Adventist Youth Honors Answer Book/Health and Science/Viruses

Adventist Youth Honors Answer Book | Health and Science

Other languages:	English • español • français

Viruses		
General Conference Health and Science	Skill Level 2 Year of Introduction: 2012	

Requirements [Collapse]

Contents

    - b. Measles
    - c. Chickenpox
- 3. Choose three of the following viral diseases and describe their form of infection, symptoms and prevention. Demonstrate your learning creatively through a display, presentation, or prepared speech:
    - a. Cholera
    - b. Herpes
    - c. AIDS
    - d. Mumps
    - e. Poliomyelitis
    - f. Meningitis
    - g. Hepatitis
    - h. Dengue
- 4. Explain the difference between a cold and the flu. Why does the influenza virus cause periodic epidemics (like the Spanish flu, avian flu, H1N1, etc.)?
- 5. What is the difference between a virus and a prion? Name a disease caused by a prion.
- 6. Do one of the following:
    - a. Give a brief report about a viral pandemic and the impact it had / is having on the world.
    - b. Create a skit, multimedia presentation, or other interactive display that informs a 3rd world audience to the danger of one or more of these viruses and gives them training in how to combat or control the virus.
    - c. Have an aid/relief worker give a talk or presentation about epidemics and virus control in third-world countries. Raise money as a group to support aid relief in the country/(ies) the worker tells you about.
- References

This Honor is a component of the Health Master Award.

1. Describe or discuss the following with a group. If necessary research possible answers to these topics so that you can make meaningful contributions to the group.

The Pathfinder is encouraged to independently research online or in a high school biology textbook to get an understanding of viruses, their characteristics and effects. Independent reading, especially online where links can be followed, gives the Pathfinder the opportunity to dig deeper and explore areas of interest that will help them complete the practical Requirements #3 and #6 of this honor.

We provide introductory information to assist in teaching the honor.

a. What does the word virus mean? Explain the controversy regarding whether it is alive or not.

A virus is a small infectious agent that replicates only inside the living cells of other organisms. Viruses can infect all types of life forms, from animals and plants to microorganisms, including bacteria and archaea. The study of viruses is known as virology, a subspecialty of microbiology.

Dmitri Ivanovsky, a Russian botanist, was the first person to discover viruses (1892) and thus one of the founders of virology. He identified a non-bacterial pathogen infecting tobacco plants, which was named the tobacco mosaic virus by Martinus Beijerinck in 1898.

About 5,000 virus species have been described in detail, although there are millions of different types. Viruses are found in almost every ecosystem on Earth and are the most abundant type of biological entity.

Viruses are considered by some to be a life form, because they carry genetic material, reproduce, and evolve through natural selection (microevolution and mutation). However they lack key characteristics (such as cell structure) that are generally considered necessary to count as life. Because they possess some but not all such qualities, viruses have been described as "organisms at the edge of life".

b. Name the distinctive characteristics of viruses and why they're not included in any kingdom.

While not inside an infected cell or in the process of infecting a cell, viruses exist in the form of independent particles known as virions that are inert and lifeless as a rock.

Since they are not alive and do not have cells, they are not classified into any of the five life kingdoms of Protista (mostly waterborne and single celled), Fungi, Plantae (plants), Animalia (animals), and Monera (unicellular organisms with a prokaryotic cell organization including bacteria).

Instead, Virions consist of two or three parts:

(i) the genetic material made from either **DNA or RNA**, long molecules that carry genetic information;

(ii) a **protein coat**, called the **capsid**, which surrounds and protects the genetic material; and

(iii) in some cases an **envelope of lipids** that surrounds the protein coat when they are outside a cell.

Most virus species have virions that are too small to be seen with an optical microscope. The average virion is about one one-hundredth the size of the average bacterium.

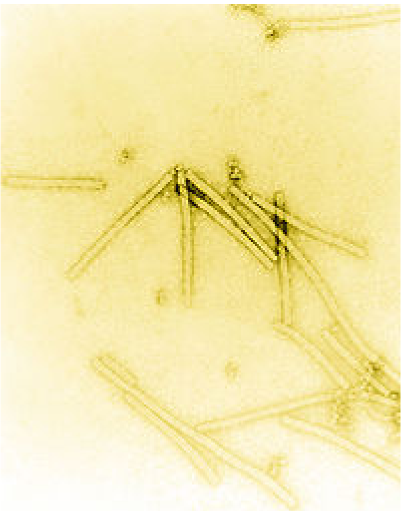
Viruses are an important means of horizontal gene transfer, which increases genetic diversity.

c. Name some morphological shapes of viruses and give an example of each.

