

## Identification and Isolation of Natural Compounds from Two Types of Sponges of Demospongiae Class, Kish Island

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### ABSTRACT

In recent years, mollusks, as the main marine sources in extracting pharmaceutical drugs, have been studied by many researchers from all over the world. Sponges are mollusks which contain bioactive compounds for treating various kinds of diseases. This research studies two types of sponge from Demospongiae class in Kish Island, and investigates separation and recognition of non-polar and semi-polar natural compounds of these sponges. Three main processes of the study include: collecting, separating and purifying natural products, and recognizing biologic compounds. Investigating the compounds derived from these sponges reveal that marine compounds can be regarded as rich sources of medical drugs in treating different types of diseases. This study is limited to two samples of sponges of *Irciniidae* and *Niphatidae* family. These samples are just small representatives of Demospongiae class.

**Keywords:** Bioactive compounds, mollusks, sponges, pharmaceutical drugs

### 1. INTRODUCTION

From ancient times, using herbaceous drugs in curing diseases were common all over the world, and herbs were considered as the main sources of drugs. By increasing population, demand for new drug to cure new diseases, such as AIDS and SARS, has been regarded as the main concern. In the other hand, increasing drug-resistant microbial diseases, justifies the investigation to find new drugs to confront these new diseases. Nowadays, inner space, or the oceans are considered as the most extensive source of drug production [1-4].

Search to find new drugs from marine ecosystem indicate the fact that marine animals and plants are compatible with marine environment and are in competition to choose space, food, and reproduction. More than one million years of this competition result in gradual evolution and production of secondary metabolites to neutralize the negative effects of this choose [5].

Bergman [6], 50 years ago, pioneered in doing first researches on marine products. Primary practices of Bergman was due to his curiosity, but discovery of new and important bioactive and pharmaceutical function of active materials of *arabino-nucleosides*, obtained from *Cryptotellacrypta sponges*, attracted him in natural products and clarified the importance of biomedical properties of marine materials.

Cooperation of chemists and pharmacologists results in finding some natural marine products in the last stage of clinical tests that were mainly concerned with Cancer, pain and inflammatory diseases. Some of the products are under investigation as the candidate for pre-clinical evaluation [7].

In recent years, mollusks or Molluscs [8], as the main marine sources in extracting pharmaceutical drugs, have been studied by many researchers from all over the world. They are considered as one of the most vital and significant part of ecology and marine economy, and constitute the main part in today animal set. Many reports indicate the explored anti-bacterial, anti-fungi, anti-viral, anti-tumor and other properties of marine mollusks [9-18].

In this research we study the new consequences of investigating pharmaceutical properties of marine mollusks.

### 2. MATERIALS AND METHODS

This research studies two types of sponge from Demospongiae class in Kish Island, and investigates separation and recognition of non-polar and semi-polar natural compounds of these sponges. For extracting components, Blight and Dyer method [19] was used. Three main processes of the study include: collecting, separating and purifying natural products, and recognizing biologic compounds. However, for implementation of biological tests, and separation and purification of active compounds, extract or the composition was infused to GC/MS system, and then the compounds were recognized.

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Samples include sponges collected from Kish Island, and approved by Dr. Rob Venn WM Soest of zoology museum, Amsterdam, Holland.

Immediately after collecting sponges for extraction, they were placed in freezer and freeze in -20C. A small piece of any sample sponges were cut down and transferred to pure Ethanol solution [20]

Using Dr. Hooper[20] recognition key, information found in the table for any sample, and pictures of samples, these samples were studied. Microscopic research on sponges was carried out in Science and Research University of Tehran to grant this recognition. Samples transferred to zoology Museum of Amsterdam University for final approve by Dr. Soest [21].

Spicules were prepared in two ways: Bleach digestion; Acid digestion. Bleach digestion is suitable for immediate investigation of sponge spicules, but is not as suitable as acid digestion [21]. Therefore, both ways were used for better recognition.

In this research, after placing sponges in freezer, they were transferred to the laboratory of Chemistry faculty. Its components were derived using Blight & Dyer method [19]. Natural components were derived using Di-ethyl-ether and D-Chloro-methan for non-polar compounds and Chloroform for semi-polar compounds. After complete evaporation of solution, diluted samples transfused to chromatography gas system having mass spectrometry GC-MS. Mass spectrum of compounds was derived. Using special software, existing compounds of chloroform, di-ethyl-ether and di-chloro-methan phases were recognized.



**Figure 1.** After freeze dryer sample

### 3. DISCUSSION

Two types of sponges were studied in this research. The first type was Ircinia sponges. Ircinia sponge derived metabolites are compounds that help to prevent cancerous cells in human. In a study it was shown that organic extract of a sample of *Penisilium* extracted from *Irciniacelina* is active against *Staphilococcus aureus*, *Staphilococcus epidermidis*, *Bacillus cereus*, and *Bacillus subtilis*[22]. Natural compounds of 2-hexaprenylhydroquinone derived from Ircinia sponges in Red Sea is restrainer of HIV [23].

Several nor-sterterpene peroxide antibiotics have been isolated from Red Sea sponges. Sokoloff et al [23] have investigated norsterterpenoidperoxide antibiotics from the Red Sea sponge *Prianos*spp. The peroxides strongly inhibit the growth of Gram-positive bacteria.

The compound derived from Ircinia sponges include: Geranylisovalerate, and 3-Hexadecyloxycarbonyl-5-(2-hydroxylethyl)-4-methylimidazolium ion (di-chloro-methan solution); 15-Octadecenal & 2-Hydroxy-1,1,10-trimethyl-6,9-epidioxydecalin (di-ethyl-ether); Phytol& 2-Piperidinone, N-[4-bromo-n-butyl]- (chloroform).

The second sample, Gelliodes, is a member of Niphataidae group. Derived compounds of this sample include: Geranylisovalerate, and Isomenthone (di-ethyl-ether); Agaricic acid and Decylolate (di-chloro-methan solution); 17-Pentatriacontene and 9,12,15-Octadecatrienoic acid, 2-phenyl-1, 3-dioxan-5-yl ester (chloroform ).

#### 4. CONCLUSION

Studying these compounds indicate that marine compounds can be regarded as the main rich source of pharmaceutical drugs in treating diseases. This study is limited to two types of sponges of Irciniidae and Niphatidae family. They are only a small part of Demospongiae. In recent years, studying other species of this family has attracted researchers from all over the world. Regarding diversity of different types of sponges, and the fact that each type has numerous properties, it's suggested to study other types of sponges in the future to be familiar with their entity and use them in treating incurable diseases.

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