Structure of Nanomole Quantities of Marine Chemicals

2009 NHMFL Science Highlight for NSF

DMR-Award 0654118

Advanced Magnetic Resonance Imaging and Spectroscopy User Facility, Univ. of Florida

Many marine organisms produce chemicals for defense and communication, and these chemicals often become important components of future biological and biomedical research. The Indo-Pacific nudibranch *Hexabranchus sanguineus* (upper figure) is a shellless mollusk that produces an extraordinary group of bioactive natural products known as "trisoxazole" macrolides (lower right). These compounds bind to G-actin and disrupt actin filament formation, and as a result they are useful reagents with anti-fungal and cytotoxic activities. The Tadeusz F. Molinski group of the University of California at San Diego collected a nudibranch sample nearly 2 decades ago and isolated about 30 μg of the compound in the figure. This amount of material was insufficient for conventional NMR studies. Using the NHMFL 1-mm high temperature superconducting probe, the structure of the novel compound was finally determined.

Dalisay, D.S.; Rogers, E.W.; Edison, A.S. and Molinski, T.F. (2009) *J. Nat. Prod.* ***72***, 732-738.

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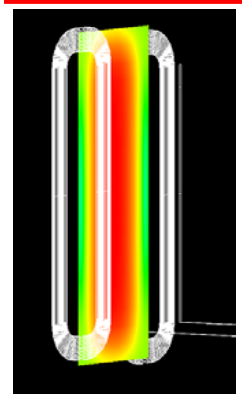

The NHMFL 1-mm high temperature superconducting probe is an important tool to study rare and difficult to collect chemicals from nature. Available samples are so small (nanomoles) that the unique sensitivity of this NHMFL probe is required.

Animals, plants, and microorganisms all communicate with chemicals. Discovery of these chemicals is an important step in understanding the basic biology, ecology, and behavior of life. Oftentimes, living organisms produce unique chemicals that have never been isolated or synthesized in a laboratory. These chemicals are often useful in the laboratory to study basic biology or as drugs for human disease or as chemicals to biologically control pests and pathogenic microorganisms. The most potent chemicals are almost always produced in the smallest quantities. This makes identification of these rare, but important, molecules a challenge. The high sensitivity NMR capabilities of the NHMFL are important new tools for the natural product studies.