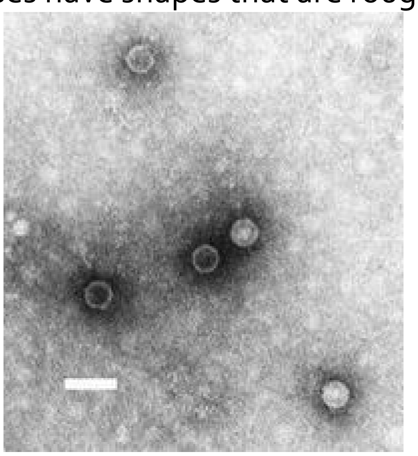
The shapes of virus particles range from simple helical and icosahedral forms for some virus species to more complex structures for others.

Viruses come in many shapes and sizes, but these are consistent and distinct for each viral family. In general, the shapes of viruses are classified into four groups:

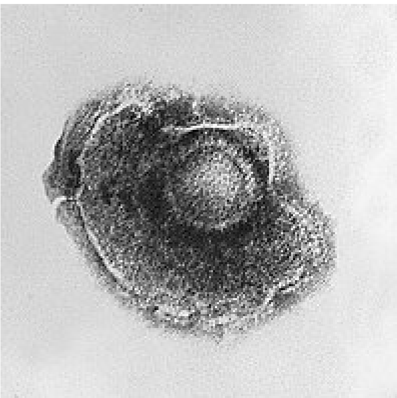
Filamentous viruses are long and cylindrical. Many plant viruses are filamentous, including the*TMV (tobacco mosaic virus)* which was the first virus identified.



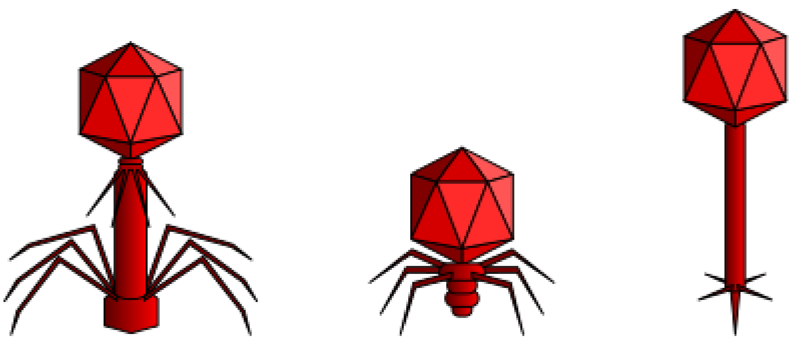
Isometric viruses have shapes that are roughly spherical. Examples include poliovirus (shown) and herpesviruses.



Enveloped A virus that has an outer wrapping or envelope. This envelope comes from the infected cell, or host, in a process called "budding off." During the budding process, newly formed virus particles become "enveloped" or wrapped in an outer coat that is made from a small piece of the cell's plasma membrane. The envelope may play a role in helping a virus survive and infect other cells. Animal viruses, such as HIV (caused AIDS), are frequently enveloped. Chickenpox virus is shown.



Head and tail viruses infect bacteria. They have a head that is similar to icosahedral viruses and a tail shape like filamentous viruses. Here are the three families based on like shape and other characteristics:



From left to right: Myoviridae, Podoviridae, and Siphoviridae

Many viruses use some sort of glycoprotein to attach to their host cells via molecules on the cell called viral receptors. For these viruses, attachment is a requirement for later penetration of the cell membrane, allowing them to complete their replication inside the cell. The receptors that viruses use are molecules that are normally found on cell surfaces and have their own physiological functions. Viruses make use of these molecules for their own replication. [1]

d. Explain the importance of vaccines to combat viruses. How do they work?

Antibiotics do not work on viruses, which leaves vaccines (and certain antiviral drugs) as the main defense against harmful virus caused diseases.

Vaccines help develop immunity by imitating an infection. This type of infection, however, does not cause illness, but it does cause the immune system to produce T-lymphocytes and antibodies. Sometimes, after getting a vaccine, the imitation infection can cause minor symptoms, such as fever. Such minor symptoms are normal and should be expected as the body builds immunity. Once the imitation infection goes away, the body is left with a supply of "memory" T-lymphocytes, as well as B-lymphocytes that will remember how to fight that disease in the future. However, it typically takes a few weeks for the body to produce T-lymphocytes and B-lymphocytes after vaccination. Therefore, it is possible that a person who was infected with a disease just before or just after vaccination could develop symptoms and get a disease, because the vaccine has not had enough time to provide protection.

Types of Vaccines

Scientists take many approaches to designing vaccines. These approaches are based on information about the germs (viruses or bacteria) the vaccine will prevent, such as how it infects cells and how the immune system responds to it. Practical considerations, such as regions of the world where the vaccine would be used, are also important because the strain of a virus and environmental conditions, such as temperature and risk of exposure, may be different in various parts of the world. The vaccine delivery options available may also differ geographically. Today there are five main types of vaccines that infants and young children commonly receive:

- Live, attenuated vaccines fight viruses. These vaccines contain a version of the living virus that has been weakened so that it does not cause serious disease in people with healthy immune systems. Because live, attenuated vaccines are the closest thing to a natural infection, they are good teachers for the immune system. Examples of live, attenuated vaccines include measles, mumps, and rubella vaccine (MMR) and varicella (chickenpox) vaccine. Even though these vaccines are very effective, not everyone can receive them. Children with weakened immune systems—for example, those who are undergoing chemotherapy—cannot get live vaccines.

