DENDROBEANIAMINE A, A NEW ALKALOID FROM AN ARCTIC MARINE BRYOZOAN DENDROBEANIA MURRAYANA

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ABSTRACT: A new marine guanidine alkaloid named Dendrobeaniamine A was isolated from an organic crude extract of the Arctic marine bryozoan *Dendrobeania murrayana*. The chemical structure was elucidated by spectroscopic experiments including ^{1}H and ^{13}C NMR and HR-ESI-MS spectrometry analysis. The biological activities were evaluated based on cellular and biochemical assays *in vitro*. This is the first report of a guanidine based alkaloid, isolated from this marine bryozoan species.

/INTRODUCTION

Marine alkaloids is a major class of structurally diverse secondary metabolites, biosynthesized by marine organisms including marine invertebrates, seaweeds and microorganisms [1-2]. Alkaloids are nitrogen containing organic compounds, which have diverse biological, physiological and chemical properties. Alkaloids are classified based on the position of nitrogen atoms in the chemical structure of compounds, which are represented including pyrrole, pyridine, indole, isoquinoline, purine and guanidine etc [2-3].

Marine alkaloids have proved to be a rich source of biologically active compounds [4]. Marbio is an analytical platform at the UiT-The Arctic University of Norway for screening, isolation and identification of bioactive natural products from Arctic marine macro- and micro-organisms. In our continuing search for new secondary metabolites from Arctic marine bryozoans [5], we describe herein the isolation and structure elucidation of new guanidine based alkaloid compound, Dendrobeaniamine A (**1**).

/METHODOLOGY

- The Arctic marine bryozoan, *Dendrobeania murrayana*, was collected by scuba diving from the subtidal region at 30 m depth in Vesterålsfjorden in Norway.
- The freeze dried sample was extracted with milliQwater for aqueous extract. Subsequently, the lyophilazed pellet was extracted with methanol and dichloromethane for organic extract.
- The oganic crude extract was analysed by ultra performence liquid chromatography and high resolution of mass spectrometry (UPLC-HR-MS).
- The target compound was selected based on intensity. The elemental composition of compound **1** was calculated and dereplicated by using UPLC-HR-MS with positive electrospray ionization (ESI^{+}). ChemSpider, Dictionary of Marine Natural Products and SciFinder were used for database search.
- The compound **1** was isolated from the organic crude extract by using mass-guided isolation on a preparative HPLC-MS. Prep C_{18} HPLC column and CSH flurophenyl column were used for the isolation of compound **1**.
- The structure of compound **1** was elucidated by using ^{1}H and ^{13}C NMR specroscopic methods.
- Compound **1** was evaluated for its cytotoxicity and antibacterial, antifungal, antioxidant activities as well as the ability to inhibit the growth of biofilm.

