Bacteria friend or foe? essay sample



Bacteria are the most ancient life forms, most bacteria are so small that under a light microscope you can only see them as little dots. Some groups however grow to larger sizes and have spectacular shapes (1). Bacteria are present in most habitats on the planet, growing in soil, water, acidic hot springs, radioactive waste, and deep in the Earth's crust, as well as in organic matter and the live bodies of plants and animals (2). Bacteria is mostly thought of as a pathogen, while it is true that bacteria are responsible for a large number of human diseases, they are also very beneficial to humans. Some of the benefits include the symbiotic relationship they have with other organisms, the recycling of nitrogen, carbon and phosphorus, which decomposes waste and dead organisms (3). Bacteria also provide the food production of some cheeses and yoghurts, the making of antibiotics and vaccines and they can also be used for research in genetics (4). Bacteria are the smallest cellular organisms and are the most abundant (4). Bacteria are tiny single-cell microorganisms, they are neither plants nor animals they belong to a group all by themselves and are usually only a few micrometers in length (5). Bacteria are generally distinguished from each other by their shape. Spherical bacteria are known as cocci, rod-shaped as bacilli and spirilla (4). Bacteria are prokaryotic cells, they have no nucleus or membrane bound organelles except for ribosomes.

Most bacteria have pili, flagella, and a cell capsule unlike animal or plant cells (5). Bacteriologists say bacteria are found absolutely everywhere except places that humans have sterilized. Even the most unlikely places where temperatures may be extreme, or where there may be a high concentration of toxic chemicals have bacteria, these are known as extremophiles (5). An extremophile is any organism adapted to living in conditions of extreme temperature, pressure, or, and chemical concentrations these bacteria can survive where no other organism can (5). The decision as to whether bacteria are friend or foe becomes more difficult when both the positive and negative aspects of the relationship between humans and bacteria are considered (3). There are three types of symbiotic relationships between bacteria and their host, commensalism, mutualism, and parasitism (2). Commensalism is a relationship that is beneficial to the bacteria which live off of the host, but does not help or harm the host.

Most of the bacteria that reside within the bodies of humans are commensalistic (3). In a mutualistic relationship, both the bacteria and the host benefit. For example, there are several kinds of bacteria which live inside the mouth, nose, throat, and intestines of humans and animals. These bacteria receive a place to live and feed while keeping other harmful microbes from taking up residence (3). A parasitic relationship is one in which the bacteria benefit while the host is harmed (2). Pathogenic parasites, which cause disease, do so by resisting the host's defenses and growing at the expense of the host. These bacteria produce poisonous substances called endotoxins and exotoxins which are responsible for the symptoms that occur with an illness (3).

Pathogenic bacteria can cause diseases in humans, in other animals, and also in plants (6). Some bacteria can only make one particular host ill; others cause trouble in a number of hosts, depending on the host specificity of the bacteria. The diseases caused by bacteria are almost as diverse as the bugs themselves and include food poisoning, tooth ache anthrax, even certain https://assignbuster.com/bacteria-friend-or-foe-essay-sample/ forms of cancer (6). The oral cavities, intestinal tract, and skin are colonized by enormous numbers of specific types of bacteria that are adapted to life in those habitats. These organisms are harmless under normal conditions and become dangerous only if they somehow pass across the barriers of the body and cause infection (7).

The few pathogenic bacteria that enter are body does so through internal surfaces, typically those of the respiratory, alimentary and urogenital systems. The external skin is such an effective barrier that is normally only crossed at a break, such as an open wound or insect bite is an entry point for bacteria (8). Tooth decay provides a good example of how multiple factors contribute to bacterial disease. Communities of bacteria form what are called biofilms on many body surfaces (9). Dental plaque is a biofilm covering the teeth. These bacteria ferment the sugar we eat to produce acids, which over time can dissolve the enamel of the teeth and create cavities in the teeth. The human body hosts the bacteria, the diet supplies the sugars, and the bacteria produce the acid that damages the teeth (9).

Bacteria diseases have played a dominant role throughout the world's history (6). As well as tooth decay bacterial diseases have also caused widespread epidemics of cholera and plague reducing populations of humans in some areas of the world by more than one-third. Bacterial pneumonia was probably the major cause of death in the older generation. Perhaps more armies were defeated by typhus, dysentery, and other bacterial infections than by force of arms (7). Cholera is an example of how a pathogenic bacterium occurs and the affect it has on the body. Cholera is caused by the gram negative, curved rod bacterium Vibrio Cholerae. This pathogen is https://assignbuster.com/bacteria-friend-or-foe-essay-sample/ usually acquired through drinking water that is heavily contaminated by the feces of patients or carriers of the pathogen (7). It is also possible the bacterium may also introduced on food contaminated by flies that have previously feed on feces, or via eating raw shellfish taken from waters polluted with untreated sewage rich in V. cholerae (10).

Cholera is an infection in the small intestine, the main symptoms are profuse, watery diarrhea and vomiting. The severity of the diarrhea and vomiting can lead to rapid dehydration and electrolyte imbalance, and death in some cases (10). These symptoms are caused by the pathogen increasing in numbers and attaching itself to the epithelium membrane (6). The release of enterotoxin follows. The effect of the toxin is to trigger a loss of ions from the epithelium, which will lead to an outflow of water (6). The primary treatment is oral rehydration therapy, typically with oral rehydration solution, to replace water and electrolytes. If this is not tolerated or does not provide improvement fast enough, intravenous fluids can also be used. Antibiotics are beneficial in those with severe disease to shorten its duration and severity (10).

