HEALTHSTATE Pulse
VITAL SIGNS FROM UMDNJ: A USEFUL MONSTER

Pulse Index

Winter 2000 Table of Contents

HEALTHSTATE Home

A Useful Monster

Bold, bloody and resolute is how this creature has been characterized: The Komodo dragon is a beast you might encounter in myth or fable. But actually it's alive and fairly well and living with its fellow "dragons" on several small Indonesian islands. The largest lizard in the world, it can top 10 feet in length and weigh in at up to 200 pounds. Its inch-long curved and serrated teeth and powerful jaw muscles help complete the picture of a fierce predator that might consume a meal equaling a quarter of its own body weight. Dinner could be a feast of deer, goat, pig or dog, including meat, bones, hooves, hide and intestines. And this dragon also occasionally attacks humans.

But why have vials of the Komodo's blood made their way from Asia to a laboratory in Newark? It so happens that the creature's saliva is home to 52 different strains of bacteria, some of them known to be highly septic. If the beast doesn't manage to kill its prey on the spot, its bite will introduce germs potent enough to destroy its quarry with a massive infection within 72 hours. But Komodo observers have witnessed these creatures battling each other, and have noticed that they are never sickened by the bacteria-laden saliva of a fellow dragon.

The question, of course, is why. Investigators hypothesize that proteins in the dragon's blood must provide immunity to the dangerous germs in its saliva.

Enter Gill Diamond, Ph.D. A molecular biologist and an assistant professor of anatomy, cell biology and injury sciences at UMDNJ-New Jersey Medical School, he investigates defensins, naturally produced molecules that have antimicrobial properties. He has discovered such a molecule in the airways of cows and named it tracheal antimicrobial peptide or TAP, and has also

been studying similarly active peptides in the skin of winter flounder. He was a natural to be tapped by expeditionary biologist Terry Fredeking, chief of Antibody Systems, Inc, in Hurst, Texas (a company that studies and markets biologically interesting molecules from unusual species), to take on the Komodo dragon.

A dragon wrestler Diamond is not. But there are several adventurers willing to tackle that end of the job. Since the Komodo is an endangered species (there are thought to be about 5000 in the world), care must be taken not to maim or kill the creature when drawing its blood. Claudio Ciofi, a biologist who has been investigating the species for years, temporarily traps the beasts, duct tapes their jaws shut, draws blood from their tails, applies an antibiotic, then untapes their mouths and releases them back to the wilds. The blood is frozen and shipped to New Jersey.

Diamond and his team have already identified two molecules in the dragon's blood that have antibiotic properties, one somewhat weak, the other stronger. They are looking for others.

He explains that this is just the beginning of a long process. "We've been working on this for a year," he says. "First we have to separate the blood into different components, then test each component for antimicrobial activity." This testing is done by placing drops of the purified component on a simple strain of E. coli in a petri dish.

If it is found to be very active against the bacteria, Diamond says the next step is to characterize its structure (determine its amino acid sequence if it's a protein) and to synthesize it in the lab, if possible. "We want to measure the molecule's potency. The ultimate question is: Can it be turned into a useful antibiotic?"

If the molecule has the potential to be developed into a drug, the researcher says its activity against pathogens will have to be maximized and its activity against the host minimized. Finally, the new molecule will have to go through a series of clinical trials. "We need to know if it works against real infections and if it is more effective than drugs that already exist," he explains. The entire process generally takes at least 10 years.

Diamond's work with the skin of winter flounder has yielded an antimicrobial peptide (small protein that has anti-bacterial activity) that works well with an already used TB drug, so that the medication can be used in much lower concentrations. The peptide may also be effective against organisms that are resistant to conventional antibiotics.

The researcher's primary interest is enhancing the production of bacteria-fighting molecules already produced by the human body. "If we can understand how we make them, we can enhance our own immunity," he explains.

But what about the Komodo? According to Diamond, its blood may prove to yield a molecule that will attack blood-borne infections with the same ferocity that the beast attacks its prey. And if that's the case, we may find that wrestling dragons will no longer be an activity confined to myth and fairy tale.