/RESULTS

Chemical analysis of organic crude extract by using UPLC-HR-MS

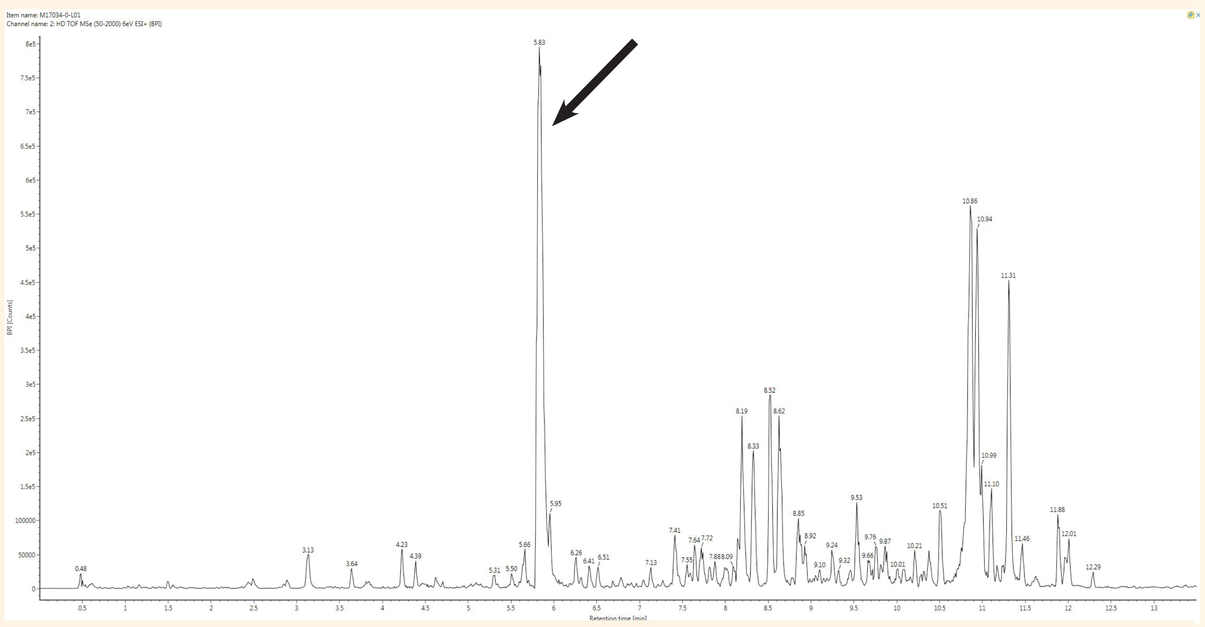

Figure 1: *Positive electrospray base peak intensity (BPI) chromatogram achieved from the chemical analysis of organic crude extract of* D. murrayana. *The target peak was selected (marked with black arrow) based on the intensity and compound **1** eluted at the retention time of 5.8 min.*

Analysis of mass spectrum of compound 1

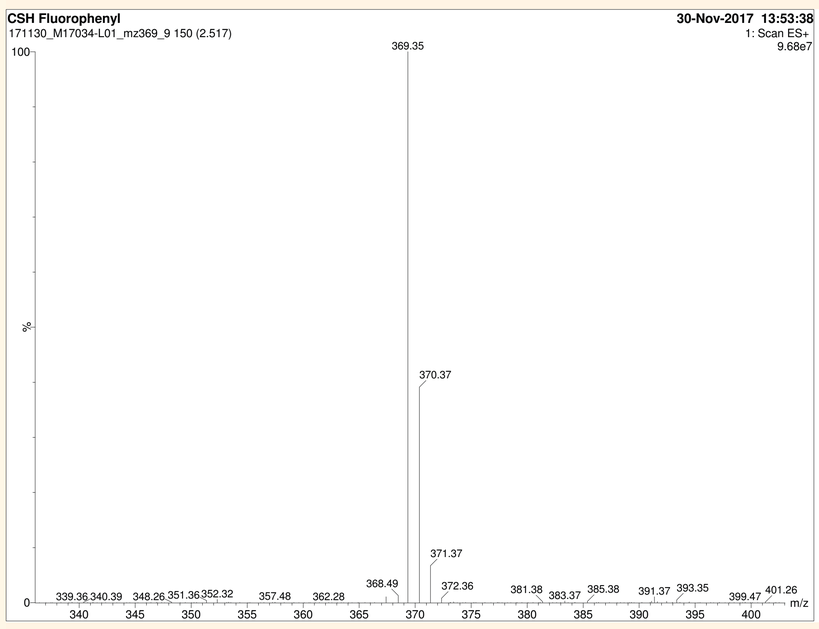

Figure 2: *Positive electrospray ionization mass spectrum of target compound* **1**

Dereplication:
The isotopic pattern indicated that compound **1** had a protonated ion $[M+H]^{+}$ with *m/z* 369.2861 (calculated *m/z* 369.2865) (**Figure 2**) and the elemental composition was calculated as $C_{19}H_{36}N_4O_3$. Compound **1** was dereplicated, and database searches suggested that compound **1** was new.

Isolation of compound 1 by using prep HPLC-MS

Mass guided prep HPLC was used for the isolation of compound **1**. Aliquots of organic crude extract was injected repeadly onto a prep C_{18} HPLC column for first round of isolation. The mass of the compound *m/z* 369.28 was used as collection trigger. Flurophenyl prep HPLC column was used for second round of purification (**Figure: 3**). The yield of a pure compound was 2.5 mg out of 0.75 g of organic crude extract.

