AMERICAN SOCIETY OF SAFETY ENGINEERS
NORTH FLORIDA CHAPTER

JUNE 2016 NEWSLETTER

Antibiotics and Ants

In an advisory dated June 13, 2016, the CDC shared important and concerning health information with the world. The advisory starts out with some technical jargon. *"Escherichia coli* (*E. coli*) bacteria carrying the *mcr-1* gene were found in a urine sample from a person in Pennsylvania with no recent travel outside of the United States who presented to a clinic with a urinary tract infection."

In simpler English, this person has potentially-harmful bacteria in their body that the medical community does not presently know how to destroy. The bacteria in this person's body are resistant to colistin, which is a last-resort drug used to treat infections caused by multidrug-resistant bacteria. This particular bacteria is allegedly also resistant to antibiotics in at least five other classes, including cephalosporins, fluoroquinolones, sulfonamides, minoglycosides, and tetracyclines.

Many of us have at some point in our lives received a course of antibiotics to treat some type of bacterial infection. However, present-day treatment options are becoming limited for many infections. This is because some bacteria have developed resistance to multiple antibiotics. Two of the most notable bacteria to have done this are the 'superbug' methicillin-resistant Staphylococcus aureus (MRSA) and the recently-emerged totally drug-resistant tuberculosis (TDR-TB). Some doctors and researchers believe that antibiotic resistance is presently a global threat to health and warn that infections which have been fairly benign and treatable for many years can once again make humans very ill or even cause death.

According to the National Institute of Allergy and Infectious Disease (NIAID), microbes, such as bacteria, viruses, fungi, and parasites, are living organisms that evolve over time. Their primary functions in life are very simple; they are to reproduce, thrive, and spread quickly and efficiently. Therefore, microbes adapt to their environments and change in specific ways that ensure their survival. If something stops their ability to grow, such as an antimicrobial, genetic changes can occur that better enable the particular microbe to survive.

The NIAID tells us that there are several ways that microbes' chance of survival can be elevated. One is selective pressure. In the presence of an antimicrobial, microbes are either killed off or, if they carry resistance genes, survive. The survivors then replicate, and their descendants will quickly become the dominant type throughout the existing microbial population. Another way is mutation. Most microbes reproduce by dividing every few hours. This rapid reproduction allows them to evolve swiftly and adapt very quickly to new environmental conditions. During this replication process,

mutations arise and some of these mutations may help an individual microbe survive exposure to an antimicrobial. Yet another way that microbes can adapt is through gene transfer. With this methodology, microbes may receive genes from each other, including ones that make the microbe drug resistant. Moreover, inappropriate use of antibiotics, overuse of antibiotics, and adding antibiotics to agricultural feed are all believed to contribute to the growing level of antibiotic resistance.

Now let's talk about the positive news. Scientists at the University of East Anglia in the United Kingdom believe that three colonies of leafeater ants could be the key to developing new strains of antibiotics. Yes, that's right, ants. Leafcutter ants collect plant material and feed it to what is known as a symbiotic fungus – essentially, colonies of fungi that share nutrients, play well together, and thrive. This symbiotic fungus is the sole source of food for their larvae.

The pioneering research by the University of East Anglia's School of Biological Studies is focused on a particular type of fungus the ants eat, and also how the ants' natural resistance protects it. Leafcutter ants create a warm, humid environment to grow their fungus. Unfortunately, this environment is attractive to many other parasitic and disease-causing microbes. To protect their food source, the worker ants constantly patrol their fungus gardens and then miraculously remove unwanted bacteria and fungi.

Certain species of ants, leafcutter being one, grow what is called symbiotic filamentous actinobacteria on the outside of their bodies. From these actinobacteria, antibiotics are produced that kill off the unwanted microbes. Then, when an ant colony produces new queens, they take a piece of the fungus and some of the actinobacteria with them to start their new colonies. The fungal and bacterial organisms are then able to be passed directly to future generations.

So, scientists are currently thinking that if they can study these ingenious ants and figure out how they have been doing this for some 50 million years, there will be renewed hope for the human race. And the next time you consider stepping on an ant, it would likely be better for humankind if you didn't.

Bob Dooley

Photo Source = www.dailymail.co.uk

Article Sources and Hyperlinks of Interest

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ASSE Local Chapter Meeting Schedule

We are currently participating in summer break and hope that you and yours have a safe and fun-filled summertime.