

## PREVENTION OF INFLUENZA AND ACUTE RESPIRATORY VIRAL INFECTIONS

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This article is devoted to the problem of influenza and acute respiratory viral infections. The article presents information on causes, symptoms, and prevention of the flu, discusses the mechanisms of pathogenesis of this disease. Analysis of the literature data made it possible to identify the causes of the pandemics and epidemics of the flu and formulate regarding the treatment and prevention of this disease.

**Key words:** acute respiratory viral infections, prevention, pandemics, pathogenesis, recovery period, specific clinical manifestations, inflammation of the respiratory tract, sore throat

### INTRODUCTION

The flu is an acute and highly contagious disease caused by extremely small, invisible viruses. There are three known types of flu viruses: A, B, and C. The main source of infection is flu patients or virus carriers. Even those with mild symptoms or those who unknowingly carry the virus pose a risk to healthy individuals, as they continue to be around others despite being infected. The flu spreads through airborne droplets. When an infected person coughs, sneezes, or talks, they release flu viruses into the air through saliva droplets. These viruses can remain in the air for up to three hours. A healthy person can become infected by inhaling air that contains flu viruses.

Once inside the body, the flu virus affects the mucous membranes of the mouth, nose, throat, and upper respiratory tract, then enters the bloodstream, poisoning the entire body. It damages the respiratory, nervous, and cardiovascular systems, along with other organs. The flu has an incubation period of a few hours to up to three days before

symptoms appear. The disease progresses rapidly. The patient experiences extreme fatigue, headache, coughing, and sneezing. Their body temperature rises to 38-40°C, accompanied by excessive sweating. Muscle pain, eye socket pain, and watery eyes are also common. As soon as flu symptoms appear, it is crucial to consult a doctor immediately. If left untreated, the flu can lead to serious complications.

To prevent the spread of the flu, an infected person should be isolated in a separate room. Caregivers should be educated on preventive measures. The patient's utensils, towels, and bedding should be kept separate. The sick person should rest and minimize physical activity.

Family members caring for the patient should wear a mask covering their nose and mouth and wash their hands frequently with soap. The patient should cover their mouth and nose with a tissue when coughing or sneezing, and if possible, use a new tissue each time and wash and iron reusable ones. The patient's room must be regularly ventilated. When fever is present, the patient should drink plenty of fluids, including compotes made from dried fruits and fresh fruit and vegetable juices. The diet should include easily digestible, protein- and vitamin-rich foods.

Flu patients should be placed in separate rooms, which must be frequently aired. Floors, doors, and windows should be cleaned with soapy water or disinfectant solutions. During flu outbreaks, individuals infected with flu or acute respiratory illnesses should not work in educational and childcare institutions. Patients should never self-medicate.

#### Causes of Pandemics Specific to Type A Viruses:

- **Mutations** that replace a genome segment coding for H or N.
- **Reassortment** – exchange of whole RNA genome segments between two different virus variants that have simultaneously infected a cell.

#### Cause of Epidemics:

- **Antigenic Drift** (occurs in both types) – partial renewal of antigenic determinants.

The 1889-1890 flu pandemic was the year of the Eiffel Tower's construction and the beginning of the first flu pandemic, called the "Russian flu" and the "Asian flu." It caused the deaths of 1 million people worldwide. The beginning and main losses occurred in the period from October 1889 to December 1890, the "plume" of the pandemic lasted in the form of outbreaks in the spring of 1891, from November 1891 to June 1892, in the winter of 1893-1894 and in the spring of 1895. There are hypotheses that the cause of the pandemic was a type A virus with the H2N2 or H3N8 genotype. More recent studies indicate that influenza of the "1890 sample" and the modern coronavirus may have a common ancestor, and this pandemic is somehow connected with the first entry of beta-coronavirus from cattle into the human population. The spread of the infection was "helped" by a well-developed transport network: at that time, a railway network was built in the largest cities of Europe, and it took only 6 days to cross the Atlantic by ship. The cases were first identified in May 1889 in Central Asia (the city of Bukhara). According to some reports, up to 60% of the population died in that area within a short time. Then the flu traveled by rail to Samarkand, then by October 1889 to Tomsk. Within a month, the virus "sailed" through the Volga trade routes to St. Petersburg, where about 20% of residents fell ill, and then headed to Moscow. The virus "met" the New Year 1890 in Siberia, on Sakhalin.

