Towards the improvement of anti-microbial compounds for food safety and extended shelf life.

Rationale and Significance

To increase the shelf-life, anti-microbial compounds are added on foods to battle against the microbes associated with foodborne illnesses.

There are natural compounds, such as lactic acid which are especially attractive because these compounds are natural and can be degraded in cells of raw foods. As such, FDA and USDA have approved some of them to treat organic foods. Compared with other compounds used (e.g. octenidine hydrochloride and benzethonium cbhloride), lactic acid is degraded faster due to natural utilization by foods. In addition, the anti-bacterial mechanisms of lactic acid need to be better understood, which requires computer modelling combined with wet bench chemistry and biochemistry. Very recently, organic acids were correlated with disruption of bacterial quorum sensing in that malic acid was shown to be related to the reduction of biofilm. If this mechanism can also apply to other molecules, food safety could be greatly impacted from processing to storage.

In this proposal, we aim to discover new natural products and derivatives of natural products, which could prolong the shelf-life of foods and reduce bacterial biofilm formation. To achieve this goal, we will combine state-of-the-art computational modeling with experiments with common foodborne pathogens. In collaboration with Safe Foods Corporation and the Arkansas Food Bank, this research should deliver significant impacts on local and global food supply. It has been estimated that for every extra day of food shelf-life, it helps extends the food supply by an additional 10%. Compounds from Safe Foods Corporation are used world-wide to process 110 million pounds of food daily which can feed ~ 100 million people per day. Out of those people, one-day delay of food expiration will help feed an additional ~ 10 million people.

Research Team:

This grant will be research by three faculty members of UALR specified below.

Dr. Shanzhi Wang, assistant professor of Chemistry, specializes at biochemistry and evaluation of compound effects on bacteria.

Dr. Jerry A. Darsey, professor of Chemistry and Director of the Center for Molecular Design and Development, specializes at molecular modeling on compounds and cells.