

## 15. Biomedical Application of Bioactive Species from Deep-Ocean Water

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### I. Introduction

Deep-ocean water (DOW) from 200 meters below sea level is non-polluted cool and clean water full of a variety of ions and organic species with high bioactivity. In the ocean there are many known and undiscovered substances, many of which become valuable to human through concentration, filtration and purification. DOW occupied 95% sea water in the earth. Therefore, DOW as sustainable materials can be continuously and richly supplied from the sea water. Among DOW, the higher value of biomedical application of the bioactive molecules is important and worth exploring and acquiring. Our preliminary data found that an extract of 1070 molecules from DOW efficiently inhibited the growth of *Helicobacter pylori* *in vivo* and *in vitro*. This novel finding rejected the thinking that high  $[Ca^{2+}]$  and  $[Mg^{2+}]$  affect the bacterial growth and biomedical effects. In addition, this novel finding is the newest discovery and it has led to the application for several patents in the world. We further determined the biomedical effects of these possible bioactive molecules on the *Helicobacter pylori* growth, *Atopic dermatitis*, lipid profiles and atherosclerosis in the animal models. How to purify, characterize, mass produce and valuably develop of these biomedical molecules from DOW to biomedical application is the urgent target for high-valued sustainable materials bio-application. Therefore, we studied the characteristics of DOW and tries to understand their physical and chemical properties.

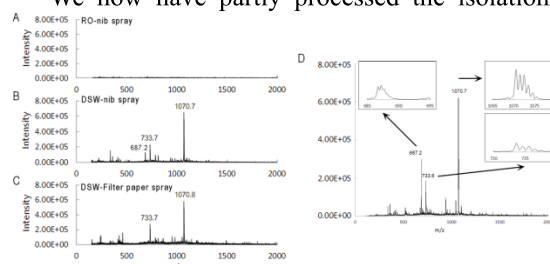
### II. Materials and Methods

We used micro liquid-liquid extraction technique and fiber-spray mass spectrometry to identify and to analyze the bioactive species obtained from DOW. Other spectroscopic studies were also incorporated to establish the pattern characteristic of its physiological activity. In addition, we isolated and

purified the organic matter possessing bioactivity, and further to identify the structure of the bioactive species by NMR and crystallography. We explored the biomedical function of these high-valued bioactive molecules from sustainable materials DOW in the animal model and clinical human trial. Finally, the pilot production and mass production of the high-valued sustainable materials of biomolecules from DOW were prepared by Stone and Resource Industry R&D Center and industry.

### III. Results and Discussion

We now have partly processed the isolation,



chemical formula and structures of the DOW bioactive species for the purpose of patenting and new drugs. Our data also indicated that the isolated DOW bioactive species inhibit the growth of *Helicobacter pylori* and ameliorate gastroesophageal reflux diseases in the rat models. We also established two VACHI commercial products.