

ABSTRACT

PRESENTER: Dr. Michael Fevola

COMPANY: INOLEX Inc.

JOB TITLE: Vice President, Head of R&D

Podium Title: *The next Nirvana, naturally: Taking alternative preservation mainstream with safe and effective biobased ingredients*

Background information (Short introduction)

Traditional biocidal preservatives have given way to alternative preservation (AP) systems, which rely on multifunctional ingredients and the hurdle technology approach to formulate products that inherently inhibit the growth of microorganisms and prevent microbial contamination. The first generation of AP ingredients were largely non-renewable products of petrochemical processes, which tended to limit their utility to formulators seeking to use natural, i.e. plant-based, preservation systems.

Objective

This presentation will review recent advances in natural AP systems using 100% biobased ingredients synthesized according to the principles of green chemistry. We will examine key aspects including feedstock sourcing, ingredient manufacture and use, and environmental, health, and safety considerations. Additionally, new chemistries for medium chain terminal diols (MCTDs) that offer improvements in plant-based content and functional performance will be presented.

Methodology

The manufacture of various biobased AP ingredients, including hydroxamic acids, 1,2-alkanediols, glyceryl ethers, and glyceryl esters, will be mapped from the starting plant feedstocks to the final ingredient. Biobased carbon content of AP ingredients is determined using radiocarbon dating based on carbon-14. Preservative efficacy of AP systems in model formulations will be demonstrated using traditional microbiological challenge testing methods for gram positive/negative bacteria, yeast, and mold. Other performance attributes will be articulated using published methods; for example, irritation potential will be assessed using the EpiDerm™ skin equivalent model to assess cytotoxicity and inflammatory cytokine release endpoints.

Results

100% biobased AP systems demonstrate robust preservative efficacy in a broad range of leave-on and rinse-off formulations. Depending on the specific formulation type, the hurdles employed for preservation may need to be tailored to maximize preservative efficacy while maintaining

overall performance and aesthetics. Specific examples of layering hurdles to achieve optimal preservative efficacy will be discussed. In addition to providing preservative efficacy, next generation MCTD ingredients will be shown to deliver additional functional and performance benefits, e.g. enhanced skin mildness.

Conclusion

The hurdle technology approach using 100% biobased, multifunctional AP ingredients delivers equivalent preservative efficacy to prior petro-based ingredients with the added benefits of functional performance improvements and enhanced sustainability across the product life cycle. Validation of the plant-based origin of these ingredients is readily achieved via radiocarbon dating based on carbon-14 and enables independent natural certifications.

Why is this important to the industry?

All products must be formulated for robust protection against microbial contamination. Thus, we will always require safe, effective, and consumer-acceptable methods for protecting products from microorganisms. Regardless of the safety and efficacy of traditional preservatives, consumer demand for more sustainable, “natural”, or “clean” products has rendered the traditional technologies obsolete and necessitated the development and adoption of viable alternatives, which are here to stay.



Michael J. Fevola is Vice President, Head of R&D at INOLEX, a leading global specialty ingredients company headquartered in Philadelphia, PA, where he leads the Research & Development and Product Stewardship teams and partners closely with Marketing, Sales, and Operations to fulfill the company's innovation and growth objectives. Previously, Mike was a Research Director & Fellow in Global Beauty R&D at Johnson & Johnson Consumer Inc., where he led the Sun and Body Care Upstream Innovation teams. While at J&J, he drove the development of technologies that have been commercialized to generate cumulative sales exceeding

\$250,000,000, and he was twice awarded the Johnson Medal for Research & Development, the most prestigious scientific recognition at J&J. Mike holds a Ph.D. in Polymer Science & Engineering from the University of Southern Mississippi and a B.S. in Chemistry from the University of Delaware. He is an inventor on 32 issued US patents and is a coauthor of 18 peer-reviewed publications. Mike has served as a member of the SCC's Committee on Scientific Affairs and is Chair of the Personal Care Products Council's International Nomenclature Committee.