

# An underwater drugstore?

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No matter how sophisticated modern medicine becomes, common ailments like fungal infections can outrun the best of the world's antibiotics. In people with compromised immune systems (like premature babies, AIDS victims or those undergoing chemotherapy for cancer) the risk is very high: contracting a fungal infection can be deadly.

Now Tel Aviv University zoologists are diving deep into the sea to collect unique chemicals -- drugs of the future -- to beat unnecessary death by fungal infection. And their secret weapon is the common marine sponge.

Prof. Micha Ilan from the Department of Zoology at Tel Aviv University, who is heading the project, has already identified several alternative antibiotic candidates among the unique compounds that help a sponge fend off predators and infections. He and his graduate students are now identifying, isolating and purifying those that could be the super-antibiotics of the future.

The research group at TAU has found and isolated thousands bacteria and fungi, including a few hundred unique actinobacteria. So far, several tens hold promise as new drugs.

## From the Sea to the Lab

"Resistance to antibiotics has become an unbelievably difficult challenge for the medical community," says Prof. Ilan. "Sponges are known for

hosting an arsenal of compounds that could work to fight infections. We're now culturing huge amounts of microorganisms, such as actinobacteria, that live in symbiosis with marine sponges."

Marine sponges were recently made famous by the popular Nickelodeon TV cartoon *SpongeBob SquarePants*, which features a sea sponge who lives in a pineapple beneath the ocean. In real life, sea sponges are animals whose bodies consist of an outer thin layer of cells and an inner mass of cells and skeletal elements. The sedentary creatures don't really have the sort of adventurous life that the cartoon depicts.

Marine sponges can't move. Glued to the seafloor, they must rely on the flow of water through their bodies to collect food and to remove waste. This has led to a unique adaptive response to enemies and competition. Sponges don't have teeth, or shells, but protect themselves by building associations and partnerships with bacteria and fungi. Tel Aviv University is tapping into these relationships -- looking at the same chemicals that the sponge uses for defense to fight infection in humans.

## **Research Combines Several Fields of Study**

Drug developers have known for decades about the potential goldmine of pharmaceuticals in the marine environment, particularly among sedentary life like marine sponges.

"One of the major problems is that these novel and natural compounds are found in very small quantities," Prof. Ilan explains. Collecting and extracting such large amounts of these unique chemicals would require huge quantities of animals to be sacrificed, a practice which is not in line with zoological conservationist values. So Prof. Ilan takes cultures from sea sponges with minimal damage to the natural environment. He then grows their symbionts and tests them in a "wet" laboratory. The methods Prof. Ilan has perfected can now be used by other scientists developing

pharmaceuticals from marine sponges.

"Our research is unique in that we take both an agricultural and microbiological approach — not found often in the drug discovery community," says Prof. Ilan, whose work is done in collaboration with the School of Chemistry's Prof. Yoel Kashman and Prof. Shmuel Carmeli.

Source: American Friends of Tel Aviv University

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