An antibiotic is an agent that inhibits bacterial growth or kills bacteria. They are a natural occurring chemical substance and are one of the many beneficial uses of bacteria. Antibiotics are obtained from bacteria and also certain types of fungi (7). Before bacteria can multiply and cause symptoms, the body's immune system can usually destroy them. Humans have special white blood cells that attack harmful bacteria. Even if symptoms do occur, the immune system can usually cope and fight off the infection. There are occasions, however, when it is all too much and some help is needed from https://assignbucter.com/bacteria friend or foo assay sample/ antibiotics (11). An antibiotic is given for the treatment of an infection caused by bacteria. Antibiotics target microorganisms such as bacteria, fungi and parasites. However, they are not effective against viruses (11).

Many different antibiotics have been discovered, and new ones are continually being searched for. Some new discoveries are effective and are not toxic to patients, there is however problems with antibiotics with time (7). Over time the pathogenic bacteria build up a resistance to the antibiotic, either by mutation or gene transfer between bacteria by conjugation (7). The pharmaceutical industry faces the challenge of producing new antibiotics more quickly than bacteria can develop to resist them (7).

As well as the medical uses bacteria are also beneficial within the industry and ecosystem (2). The ecosystem, both on land and in the water, depends heavily upon the activity of bacteria. The cycling of nutrients such as carbon, nitrogen, and sulphur is completed by their ceaseless labour (12). Organic carbon, in the form of dead and rotting organisms, would quickly deplete the carbon dioxide in the atmosphere if not for the activity of decomposers. This may not sound too bad to you, but realize that without carbon dioxide, there would be no photosynthesis in plants, and no food. When organisms die, the carbon contained in their tissues becomes unavailable for most other living things. Decomposition is the breakdown of these organisms, and the release of nutrients back into the environment, and is one of the most important roles of the bacteria (12). The cycling of nitrogen is another important activity of bacteria (12). Although the atmosphere contains 78% nitrogen, very few organisms can use this gaseous nitrogen directly. Instead they depend upon soil minerals, especially nitrates, as their source of nitrogen (4). https://assignbuster.com/bacteria-friend-or-foe-essay-sample/

Surrounded by an atmosphere abundant in nitrogen, the growth of many plants is stunted by lack of it (4).

The primary way in which nitrogen becomes available to them is through nitrogen fixation by bacteria such as Rhizobium, and by cyanobacteria such as Anabaena, Nostoc, and Spirulina (12). These bacteria convert gaseous nitrogen into nitrates or nitrites as part of their metabolism, and the resulting products are released into the environment. Some plants, such as liverworts, cycads, and legumes have taken special advantage of this process by modifying their structure to house the bacteria in their own tissues (12). The saprotrophic bacteria and fungi in the soil community break down organic matter in the soil such as dead remains of organisms, waste matter excreted by animals, humus around soil partials and a lot more (8). The final products of the break down include carbon dioxide, water and a range of metal and non-metal ions. The combined nitrogen present is reduced to ammonia. The ammonia is guickly oxidised to nitrate ions by enzymes of bacteria (8). Other denitrifying bacteria metabolize in the reverse direction, turning nitrates into nitrogen gas or nitrous oxide (12). This process is carried out by anaerobic bacteria like Pseudomonas denitrificans and Thiobacillus denitrificans. The necessary anaerobic conditions are more likely in waterlogged soil.

When colonies of these bacteria occur on croplands, they may deplete the soil nutrients, and make it difficult for crops to grow (4). Biological warfare is the use of disease causing microorganisms as military weapons (13). Biological warfare is an example of how bacteria can be used as against humans and the environment, it is capable of causing sickness or death in humans or animals, destroying crops, or contaminating water supplies (13). https://assignbuster.com/bacteria-friend-or-foe-essay-sample/

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Biological weapons include any organism such as bacteria, viruses, or fungi or toxin found in nature that can be used to kill or injure people (14). The act of bioterrorism can range from a simple hoax to the actual use of these biological weapons, also referred to as agents (14). One of the earliest recorded uses of biological weapons occurred in the fourteenth century.

Invading Asian armies used a catapult to hurl bodies of plague a deadly, highly contagious disease caused by a bacterium, victims over city walls to infect the resisting townspeople (13). Various bacteria have been used or experimented with as biological weapons. Anthrax is an infectious disease that can be passed from cattle and sheep to humans. Inhaling anthrax spores can result in a deadly form of pneumonia. During World War II (1939-1945), Japan and Great Britain built and tested biological weapons carrying anthrax spores, and the inhalation of anthrax may still be a threat as a biological weapon today (13). Biological warfare is among the least commonly used military strategies. Most military leaders have been reluctant to release microorganisms that might cause an uncontrolled outbreak of disease, affecting not only the enemy but friendly populations as well (13).

When all of the facts are considered, bacteria are more helpful than harmful (3). Humans have exploited bacteria for a wide variety of uses, such as, making cheese, the decomposing of waste in sewage plants and the production of re-reusable water is also possible using a number of microorganisms (8). Bacteria also benefit humans threw manufacturing processes such as making soap powders, tanning leather and retting flax to make linen (4). Bacteria would have been able to survive without us, but we could never live without them (3).

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