

THE PREMED SCENE - Virtual Research Competition

PROMPT

The year is **2085**. The world has been struck by a pandemic with a virus more infectious than ever before. It is your job to **devise a solution to slow the spread of the virus and mitigate its effects**.

You may **only** consider the information stated below when creating your solution. **Your solution may be a biochemical, biomedical, engineering, public health, or political/legal solution**. You can build off of current research and knowledge of the current monkeypox pandemic and previous TB outbreaks, for this virus is similar in nature to Tuberculosis and Monkeypox (more information below).

Your results will be different per team, because this virus is not on Google. You may refer to it as **TB Pox**.

DISEASE DETAILS

TB Pox is caused by the same bacteria that causes tuberculosis, *Mycobacterium Tuberculosis* and the virus that causes Monkeypox is viral zoonosis. It spreads through droplets in the air that are then transmitted from one person to the other. When an infected person coughs, sneezes or speaks, other individuals breathe in the bacteria or the virus which then resides and grows in the lungs, negatively impacting the pulmonary system and the respiratory system. It can also be transmitted through direct contact with the infection from the virus as well as touching objects, fabrics, or surfaces of someone else who is infected.

The bacteria can also move through the bloodstream and affect other parts of the body such as the urinary system and the spinal cord. The bacteria can create lesions in the urinary system which can obstruct arteries and result in bleeding in the urine. Within the spinal cord, the bacteria can block fluid and cause the collapse of the vertebrae. Such lack of proper function in these systems can lead to further complications in other systems within the body that can be detrimental.

Mycobacterium Tuberculosis, the same bacteria that causes tuberculosis, is an extremely successful pathogen that adapts to survive within the host. During the latency phase of infection, *M. tuberculosis* employs a range of effector proteins to cloud the host immune system and shapes its lifestyle to reside in granulomas, sophisticated, and organized structures of immune cells that are established by the host in response to persistent infection. (Chai et al., 2018)

Individuals who are infected with the TB variant have been reported to have various symptoms within 7 to 14 days of becoming infected with the disease. Within 24 hours, individuals may develop a persistent cough, and in many cases may cough up blood as well as experience sharp chest pains that progress and cause difficulty breathing or shortness of breath. These symptoms can lead to the heart not getting enough blood due to lack of oxygen and a gradual build up of fluid within the lungs, which results in heart failure.

Such devastating outcomes make the TB variant an extremely dangerous disease. Most individuals who contract the disease are given a life span of 24-48 hours. Individuals who are at the highest risk of contracting the disease are those who are immunocompromised or have pre-existing medical conditions, such as diabetes, coronary heart disease, high blood pressure and so forth.

In contrast, the viral zoonosis, formerly referred to as Monkeypox, is transmitted in many ways but it is most commonly spread from skin-to-skin contact. The primary symptom is a skin rash that builds into pus-filled blisters that may be painful or itchy. Other symptoms include fever, chills, swollen lymph nodes, exhaustion, muscle aches and backache, headache, and respiratory symptoms. Some people tend to experience flu-like symptoms prior to the rash, and some after the rash. There are a few people that only receive the rash and no other symptoms.

The symptoms usually present within 3 weeks of exposure to the virus. Generally, if a person contracts monkeypox, they would develop a rash 1-4 days after experiencing flu-like symptoms. Monkeypox can be spread from the time symptoms start until the

rash has healed, all scabs have fallen off, and a fresh layer of skin has formed. The illness typically lasts 2-4 weeks.

At the moment, testing is recommended if an individual is experiencing a rash consistent with monkeypox. The test entails a provider using a swab to rub on the lesion of the rash to collect a specimen. This specimen determines whether or not the individual has contracted monkeypox, and the results are usually available within a few days.

The TB pox virus entails all these symptoms and has a much higher fatality rate than TB and monkeypox combined. The fatality rates are generally higher in under-developed and developing countries, however have increased in developed countries as well. Internationally, the fatality rate of this virus is 63%, meaning 63 out of every 100 people who test positive from TB pox die for children under 12 years old and adults over 60 years old. For those who do not fall in this range, the fatality rate drops to 43%.