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Search and structural studies of secondary metabolites from Far Eastern marine invertebrates

Search, structural studies of new secondary metabolites and biological activities done in the Laboratory of Marine Natural Product Chemistry are reviewed. The main biological sources of these compounds were proved to be Far Eastern marine invertebrates, such as sponges, hydroids, as well as polychaete. Emphasis is directed to the unusual alkaloids, glycolipids, and polyhydroxysteroids which were recently isolated during 2013-2018.

Key words: secondary metabolites, marine sponges, hydroids, polychaete, alkaloids, glycolipids, polyhydroxysteroids

Marine invertebrates have long been known as a prolific source for the discovery of bioactive secondary metabolites. Most research in this area has been focused on invertebrates from tropical waters, but more recently the focus has shifted to the less accessible invertebrates of temperate and colder waters. A potentially fruitful opportunity for search of new marine secondary metabolites lies within the Northwestern Pacific region, where promising search for new natural products has been completed. The most common marine invertebrates of the region are sponges and echinoderms. In our laboratory about 300 natural compounds from numerous species of the Far Eastern marine invertebrates have been isolated, the corresponding chemical structures established, and biological activities studied. These substances belong to a wide variety of biogenetic classes including polar steroids (more 100), triterpene glycosides (about 100), and alkaloids (about 50). Up to day we have collected 3939 samples of marine organisms during 15 scientific cruises on board the research vessel “Akademik Oparin” at the period 1986 to 2017 from the Northwestern Pacific region mainly near the Kuril Islands. In result, urupocidins A and B with an unprecedented skeleton system have been isolated from the Far Eastern sponge *Monanchora pulchra*, are noticeable examples of recently discovered novel marine bioactive secondary metabolites. Urupocidin A increases nitric oxide production in murine macrophages *via* inducing iNOS expression [4].

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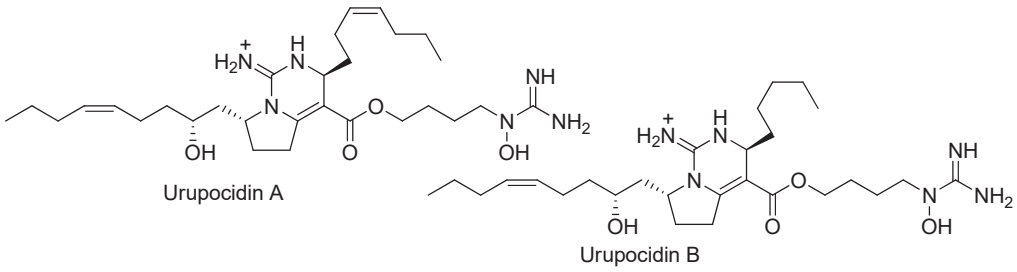
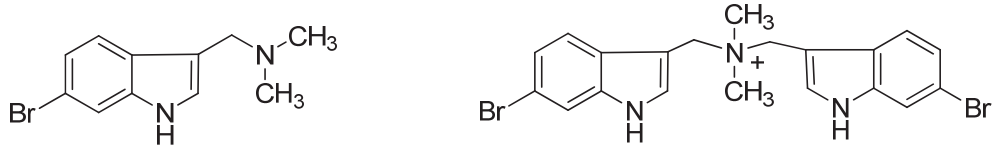
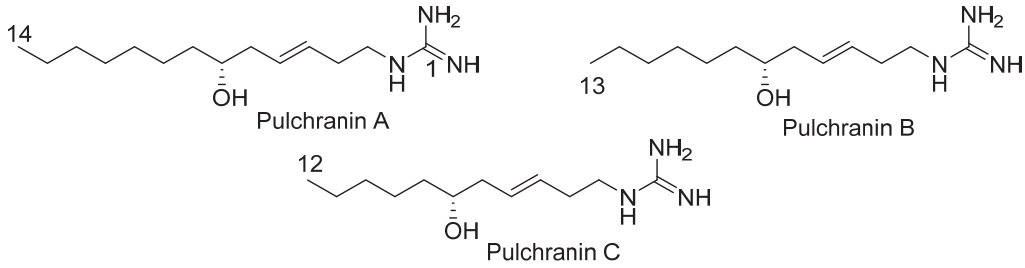


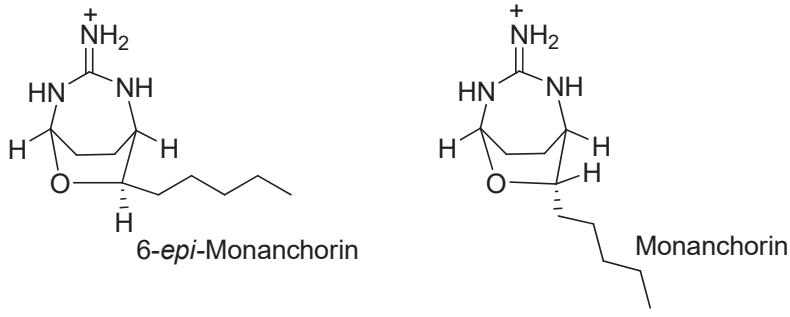
Two new natural products, 6-bromogramine and bis-6-bromogramine, inducing NF-κB activity, have been isolated from the marine Far-Eastern hydroid *Abietinaria abietina* [2].



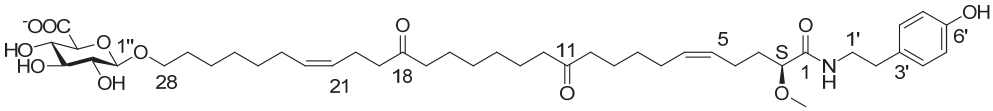
Pulchranin A, the first nonpeptide TRPV1 channel inhibitor, and two its homologic acyclic alkaloids were isolated from the Far Eastern marine sponge *Monanchora pulchra*. We have found that activity of pulchranins decreased in the row pulchranin A - pulchranin B - pulchranin C and in the row TRPV1- TRPV3 - TRPA1. So, we propose that the hydroxylated alkenyl moiety plays an important role in inhibitory activity of pulchranins [3, 5, 6].



As a result of the first study on secondary metabolites from the cosmopolitan bioluminescent marine tube polychaete *Chaetopterus variopedatus*, a new bicyclic guanidine alkaloid 6-*epi*-monanchorin along with the previously known monanchorin were isolated [7].



Unprecedented bipolar glycolipids, melonoside A and its analogues, have been isolated from the Far-Eastern marine sponge *Melonanchora kobjakovae*. Melonoside A induces autophagy of human cisplatin-resistant germinal tumor cells NCCIT-R [1].



Melonoside A

Recently we have been isolated from Far Eastern sponge *Haliclona* sp. new structurally unique sulfated polyhydroxysteroids named by us gracilosulfates A-C. The structures of new secondary metabolites were elucidated by NMR, MS analysis and chemical transformations.

Herein we discuss the diversity of unusual secondary metabolites from Far Eastern marine invertebrates as well as the details of their structure elucidation and provide insights into their biological activities.

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