From St. Petersburg, the flu traveled by water to Sweden, then Denmark, Norway. In December 1889, the virus visited Germany, where at first 600 workers showed symptoms, but within a week about 750,000 people fell ill.

Then the flu came to France, Italy, Spain, Scotland. In Madrid alone, 300 people died from the disease every day. At the end of 1899, the virus began to spread along the East Coast of North America. The total number of deaths was about 13 thousand people. Then Mexico, India, Indonesia, Singapore, Australia, Japan, New Zealand, China. In the spring of 1890, the flu returned to the point in Central Asia from where it began its journey. The lack of information on anti-epidemic measures, the doubts of European scientists about the contagiousness to one degree or another contributed to its spread, and the lack of knowledge about how to treat the disease led to significant human casualties. So in the 19th century, hunger (to lower the temperature), whiskey, brandy, quinine, strychnine, and salty warm water were considered remedies for influenza.

1918 was the year of the end of the First World War and the beginning of the worst flu pandemic in the history of mankind. The epidemic lasted from 1918 to 1920, and during that time: 550 million people (one third of the world's population) became infected with the flu; according to various sources, from 50 to 100 million people (up to 5% of the world's population) died; mortality among the infected reached 20%. The first pandemic in the 20th century began during the First World War, but it quickly surpassed it in terms of the number of victims. The spread of the virus was facilitated by the hardships of that time – poor nutrition, overcrowding of refugees in military camps, and poor sanitation. Under such conditions, the virus mutated into more aggressive forms. The name "Spanish woman" was associated with military censorship – the countries involved in the battles tried to hush up rumors about the epidemic, and only Spain, which was neutral at that time, made a public announcement about the new pandemic in May 1918.

What is known about this disease? Already in the spring of 1918, about 40% of the population in Spain itself was infected. Usually, children, pregnant women, the elderly, and people with chronic illnesses became victims of infectious diseases. This time, many of the patients were in their 20s and 40s, and they initially had no health problems. In severe cases, "Spanish flu" was described as a disease manifested by hypoxia (oxygen starvation) with cyanosis, pneumonia. As the infection progressed, the cough began to be accompanied by bloody sputum, followed by intrapulmonary bleeding, and patients died.

Subsequently, a hypothesis arose that this strain of the H1N1 virus more often led to the death of young people with good health due to its ability to cause an excessive immune response (the so-called cytokine storm). Rapid destruction of lung tissue occurred with the filling of the alveoli with inflammatory fluid. People with reduced immunity did not react this way to infection and tolerated it more easily. The place where the virus first appeared is still unknown. There is a hypothesis that China became the first country. Then, within 2 months, the epidemic spread across America, and in the spring of 1918 it came to Europe – Italy, Spain, Switzerland, England, and Serbia, Poland, and Romania "fell ill." In the summer, the flu struck residents of Belgium, Denmark, and the Netherlands. In the same wave, the virus spread to South Africa. Then the incidence began to fall. But by the fall of 1918, the flu had once again engulfed the entire planet. So in Japan at the beginning of 1919, there were up to 20 million cases (one third of the country's population) and about 250,000 deaths. In some countries, the infection affected up to 80% of people. People were dying in whole villages. Common graves were used for funerals, and there was no question of a decent burial using all the accessories.



In Russia, the "Spanish flu" spread during a difficult time – there was a Civil War that coincided with an epidemic of typhus and other infectious diseases. There is no reliable information about the number of people who have had the flu. It is not uncommon for patients with H1N1 symptoms to be diagnosed with typhus. So, according to the People's Commissariat of Health of the RSFSR, about 1 million 10 thousand people had the flu in the USSR. The spread of the virus was facilitated by the development of transport and military operations. So in the first 25 weeks, 25 million people died from the "Spanish flu". In some countries, anti-epidemic measures were introduced to limit the epidemic - courts, schools, temples, as well as cinemas and theaters were closed. People were not allowed into the shops and were served on the street. A military regime has been introduced somewhere, in Arizona, USA, handshakes are prohibited.

