

There was a time when medical science believed it was invincible. With the development of antibiotics, once life-threatening bacteria like gonorrhea, syphilis, tuberculosis, and scarlet fever became treatable ailments. In 1979, the World Health Organization declared success in ridding the world of smallpox, showing the power of vaccinations. Beliefs started circulating that human illness would be a thing of the past. Modern medicine could develop a cure or vaccine for any microscopic foe. Unfortunately, that peaceful state of mind ended shortly. The onslaught of HIV in the early 1980's showed that Mother Nature was not without new weapons. Ebola surfaced in Africa killing an unprecedented 97% of its victims. With the incredible hazard these viruses pose, public attention has been ignoring a growing threat happening world wide, and even in our own hospitals. The miracle of antibiotics is creating a looming fallout in the medical world where once fatal, now curable diseases, are becoming fatal once again. For a variety of reasons, bacteria are developing resistances to antibiotics and are slowly growing in numbers.

To begin, bacterial infections are different than viral infections. Bacteria are much larger than viruses, able to be seen under a normal microscope. Everything from the green mold on bread to making cheese is caused by different bacteria. Certain bacteria cause infections in humans. Unlike viruses, bacteria can be cured. Viruses are twenty to one hundred times smaller than bacteria and can only be seen using special, electron microscopes. Viruses like the common cold and the flu cannot be cured once

you get sick, although vaccines can be administered in order to prevent a person from ever becoming sick.

Bacteria gain a resistance to antibiotics through evolution. When a person infected with a bacteria is given antibiotics, those antibiotics kill most, if not all of the bacteria. If the antibiotics do not kill all the bacteria, that bacteria might have evolved a defense against the antibiotic, a trait it reproduces in its millions of offspring; the way tuberculosis evolves. Another way bacteria become drug resistant thrives inside areas of high infestation like hospitals. A person in the hospital being treated with one bacterium may contract another bacteria from another patient. The new bacteria trade DNA with the other bacteria, trading a genetic immunity to the antibiotics. Gonorrhea became resistant to penicillin in this manner. Because this is a part of evolution, different strains of different bacteria will exist. A person may contract a strain of gonorrhea resistant to penicillin while another may contract the strain that is not resistant. The survival of the fittest threat is that the more drug-resistant strains will continue to spread.

Numerous factors have contributed to the development of drug resistant bacteria. The largest factor has arguably been the overuse of antibiotics. Because of the public view that modern medicine had defeated its foes, people demanded results when they were sick. Doctors prescribed antibiotics in cases where mild infections were present or viruses were the cause, meaning the antibiotics wouldn't even work. Healthcare organizations outline guidelines for the administration of these medicines, but the Center for Disease Control reported in 1999 that 60% of hospital prescriptions for vancomycin did not follow guidelines. A 2004 study in Washington state found that 20% of adults

asked for antibiotics before recommended by their health care provider. Michael Blum, M.D. of the Food and Drug Administration says “There was complacency in the 1980s. The perception was that we had licked the bacterial infection problem. Drug companies weren't working on new agents. They were concentrating on other areas, such as viral infections. In the meantime, resistance increased to a number of commonly used antibiotics, possibly related to overuse of antibiotics. In the 1990s, we've come to a point for certain infections that we don't have agents available.” Furthermore, patients who do not complete their dosage risk spreading drug-resistant strains of bacteria. The more resistant bacteria may survive until the last few days of your medication, which is why doctors say patients need to complete their full dosage, regardless of whether they feel better or not.

Hospitals have helped spread drug-resistant strains, most often due to patients contracting new infections while in the hospital. The Nation Institute of Allergy and Infectious Diseases, a division of the U.S. Department of Health and Human Services reported in April of 2004 that two million patients got an infection while in a United States hospital. 90,000 of those patients died as a result of those infections, up from 13,300 deaths in 1992. Over 70% of the bacteria contracted during hospital stays are resistant to at least one antibiotic used to combat the infection.

The last major contributor to drug-resistant bacteria is found in livestock. Caretakers and farmers give their livestock numerous antibiotics even when the animals are not sick in order to prevent illness in the future. Sometimes lower doses are fed to the animals through their food. As a result, animals may have bacteria in them without

symptoms. The National Antimicrobial Resistance Monitoring System found that 11,477 people contracted the bacteria *Campylobacter* from chicken treated with the antibiotic *fluoroquinolone*. Even in people, the bacteria were resistant to the antibiotic.

Health organizations are actively trying to prevent further antibiotic resistance. Though officials admit resistance is inevitable, slowing the spread of resistant strains and developing more drugs will help. The CDC and other organizations are advising health care providers about recommended treatments and the guidelines with which to use them. Emphasis is put on keeping “last resort drugs” safe from resistance, though vancomycin, considered the “last resort” for many infections, is being found ineffective against a select few bacterial strains. Nevertheless, progress is being made slowly, mostly by ensuring that patients take their medications correctly. Efforts are being made to monitor drug-resistant stains in hospitals and provide improved sanitation in developing nations. The fear is still there as education remains limited regarding these “super bugs.” Globalization has helped the spread of drug-resistant bacteria; drug-resistant gonorrhea came to America through soldiers who contracted the bacteria from prostitutes in Southeast Asia during the 1970’s. Education, moderation, and awareness can stave off further resistance. But solutions are far from found.

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