# Researchers decode structure of promising sea compound

August 28 2009

An image of the source cyanobacteria assemblage for hoiamide A as seen under the microscope. Credit: Alban Pereira, William Gerwick

Scientists at Scripps Institution of Oceanography at UC San Diego and their colleagues at Creighton University have deciphered the highly unusual molecular structure of a naturally produced, ocean-based compound that is giving new understanding of the function of mammalian nerve cells.

The findings are reported in the Aug. 27 online version of the journal *Chemistry & Biology* by principal co-investigators William Gerwick, professor of oceanography and pharmaceutical sciences at the Center for Marine Biotechnology and Biomedicine (CMBB) at Scripps Institution of Oceanography and UCSD Skaggs School of Pharmacy and Pharmaceutical Sciences and Thomas Murray, professor and chair of pharmacology at the Creighton University School of Medicine in Omaha, Neb.

Scripps scientists collected cyanobacteria, tiny photosynthetic sea organisms, in Hoia Bay off Papua New Guinea in 2002 and recently discovered that the bacteria produce a compound with a structure previously unseen in biomedicine.

The compound, which the researchers have dubbed hoiamide A, offers a novel template for drug development.

"We have seen some of hoiamide A's features in other molecules, but separately," said Alban Pereira, a postdoctoral researcher in Scripps' CMBB and a paper coauthor. "We believe this new template may be important because it's showing different mechanisms of action—different ways to interact with neurons, possibly with a good therapeutic effect for such diseases as epilepsy, hypoxia-ischemia and several neurodegenerative disorders."

In pharmacological tests conducted at Creighton University, Hoiamide A was shown to interact with the same important therapeutic target as analgesic, antiarrhythmic, antiepileptic and neuroprotective drugs.

Dan Edwards and Luke Simmons, former members of Gerwick's laboratory, collected a mixture of cyanobacteria species Lyngbya majuscula and Phormidium gracile in May 2002 at five- to 10-meters (16 to 33 feet) depth from Hoia Bay. Extractions of this sample were shown to have intriguing neurochemical properties in assays run at Creighton University's School of Medicine. Gerwick and Murray's laboratories then collaborated to isolate the neuroactive substance and characterize its extraordinarily complex chemical structure.

"Classically, what we know about the workings of the human nervous system has come largely from studies of different toxins on the function of model systems, such as in this case, the action of hoiamide A on nerve cells in petri dish cultures," said Gerwick. "The toxins serve as

'molecular tools' for manipulating cells at an extremely microscopic scale. Ultimately, by understanding how neurons work at this detailed level, and having a set of tools such as hoiamide A, we can envision the development of new, more effective treatments for such diverse conditions as epilepsy, pain control and memory and cognition enhancement. The natural world still has many valuable molecules left for us to discover and hopefully develop into new classes of medicines."

Source: University of California - San Diego (news : web)