#### Pathogenesis

**Incubation period** (from 12 hours to 3 days due to high replication speed):

- Entry into mucous membranes, overcoming protective barriers, virus penetration, and replication in the epithelium, resistance to non-specific immunity factors. If protection is ineffective, the disease progresses.
- The pathogen can be released into mucus and aspirated into the lower respiratory tract.

**During the period of specific clinical manifestations (up to 7 days), active virus replication continues, leading to:**

- **Viremia**
- **Inflammatory-intoxication syndrome** – damage to parenchymal cells, neurons, interstitial inflammation.
- **Endothelial damage** – increased vascular permeability (up to diapedesis, hemorrhagic syndrome, excessive cerebrospinal fluid production – meningism).
- **Immune cell damage** – secondary immunodeficiency.

**During the period of specific clinical manifestations (up to 7 days), the following occur:**

- **Severe epithelial destruction of the respiratory tract** (including by the immune system's own cells).
- **Local inflammatory reaction** with increased vascular permeability (up to erythrocyte diapedesis).
- **Upper respiratory tract** – irritation leading to catarrhal syndrome.
- **Lower respiratory tract (severe cases, as a result of viremia)** – influenza pneumonia, ARDS.

### Recovery Period (After a Week from the Onset of the Disease)

- Formation of **cellular and humoral, type-specific lifelong antiviral immunity**.

- Possible activation of secondary conditionally pathogenic flora.

### Causes of Death from Influenza

- **Pulmonary-cardiac and cardiopulmonary failure** due to pneumonia and complications.

- **Rare cases** – hemorrhagic pulmonary edema, brain hemorrhage, adrenal hemorrhage.

- **True and false croup** (in children).

### Recommendations:

- For patients suffering from **acute respiratory viral infections (ARVI)** and **flu**, fresh raspberries mashed with sugar and raspberry jam prepared in autumn have a healing effect. **A decoction made from raspberry leaves and branches** also induces sweating. The infusion of raspberry leaves is used for **inflammation of the respiratory tract, sore throat, and to help expel phlegm**.

- **Raspberry fruit or its dried form**, as well as its leaves, can be brewed like tea and consumed **3-4 times a day** in a hot state. This helps induce sweating and reduce fever. After drinking the infusion, the patient should be well covered in bed. Once the patient sweats thoroughly, **bedding and clothes should be changed immediately** to dry ones.

- The caregiver should regularly monitor the patient's condition. If the wet clothes and underwear are not changed promptly, the patient may **catch a cold again, leading to complications like flu-induced pneumonia (bronchopneumonia)**.

- **Black cumin tea** is beneficial for colds.

- **A decoction of dill and dried figs** is useful in treating colds.

- **Boiling dried figs in milk and drinking it** helps soothe coughs.

- **Carving out the inside of a radish or black radish, filling it with honey or sugar, and drinking the juice** helps relieve coughs.

- **A soup made with turnips, chickpeas, lamb, black onions, pepper, and red chili peppers** helps induce sweating. **Black onions contain phytoncides, which act like natural antibiotics against bacteria and viruses**.

### Important Precautions:

- Patients with **digestive system diseases** should **avoid pepper and red chili peppers**.

- Patients with **inflamed gallbladders or bile duct congestion** should **avoid chickpeas**.

• **A decoction made from one liter of milk, one head of garlic, one tablespoon of butter, and an equal amount of honey** should be boiled and consumed **2-3 times a day in half or one cup portions, depending on the patient's preference.**

• **Fresh black and red currants, as well as sea buckthorn berries mashed with sugar or prepared as jam,** have healing effects.

• **Burning wild rue (Peganum harmala) in the room** is necessary because its smoke has a **powerful antiviral effect.**

• The patient should drink **plenty of warm fluids.**

• The patient should be given **chicken broth or light soups made from lean beef** to aid recovery.

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