

William Fenical



Drugs From the sea 25th May 2009

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Communication
Access to Biological Sciences

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1. Introduction

This report has been requested by Mark Hetherington and John O'Neill for the purpose of my scientific hero project. This report will detail the work undertaken by William Fenical and explain the discoveries he has made. This report is to be submitted by 25/05/2009.

2. Research Methods/Plan

I decided to do my report about Fenical on 30th of September 2008. On the 17th February 2009 I completed a summary and on the 30th March 2009 I presented my presentation about William Fenical. All methods of research were found using the internet. This report has to be completed by 25 May 2009. All websites used can be found in the bibliography section.

3. Biography

William Fenical PhD

Professor & Director of the marine research division Tumour Growth, Invasion & Metastasis Program at University of California, San Diego.

Co Founder of Nereus Pharmaceuticals (a private company licensed through the University to get Marine medicines onto the market)

MERIT Award Recipient February 2004. Scripps Institution of oceanography, University of California, San Diego.

4.1 Fenical's Question

In 1928 penicillin was discovered by Alexander Fleming, no doubt the biggest discovery in medicine and the most powerful antibiotic we have in our hospitals today. From that day man has searched every inch of the earth from rain forests of Brazil to the gardens we maintain every year looking for the next wonder drug.

William Fenical asked “Why don’t we look in the oceans”?

Nobody had an answer, but nobody would support the question. Expert’s informed major companies that there was no evidence to support the theory that antibiotics would survive in the ocean’s harsh environment. In the 1940’s Claude ZoBell *the father of marine microbiology* defined what Marine Bacteria was and they still believed that all the bacteria in the oceans came from the land via rivers and streams running into the sea.

William Fenical set out to prove his theory. As a diver he had the skills to collect sediments (mud samples), clippings of coral and seaweed then ran tests on them over the years, breaking them down into their elements.

4.2 What He Has Found

In 1987 William Fenical along with Robert S Jacobs discovered *pseudopterisins* which is from a sea fan called Pseudopterogorgia (see appendix 1). This compound has anti-inflammatory properties, the licensing rights were sold to Estee Lauder and are currently used in there resilience line (see appendix 2). This compound also shows potential for pain relief and is in advanced clinical trials.

In 1991 from a sediment sample found in shallow waters of the coast of the Bahamas William Fenical and Paul Jenson discovered *Salinispora* (see Appendix 3). By genetically sequencing this bacterium they have found signs this may treat cancer. Its product which is called Salinisporamide A is currently being tested in humans for multiple myeloma, a cancer of plasma cells in bone marrow as well as solid tumours.

Working with Doctors Gerrit Los and Stephen Howel from the UCSD Cancer Centre William focused on new mitotic inhibitors found in sea squirts and tunicates. These invertebrates show chemical formulations against HCT-116 human colon carcinoma and two new drugs diazonamide A and tamndarin A were produced.

Also in the 90’s William conducted studies of Sargassamide, Halimide and avrainvillamide. All found from marine fungi and bacteria had shown selective inhibition of certain cancer cells (388 lymphocytic leukaemia and progesterone dependent prostate cancer).

In 1995 Eleutherobin was discovered and by working with Bristol-Myers Squibb was found to be identical qualitatively and quantitatively to taxol which is used to treat breast and ovarian cancer.

Cyclomarin A, Exumolides and Avrainamide have also been found and show inhibition of edema and control pain like Indocin and Hydrocortisone.

From one sediment sample, over 1000 different strains of bacteria have been isolated. Ten groups of True Marine Actinomycetes have been discovered from various samples. Over 4000 different strains of bacteria we have never seen before have been collected from the Atlantic, Pacific and Indian Oceans.

