

St. Norbert College

Digital Commons @ St. Norbert College

Student Presentations

St. Norbert Collaborative Center for
Undergraduate Research

2022

Antimicrobial Effects of Compounds Used in Cleaning Wipes

Emma O'Neill

Will Butak

Audrey Makope

Morgan Gauthier

Follow this and additional works at: https://digitalcommons.snc.edu/collaborative_presentations

Antimicrobial Effects of Compounds Used in Cleaning Wipes

Emma O'Neill, Will Butak, Audrey Makope, Morgan Gauthier, Corinne Voss, Jonathon Russel, and David W. Hunnicutt

St. Norbert College, De Pere WI, USA.

ABSTRACT

The antimicrobial effectiveness and level of biofilm inhibition of three compounds from Rockline Industries were tested, along with five compounds made by the St. Norbert College Organic Chemistry Department. The Rockline compounds, ColaLipid (CL), Sodium Benzoate (NaB) and Benzoic Acid (BA), were solubilized in 10% DMSO and tested at concentrations of 0.15%, 0.10%, and 0.01%. To ensure that any growth effects were due to the compounds in question, DMSO was also tested for antimicrobial activity. The compounds were tested against safe relative of eight bacteria of clinical importance (*Acinetobacter baylyi*, *Bacillus subtilis*, *Escherichia coli*, *Enterococcus raffinosus*, *Enterobacter aerogenes*, *Pseudomonas fluorescens*, *Pseudomonas putida*, *Staphylococcus epidermidis*) and one species of fungus (*Candida albicans*). The antimicrobial properties of these compounds were measured by reading absorbance at 600 nm of overnight cultures. Biofilm formation inhibition was measured using a crystal violet biofilm assay. ColaLipid and Benzoic Acid were found to inhibit growth of the bacterial and fungal strains, while Sodium Benzoate did not. Of the compounds synthesized by in St. Norbert organic chemists, two showed consistent inhibition of growth and three did not. ColaLipid, Benzoic Acid, and one organic compound showed consistent inhibition of biofilm formation.

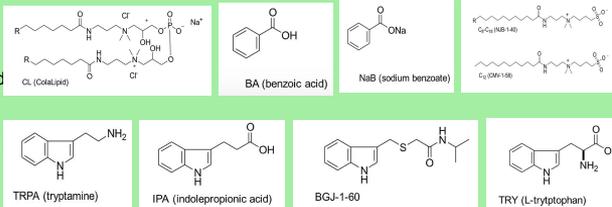
INTRODUCTION

Surfactant molecules are found in many soaps and are used to decrease surface tension to remove bacteria from surfaces, as well as for antibacterial purposes. Rockline Industries current include ColaLipid (CL), Sodium Benzoate (NaB) and Benzoic Acid (BA) in their surface-cleaning wipes, but the distinct antimicrobial and biofilm inhibition properties of these three ingredients have not been tested in isolated experimentation, so experimentation was done to determine the unique antimicrobial and biofilm-inhibition properties of each. Additionally, the St. Norbert College organic chemistry department produced several compounds that were speculated to have similar antimicrobial properties. These compounds included NJB-1-40 and CMV-1-58, two zwitterionic compounds that have similar chemical properties to Rockline's ColaLipid. Along with these two zwitterionic compounds, TRPA (tryptamine), TRY (L-tryptophan), BJG-1-60, NRB, and IPA (indolepropionic acid) were tested for potential antimicrobial effects. All samples were tested in 10% DMSO, which allowed for adequate dissolving of the compounds into deionized water while not significantly affecting the growth of the microbes.

METHODS

Microbial Cultures: Strains of *E. coli*, *S. epidermidis*, *E. aerogenes*, *E. raffinosus*, *A. baylyi*, *P. fluorescens*, *B. subtilis*, and *P. putida* were inoculated in test tubes containing Mueller-Hinton Broth. The tubes were placed in a shaking incubator at 30 °C and 150 rpm and grown for 24 hours. The fungus *C. albicans* was inoculated in test tubes containing Yeast Malt Broth.

Microplate Growth Assay: The bacterial cultures were diluted 1:1,000 in Mueller-Hinton broth, and the fungal cultures were diluted to 1:1000 in Yeast Malt Broth. Quadruplicate trials were run in 96-well plates. In said 96-well plates, 50uL of each surfactant dilution were pipetted into the wells along with 50uL of the desired bacteria and incubated at 30°C for 24 hours. Blanks were made using 50uL of deionized water and 50uL of the microbe's respective broth. Plates were read using an ELISA reader measuring optical density at 600 nm. Two trials were performed for each surfactant.



RESULTS

Antimicrobial Activity of Commercial Compounds in 10% DMSO



Figure 1: A. The antibacterial activity of varying concentrations of DMSO, which was used to dilute the compounds in dH₂O. B, C, D. The antibacterial activity of isolated compounds from Rockline disinfectant wipes.

Antimicrobial Activity of Novel Compounds

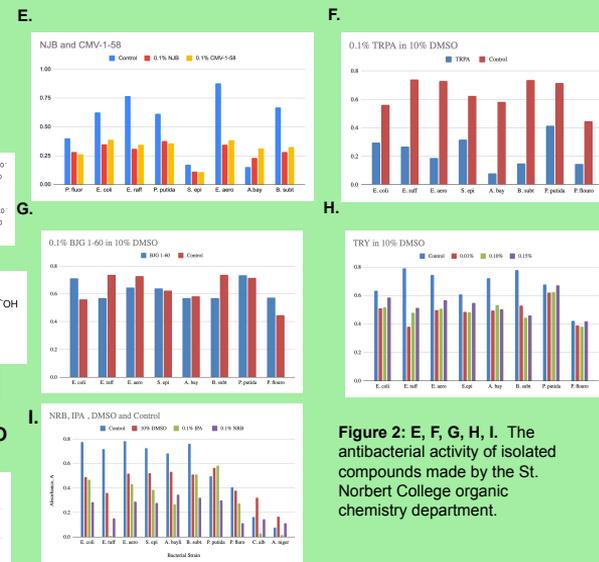


Figure 2: E, F, G, H, I. The antibacterial activity of isolated compounds made by the St. Norbert College organic chemistry department.

CONCLUSIONS

Rockline Compounds

- All concentrations of ColaLipid and BA concentrations above 0.10% inhibit growth of all tested microbes.
- NaB effects were inconsistent within and between trials.

Novel Compounds

- NJB, CMV, and TRPA displayed consistent antimicrobial effects.
- BJG-1-60 and TRY tests did not show to be antimicrobial in nature.
- ColaLipid, Benzoic Acid, NJB, and CMV all show potential biofilm formation inhibition.

ACKNOWLEDGEMENTS

Reagents and funding were provided by Rockline Industries.