Phage Alternatives to Bacterial Superbugs

Word Count 1650

Palm Beach State College
Phage Alternatives to Bacterial Superbugs

We live in a world not ruled by giant’s but by the smallest organisms that build up most of our biodome. The biodome is the area surrounding planet Earth where ever life exists. “There are far more bacteria on earth than there are stars in the universe” (Dr. Whitehouse, 1998). Modern medicine has developed and used antibiotics for a relatively short time. “Penicillin was the first antibiotic, discovered by Alexander Fleming in 1929” (BBC, 1999). More often than not people become ill due to antibiotic resistant bacterial infections. Bacterial infections are caused when a bacterium also known as a pathogen finds a host to inhabit. There are obvious side effects of a bacterial infection. The body normally reacts when being harmed by an invader. Symptoms very through various strains of bacteria and possible death can occur when pathogens are left untreated. Bacterial superbugs are out growing the scientific medical research currently at our disposal and as a result we are in a race to prevent a major pandemic if left unresearched. We live in a constant race against the harmful bacteria and we struggle as they continue to mutate and build defenses to antibiotics.

Humans are more susceptible to superbugs since the creation of antibiotics, and the potential for a pandemic to occur has risen. These so-called superbugs are bacteria that have developed mutations that protect them from most if not all antibiotics. To develop knew antibiotics takes time and many people may die before an alternative is to be found. Since the dawn of life, it has been survival of the fittest. Just like most habitats there is usually competition for food and resources. Some bacteria produce metabolites that act as chemical weapons, which are used to kill off the competition (Amyes, pg. 7, 2013). The chemical metabolites are the antibiotics. Bacteria can also fall victim to other predators. Bacteriophage also known as phage are a group of viruses that use bacteria as a reproduction vessel. “Bacteriophages were
discovered independently by Frederick W. Twort in Great Britain (1915) and Félix d’Hérelle in France (1917)” (Britannica, 2017). The phage only attack their primary bacteria by injecting their DNA in order to replicate and in the process may rupture the bacteria killing it effectively. Figure 1-1 illustrates a Bacteriophage taking over its primary bacteria.

(Figure 1.1) Bacteriophage injecting DNA into bacteria

The virus does not attack healthy human cells. "Bacteriophage literally means bacteria eater," (Scitable. n.d.). Evolution has naturally produced mutations in these fast reproducing microbiomes. The small organisms that call earth home have mastered survival. “Bacteria differ
from other organisms because they are single cells also known as prokaryotes that don’t have defined compartments within their biological structure,” (Amyes, pg. 1, 2013).

Today most people do not bother to worry about bacterial infections that would have once killed easily without antibiotic treatment. On the contrary bacterial infections have become more of threat than ever before. History tells of numerous plagues that ravaged humanity and even in the present. It is scary to think that humans are out numbered by bacteria. Not all bacteria are harmful. Think of the human body as a factory. Some stages of the body processes require outside help for certain jobs. Bacteria can affect humans with mutual benefits or remain neutral. Humans provide a habitable zone for healthy bacteria to grow and in turn they provide certain benefits. For example, there are numerous types bacteria that help the digestive system function properly in humans (Amyes, pg. 12, 2013).

It has become a priority to research all possible medicines against an inevitable superbug doomsday. It becomes important to find cures to infections that were once treatable. Treatment becomes imperative as Humans become connected more every day. “Each year in the United States, at least 2 million people become infected with bacteria that are resistant to antibiotics and at least 23,000 people die each year as a direct result of these infections” (CDC, 2018). Within a day a human can travel completely around the earth. The possibility of a bacteria becoming a global pandemic has become a global health risk concern.

It is important to establish the differences between healthy bacteria and pathogens also known as infectious bacteria. Most antibiotics are derived from chemical byproducts produced by competing bacteria, or fungi that fight over the same resources. There is a whole field of research left neglected with in the medical study of antibiotics. Western medicine immediately stuck to antibiotics when they hit the market. Antibiotics where readily available quicker and
cheaper to produce. Although antibiotics are useful they do come with negative side effects. For example, antibiotics are indiscriminate killers and reap damage on healthy bacteria essential to human functions. Over prescription, agriculture, and patients not following instructions are also to blame for the explosion of superbugs. One of the biggest contributors to this world-wide problem has been the agriculture industries. Most animals farmed are showered with antibiotics due to the terrible living conditions they are placed in. “Globally, more antibiotics are prescribed to treat animals on farms than to treat humans” (PETA, 2016). To make it simple antibiotics are not a long term solution and other alternatives must be achieved.

During the same developmental period of antibiotics, bacteriophage was exclusively being study in the eastern hemisphere, such as Russia and Georgia. It has been estimated that for every piece of sand there is a trillion bacteriophage (keen, pg. 7, 2015). Bacteriophage exist in almost every environment. The viruses can be extracted from dirt or even garbage. The point is that there are numerous variations of bacteriophage. Due to the vast diverseness of these bacteriophage, it can be plausible that there is one for every kind of bacteria. Further research in bacteriophage and alternative antibiotics can develop knew medical benefits. Phage are not a cure-all solution to antibiotic resistant bacteria. Phage have many setbacks. The vast amount of phage has yet to be genome sequenced. It is very important to sequence the virus. Sequencing the genome of a phage, allows for the process of identifying the individual pieces that make up DNA (GNN, 2003). Once the genome has been completed on an individual phage, the scientist can then figure out beneficial genes that are used to kill bacteria. Once the phage is identified further clinical trial can start. Because the study of phage has been pacing so far behind antibiotics there is a limited amount of knowledge on what is effective. For the very same reason that the study of
phage has been delayed further studies have not been approved by most western countries. We are constantly locked in warfare against these tiny organisms every day.

The continued use of antibiotics without an alternatives plans has become detrimental to all of society. Mankind must come together to support research and diversification to this man-made problem. In *The Handmaid’s tale*, Offred on and off talked about how infections and other diseases caused infertility around the world placing her in a situation as surrogate mother (Atwood, pg. 69, 1998). Well most of the common bacterial STDs can cause infertility if left untreated and many of those same STD’s have become superbugs. Gonorrhea has diversified and some of variations of the bacteria have become resistance to most antibiotics currently at our disposable. Cephalosporin is the last known antibiotic known to work on drug-resistant Gonorrhea (CDC, 2018). “Cephalosporin-resistant gonorrhea would significantly complicate the ability of providers to treat gonorrhea successfully” (CDC, 2018). The common perception is that most STDs are bacterial and can be treated. Reality starts to sink in when the statistics of how many people become infected in the United States each year. “DC estimates that approximately 820,000 new gonococcal infections occur in the United States each year, CDC estimates that 570,000 of them were among young people 15-24 years of age” (CDC, 2018).

As citizens of the world everyone shares the burden of maintaining public health. “Medical technology has had a significant, positive impact on economic growth. While GDP measures the size of a nation’s economy, it can also measure economic and human development of said nation” (Rosenblum, 2016). The advancement of society can be attributed to health. The less there is to worry about the more humans can advance in all aspects of life. It becomes important to treat those who are currently affected by bacterial superbugs. If as a society everyone chooses to leave this issue unattended, the world maybe become ravaged by bacterial
diseases and loss of life. It is important to sequence genomes of more phage and stockpile an arsenal of anti-bacterial cures. These tiny monsters have been doing this for millions of years, and we need to catch up. We must find every possible alternative to combat superbugs.
References


References

