CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
S0515

Project Title
Separation and Analysis of Marine Compounds Using TLC

Abstract

Objectives/Goals
Marine natural products have demonstrated potential in treating cancer and other diseases. The goal of this experiment was to separate, recover, and identify structures of compounds found in a series of marine organisms. By working with smaller quantities of crude extract, it evaluated the effectiveness of a miniaturized analysis process.

Methods/Materials
One-dimensional (1D) and two-dimensional (2D) thin-layer chromatography (TLC) techniques were used to separate compounds within 62 extracts from marine organisms. Extracts were developed in different solvents to determine which solvent would provide optimal separation; the stationary phase was a silica-coated TLC plate. Next, 30 and 150 µg of a pure, known compound (C(34)H(49)BrO(2)) were spotted on a 2D TLC plate. The compound was recovered and analyzed with UV spectrometry to determine a percent yield. Nuclear magnetic resonance (NMR) was used to determine the chemical structure and identity of an unknown compound from a marine sponge extract.

Results
Overall, 2D TLC proved more effective than 1D TLC because it revealed many additional spots by further separating the compounds in a second direction. The 2D solvent combination of 1:9 CH(3)OH/CH(2)Cl(2) and 40:8:1 CHCl(3)/CH(3)OH/NH(4)OH provided optimal separation. The experiments involving the UV spectrophotometer revealed that the recovered compounds had an average 93.1% recovery rate. NMR peaks of the unknown compound revealed distinct structural features indicating that the unknown compound belonged to the spongian diterpene family.

Conclusions/Discussion
This experiment supported the hypothesis that the compounds within a crude marine extract can be analyzed on a microgram scale. It was shown that TLC can be used as an effective, time-efficient method for separating compounds within a crude extract from a marine organism. It also demonstrated that small masses recovered from the TLC plate can be detected and quantified using UV spectrophotometry. Finally, the experiment demonstrated that a compound from a TLC plate can be recovered and accurately analyzed using NMR spectroscopy to identify its structure. This outlined process can be used in the future as a miniaturized method for finding and analyzing novel compounds within marine organisms.

Summary Statement
Using thin-layer chromatography to miniaturize the analysis process, this project separated, recovered, and identified structures of compounds found in marine organisms.

Help Received
Used lab equipment at University of California, San Diego under the supervision of Prof. Tadeusz F. Molinski; Brandon Morinaka provided additional supervision; Mother helped build board; Mrs. Newman provided guidance and support