- Inactivated vaccines also fight viruses. These vaccines are made by inactivating, or killing, the virus during the process of making the vaccine. The inactivated polio vaccine is an example of this type of vaccine. Inactivated vaccines produce immune responses in different ways than live, attenuated vaccines. Often, multiple doses are necessary to build up and/or maintain immunity.

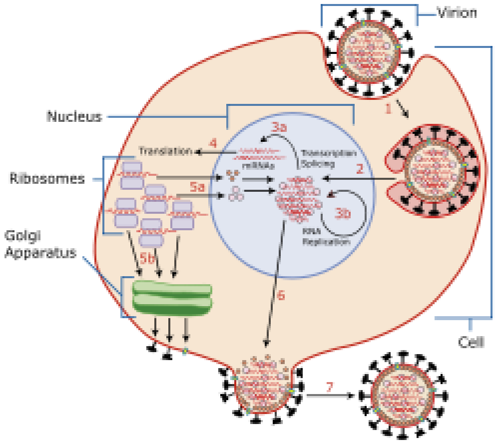
- Toxoid vaccines prevent diseases caused by bacteria that produce toxins (poisons) in the body. In the process of making these vaccines, the toxins are weakened so they cannot cause illness. Weakened toxins are called toxoids. When the immune system receives a vaccine containing a toxoid, it learns how to fight off the natural toxin. The DTaP vaccine contains diphtheria and tetanus toxoids.

- Subunit vaccines include only parts of the virus or bacteria, or subunits, instead of the entire germ. Because these vaccines contain only the essential antigens and not all the other molecules that make up the germ, side effects are less common. The pertussis (whooping cough) component of the DTaP vaccine is an example of a subunit vaccine.

- Conjugate vaccines fight a different type of bacteria and are therefore outside the scope of the question.

Source CDC (http://www.cdc.gov/vaccines/hcp/patient-ed/conversations/downloads/vacsafe-understand-color-office.pdf).

e. Describe how viruses reproduce and how the genetic modifications called mutations occur and viral resistance.



Viruses are classed into 7 types of genes, each of which has its own families of viruses, which in turn have differing replication strategies themselves. David Baltimore, a Nobel Prize-winning biologist, devised a system called the Baltimore Classification System to classify different viruses based on their unique replication strategy. There are seven different replication strategies based on this system (Baltimore Class I, II, III, IV, V, VI, VII). These seven classes of viruses are listed here briefly and in generalities.

Class 1: Double Stranded DNA Viruses

This type of virus usually must enter the host nucleus before it is able to replicate. Some of these viruses require host cell polymerases to replicate their genome, while others, such as adenoviruses or herpes viruses, encode their own replication factors. However, in either cases, replication of the viral genome is highly dependent on a cellular state permissive to DNA replication and, thus, on the cell cycle. The virus may induce the cell to forcefully undergo cell division, which may lead to transformation of the cell and, ultimately, cancer. An example of a family within this classification is the Adenoviridae

There is only one well-studied example in which a class 1 family of viruses does not replicate within the nucleus. This is the Poxvirus family, which comprises highly pathogenic viruses that infect vertebrates.

Class 2: Single-stranded DNA viruses

Viruses that fall under this category include ones that are not as well-studied, but still do pertain highly to vertebrates. Two examples include the Circoviridae and Parvoviridae. They replicate within the nucleus, and form a double-stranded DNA intermediate during replication. A human Circovirus called TTV is included within this classification and is found in almost all humans, infecting them asymptomatically in nearly every major organ.

Class 3: Double-stranded RNA viruses

Like most viruses with RNA genomes, double-stranded RNA viruses do not rely on host polymerases for replication to the extent that viruses with DNA genomes do. Double-stranded RNA viruses are not as well-studied as other classes. This class includes two major families, the Reoviridae and

Birnaviridae. Replication is monocistronic and includes individual, segmented genomes, meaning that each of the genes codes for only one protein, unlike other viruses, which exhibit more complex translation.

Classes 4 & 5: Single-stranded RNA viruses

These viruses consist of two types, however both share the fact that replication is primarily in the cytoplasm, and that replication is not as dependent on the cell cycle as that of DNA viruses. This class of viruses is also one of the most-studied types of viruses, alongside the double-stranded DNA viruses.

Class 4: Single-stranded RNA viruses - Positive-sense.

The positive-sense RNA viruses and indeed all genes defined as positive-sense can be directly accessed by host ribosomes to immediately form proteins. These can be divided into two groups, both of which replicate in the cytoplasm:

Viruses with polycistronic mRNA where the genome RNA forms the mRNA and is translated into a polyprotein product that is subsequently cleaved to form the mature proteins. This means that the gene can utilize a few methods in which to produce proteins from the same strand of RNA, all in the sake of reducing the size of its gene. Viruses with complex transcription, for which subgenomic mRNAs, ribosomal frameshifting and proteolytic processing of polyproteins may be used. All of which are different mechanisms with which to produce proteins from the same strand of RNA.

