Battle-Hardened Bacteria. Drug-resistant bugs are smart, so new types of antibiotics are finding ways to be smarter

WHEN ANDREW SPEAKER BOARDED AN AIR France flight for Paris last month carrying a form of extensively drug-resistant tuberculosis, he became a global pariah—both for the lethal bug in his system and for the folly of exposing other people to it. But while Speaker may have been reckless, the blame for the emergence of drug-resistant bugs like the one he is incubating falls partly on the rest of us. For years public-health officials have been raising the alarm about how our overreliance on antibiotics is breeding a generation of superbugs, increasingly resistant to the medicines designed to kill them. The problem has only gotten worse as antibiotic use has expanded to agriculture, where cattle, chicken and fish are routinely treated with the drugs to keep infectious diseases in check.

According to the Centers for Disease Control and Prevention, more than 70% of the bacteria that cause infections in hospitals are resistant to at least one antibiotic. Methicillin-resistant Staphylococcus aureus (MRSA), which causes boils or pimples on the skin, is only the latest superbug to make the rounds and has appeared in dozens of high school and college athletic locker rooms, as well as in three NFL locker rooms. Drug-resistant tuberculosis cases, including those of the variety affecting Speaker, have risen along with peaks in MRSA cases, as people with weakened immune systems are especially vulnerable to infection with multiple bugs.

The only way to thwart the bacteria, say public-health officials, is to curb the use of antibiotics. That's not likely to happen, with antibacterial hand sanitizers now in handy pocket packs and few folks willing to tough out a throat or ear infection without pharmaceutical help. The more the bugs come into contact with such agents, the faster bacteria find ways to mutate around them.

And that points to a fundamental weakness of current antibiotics. All exploit the fact that the agents to kill bacteria come from other bacteria. Each species makes toxins that can either kill other species or arrest their growth, and existing antibiotics are modified versions of these natural defenses. But that is just the kind of biological arms race that microbes and other living things excel at adapting to. So researchers work-

Researchers working on the next generation of antibiotics are exploiting new knowledge about bacterial genetics streptococcus and anthrax and hopes to eventually treat infected patients by squirting the enzymes in nasal-spray form weekly.

None of these agents are quite ready for the pharmacy yet, and until they are, researchers are focusing on new ways to maximize the power of drugs we do have. By studying bacterial DNA, scientists at the Naval Research Laboratory are decoding the genetic battle plans that the bugs use to develop resistance. These secrets can help doctors prescribe antibiotics more effectively by knowing which strains are most susceptible to which drugs.

As the TB scare reminded us, that's important in a world in which superbugs can quickly go global. Bacteria may be resourceful things, but science, while slower, can be smarter. It's just a matter of knowing your enemy—and packing the right weapons.
Battle-Hardened Bacteria Question Guide

1. What does it mean for bacteria to be "resistant"?

2. Who does the article state is to blame for the emergence of drug-resistant bacteria such as tuberculosis?

3. What are superbugs and what appears to be the cause these “superbugs”?

4. What percentage of bacteria that cause infections in hospitals are resistant to at least one antibiotic?

5. What do health officials encourage us to do to resolve the problem of superbugs?

6. Do you believe that American citizens will take the steps necessary to help decrease the amount of antibiotic substances used in their daily lives?

7. What is the fundamental weakness of current antibiotics?

8. Where do the best agents to kill bacteria come from?

9. Researches working on the next generation of antibiotics are using what two strategies to control bacteria?

10. What is the advantage of using two toxins instead of only one to kill bacteria?

11. What is a bacteriophage?

12. Look at the diagram showing how a virus can be used to attack bacteria. Summarize all 5 steps of the process below.