The Effects of Sugar Substitutes and Prebiotics on the Virulence of Gastrointestinal Bacteria

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The gut microbiome plays an essential role in human health, and our diet has the ability to alter it. Pseudomonas aeruginosa and Escherichia coli are two of the leading causes of bacteremia, but both are also part of the normal gastrointestinal flora. Species of gut bacteria can become pathogenic if they acquire virulence. Virulence factors, including biofilm formation and motility, are mechanisms that allow bacteria to cause disease and evade host immune responses. Biofilm formation is associated with many chronic infections. It can also cause infections on endotracheal tubes in ICU patients which can cause ventilator-associated pneumonia. This is difficult to treat because the biofilm enables the bacteria to resist antibiotics. This research aimed to determine if the sugar substitute sucralose affects the virulence of bacteria and if the prebiotic inulin could counteract this effect. To test this, sublethal concentrations of sucralose were determined for both species. Biofilm formation and motility were measured with exposure to serial dilutions of sucralose with or without inulin. The results showed that while sucralose did not seem to affect motility, there was a statistically significant increase in the biofilm formation index of P. aeruginosa, E. coli, and the combination of the two species with exposure to sucralose. The addition of inulin showed mixed results. Gastrointestinal bacteria are important to our health, but some also have the ability to become pathogenic. This study suggests that sucralose may play a role in the development of virulent strains of bacteria.

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