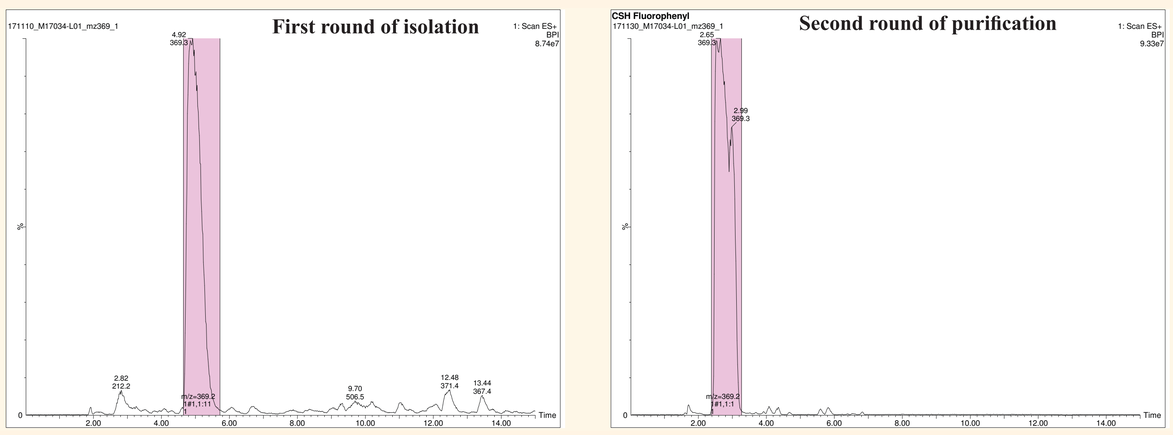

Figure 3: *Basepeak ion (BPI) chromatograms showed the stepwise purification of compound **1** (marked in pink colour) by using prep C_{18} HPLC and flurophenyl HPLC columns.*

Structure elucidation of compound 1 by using 1D and 2D NMR

The chemical structure of compound **1** was determined by various ^{1}H, and ^{13}C and NMR experiments including HSQC+HMBC, H2BC, DQCOSY, TOCSY, NOSEY, 15N HSQC and 15N HMBC. The structure of compound **1** was elucidated as a new guanidine alkaloid named as “Dendrobeaniamine A”, and its chemical structure can be seen in **figure 4**

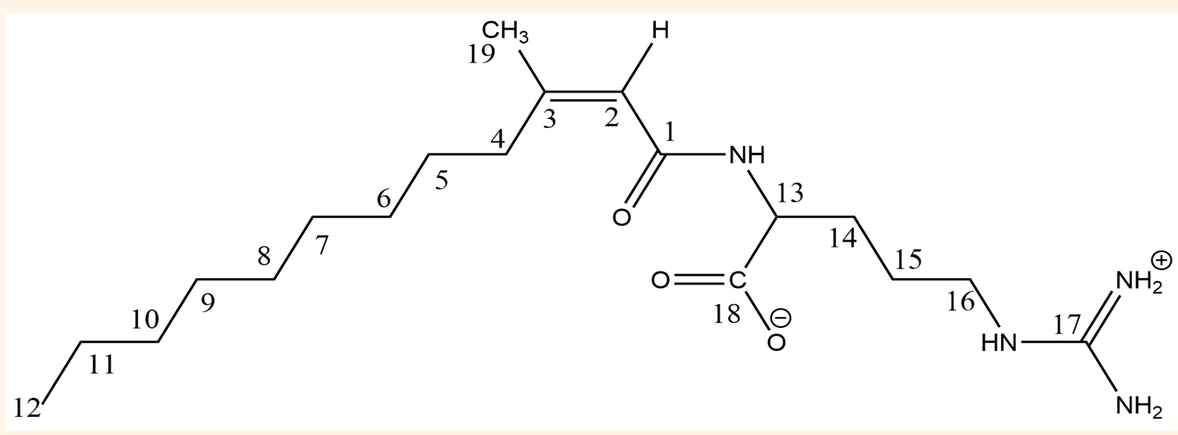

Figure:4 *The chemical structure of a new compound, Dendrobeaniamine A.*

/SUMMARY

The new guanidine based alkaloid Dendrobeaniamine A was isolated from the organic crude extract of the Arctic marine bryozoan *Dendrobeania murrayana*. The structure was determined by interpretation of data from 1D and 2D NMR spectroscopic methods and mass spectrometry (HR-MS) analysis. Dendrobeaniamine A did not show any biological activities in the applied bioassays. Further bioactivity profiling is required in order to identify any potential biological activities of the molecule.

/ACKNOWLEDGEMENT

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