Contagion Worksheet

1. **Do you think the discussion with the physician right after his wife dies realistically portrays how a medical provider could explain such a phenomenon?**

No. Doctor portrayed a lack of compassion and empathy. The doctor suggested grief counseling to Matt Damon's character as a way to find some sort of resolution. Also, the doctor lacked therapeutic conversation regarding the loss of a loved one.

2. **How many times do you touch your face during the movie?**

What do they quote as the range in which people touch their face in an hour?

The range is 2,000-3,000 times a day; people touch their face, which equates to 83 to 125 times an hour.

3. **Identify the chain of infection:**

Bat→ pig → chef→ food→Gwyneth Paltrow → several people at the casino → → → world

The chain of infection is pathogenic agent, reservoir, the portal of exit, transmission, the portal of entry, and host susceptibility.

- Infectious agent: organism capable of producing an infection or infectious disease
- Reservoirs: the environment in which a pathogen lives and multiplies
- Portal of exit: means by which an infectious agent is transported from the host
- Mode of transmission: a method whereby the infectious agent is transmitted from one host to another host
- Portal of entry: means by which an infectious agent enters a new host
- Host susceptibility: the presence or lack of sufficient resistance to an infectious agent to avoid contracting an infection or acquiring an infectious disease

4. **What is/are the infectious agent?**

- MEV-1 from bats

5. **What diseases did they rule out?**

- Meningitis
- H1N1
- Encephalitis
- Herpes

6. **What is the reservoir?**

Bats → Pigs → Chef

7. **What are the portals of entry? The portals of exit?**

The bats transmitted the virus to the pigs; airborne (The portal of exit) The portal of entry is transmitted through touch Mucous membranes (mouth, nose, eyes, genitals)

8. **What are the fomites? Can the virus live for 6 days on a box?**

Fomites are the transmission of pathogens to animate objects. Examples from the movie are doorknobs, elevator buttons, and light switches

9. **What is the process they take to determine what the disease is?**

Autopsy of the infected people that died, studies under the microscope, studies in labs

Blood samples

10. **What agencies get involved?**

- CDC
- WHO
- Department of Homeland Security
- FEMA
- Local state and governmental agencies
- CIA
- And also the Chronicle (the newspaper)

11. **What precipitates these agencies getting involved?**

The unknown cause of the disease and the fast rate of spreading.

12. **What is the role of these agencies?**

CDC is receiving the samples of the infected people and is supposed to identify the pathogen that is causing the disease. The WHO is concerned about the public, how to prevent the spread of the disease, how to ensure that the least amount of people get infected. They are trying to find out where the disease originated and whether it could be a biological weapon and an attack on the country.

Department of Health and Human Services (HHS)

i. **Secretary of Health and Human Services**
Directs all HHS pandemic response activities.

ii. **Office of Assistant Secretary for Health (ASH)** **Coordinates HHS pandemic activities, and monitors progress.**

iii. **Office of the Assistant Secretary for Public Health Emergency Preparedness(OPHEP)**
Coordinates HHS response activities with other federal departments and agencies.

iv. **National Vaccine Program Office (NVPO)**
Coordinates development and revisions of the pandemic preparedness and response plan; coordinates and monitors preparedness activities during the inter-pandemic period, reporting to ASH; coordinates HHS agencies on vaccine issues via the Interagency Vaccine Group (IAVG).

v. **Office of the General Counsel (OGC) Advises on law related to key pandemic response activities.**

vi. **Office of the Assistant Secretary of Public Affairs (ASPA)**
Develops communications plan, including public messages and materials.

vii. **Office of Global Health Affairs (OGHA) Oversees interactions with other governments and international organizations related to pandemic preparedness.**

viii. **Centers for Disease Control and Prevention (CDC)**
Works with partners throughout the nation and the world to monitor health, detect and investigate health problems, develops, evaluates, and modifies disease control and prevention strategies; stockpiles antiviral drugs and other essential materials; promotes and supports influenza vaccination programs. The Influenza Pandemic Operation Plan (OPLAN) is published by the CDC.

ix. **Food and Drug Administration (FDA)**
Regulates and licenses vaccines and antiviral agents through the Center for Biologics Evaluation and Research and the Center for Drug Evaluation and Research, respectively; develops influenza viral reference strains and reagents and makes them available to manufacturers for vaccine development and evaluation.

