Science of bacteria in the human body

Lab Write-Up

For centuries, scientists have studied the microorganism bacteria. Modern Society is still perplexed by bacteria, and we continue to study it. Bacteria were among the first life forms to appear on Earth about 4 billion years ago that fall into the two kingdoms: Archaebacteria and Eubacteria which make up the Monera family. Bacteria is a prokaryotic cell: a member of the unicellular organisms that lack a nucleus and other membrane-bound organelles. The genetic material in Bacteria is one continuous, circular DNA that lies freely, and why they lack a nucleus Bacteria may have flagellum or cilia, a long fiber that helps with the mobility of the organism. Bacteria host a bacterial chromosome, a plasma membrane, ribosomes, a cell wall composed of peptidoglycan, and may have flagella or cilia. In order to reproduce, bacteria undergo the process of binary fission; asexually reproducing replicate bacteria. In addition, Bacteria has many different types and one way of classifying them is by shape. Bacteria can be identified using different staining processes such as acid fast and gram staining.

There is good bacteria and bad bacteria in our society. According to Koch’s and Pasteur’s work, Microorganisms can cause disease in people, animals, and even plants. Antibiotics has been an advancement that can kill these bacteria in which it cannot harm the organism. They fight against bacterial infections via preventing bacteria from spreading, or killing the bacteria (Brian 2014). Antibiotics are designed to eradicate a certain characteristic vital to the bacteria and not the human cells. Antibiotics kill bacteria in a variety of ways. Some antibiotics can halt specific enzymes that perform the job for the bacteria. This generally stops the transcription and translation in

bacteria, therefore no decoding will occur, the genetic message will be halted as well that is typically performed by mRNA. Halting specific proteins can also block the movement of each protein to its final location, it can also block the import of specific compounds that are crucial to the survival of the bacterium. Most antibiotics alter the structure of the bacteria in turn making the bacteria unable to handle environmental pressures and stress. This essentially causes the bacteria to explode, therefore dying. Alternatively, *narrow-spectrum antibiotics* attack very specific structures in the bacteria different of that from humans. The specific antio beta-lactam antibiotics exert their effect by disrupting the manufacture and construction of peptidoglycan which is what the bacteria's cell wall and backbone and provides rigidity and strength to the bacteria. " The disruption can occur by either blocking construction of the subunits of the peptidoglycan or preventing their incorporation into the existing network" (Brian 2009). This component is a thin layer located between the inner and outer membranes of Gram-negative bacteria. Aminoglycoside, another variant of antibiotics, works by binding to certain regions of the cellular structure known as ribosomes. Ribosomes serve to decode the information within mRNA responsible for producing proteins. In this way Aminoglycoside disrupts protein production, which is often fatal for the bacterium. (Lerner 2009). In addition, quinolone antibiotics is a toxicity to the genetic material in the bacteria called DNA. DNA as discussed before, is running freely in the bacteria so it is easily targeted. This type of antibiotic destroys the enzyme called helicase that unwinds the DNA material. This unwinding is essential to the bacteria in that it is the vital process for DNA replication and it supports the jobs of other proteins. These antibiotics kill bacteria at the genetic level.

Lastly, the antibiotic called sulphonamides essentially stop the multiplication of these bacteria. Basically it stops the bacteria from performing self-replication in which is harder to kill later.

E-Coli B, E-Coli C, R. Rubrum, B-megaterium, and B, catarrhalis are among the main bacteria that are studied by scientists today. The first bacteria in which has been tested in labs is E. coli. There is not a lot of information on this today. E. coli comes into two forms: E. coli B and E. coli C. E. coli is one of the bacterium's that are healthy to human beings and an essential to the biosphere. E. coli is located in the lower gut of human beings that includes the stomach and intestines However, " when *E. coli* is consumed in contaminated water, milk, or food or is transmitted through the bite of a fly or other insect, it can cause gastrointestinal illness"(Brian 2014). E. coli are responsible for many diseases that include, pneumonia, meningitis, and traveler'sdiarrhea. Diving into the characteristics , E. coli B is in a shape of a straight rod. It is composed of a flagellum, that is a structure shaped as a tail used for mobility . It is anaerobic and capable of fermentative metabolism. E. coli C and E. coli B differ in their flagellum. E. coli C has multiple flagellum wheareas E. coli B only contains one. R. rubrum is another classification of bacteria. " They are the only known species of its kind which produces maximum amounts of intracytoplasmic photosynthetic membranes (PM) under"(Carius 2013). It is a type of bacterium shaped in a bacilli that can grow in multiple conditions including anaerobically or arerobically. In that case it can grow and be found in ponds, lakes (no oxygen) and it is found on the drylands(oxygen). In order for this bacteria to thrive it must grow under

optimal temperatures which is 25-30 degrees Celsius. Unlike E. coli It does not infect animals or humans.

Bacillus Megaterium is another classification of bacteria. Its shape is rod like and is found in multiple habitats. It is considered Aerobic, but, it is also capable of growing under anaerobic conditions when necessary. It’s name is derived from the word mega meaning large or relatively big. Hence, the name B. megaterium is 100 times the size of E. coli and one of the largest Eubacteria found in soil. *Bacillus megaterium* is able to survive in conditions relatively hot because of its spores that it forms, a unique characteristic. Some are located in the desert and are able to live. It is motile, with the use of its flagella. It is different from the other 4 bacteria in that it is considered a “ Saprophyte” which is a fungus or an microorganism that lives in dead or decaying organism. Another characteristic of this bacterium is the cell wall, and like any other bacteria it has large amounts of peptidoglycan. Lastly, B. Catarrhalis is a bacterium that has been studied throughout history. It is considered to belong to the subgenus Branhamella and “ are members of the Neisseriaceae”(OBI)It is an aerobic bacterium, meaning that it can only live under conditions that have oxygen. The shape of this bacterium is a shape of diplococci (group of 2). This species is known for its respiratory infections that it has caused.

For the purpose of classifying bacteria, this experiment utilizes procedural analysis to identify and describe the various specimen. To prepare for observation, bacteria were dry mounted into slides and heat fixed. Subsequently, they were stained with two different methods — Gram Stain and Acid Fast. Because the better part of our inspected bacteria have an

outer cell membrane, we hypothesized that most of our stain results would be gram-negative.

Bibliography

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