**An Exploration into the Antimicrobial Resistance of *E. coli* Toward Essential Oils**

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Antibiotics have been used for years to treat infections and save lives. Unfortunately, antibiotic use has also led to bacterial resistance. This project focuses on the use of essential oils (EOs) as alternatives to traditional antibiotics and investigates whether similar resistance patterns are observed. EOs were selected based on their reported disinfecting potential and included seven oils: oregano, peppermint, cinnamon, lavender, tea tree, lemon, and a disinfecting oil blend (“germ fighter”). Seven oil components: thymol, linalyl acetate, limonene, *trans-*cinnamaldehyde, (+)-terpinen-4-ol, menthol, and carvacrol were also investigated. Research included verifying that the oils possess bactericidal effects against *Escherichia coli* (ATCC 25922) and examining the bacteria’s resistance capabilities. The minimum inhibitory concentration (MIC) values determined for the oils were as follows: peppermint and oregano: 1.25 µL/mL, tea tree: 2.5 µL/mL, cinnamon: 0.125 µL/mL, lavender: 5 µL/mL, lemon: >5 µL/mL, camphor: >10 µL/mL, and germ fighter: 1.25 µL/mL. The MICs of the components were thymol: 10 µL/mL, linalyl acetate: >5 µL/mL, *trans*-cinnamaldehyde: 0.3 µL/mL, (+)-terpinen-4-ol: 1.25 µL/mL, menthol: 10 µL/mL, and carvacrol: 1.25 µL/mL. Resistance propagations, conducted for at least five days in culture tubes and at least seven days in flasks, indicated an increased resistance to most oils before the resistance level either became constant or collapsed (where the culture failed to grow at the previous highest tolerable concentration). *E. coli* cultures took more days to begin developing resistance to peppermint than other EOs, while the cultures never developed resistance to tea tree oil.