x. **National Institutes of Health (NIH)**
Conducts and supports biomedical research, including vaccine research and development.

xi. **Health Resources and Services Administration (HRSA)**
Oversees the National Vaccine Injury Compensation Program; coordinates planning for health care and hospital surge capacity and emergency preparedness.

xii. **Centers for Medicare and Medicaid Services (CMS) Promotes and supports influenza vaccination for Medicare patients' fosters improved delivery of influenza vaccination to hospitalized pneumonia patients.**

xiii. **National Vaccine Advisory Committee (NVAC)**
The NVAC is made up of 15 members appointed for rotating four-year terms by the Director of the NVP in consultation with the National Academy of Sciences, from among individuals who are engaged in vaccine research or the manufacture of vaccines; who are physicians, members of parent organizations concerned with immunizations, or representatives of state or local health agencies or public health organizations. The Committee advises the Assistant Secretary for Health (ASH) on pandemic preparedness from perspectives of multiple stakeholders, including the committee membership.

xiv. **Vaccines and Related Biological Products Advisory Committee (VRBPAC)**
Advises the Commissioner of Food and Drugs in discharging his responsibilities as they relate to helping to ensure safe and effective biological products, and as required, any other product for which the FDA has regulatory responsibility.

- Department of Homeland Security (DHS)
  Has the overall authority for emergency response activities and will coordinate interventions to maintain community services during a pandemic.
- Department of Defense (DoD) and Department of Veterans Affairs (VA)
  Provides surge capacity of medical equipment, materials, and personnel when needed during an emergency.
- Department of Agriculture (USDA) Conducts surveillance for influenza in domestic animals.
- Department of Energy (DOE) and Department of Transportation (DOT)
  Maintains infrastructure during a pandemic.
- Department of Interior (DOI)
  Responsible for ensuring public health on more than 500 million acres of land across the country

13. **What is the time frame from onset to manifestations of symptoms, i.e., incubation period and then to death?**

Less than ten days.

14. **What are the actions taken by the CDC in terms of containing the infection?**

Actions taken by the CDC include:

- Close the schools down in some districts, tell people to keep children with symptoms home.
- Shut down of airports
- Closing state borders
- Isolating the sick and quarantining the ones believed to have been exposed
- Social distancing; 10 feet
- Curfews
- Importance of handwashing

15. **What is an "R naught" (R0)? See handout**

It is the amount of people that are likely to be infected from a person that gets sick

.R=reproductive rate of the virus. It depends on multiple factors, like how big is the population of people susceptible to the virus, or how long is the incubation period.

R naught for this virus is thought to be 2 at first, then no less than 4.

16. **What do the investigators do to protect themselves?**

- Limit the amount of people working with the virus
- Use PPE
  - Gowns-hazmat suits
  - Duct tape
  - Respirators
  - Mask
  - Gloves
  - Face shields
- Distance from infected people/social distancing/quarantining
- Investigative staff i.e.epidemiologist
- Hazmat tents to screen and treat as well as separate the dead.

17. How do the personnel involved communicate the risks to the public?

Meet to discuss what is known
Press conferences
A variety of media
*NOTE: Some information that is known by those in charge does not get disseminated

18. **Calculate the mortality rate from the disease in the first 7 days in Minneapolis?**

- Day 6→ 8 deaths /47 cases (pop. 3.3 million) Use the multiplier of 100,000

19. **What does the epidemiologist from the WHO do to track the progression of the disease?**

Epidemiology is the study of the distribution and determinants of health-related states or events (including disease) and the application of this study to the control of diseases and other health problems. Various methods can be used to carry out epidemiological investigations: surveillance and descriptive studies can be used to study distribution; analytical studies are used to study determinants; live studies of the locations where those with the virus are known to have been.

20. What is an epidemic? Versus a Pandemic?

Epidemic: An outbreak of disease that attacks many peoples at about the same time and may spread through one or several communities

. Pandemic: When an epidemic spread throughout the world.

21. What is a quarantine?

Quarantine is a strict isolation imposed to prevent the spread of disease. In this scenario, a period, originally 40 days, of detention or isolation imposed upon ships, persons, animals, or plants on arrival at a port or place,

when suspected of carrying some infectious or contagious disease. Personal isolation includes separating those known to have been in contact with the disease from others.

