

## Fighting Back by Mary Kathryn Dickinson

For countless years, bacteria has been waging an invisible war against mankind. Some are aware of this war, most are oblivious, and some simply deny its existence. In this war, knowledge of the struggle is one of the most important factors in victory. Infectious bacteria are becoming immune to antibiotics and antibacterial chemicals due to their overuse. Without antibiotics and antibacterial chemicals, the human race is at a serious disadvantage, causing us to be once again susceptible to many historically deadly epidemic infections. Nevertheless, antibiotic resistance will continue to increase if nothing is done to impede it. This fast-acting enemy is not one to take lightly. Antibiotic resistance is a growing problem for mankind, but simple steps to halt it can be taken now.

According to the Centers for Disease Control, "Antibiotics...are drugs that fight infections caused by bacteria." Antibiotics entered the scene after the accidental discovery of penicillin in 1928. Scottish microbiologist Alexander Fleming was experimenting with *Staphylococcus aureus*, a notorious cause of life-threatening wound infections, when one of his experimental cultures was accidentally exposed to a fungus known as *Penicillium notatum* (Salyers 19). Fleming later observed this tainted plate and saw what is now known as a zone of inhibition, or a small area around the fungal growth that contained no bacteria (Salyers 20).

The discovery of *Penicillium notatum's* ability to produce an antibiotic chemical led to the mass production of the first antibiotics. During World War II, antibiotics were produced in enormous quantities and easily accessible to inhabitants of industrialized countries. The period that followed was one of huge medical success. Many major diseases were brought under control, and battles with infections were no longer the leading cause of death for soldiers. Antibiotics were hailed as "miracle drugs." According to Michael Blum, medical officer in the Food and Drug Administration's division of anti-infective drug products, "The perception was that we had licked the bacterial infection problem. Drug companies weren't working on new agents" (qtd. in Lewis). However, overuse of these same drugs leads to antibiotic resistance, a problem that has dramatically increased in the last twenty years.

Quite often people with a cold, the flu, or other viral infections demand antibiotics from their doctor, causing antibiotics to be frequently prescribed without due cause. Ailments such as the ones mentioned above are caused by viruses, not bacteria, and antibiotics have no positive effect on the patient. Use of antibiotics when not needed allows for some of "good" bacteria present in your body to die, while some survive due to genetic mutations that allow them to evade the effects of the antibiotic. When a "bad," or infectious, bacterium is introduced to the body, the harmless bacteria that are resistant to antibiotic activity pass on that ability. Resistance, along with many other genetic mutations, can be passed from the "good" bacteria to the "bad" bacteria via three forms of bacterial sex known as transformation, transduction, and conjugation (Lewis). As a result of this interaction, DNA is passed between two bacteria, in this case, the harmful and the harmless.

In our day-to-day lives, we use many items and medicines that contain the key causes of antibiotic resistance. A lesser known cause is overuse of a chemical called triclosan. This antibacterial agent appears in many consumer products such as soaps, deodorants, toothpastes, shaving creams, kitchen utensils, toys, bedding, socks, and trash bags (Glaser 12). Triclosan is an antibacterial chemical that works by inhibiting the construction of cell membranes. An article published by the National Coalition Against the Misuse of Pesticides explains that antibacterial chemicals such as triclosan "are similar to antibiotics in that they both hinder bacterial growth" (Glaser 12). However, the two are different in that antibiotics are meant to cure disease while antibacterials are meant to prevent transmission of malignant bacteria (Glaser 12). The precautions provided by antibacterials have proven to be very useful in hospital settings. Use of triclosan in hospital soaps has dramatically decreased the occurrence of *staph aureus* (more commonly known as staph infection); however, it is not necessary for everyday wellness (Glaser 13). Triclosan use in hospitals is understandable, if not necessary, but the use of it in millions of household items is simply overkill. In the year 2000, Dr. Eli Perencevich, who studied common consumer goods, discovered that "over 75% of liquid

soaps and nearly 30% of bar soaps...contained some type of antibacterial agent. Nearly half of all commercial soaps studied contained Triclosan” (qtd. in Glaser 13). Because this chemical is present in so many consumer goods and household items, mutated bacteria become immune to its effects, and researchers speculate that this immunity will lead to antibiotic resistance (Glaser 14).

The two aforementioned causes for antibacterial resistance are obviously not the only causes but are major constituents in the spread of the problem. Accordingly, we must monitor and decrease our use of antibiotics and bacteria-fighting chemicals in order to prevent them from becoming obsolete. The American College of Physicians provides steps one can take in order to prevent antibiotics from becoming ineffective. First, avoid insisting upon the use of antibiotics when it is clearly unnecessary. According to the American College of Physicians, half of the 100 million antibiotics prescribed per year in the U.S. are unnecessary. If you have an ailment that is not caused by a bacterial infection, do not use or request antibiotics. Second, it is very important to follow the doctor’s instructions on how to obtain and use the medicine. By obtaining antibiotics legally and using them as directed, we reduce the spread of antibiotic resistance. Third—the easiest and perhaps the most important of the techniques—is merely to wash your hands frequently and keep your immunizations up to date. Washing hands and keeping current on your immunizations is enormously important. By reducing illness, we reduce the need for antibiotics, thus preventing the problem as a whole. Lastly, instead of continuing to use antibacterial soaps like “Micrell” and “Dial,” one can use regular soap with no antibacterial chemicals present. If you are concerned that plain old soap just isn’t doing the trick, you can use alcohol-based hand sanitizers that use ethanol to effectively kill bacteria on your hands. These easy steps, if followed by people around the world, could dramatically reduce the overuse of antibiotics and the progression of antibiotic resistance.

If adopted on a wide scale, the steps listed above would dramatically reduce antibiotic resistance. Individual responsibility is absolutely key; however, the government could also aid in slowing the progress of antibiotic resistance. Stricter government regulation of the number of antibiotics prescribed per year would help to do this. If the government monitored the number of prescriptions written, fewer people would receive the treatment when unnecessary. Also, limiting the amount of triclosan put in consumer goods would be beneficial, for it could seriously inhibit antibiotic resistance. The limitations on triclosan use would also allow this antibacterial chemical to counter the spread of infection in hospitals around the world.

Antibiotics are essential to human survival. Before their use, epidemics of bacterial infections such as cholera and the bubonic plague ravaged the world and caused many unimpeded deaths. If used correctly, antibiotics could continue to supply remedies to many common sicknesses, and thus protect human life. Antibiotic resistance is a rampant phenomenon due to the incredible rate of bacterial reproduction, and if left unhindered, it could completely destroy the effectiveness of antibiotics. With smart use of antibiotics and a more limited use of triclosan-containing products, we can prevent this problem and continue to benefit from the miracles of antibiotics.

#### Works Cited

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