

The Killers Within: The Deadly Rise of Drug-Resistant Bacteria.

Michael Shnayerson and Mark J. Plotkin. 2002. Little, Brown and Company, Boston. 328 pp., clothbound. \$24.95.

A good friend recently died in one of our most dangerous places: a hospital. He was admitted to the prestigious hospital with an aneurysm but with treatment was soon recovering. Then he acquired a bacterial staph infection. It killed him.

To people like me who grew up after modern antibiotics were developed during World War II, this is shocking. Surely a course of some antibiotic should have cured this infection; to die of it in a hospital, while under the care of nurses and doctors, seemed impossible. But many hospitals harbor deadly drug-resistant strains of *Staphylococcus*, *Streptococcus*, and other bacteria, which in recent years have killed an estimated 40,000 people annually in the U.S. Moreover, drug-resistant bacteria are turning up in daycare centers, schools, and homes. Many medical scientists believe that the “golden age” of antibiotics is over and our ability to win the battle against bacterial diseases is about to disappear.

The Killers Within offers a litany of case studies of reasonably healthy people who have died, or nearly so, from bacterial infections that would not respond to any antibiotic. Sadly, we know how it got to this state and how to begin to address it, but too few people are listening. Shnayerson and Plotkin hope to raise the profile of the problem so more of us will demand policies and programs to solve it. At the very least, those little inclined to activism will be moved to change their personal practices and contribute to the solution.

Plotkin is the renowned ethnobotanist and best-selling author of *The Shaman's Apprentice* and other books on the search for new drugs in the world's vanishing natural habitats. You may wonder, as I and many others who know his work did, why an ethnobotanist would be writing about drug-resistant bacteria. You may also wonder why I would be reviewing this book. For one thing, scientists must continue to look to nature for new antibiotics, so the specter of killer bugs adds urgency to efforts to conserve wildlife and wild lands, and may create a new constituency

for conservation among people who are indifferent to the plights of species other than our own. In one short, fascinating episode in this book, the authors describe the search for new weapons against bacteria in the saliva and blood of Komodo dragons, creatures admired only by ardent animal-lovers. The Komodo dragon often eats rotted carrion and as a result its mouth is a bacterial megalopolis. If a dragon's bite doesn't kill a deer or pig outright, the animal will die of a bloodstream infection within a few days. That the dragons can live with this deadly bacteria suggested that they possess some antibacterial agent, and, indeed, after a dangerous adventure to collect saliva and blood samples from wild dragons, researchers have isolated a promising antibiotic peptide.

Contrary to the complaints that environmentalists and conservationists care more about tigers and trees than about humans, people adopt these roles because they are concerned about our quality of life, and that of our children. The proliferation of deadly super bugs is an environmental problem of our own making, no different from water and air pollution that affect our health, or deforestation that contributes to global climate change, or the extinction of species that leaves us poorer in spirit.

Another subtext throughout this book is that people should know better. At the Zoo, we are devoted to improving biological literacy, and many of our exhibits explore themes of evolution and adaptation through natural selection—a fundamental principle of biology that we ignore or misunderstand at our peril. This principle predicts the rise of bacteria resistant to antibiotics. Scientists think of the relationship between a predator (whether a bacteria or a bear) and its prey as an arm's race. As prey evolve to outwit or outrun their predators, the predators evolve to outwit or outrun their prey. If one doesn't evolve, it will likely go extinct. We and our bacteria are in an arm's race. But while our bacteria evolve quickly, we reproduce too slowly to keep up. In the 20 years since a new class of antibiotics was

developed—roughly one human generation—most bacteria have gone through about 100,000 generations. Instead, we have to be smart and change our behavior to defend ourselves.

A variety of factors have brought us to the verge of a “post-antibiotic world.” One is the over-prescription of antibiotics. Another is prescribing antibiotics for viral infections, when doctors, the authors write, “might as well be prescribing M&Ms.” Patients demand drugs when they are sick and doctors are reluctant to say no. Another is our tendency not to finish prescriptions—when

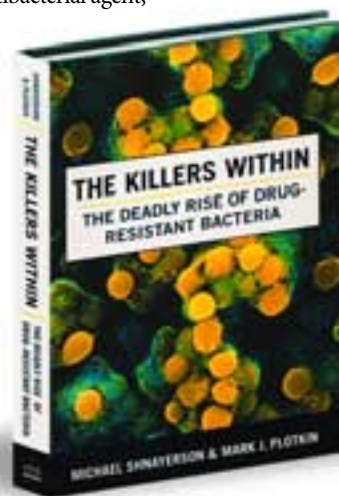
we take half the dosage, we kill the least resistant bacteria, leaving the strong to survive. Another is the routine, massive, and uncontrolled use of antibiotics to promote rapid growth in livestock. We eat antibiotics in our meat and drink them in our milk. This use has led to resistant bacteria in livestock, some of which have passed to people. According to the authors, two food-borne bacteria account for 75 percent of food-related deaths in the U.S., and “many if not most of those deaths

involved multi-drug resistant strains.” And—surprisingly—the use of antibacterial soaps is counterproductive, killing harmless strains and leaving room for the dangerous ones to grow!