4.3 How He Finds Them

Although Fenical has found a lot of drugs we use today by simply diving there is only so far down he can go. The discoveries of the antibiotics he has found has encouraged him to go deeper, and for that more equipment is needed. Scripps institute of oceanography own an old Italian fishing boat which has been used along with a Mud Torpedo (see appendix 4) to collect sediment samples from as far down as 3,600 feet. The mud torpedo is a simple construction with maximum results; rocket shaped 15kg with titanium fins. The mud torpedo would be thrown off the side of the boat and allowed to fall to the bottom of the ocean. Once the torpedo hits the desired destination the scoop on the end of the torpedo will clamp shut collecting a sediment sample. The torpedo will then be pulled back onto the boat and the sediment examined. Upgraded mud torpedoes are now being designed which will hopefully collect sediment from as far down as 12,000 feet. There are also some modifications to the collection method, instead of the "ice cream scoop" collection there is now a torpedo with a long hollow tube encased within another tube which would be attached to the fin structure of the first mud torpedo. This will then allow a stratified sample to be taken and sections of sediment can be sliced off and examined at different depths of the sea bed. This new mud torpedo will open new doors of discovery in the diversity of micro organisms in the ocean. As successful as the first design has been there is no way to tell what is being collected. A whale carcass on the sea floor for example will draw upon millions of bacteria which we might have never seen before, but if we go back to that same spot later for some more sediment the whale carcass and the bacteria will be gone. This stratified sample will help to discover where the bacterium is hiding when there is no food source for them.

There are of course other problems. We still cannot see what is down there when samples are taken. It is too dark or murky for most cameras to see any further than 2 metres on front of them. Therefore new devices will still have to be invented in the future.

5. Conclusion

William Fenical may have been conducting his research for the last 33 years, trained over 113 doctoral and post doctoral researchers and written over 300 scientific papers, but his work is only the start of it.

Between 1900 and 1980 the number of deaths from infectious diseases over the world was 36 in every 100,000 people. Between 1980 -2000 the number doubled. The need for new antibiotics is at a crucial stage and getting worse as each year go by.

Most of the work this man has dedicated his life to has only ever been in warmer climates. What about the Arctic Ocean or North Sea? These environments will surely have different bacteria to those in warmer climates, therefore there is still so much more research that hasn't even started.

6. Evaluation

While researching for this project I have become fascinated by the work of William Fenical. As a chemist he has been forced to stretch the boundaries of his knowledge and delve into the unknown of genetics, biomedicine as well as marine biology. Although everything he has done so far is beyond the imagination of most men, he is still very modest in his genius. I would love nothing more than to have the natural ability of this man, but I would be delighted to have the dedication and passion for my work as he has for his. Fenical has opened the world of biomedicine to me and although I will continue to follow my own goals, I can't help feel that when I make my important decisions during my career Fenical will be influencing them.

Gathering information about Fenical was easy and there is plenty of it. Writing a report about Fenical isn't so easy. There is so much work he has done that I would like tell people about, but you will need to do all your own research after reading this report.

I believe there was sufficient time to complete this report and have really enjoyed the research. If it wasn't for this project I wouldn't have heard of William Fenical and I am glad to have had this opportunity to learn more about his work. I will be keeping a keen eye on Fenical and his work and hopefully the work he has encouraged other to do in the future.

7. Bibliography

All Information was found on the following websites;

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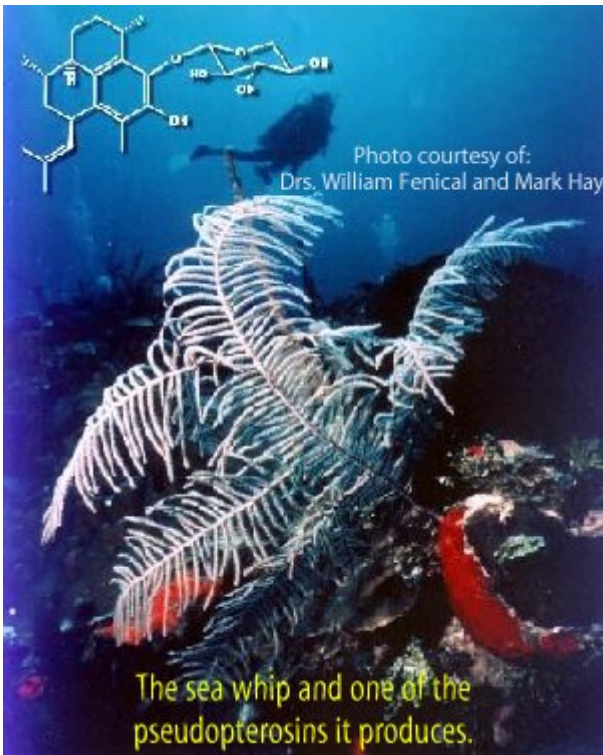
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8. Appendix



1. Sea fan



2. Estée Lauder Resilience Range



3. Salinispora



4. Mud Torpedo