Examples of this class include the families Coronaviridae, Flaviviridae, and Picornaviridae.

Class 5: Single-stranded RNA viruses - Negative-sense

The negative-sense RNA viruses and indeed all genes defined as negative-sense cannot be directly accessed by host ribosomes to immediately form proteins. Instead, they must be transcribed by viral polymerases into the "readable" complementary positive-sense. These can also be divided into two groups:

Viruses containing nonsegmented genomes for which the first step in replication is transcription from the negative-stranded genome by the viral RNA-dependent RNA polymerase to yield monocistronic mRNAs that code for the various viral proteins. A positive-sense genome copy that serves as template for production of the negative-strand genome is then produced. Replication is within the cytoplasm.

Viruses with segmented genomes for which replication occurs in the cytoplasm and for which the viral RNA-dependent RNA polymerase produces monocistronic mRNAs from each genome segment. Examples in this class include the families Orthomyxoviridae, Paramyxoviridae, Bunyaviridae, Filoviridae, and Rhabdoviridae (which includes rabies).

Class 6: Positive-sense single-stranded RNA viruses that replicate through a DNA intermediate

A well-studied family of this class of viruses include the retroviruses. One defining feature is the use of reverse transcriptase to convert the positive-sense RNA into DNA. Instead of using the RNA for templates of proteins, they use DNA to create the templates, which is spliced into the host genome using integrase. Replication can then commence with the help of the host cell's polymerases

Class 7: Double-stranded DNA viruses that replicate through a single-stranded RNA intermediate

This small group of viruses, exemplified by the Hepatitis B virus, have a double-stranded, gapped genome that is subsequently filled in to form a covalently closed circle (ccc DNA) that serves as a template for production of viral mRNAs and a subgenomic RNA. The pregenome RNA serves as template for the viral reverse transcriptase and for production of the DNA genome.

Mutation

Any study of virus mutation quickly leads to the idea of virus evolution. Viruses do, in fact, mutate and assume new forms. Some viruses mutate within weeks or months, including the ever changing flu viruses. Does this prove the theory of evolution?

Most Seventh-day Adventists reject Darwin style macroevolution theory that says all life evolved from single celled organisms, with good reason. The Bible says that God made the heavens and the earth. However, a well read Adventist realizes that [W:Microevolution|microevolution] is true and common. Human and natural causes are responsible for the obvious diversity within and between closely related individual species. Microevolution caused the visual differences between the human races, between different types of dogs, and between many related types of viruses.

Even Wikipedia editors, ever diehard supporters of Darwin macroevolution, summarize the problems with the supposed macro-evolution of viruses and how the are supposed to tie in with . "There are three classical hypotheses on the origins of viruses: Viruses may have once been small cells that parasitised larger cells (the degeneracy hypothesis or reduction hypothesis); some viruses may have evolved from bits of DNA or RNA that "escaped" from the genes of a larger organism (the vagrancy hypothesis or escape hypothesis); or viruses could have evolved from complex molecules of protein and nucleic acid at the same time as cells first appeared on earth (the virus-first hypothesis). None of these hypotheses was fully accepted: the regressive hypothesis did not explain why even the smallest of cellular parasites do not resemble viruses in any way. The escape hypothesis did not explain the complex capsids and other structures on virus particles. The virus-first hypothesis was quickly dismissed because it contravened the definition of viruses, in that they require host cells." Virologists are beginning to reconsider and re-evaluate all three hypotheses.

The way viruses reproduce in their host cells makes them particularly susceptible to the genetic changes or mutations. The RNA viruses are especially prone to mutations. In host cells there are mechanisms for correcting mistakes when DNA replicates and these kick in whenever cells divide. These important mechanisms prevent potentially lethal mutations from being passed on to offspring. But these mechanisms do not work for RNA and when an RNA virus replicates in its host cell, changes in their genes are occasionally introduced in error, some of which are lethal. One virus particle can produce millions of progeny viruses in just one cycle of replication, therefore the production of a few "dud" viruses is not a problem. Most mutations are "silent" and do not result in any obvious changes to the progeny viruses, but others confer advantages that increase the fitness of the viruses in the environment. These could be changes to the virus particles that disguise them so they are not identified by the cells of the immune system or changes that make antiviral drugs less effective. Both of these changes occur frequently with HIV.

Many viruses (for example, influenza A virus) can "shuffle" their genes with other viruses when two similar strains infect the same cell. This phenomenon is called genetic shift, and is often the cause of new and more virulent strains appearing. Other viruses change more slowly as mutations in their genes gradually accumulate over time, a process known as genetic drift.

Through these mechanisms new viruses are constantly emerging and present a continuing challenge to attempts to control the diseases they cause.

f. Have viral diseases ever been eradicated? Why is it difficult to treat patients with viral diseases?

Eradication is the reduction of an infectious disease's prevalence in the global host population to zero. It differs from elimination, which means reducing the disease to zero cases in a regional population. Eradication is not easy to accomplish and many considerations go into selecting diseases to attempt eradication on. See Eradication of infectious diseases for more information.

Successes

Two viral diseases (smallpox and rinderpest) have been eradicated so far and one (polio) is close to eradication. Also regional efforts are being made to eradicate viral human diseases measles and rubella. Some scientists believe that ovine rinderpest, affecting goats and sheep, can be eradicated.

Smallpox was caused by infection with variola virus. The English physician Edward Jenner discovered the first vaccine - cowpox to protect humans from smallpox in 1796, making it the first vaccine. Various attempts were made to eliminate smallpox on a regional scale starting soon after this discovery. Ultimately worldwide vaccinations combined with a isolate and containment strategy were successful in eradicating smallpox, with Ali Maow Maalin of Somalia bring the last naturally occurring infection occurring in 1977. Pathfinders are urged to read about how smallpox was eradicated and the efforts to ensure it stays eradicated and is not reintroduced via weapons or accident.

Rinderpest, was a viral disease which infected cattle, domestic buffalo, and some other species of even-toed ungulates, including buffaloes, large antelope and deer, giraffes, wildebeests, and warthogs. Rinderpest belonged to the same family as measles. Mainly a live attenuated vaccine was used, starting in the early 1900s on a regional or national basis. The Food and Agriculture Organization (FAO) of the United Nations gave a final push, and on 14 October 2010, with no diagnoses for nine years, the FAO announced that the disease had been completely eradicated in all countries. Rinderpest is the first (and so far the only) disease of livestock to have been eradicated by human undertakings and only the second disease of any type after smallpox.

Polio is a viral disease now close to eradication, with only Pakistan and Afghanistan still reporting wild cases as of September 2015. The public health effort to eliminate all cases of poliomyelitis (polio) infection around the world, begun in 1988, led by the World Health Organization (WHO), UNICEF and the Rotary Foundation. This global effort has reduced the number of annual diagnosed cases from the hundreds of thousands to 291 in 2012, though case counts rose in 2013 and 2014. In 2014, Pakistan had the largest number of polio cases at 328, an increase from 43 in 2013. This increase was blamed on Al Qaeda and Taliban militants preventing aid workers from vaccinating children in rural regions of the country. Hopefully the increases are over because there were only 41 wild cases in between January and September 2015. The live vaccine, now being phased out, can trigger circulating vaccine-derived type 1 cases as well.

Of the three types of polio, and all reported cases since 11 November 2012 have been of type 1. The last recorded wild case of type 2 was in 1999 (declared eradicated in September 2015). The last recorded case of type 3 was on 11 November 2012.

Reasons for failure

Efforts to eradicate Yellow Fever have failed. Virus eradication programs have mostly relied upon vaccination in Africa where the programs have largely been unsuccessful because they were unable to break the sylvatic cycle involving wild primates. With few countries establishing regular vaccination programs, measures to fight yellow fever have been neglected, making the future spread of the virus more likely.

Difficulty of treatment

Viruses cause familiar infectious diseases such as the common cold, flu and warts. They also cause severe illnesses such as HIV/AIDS, smallpox and hemorrhagic fevers.

Viruses are like hijackers. They invade living, normal cells and use those cells to multiply and produce other viruses like themselves. This eventually kills the cells, which can make you sick.

Viral infections are hard to treat because viruses live inside your body's cells and are basically "protected" from medicines, which usually move through your bloodstream. Antibiotics do not work for viral infections, which is while you are wasting your time fighting the common cold with antibiotics. However, there are a few antiviral medicines available today. The most effective weapon against most viruses is vaccines to prevent infection in the first place.[2]

2. Through pictures, video, or detailed descriptions, explain the difference in the following exanthematous or rash diseases:

a. Rubella

Rubella, sometimes called German measles or three-day measles, is a contagious disease caused by a virus. The infection is usually mild with fever and rash.

Symptoms Rubella usually causes the following symptoms in children:

Rash that starts on the face and spreads to the rest of the body Low fever (less than 101 degrees) These symptoms last 2 or 3 days.

Older children and adults may also have swollen glands and symptoms like a cold before the rash appears. Aching joints occur in many cases, especially among young women.

