stored in a secret location. This warehouse in the German state of North Rhine-Westphalia gives an impression of the quantities required.



ers could stay at the site permanently to keep production and operations up and running. After all, as a leading international manufacturer of medical and safety technology, Dräger has a special responsibility in the event of a possible crisis.

Whether it ever comes to that remains to be seen. Although WHO has announced that the pandemic has since moved into the final phase (Phase 6), the actual measures that have been taken only correspond to Phase 4 because so few people in Germany have gotten sick (as of July 2009). No one can say what further course the disease will take. The Spanish Flu that killed between 25 and 50 million people worldwide, was also mild at first and did not turn deadly until a second wave circled the globe. We won't know whether our precautions are sufficient until after the fact.

One thing is certain, though: There has never before been a virus whose appearance was predicted so far in advance. And never have such detailed preparations been made for a future illness. Foresight, human ingenuity and resolute global cooperation currently has mankind a step ahead of the virus.

**Dr. Birgit Herden**

Further information online, including:  
 Checklist for companies  
[www.draeger.com/98/pandemic](http://www.draeger.com/98/pandemic)

>>> <b>1916–17</b> The worst polio epidemic in history rages across the U.S.A.	<b>1918–1919</b> Spanish Flu is the largest flu pandemic of all times	<b>1961 to present</b> Cholera in Asia, Russia, parts of Southern Europe, Africa, and South America		<b>1979</b> Smallpox is the first disease to be eradicated worldwide	<b>1981</b> First cases of AIDS reported in the U.S.A.	<b>2006</b> World-wide, 65 million people are infected with HIV	<b>2009</b> "New Flu" spurs world-wide fear
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