This is a bacteria, and this is a virus, and this is a protist, and this is a Fungi, and this is disease.

Diseases are abnormal conditions that affect an organism's body, organs, tissues or cells. Some are caused by pathogens. Pathogens are microorganisms that enter the body and cause a disease. A pathogen can cause a disease in both plants and animals.

Bacteria is a pathogen. Bacteria are small cells. They can reproduce very quickly inside the body. They produce toxins that make us feel ill by damaging our cells and tissues.

Viruses are also pathogens. Viruses are even smaller than bacteria. Like bacteria, they also reproduce rapidly in the body. Viruses live inside your cells where they replicate. They then burst out of the cell, releasing new viruses.

Protists are pathogens too. Protists are eukaryotes, which means that they have a nucleus, similar to animals and plants. Some protists are parasites which live on or in other organisms, often causing harm to their host.

One final pathogen is fungi. However not all fungi are pathogens.

Pathogens spread in many ways. Some of these ways are: through contaminated water that is then ingested into the body. Cholera is an example of a pathogen spread by water contamination. Another way pathogens can spread is by via the air. When we breathe, we could breathe in harmful microbes. Influenza is a pathogen spread via the air. One final way in which pathogens can spread is by direct contact. This happens when we touch contaminated surfaces. Athletes foot is a pathogen spread by direct contact.

We need to know a number of specific diseases. Measles is a virus spread by droplets from sneezes and coughs. Symptoms of Measles include a red rash on the skin and a fever. Measles can be very serious and even fatal and it can lead to pneumonia. Most people are

vaccinated against measles when they are very young. The vaccine for measles is known as the MMR vaccine.

HIV is the Human Immunodeficiency Virus. HIV is spread via direct contact. Specifically, through exchanging body fluids, usually by sexual activity. HIV attacks cells in the immune system. This can badly damage the immune system, which means that the body will not be able to cope with fighting off other infections. When the immune system is so badly damaged by HIV, this is known as AIDS. HIV can be controlled by antiviral drugs which work to stop the virus replicating.

Plants are also susceptible to viruses. The Tobacco Mosaic Virus is a virus that causes a plant's leaves to become discolored. This means that plants can not carry out photosynthesis, which is how the plant gets its energy. With parts of the leaf not being able to photosynthesize, the plant's growth will slow.

Rose black spot is a fungal disease that affects plants. Rose black spot spreads via the air and water. Rose Black Spot is similar to the Tobacco Mosaic Virus in that it causes black spots to show on the leaves of the plant, blocking its ability to photosynthesize. Rose Black Spot can be treated with fungicides, or by cutting off the infected leaves.

Malaria is caused by a protist. Mosquitoes are the vectors. Vectors are essentially the vehicle that carry the pathogen to a host. Mosquitoes become infected when they feed on an infected animal. Malaria can cause a fever and can also be fatal.

Salmonella are a type of bacteria. Salmonella bacteria cause food poisoning. Salmonella bacteria produce toxins. These toxins cause the symptoms of salmonella: fever, stomach cramps, vomiting, and diarrhoea.

Gonorrhoea is another bacterial disease. Gonorrhoea is passed on by sexual contact. Gonorrhoea causes pain when urinating, and a thick yellow-greenish fluid discharge from the penis or vagina. Gonorrhoea can be treated with antibiotics, however it is best to prevent the spread in the first place by using a condom.

We can prevent the spread of all bacterial diseases by being hygienic, washing our hands for example, destroying vectors, this can be done by using insecticides and/or destroying their habitats. Isolation, by isolating the infected person. Vaccination, to stop people from developing the infection and passing it on.

We also have defenses to help prevent the risk of infection. Us humans have our own defenses, including: our skin, which acts as a physical barrier preventing the entry of pathogens. We also have hairs and mucus in our nose to trap harmful particles. The trachea, the conecting tube between the voice box and lungs, secretes mucus to trap pathogens. The trachea also has cilia, which are tiny hairlike projections that carry mucus to the throat, where it can be swallowed, swallowing any trapped pathogens with it. The stomach contains hydrochloric acid to kill any pathogens that enter the body via the mouth.