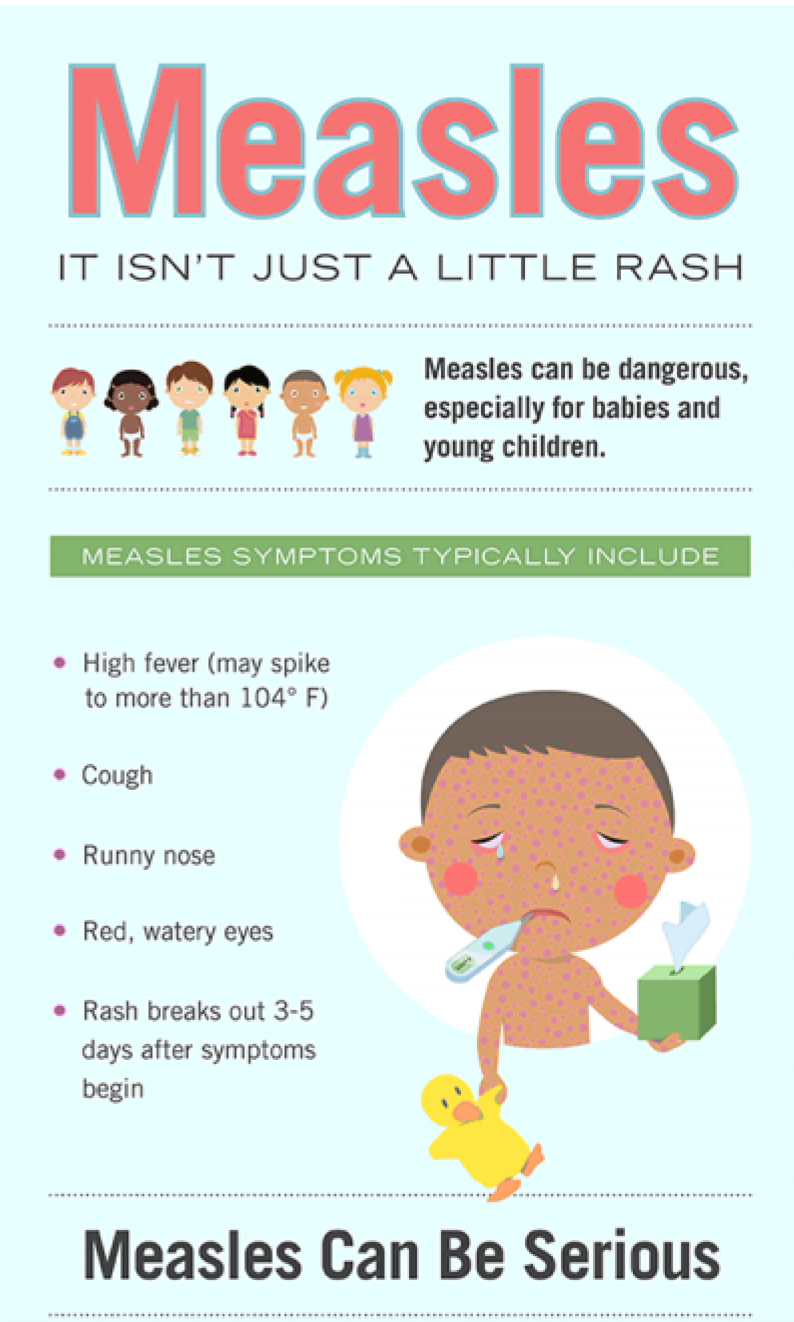
About half of the people who get rubella do not have symptoms.

Complications Birth defects if acquired by a pregnant woman: deafness, cataracts, heart defects, mental retardation, and liver and spleen damage (at least a 20% chance of damage to the fetus if a woman is infected early in pregnancy)

Transmission Spread by contact with an infected person, through coughing and sneezing

Prevention Rubella vaccine (contained in MMR vaccine) can prevent this disease.

b. Measles



The symptoms of measles generally appear about seven to 14 days after a person is infected.

Measles typically begins with

high fever, cough, runny nose (coryza), and red, watery eyes (conjunctivitis). Two or three days after symptoms begin, tiny white spots (Koplik spots) may appear inside the mouth.

Three to five days after symptoms begin, a rash breaks out. It usually begins as flat red spots that appear on the face at the hairline and spread downward to the neck, trunk, arms, legs, and feet. Small raised bumps may also appear on top of the flat red spots. The spots may become joined together as they spread from the head to the rest of the body. When the rash appears, a person's fever may spike to more than 104° Fahrenheit.

After a few days, the fever subsides and the rash fades.

Measles can be prevented with the MMR (measles, mumps, and rubella) vaccine. One dose of MMR vaccine is about 93% effective at preventing measles if exposed to the virus, and two doses are about 97%

effective. In the United States, widespread use of measles vaccine has led to a greater than 99% reduction in measles cases compared with the pre-vaccine era. Since 2000, when measles was declared eliminated from the U.S., the annual number of people reported to have measles ranged from a low of 37 people in 2004 to a high of 668 people in 2014. Most of these originated outside the country or were linked to a case that originated outside the country.

