Effects of Nickel Chelator, Urease and Carbonic Anhydrase Inhibitor on Helicobacter pylori Eradication in Artificial Gastric Environment

Ramadugu, Meena (School: John F. Kennedy High School)

Helicobacter pylori is a gram-negative bacterium affecting above 50% of the world's population, with higher prevalence in the developing world. It causes numerous gastrointestinal diseases such as gastritis, peptic ulcer, gastric carcinoma and lymphoma. Current multidrug regimens using antibiotics with proton pump inhibitors (PPI) have limitations due to antibiotic resistance and noncompliance resulting in 20% failure rate, raising the need for alternative treatment strategies. This experiment targeted the urease enzyme (using nickel chelator and garlic juice) and carbonic anhydrase enzyme (using Diamox) acid-defense mechanisms of H. pylori. A control sample was prepared with gastric juice, H. pylori, nickel, urea to simulate the human gastric environment for H. pylori growth. Five other samples were prepared with gastric juice, H. pylori, nickel, urea and an additive for each of the interventions (chelator, diamox, garlic juice, chelator and diamox, chelator and garlic juice) being tested. These samples were set aside for 90 minutes (simulating gastric emptying time) and plated on Columbia blood agar plates. CFU counts were recorded after incubating samples in microaerophilic conditions for 5 to 7 days. The experiment was repeated multiple times to ensure internal reliability of results. A one-way analysis of variance (ANOVA) was performed to compare the means of the different intervention groups. The combination of chelator and diamox sample showed statistically significant (p-value < 0.05) inhibition effect on H. pylori when compared to all other samples. Chelator and chelator with garlic juice combination did show some inhibition but garlic juice and diamox alone were not significantly effective.

Awards Won: