Evaluating the Antimicrobial Efficacies of Algal Extracts on Antibiotic Sensitivity, Planktonic Cell Growth, and Biofilm Formation in Selected Bacteria

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According to the World Health Organization (WHO), antibiotic resistance is one of the largest current threats to human health (Kaplan, 2013). Phytochemicals are currently being researched for their antimicrobial efficacies. The purpose of this investigation is to evaluate the antimicrobial efficacies of algal extracts to increase antibiotic effectiveness, inhibit planktonic cell growth, and inhibit biofilm formation. Extracts of Chondrus crispus, Chlorella vulgaris, Fucus serratus, Fucus spiralis, Laminaria digitata, and Ulva lactuca were evaluated. 6.25% algal extracts were prepared with a 40% ethanol extraction method, filtered, and evaluated by the Kirby-Bauer disc diffusion test. Results suggest significant zones of inhibition for all extract-bacterium combinations tested ($p <= 0.016$). MIC and sub-inhibitory concentrations, compared to the control, were found by using a two-fold dilution. It was determined that 17 out of 30 dilutions had MICs of <= 31 µg/mL. Mueller-Hinton agar was enhanced with 0.625% algal extracts to examine whether the extracts show a synergistic ability to increase the susceptibility of selected bacteria to the six tested antibiotics. The data suggest that the 0.625% algal extracts increased the zone of inhibition of the tested antibiotics for 85 out of 180 combinations. The effects of the 0.625% algal extracts on biofilm formation were determined using a crystal violet assay. The data suggest that all tested 0.625% algal extracts reduced the amount of biofilm formed by the selected bacteria. These data suggest that algal extracts show potential as antimicrobial agents against biofilm formation, planktonic cell growth, and that some of the algal extracts show promise in increasing the susceptibility of select bacteria to the tested antibiotics.