Measles is still common in other countries. The virus is highly contagious and can spread rapidly in areas where people are not vaccinated. Worldwide, an estimated 20 million people get measles and 146,000 people die from the disease each year—that equals about 400 deaths every day or about 17 deaths every hour.

c. Chickenpox

Chickenpox is a very contagious disease caused by the varicella-zoster virus (VZV). It causes a blister-like rash, itching, tiredness, and fever. Chickenpox can be serious, especially in babies, adults, and people with weakened immune systems. It spreads easily from infected people to others who have never had chickenpox or received the chickenpox vaccine. Chickenpox spreads in the air through coughing or sneezing. It can also be spread by touching or breathing in the virus particles that come from chickenpox blisters.

The best way to prevent chickenpox is to get the chickenpox vaccine. Before the vaccine, about 4 million people would get chickenpox each year in the United States. Also, about 10,600 people were hospitalized and 100 to 150 died each year as a result of chickenpox.

Anyone who hasn't had chickenpox or received the chickenpox vaccine can get the disease. Chickenpox most commonly causes an illness that lasts about 5-10 days.

The classic symptom of chickenpox is a rash that turns into itchy, fluid-filled blisters that eventually turn into scabs. The rash may first show up on the face, chest, and back then spread to the rest of the body, including inside the mouth, eyelids, or genital area. It usually takes about one week for all the blisters to become scabs.

Other typical symptoms that may begin to appear 1-2 days before rash include:

high fever tiredness loss of appetite headache Children usually miss 5 to 6 days of school or childcare due to their chickenpox.

Vaccinated Persons Some people who have been vaccinated against chickenpox can still get the disease. However, the symptoms are usually milder with fewer blisters and mild or no fever. About 25% to 30% of vaccinated people who get chickenpox will develop illness as serious as chickenpox in unvaccinated persons.

3. Choose three of the following viral diseases and describe their form of infection, symptoms and prevention. Demonstrate your learning creatively through a display, presentation, or prepared speech:

It is impractical to fully cover each disease in depth enough for a presentation within the wiki. A good place to get an overview of each virial disease is Wikipedia and the CDC website.

a. Cholera

Note: The editors of this answer book feel that there is an error in the official version of this requirement.

More Information [Expand]

Some alternatives could be: Ebola Virus, Varicella Zoster Virus (causes chicken pox and shingles), West Nile Virus, Zika Virus, Hand-Foot-and-Mouth Virus

b. Herpes

There are several types of herpes.

- Genital herpes is the most common and serious threat to humans. See CDC site (http://www.cdc.gov/std/herpes/default.htm%7Cthe)
- [(Herpes Zoster) (http://www.cdc.gov/shingles/about/index.html%7CShingles)] is caused by the same virus as chickenpox. 1 in 3 Americans will get shingles, often after age 60.
- B (http://www.cdc.gov/herpesbvirus/index.html%7CHerpes) virus is found in macaque monkeys

c. AIDS

HIV/AIDS continues to be studied extensively, with great effort being made to find a cure. It is transmitted via exchange of bodily fluids. site (http://www.cdc.gov/hiv/default.html/#%7CCDC) and Wikipedia are good starting points.

d. Mumps

Mumps is commonly vaccinated for. [on mumps (http://www.cdc.gov/mumps/index.html%7CCDC)] and Mumps on Wikipedia

e. Poliomyelitis

Polio is a crippling and potentially fatal infectious disease. There is no cure, but there are safe and effective vaccines. Therefore, the strategy to eradicate polio is based on preventing infection by immunizing every child to stop transmission and ultimately make the world polio free. This should happen within the next few years. Polio cases have decreased by over 99% since 1988, from an estimated more than 350 000 cases to 359 reported cases in 2014. Today, only Pakistan and Afghanistan have never stopped transmission of polio. http://www.cdc.gov/polio/ and http://www.who.int/topics/poliomyelitis/en/

f. Meningitis

Don't fall into researching Meningococcal meningitis, the bacterial form of meningitis [1] (http://www.who.int/mediacentre/factsheets/fs141/en/) since this is the Virus honor. Look at Viral meningitis on Wikipedia for an overview of this disease.

g. Hepatitis

There are 5 kinds of Hepatitis labeled A-E. Explore them here:
http://www.cdc.gov/hepatitis/index.htm

h. Dengue

With more than one-third of the world’s population living in areas at risk for infection, dengue virus is a leading cause of illness and death in the tropics and subtropics. As many as 400 million people are infected yearly. Dengue is caused by any one of four related viruses transmitted by mosquitoes. There are not yet any vaccines to prevent infection with dengue virus and the most effective protective measures are those that avoid mosquito bites. When infected, early recognition and prompt supportive treatment can substantially lower the risk of medical complications and death. http://www.cdc.gov/dengue/

4. Explain the difference between a cold and the flu. Why does the influenza virus cause periodic epidemics (like the Spanish flu, avian flu, H1N1, etc.)?

The flu and the common cold are both respiratory illnesses but they are caused by different viruses. Because these two types of illnesses have similar flu-like symptoms, it can be difficult to tell the difference between them based on symptoms alone. Special tests that usually must be done within the first few days of illness can be carried out, when needed to tell if a person has the flu.