The good news is that all of these problems can be solved, mostly through education, because it is up to each of us to take all our medicine, not demand “M&M” prescriptions, and press our food producers to reduce or eliminate antibiotics in livestock feed (or eat organic). This book should help wake people up.

The Killers Within reads like murder mystery, and you'll find it hard to put down because you'll want to know how the scientist-detectives will solve the case. Unfortunately, there is no tidy revelation of a culprit who can be prosecuted and put away. We are all implicated in the crisis, and ignoring it is potentially murder and suicide.

—Susan Lumpkin



GOOD NEWS

A recent research expedition in Angola returned with good news about the giant sable antelope (*Hippotragus niger varian*)—it has survived. Nearly 30 years of civil war has ravaged Angola in southwestern Africa and wiped out most of the country's once-abundant wildlife.

Giant sable, the largest subspecies of the common sable antelope, dwell only in the open woodlands of northern Angola and are a revered national symbol. An image of a male giant sable with elegant five-foot-long horns arcing over its back can be found on Angolan postage stamps, passports, and currency.

National Zoo research associate Richard Estes recently joined South African and American wildlife experts, photojournalists, and military and government officials for a two-week expedition in search of the species. After two days of fruitless helicopter searches, a quieter, on-foot expedition into Cangandala National Park resulted in fleeting sightings of several giant sable, as well as droppings and signs of feeding.

This is the first confirmed sighting since 1982, when giant sable populations were estimated at 1,000 to 2,000 animals, living only in two Angolan reserves and the corridor connecting them. Yet, even as the nation settles into peace, starving Angolans who live within the protected reserves may resort to hunting the antelope for food. Researchers warn that Angolan and international wildlife authorities need to act rapidly to protect the critically endangered animal.



JESSIE COHEN / NZP

mayor of Washington, D.C., to clean up the bay and get it off the EPA's list of impaired waters. That agreement provided no funds for the estimated \$20 billion cleanup that is needed.

The leading threat to the health of the Chesapeake Bay is nitrogen pollution from farmland runoff, sewage treatment plants, and other sources. Other threats include urban sprawl, toxic pollution, and poor fishery management.

On a more positive note, the National Oceanic and Atmospheric Administration recently awarded more than \$2.8 million to study and conserve Chesapeake Bay fisheries, funding studies that will acquire valuable information about local species and ecosystem-based fisheries management. The NOAA also awarded four grants totaling \$250,000 to provide Chesapeake Bay-area teachers with hands-on environmental education resources about the bay's watershed environment.

—Melissa Braddock, ZooGoer Intern

BAD NEWS

Workers at a Florida landfill last summer found a dead American bald eagle (*Haliaeetus leucocephalus*) lying amid the trash. Next to it was the body of its last meal—a euthanized pet cat. Scientists at the U.S. Fish & Wildlife Service's Wildlife Forensic Laboratory later confirmed the presence of sodium pentobarbital, a drug widely used by veterinarians for euthanasia and anesthesia, in the eagle's crop contents and liver.

Such incidents occur sporadically across the nation, according to the U.S. Fish & Wildlife Service. Animals euthanized at veterinary clinics, animal shelters, or private farms can easily contain enough residual poison to kill eagles, vultures, and other wild scavengers if the carcasses are not properly buried or burned. Scavengers that are not killed directly can also become intoxicated or anesthetized by the drug, making them easy prey for predators.

Pentobarbital in a decomposing carcass may retain the ability to kill for some time, possibly even throughout the winter in cold climates. The drug's concentration is generally highest in the liver and spleen, organs that eagles favor for food.

Veterinarians, livestock owners, and others responsible for the improper disposal of animal carcasses leading to the poisoning of protected species may be prosecuted under one or more federal laws, including the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Endangered Species Act.

>> MORE NEWS

The Chesapeake Bay, the nation's largest estuary, isn't getting any healthier, according to an annual report from the Chesapeake Bay Foundation. The bay rated a 27 out of 100 on the report's health index for 2002—far short of the organization's

goal of a rating of 40 by 2010.

The condition of the bay has remained virtually unchanged for the past five years, despite a 2000 agreement between the Environmental Protection Agency (EPA); the governors of Maryland, Pennsylvania, and Virginia; and the

>> WHAT'S IN A NAME

"Quite a lot," according to the Patrons of Biodiversity, or BIOPAT, a German non-profit organization that accepts donations in exchange for the opportunity to choose the name of a newly identified species. The group works with a variety of organizations to promote the importance of biodiversity, and scientists who relinquish their right to name species they've found to BIOPAT. The naming service is a fundraising tool, giving people the opportunity to contribute their name to the annals of science, as well as put their money behind the group's mission. The minimum donation is about \$2,600, for which the group sends a certificate and a receipt for your charitable (and potentially tax-deductable) donations.

Currently, there is a new bird species available for naming; it's from tyrant flycatcher family (Tyrannidae). Known informally as the "Yungas Tyrannulet," it was first observed in 1990 by the late Ted Parker. Additionally, there is a variety of new moth species now available for naming, as well as frogs, flowers, and two insects currently going by "Big Mac" and "Spiderman."

You can find BIOPAT at www.biopat.de.

—Brendan Horton