Efficacy of Plant-based Antimicrobials against *Streptococcus* species *in vitro*

Kevin Dalson, Libin Zhu, and Sadhana Ravishankar,
School of Animal & Comparative Biomedical Sciences, University of Arizona, Tucson, AZ

While *Streptococcus* is not typically known to be a foodborne pathogen, there are several cases of foodborne illness outbreaks associated with *Streptococcus* species. The use of plant-based antimicrobials to decontaminate food is an appealing alternative to traditional chemical-based methods, which could pose potential health risks to consumers and cause environmental hazards. The objective was to determine the efficacy of plant-based antimicrobials against two *Streptococcus* species *in vitro.* Treatment solutions of plant extracts were prepared at 5% or 50% concentrations (freshly made aqueous extract), and plant essential oils and their active components at 0.5% concentrations. Tubes containing dilutions of the initial concentration were also prepared (1:1 - 1:16 for plant extracts, 1:1 - 1:4 for aqueous extract, 1:1 - 1:8 for oils and active components). Bacterial inoculum was added to each treatment, making a 1:1 mixture of culture to treatment. Serial dilutions were performed for all treatments, and then spread-plated onto tryptic soy agar. The plates and culture-treatment mixture were incubated at 37°C. Serial dilutions and plating were repeated after 3 and 24 hours. While there was growth in the untreated control, all nine plant-based antimicrobial treatments showed significant effects on *Streptococcus*. Plant extracts showed limited reduction for *S. pyogenes* at 0 hours, but significantly reduced bacterial populations at all concentrations at 3 hours. No survivors were detected after 24 hours for all extract treatments. Some essential oils and active components reduced counts to below detection at 0 hours and after 3 and 24 hours. Similar results were observed with *S. pneumoniae,* excepting that plant extracts showed better inactivation at 0 hours in comparison to *S. pyogenes*. Results show that plant-based antimicrobials are effective against *Streptococcus* species *in vitro*. Their effectiveness, combined with their properties of being organic and non-hazardous can make for an appealing alternative to chemicals in decontaminating food.