In general, the flu is worse than the common cold, and symptoms such as fever, body aches, extreme tiredness, and dry cough are more common and intense. Colds are usually milder than the flu. People with colds are more likely to have a runny or stuffy nose. Colds generally do not result in serious health problems, such as pneumonia, bacterial infections, or hospitalizations.

[Source CDC http://www.cdc.gov/flu/about/qa/coldflu.htm]

The flu continues to mutate, creating hundreds of strains a year. Therefore vaccines need to be developed with educated guesses as to which will be strain that spreads most. Sometimes the guess is wrong, or a new dangerous strain gets out of control.

5. What is the difference between a virus and a prion? Name a disease caused by a prion.

The word prion, named in 1982 by Stanley B. Prusiner, is short for “proteinaceous infectious particle” and the word is derived from the words **pr**otein and infect**ion**. While viruses (and all other known infectious agents, including bacteria, fungi, and parasites) universally contain DNA or RNA, prions contain neither. Instead they are a protein that can fold in multiple, structurally distinct ways, at least one of which is self-propagating and transmissible to other prion proteins. This form of replication leads to disease that is similar to viral infection.

The first prion protein discovered in mammals is the major prion protein (PrP). This infectious agent causes mammalian transmissible spongiform encephalopathies, including bovine spongiform encephalopathy (BSE, also known as "mad cow disease") and scrapie in sheep. In humans, PrP causes Creutzfeldt-Jakob Disease (CJD), variant Creutzfeldt-Jakob Disease (vCJD), Gerstmann–Sträussler–Scheinker syndrome, Fatal Familial Insomnia and kuru.

All known prion diseases in mammals affect the structure of the brain or other neural tissue and all are currently untreatable and universally fatal.

6. Do one of the following:

a. Give a brief report about a viral pandemic and the impact it had / is having on the world.

A pandemic (from Greek πᾶν pan "all" and δῆμος demos "people") is an epidemic of infectious disease that has spread through human populations across a large region; for instance multiple continents, or even worldwide. A widespread endemic disease that is stable in terms of how many people are getting sick from it is not a pandemic. Further, flu pandemics generally exclude recurrences of seasonal flu. More recent pandemics include the HIV pandemic as well as the 1918 and 2009 H1N1 pandemics. The Black Death was a devastating pandemic, killing over 75 million people.

Be sure the pandemic you cover is caused by a virus, since many pandemics are bacterial. Historic or current viral pandemics include:

- Yellow fever In 1927 yellow fever virus became the first human virus to be isolated. Yellow fever has been a source of several devastating epidemics.Cities as far north as New York, Philadelphia, and Boston were hit with epidemics. In 1793, one of the largest yellow fever epidemics in U.S. history killed as many as 5,000 people in Philadelphia—roughly 10% of the population. About half of the residents had fled the city, including President George Washington. In colonial times, West Africa became known as "the white man's grave" because of malaria and yellow fever. Yellow fever remains a serious problem in Africa.
- Measles is an endemic disease, meaning that it has been continually present in a community, and many people develop resistance. In populations that have not been exposed to measles, exposure to a new disease can be devastating. In 1529, a measles outbreak in Cuba killed two-thirds of the natives who had previously survived smallpox. The disease had ravaged Mexico, Central America, and the Inca civilization. Before the vaccine was introduced in 1963, there were an estimated 3–4 million cases in the U.S. each year. Measles killed around 200 million people worldwide over the last 150 years. In 2000 alone, measles killed some 777,000 worldwide out of 40 million cases globally.
- Influenza pandemic
- Ebola
- HIV/AIDS considered the main viral long term pandemic
- COVID-19 Also known as COVID-19.

b. Create a skit, multimedia presentation, or other interactive display that informs a 3rd world audience to the danger of one or more of these viruses and gives them training in how to combat or control the virus.

Note: The editors of this answer book feel that there is an error in the official version of this requirement.

More Information [Expand]

The requirement is designed to make the Pathfinder look at the project as something practical. This option encourages creativity, physical action-oriented activities, and alternative learning methods from writing a report.

The presentation could include a live demonstration of the proper way to wash the hands, but using a basin and a pitcher since it's difficult to gather a group of people around a sink with running water.

c. Have an aid/relief worker give a talk or presentation about epidemics and virus control in third-world countries. Raise money as a group to support aid relief in the country/(ies) the worker tells you about.

You can either invite the speaker to come to your club, or maybe go to an event organized by others that fits this description.

As with all times you invite in a speaker, be sure to be clear about what is expected (will they be teaching any other part of the honor?) Pathfinders can prepare questions in advance to enrich the learning experience. Also be sure to thank the speaker.

References

1. ↑ https://www.boundless.com/biology/textbooks/boundless-biology-textbook/viruses-21/viral-evolution-morphology-and-classification-136/viral-morphology-550-11760/
2. ↑ https://www.nlm.nih.gov/medlineplus/viralinfections.html

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