Chai Tea Promotes Ampicillin Susceptibility in MRSA

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Abstract

Rationale: MRSA is a resistant, more aggressive strain of S. aureus that is presenting a challenge to both the public and medical communities. This can be seen in the 80,461 infections, coupled with 11,285 deaths, per year in the United States alone [4]. This crisis is costing the U.S. healthcare system up to $5-Trillion, or approximately $60,000 per patient, annually [5]. Consequently, MRSA treatment requires more potent and expensive drugs, accompanied by longer hospitalization [6]. As can be deduced from the given information, our options for treatment are dwindling as cost are rising, both in mortality rates and financially. Resistance is an ongoing process that will require alternative interventions. In this work we tested a novel known plant based product for the ability to modify the resistance profile in newly isolated MRSA strains.

Methods: Aqueous based chai infusion (CW) or ethanol based chai extract (CA) were added to the media in standard Diffusion antimicrobial testing. MRSA was isolated from the nostrils of healthy carriers and characterized by culture and PCR.

Results: The aqueous based chai infusion and ethanol extract promoted a significant increase in MRSA susceptibility to Ampicillin, as shown by the diameter of the inhibition halo (p<0.05).

Conclusions: Our results indicate that the aqueous based chai infusion or extract potentiated the action of Ampicillin against several isolates of MRSA in vitro. Interestingly, only Ampicillin, from all tested antibiotics, had shown synergistic action with chai. Drawing from these results, we propose the integration of natural plant compounds, with what are currently ineffective antibiotics against resistant strains, as a means of modifying resistance in MRSA [4].

Aims

• To determine the ability of chai to modify the antimicrobial resistance of MRSA “in vitro”
• To deduce differences in efficiency between water-base and alcohol base extracts.

Methods

Chai extracts

Water-based and alcohol-based extracts were prepared by infusion of cinnamon, cloves, cardamom, ginger, star anise, black tea and black peppercorn in hot water for one hour or six ethanol for a week. The extracts were filtered, bottled and kept at 4C. All experiments were performed with fresh batches of extracts, which were prepared weekly. The extracts were added to the media for standard disk diffusion antibiograms.

MRSA isolates

We utilized 3 isolates of MRSA obtained from nasal swab survey of 240 college students. The results were used in Chromagar MRSA plates (Hardy Diagnostics) for initial isolation and the isolates identification confirmed by multiplex PCR assay using specific sequences for Staphylococcus rhombens, Muc A and Patins-Valentine toxin.

Antibiogram

We performed disk diffusion tests following NCCLS CLSI standards. Extracts were added to the media before plate pouring. Prepared plates were used for tests within 12 hours. All tests were performed in quintuplicate.

Results

Figure 1—Inhibitory halo measurement in radial antimicrobial diffusion test.

Figure 2—Inhibitory halo measurement in radial antimicrobial diffusion test.

Figure 3—Ampicillin resistance of MRSA strains with and without Chai.

No significant synergistic effect between tested antimicrobial drugs and Chai infusion (CW) or extract (CA) added in controlled volumes. Results indicate that the synergistic effect on resistance is restricted to Ampicillin, among the tested antimicrobials.

Summary

Our results indicate that the aqueous based chai infusion on extract potentiated the action of Ampicillin against several isolates of MRSA in vitro. Interestingly, only Ampicillin, from all tested antibiotics, had shown synergistic action with chai. Drawing from these results, we propose the integration of natural plant compounds, with what are currently ineffective antibiotics against resistant strains, as a means of modifying resistance in MRSA. An aqueous based chai infusion will be the ideal alternative as traditional antibiotics are becoming less effective due to resistance. This could pose a major danger in the near future, from which we are looking for solutions.

Conclusion