22. Why does the husband not get sick? What type of immunity does he have?

Matt Damon's character has a natural or innate immunity against the virus, which prevented him from getting sick.

23. What are the symptoms of the virus? Rapid progression from onset to death

- Difficulty swallowing/sore throat
- Cough
- Fever
- Severe headache
- Chills
- Weakness
- Seizures

24. How do they develop a vaccine?

In this case, they first try to grow the virus in other cells, but the virus kills any cell that it enters. One researcher successfully grows the virus in a bat cell and then uses herself as the trial case. Then she exposes herself to the virus to see if she develops the illness.

Vaccines contain the same germs that cause disease. (For example, measles vaccine contains measles virus, and Hib vaccine contains Hib bacteria.) But they have been either killed or weakened to the point that they don't make you sick. Some vaccines contain only a *part* of the disease germ.

A vaccine stimulates your immune system to produce antibodies, exactly like it would if you were exposed to the disease. After getting vaccinated, you develop immunity to that disease, without having to get the disease first.

This is what makes vaccines such as powerful medicine. Unlike most medicines, which treat or cure diseases, vaccines *prevent* them.

NOTE: All ingredients of vaccines play necessary roles either in making the vaccine, triggering the body to develop immunity or in ensuring that the final product is safe and effective. Some of these include:

- Adjuvants help boost the body's response to a vaccine. (Also found in antacids, buffered aspirin, antiperspirants, etc.)
- Stabilizers help keep vaccine effective after manufactured (Also found in foods such as *Jell-O*® and resides in the body naturally.)
- Formaldehyde is used to prevent contamination by bacteria during the vaccine manufacturing process. It resides in the body naturally (more in the body than vaccines). (Also, found in the environment, preservatives, and household products.)
- Thimerosal is also used during the manufacturing process but is no longer an ingredient in any vaccine except multi-dose vials of the flu vaccine. Single-dose vials of the flu vaccine are available as an alternative. No reputable scientific studies have found an association between thimerosal in vaccines and autism.

25. How is the vaccine administered?

Vaccines are administered orally, IM, SC, and ID. The vaccine in the movie was administered intranasally.

26. Is it a live virus vaccine versus an attenuated virus vaccine?

What is the difference?

Live attenuated vaccines are produced by modifying a disease-producing ("wild") virus or bacterium in a laboratory. The resulting vaccine organism retains the ability to replicate (grow) and produces immunity, but usually does not cause illness. The majority of live attenuated vaccines available in the United States contain live viruses. However, two live attenuated bacterial vaccines are available in the United States (Ty21a and BCG). BCG is not used as a vaccine but as a treatment for bladder cancer.

Live vaccines are derived from "wild," or disease-causing, viruses, or bacteria. These wild viruses or bacteria **are attenuated, or weakened, in a laboratory, usually by repeated culturing.** For example, the measles virus used as a vaccine today was isolated from a child with measles disease in 1954. Almost 10 years of serial passage using tissue culture media was required to transform the wild virus into the attenuated vaccine virus.

To produce an immune response, live attenuated vaccines must replicate (grow) in the vaccinated person. A relatively small dose of virus or bacteria is administered, which replicates in the body and creates enough of the organism to stimulate an immune response. Anything that either damages the live organism in the vial (e.g., heat, light) or interferes with the replication of the organism in the body (circulating antibody) can cause the vaccine to be ineffective.

Although live attenuated vaccines replicate, they usually do not cause disease such as may occur with the "wild" form of the organism. When a live attenuated vaccine does cause "disease," it is usually much milder than the natural disease and is referred to as an adverse reaction.

The immune response to a live attenuated vaccine is virtually identical to that produced by a natural infection. The immune system does not differentiate between an infection with a weakened vaccine virus and an infection with a wild virus. Live attenuated vaccines produce immunity in most recipients with one dose, except those administered orally. However, a small percentage of recipients do not respond to the first dose of an injected live vaccine (such as MMR or varicella), and a second dose is recommended to provide a very high level of immunity in the population.

27. What sort of immunity does the vaccine provide?

Acquired Immunity - Acquired or adaptive immunity is the body's third line of defense. This is protection against specific types of pathogens. Acquired immunity may be either natural or artificial in nature. Both natural and artificial immunity have passive and active components, but in this case, there was more active immunity. Active immunity results from the production of antibodies by the immune system in response to the presence of an antigen.