We humans also have an immune system. The immune system can detect and respond to a variety of pathogens. White blood cells are essential in the function of the immune system. Lymphocytes are white blood cells that produce specific antibodies which disable pathogens by attaching, and therefore blocking their antigens, disabling the pathogen's ability to destroy cells. Antibodies, once bound to a pathogen's antigens also cause the pathogens to clump together, whilst also signaling to the Phagocytes. Phagocytes are white blood cells that engulf the disabled pathogens and then digest them. Even when the pathogen is eradicated, the lymphycytes that produced the correct specific antibody remain in the boodstream as memory cells, so that, If the same pathogen enters the immune system for a second time, the response is much more rapid.

Vaccines can also be used to rid pathogens in the body. Vaccines work by exploiting the body's immune response just mentioned. Vaccines contain dead, or significantly weakened versions of a pathogen. These versions of the pathogen are harmless when in the body, however they still trigger an immune response. The lymphocytes will produce specific antibodies to disable this pathogen. Later, if a person is infected with real version of the pathogen, the lymphocyte memory cells that remained in the blood after the vaccination will be able to produce antibodies rapidly.

We can also use drugs to fight diseases. Antibiotics can kill bacteria. However, they do not work on viruses, this is because viruses are very hard to kill because they live inside body cells. Painkillers are another group of drugs, these relive symptoms by blocking the brain's pain receptors, but do not tackle the cause.

Drugs have to go through extensive testing before they are approved for medical use. First, drugs are tested on computer models, as well as on human cells and tissues. Next, drugs are tested on animals. After passing the previous pre-clinical tests, the drugs are then tested on a small group of healthy human volunteers. These healthy volunteers are injected with a very small dose to determine its safety, then, once approved, the drug enters the next stage of clinical trials. This time, the drug is tested on people with the illness to ensure that the drug actually works, and to determine the correct dosage. During the clinical trials, placebo may be used. Placebo looks exactly like a real drug, but does not actually do anything. Placebo is used to compare the effects of the new treatment. A blind trial may be used during clinical testing. A blind trial is when the patient does not know whether they are receiving the drug, or placebo. A double blind trial is when neither the patient nor the doctor knows who has received placebo and who has received the drug. This makes results of the study less likely to be biased. The placebo effect is a psychological effect that occurs when a patient who has unknowingly taken placebo thinks that the treatment is working, when in reality, it is not doing anything.

Some plants use chemicals to defend themselves. We can get some important chemicals needed for drug production from plants. For example, we get the drug aspirin from willow, and digitalis from foxgloves. Microorganisms can also give us important chemicals for drugs. Penicillin comes from a mould called penicillium.

As well as chemical defenses, plants also have mechanical and physical defenses to stop the entry of pathogens. Their physical defenses include a waxy cuticle, cell walls, and an outer layer of dead cells. Plant's mechanical defenses include thorns, hairs, drooping or curling leaves, and some plants can mimic other organisms.

The final part of this topic is on monoclonal antibodies. Monoclonal antibodies are identical copies of one type of antibody. They are produced in the following stages:

1. A mouse is injected with a specific pathogen. This triggers the mouse's immune response.
2. The mouse's lymphocytes produce specific antibodies to disable the pathogen. These lymphocytes are known as spleen cells.
3. The spleen cells are extracted from the mouse and fused with tumour cells. This is because tumour cells divide rapidly, so, when fused with a spleen cell, the spleen cell can divide rapidly. The fused cells are called hybridoma cells.
4. Now, hybridoma cells are screened to ensure that they are creating the correct, desired antibody.
5. The hybridoma cells are then cloned to produce even more antibodies.
6. The antibodies are then harvested. These antibodies are called monoclonal antibodies because they have been cloned from a single cell.

Monoclonal antibodies have a range of uses. They can be used in diagnosis. Pregnancy tests use monoclonal antibodies that bind to the hormone HCG which is produced during the early development of an embryo and is present in urine. When a woman pisses on a pregnancy test, if any HCG is present, it will bind to the monoclonal antibodies and produce a colour change if positive.

Monoclonal antibodies are also used in research. They can be used to locate or identify specific molecules in a cell or tissue.

Monoclonal antibodies can also be used to measure and monitor hormone levels, and other chemical levels in the blood.

Monoclonal antibodies can also be used to treat some diseases. They can block the receptors on the surface of cancer cells and stop the cells from growing and dividing. Monoclonal antibodiescan also carry toxic drugs, radioactive substances, and chemicals around the body to attack cancer cells directly without damaging any other cells in the body.

Monoclonal antibodies have their advantages and disadvantages. An advantage is that they only bind to specific damaged or diseased cells so they do not affect healthy cells. The disadvantages include: They are very expensive to develop. They have many side affects. And they may cause harm to an animal.