

Chai Tea Promotes Ampicillin Susceptibility in MRSA

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Staphylococcus aureus (*S. aureus*) is a pathogenic organism that asymptotically resides on the skin and in nasal mucosal membranes of 11-40% of the worldwide population. *S. aureus* has mutated in response to long-term antibiotic exposure, generating strains known as methicillin-resistant *Staphylococcus aureus* (MRSA). MRSA is involved in approximately 80,000 infections, coupled with 11,000 deaths per year in the United States alone; costing the U. S. healthcare system up to \$9.7billion, or approximately \$60,000 per patient, annually. Consequently, MRSA infections require stronger, more expensive drugs, accompanied by extended hospitalization. Treatment options are dwindling as costs are rising, both in mortality/morbidity rates and financially. Antimicrobial resistance is an ongoing process that will require alternative and creative interventions.

Masala chai tea (chai tea) is a traditional tea beverage originating from India. This tea beverage is composed of a strong black tea base infused with various spices; typically cinnamon, cloves, cardamom, ginger, and black peppercorn. Each constituent listed above is composed of at least one bioactive plant compound with proven antimicrobial activity. We have taken these antimicrobial properties of each component into account, thus opting to use chai tea as a means to modify the resistance of MRSA to beta-lactam antibiotics.

In this study, we utilized seven MRSA strains. The microbes were isolated from carriers at the Cuesta College Allied Health program and were characterized by culture and PCR properties. Aqueous based chai infusion (CW) or ethanol-based chai extract (CA) was incorporated into the media used for antibiogram diffusion assays, according to standard protocols. Compared to the control conditions, the aqueous-based chai infusion and ethanol extract promoted a significant increase in MRSA susceptibility to Ampicillin, as demonstrated by the diameter of the inhibition halo (ANOVA, $F=4.92$, $p<0.05$).

The results indicate that aqueous based chai infusion or ethanol-based chai extract potentiated the bacteriocidal effect of Ampicillin against all seven isolates of MRSA in vitro. Interestingly, only Ampicillin, from all tested antibiotics, showed synergistic activity with chai. The data suggest the potential benefits from the association of established antimicrobial drugs with natural plant compounds as a means of modifying drug resistance in MRSA. The synergism shown between chai tea and ampicillin holds the possibility of assisting in deconstructing mechanisms of resistance, helping stage for future studies to progress towards reducing the MRSA global crisis.

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