28. How can the vaccine be administered to the greatest number of people?

First, the vaccine was given to healthcare workers, police, firefighters, but then was administered through a random drawing by birth dates.

29. How does the environment, transportation, communication, essential services, government, and health care facilities get involved?

Initially, the National Guard set up roadblocks; then they shut down the board of trade and public transportation. Essential government was moved to protected areas to eliminate exposure. Businesses initially sell as much as they can but then close down. Communication is maintained. Violence and looting occur. Healthcare workers go on strike.

- Measures to limit international spread – Entry screening – Travel advice & restrictions – Border closure
- Measures to reduce national and community spread – Quarantine – Social distancing – School closures, etc
- Measures taken by individuals – PPE-masks – Respiratory and hand hygiene
- Risk communication

30. In your opinion, do local, national, and global politics make a difference in the development and distribution of the vaccine?

Explain your opinion?

Politics plays a huge role in financing the development of vaccines and, ultimately, how they are administered. Power inequalities can sometimes make a difference who gets the vaccine first as some people are considered to be more essential than others. Ideally, those on the front lines of treatment would be the first to get the vaccine to preserve the potential to care for the sick. This can be dependent upon the availability of the vaccine and whether it is possible with treatment to save those who have already contracted the disease.

31. Does it make a difference if there is a rush to develop the vaccine?

Developing a vaccine takes time and clinical trials to test its effectiveness and potential adverse effects, but urgency can sometimes speed up the process and the clinical trials.

32. Does it make a difference that a vaccine may have other side effects? Ex: 1976—Swine Flu vaccine.

It makes a huge difference if the vaccine has side effects. For example, for patients allergic to egg, they should have the flu vaccine administered intranasally instead of getting the shot.

If significant side effects are noted, it could decrease the public's willingness to accept the vaccine.

33. As a community health nurse: Identify the primary, secondary, and tertiary prevention methods that could be used for infectious diseases at both the individual and community levels.

Primary prevention: Social distancing, quarantine, hand hygiene, use of PPE, immunization

Secondary: Testing (screening) those who have been exposed for early detection and treatment

Tertiary: Mitigating the long term effects of the disease process to limit disability and rehabilitate or restore affected people to their maximum possible capacities

34. What are the steps that a community needs to do to respond to an infectious disease outbreak?

- Social distancing; 10 feet
- Curfews
- Importance of handwashing
- Education and transmission of the infectious agent
- Communication of prevention mechanisms and recommendations from CDC
- Community resources

*__What Is R_0?: Gauging Contagious Infections:__ https://www.healthline.com/health/r-nought-reproduction-number#calculation

Understanding the possibilities

R_0 is pronounced "R naught." It's a mathematical term that indicates how contagious an infectious disease is. It's also referred to as the reproduction number. As an infection spreads to new people, it reproduces itself. R_0 tells you the average number of people who will catch a disease from one contagious person. It specifically applies to a population of people who were previously free of infection and haven't been vaccinated. If a disease has an R_0 of 18, a person who has the disease will transmit it to an average of 18 other people, as long as no one has been vaccinated against it or is already immune to it in their community.

What do R0 values mean?

Three possibilities exist for the potential spread or decline of a disease, depending on its R_0 value:

- If R_0 is less than 1, each existing infection causes less than one new infection. In this case, the disease will decline and eventually die out.
- If R_0 equals 1, each existing infection causes one new infection. The disease will stay alive and stable, but there won't be an outbreak or an epidemic.
- If R_0 is more than 1, each existing infection causes more than one new infection. The disease will spread between people, and there may be an outbreak or epidemic.

Importantly, a disease's R_0 value only applies when everyone in a population is completely vulnerable to the disease. This means:

- no one has been vaccinated
- no one has had the disease before
- there's no way to control the spread of the disease

This combination of conditions is rare nowadays thanks to advances in medicine. Many diseases that were deadly in the past can now be contained and sometimes cured. For example, in 1918 there was a worldwide outbreak of the swine flu that killed 50 million people. According to a review article published in BMC Medicine, the R_0 value of the 1918 pandemic was estimated to be between 1.4 and 2.8. But when the swine flu,

or H1N1 virus, came back in 2009, its R_0 value was between 1.4 and 1.6, report researchers in the journal Science. The existence of vaccines and antiviral drugs made the 2009 outbreak much less deadly.

How is the R0 of a disease calculated?

The following factors are taken into account to calculate the R_0 of a disease:

Infectious period

Some diseases are contagious for longer periods than others. For example, according to the Centers for Disease Control and Prevention, adults with the flu are typically contagious for up to eight days, while children can be contagious for up to two weeks. The longer the infectious period of a disease, the more likely an infected person is to spread the disease to other people. A long period of infectiousness will contribute to a higher R_0 value.

Contact rate

If a person who's infected with a contagious disease comes into contact with many people who aren't infected or vaccinated, the disease will spread more quickly. If that person remains at home, in a hospital, or otherwise quarantined while they're contagious, the disease will spread more slowly. A high contact rate will contribute to a higher R_0 value.

Mode of transmission

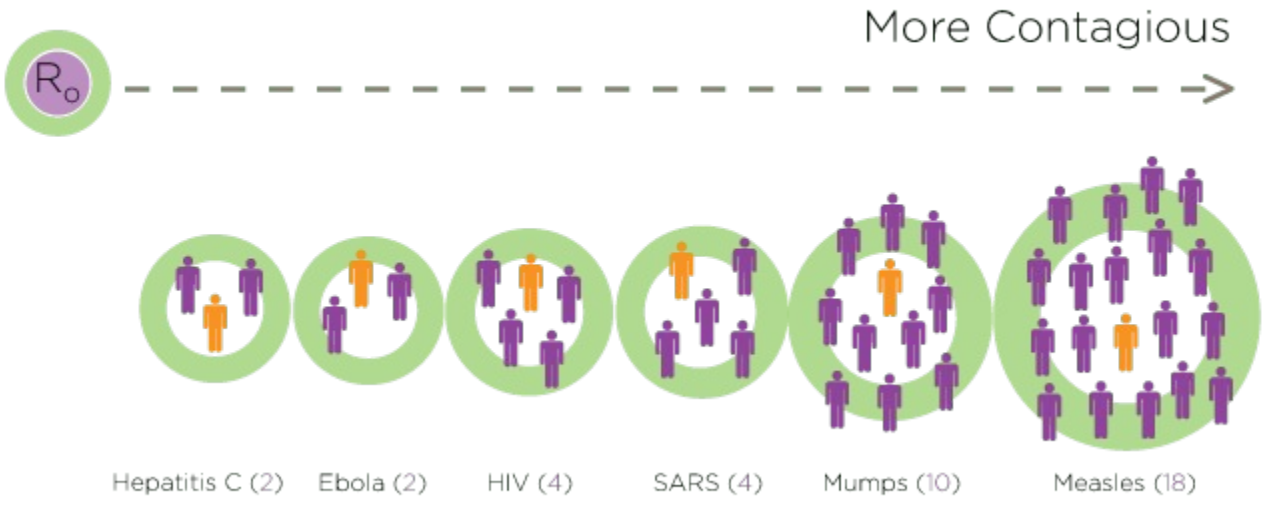
The diseases that spread most quickly and easily are the ones that can travel through the air, such as the flu or measles. Physical contact with an infected person isn't necessary for the transmission of such conditions. You can catch the flu from breathing near someone who has the flu, even if you never touch them.

In contrast, diseases that are transmitted through bodily fluids, such as Ebola or HIV, aren't as easy to catch or spread. This is because you need to come into contact with infected blood, saliva, or other bodily fluids to contract them. Airborne illnesses tend to have a higher R_0 value than those spread through contact.

What conditions are measured by R0?

R_0 can be used to measure any contagious disease that may spread in a susceptible population. Some of the most highly contagious conditions are measles and the common flu. More serious conditions, such as Ebola and HIV, spread less easily between people.

This illustration shows some commonly known diseases and their estimated R_0 values.



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Tips for prevention

R_0 is a useful calculation for predicting and controlling the spread of disease. Medical science continues to advance. Researchers are discovering new cures for different conditions, but contagious diseases aren't going to disappear anytime soon.

Take these steps to help prevent contagious diseases:

- Learn how different contagious diseases are transmitted.

- Ask your doctor about steps you can take to stop the spread of infection. For example, wash your hands regularly with soap and water, especially before you prepare or eat food.
- Stay up to date on routine vaccinations.
- Ask your doctor what diseases you should get vaccinated against.

6 sources collapsed