CLEAN LABEL CONFERENCE

Considerations for Selecting and Evaluating Clean-Label Antimicrobial Ingredients for Dressings

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Pipeline Innovation

Data Management

Consumer Research

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Process Development

Product Development

Sensory Evaluation

Shelf-Life & Stability

Nutritional Chemistry

eurofins

Food Safety & Microbiology

Challenge Studies & Process Validation

Contaminants/ Pesticides/Residues

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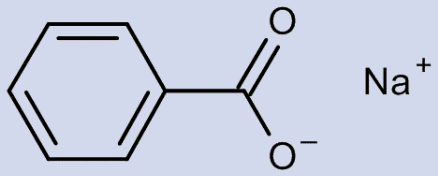
Traditional vs Clean Label Preservatives

Artificial Preservatives

- **Examples**
  - Sodium benzoate
  - Propionate
  - Sorbates
  - Sulfur dioxide
  - Nitrites



Sodium benzoate

- **Pros**
- Documented effectiveness
- Broad spectrum
- Low usage level

Cons

- Consumer perception
- On the “naughty” ingredient lists

Clean Label Preservatives

- **Examples**
  - Bacteriocins (Nisin)
  - Lactic acid
  - Acetic acid (vinegar)
  - Herbal extracts/ essential oils

- **Pros**
- Label friendly perception
- Not synthetic
- Some may allow a no-preservatives claim

Cons

- May require re-formulation and testing
- Higher usage levels in general
- Might have undesirable functional effects

Understanding Product, Process and Use

- Product (pH, acidity, particulates)
- Production (Thermal or non-thermal process)
- Packaging (Single use or multi-serve)
- Storage (Refrigerated vs Ambient)

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Development Process

1. Define Regulatory Space
2. Identify Microbiological Risks
3. Screen Formulation Options
4. Assess Food Safety and Shelf Life

Define Regulatory Space of your Dressing

High-acid food
pH<4.6

- Water activity equal to or below 0.85 → **Water activity-controlled food**
- Water activity above 0.85
  - Not shelf stable → **Refrigerated/ frozen food**
  - Shelf stable
    - Predominantly comprised of naturally high-acid ingredients → **Acid food**
    - Comprised of both high- and low-acid ingredients → **Acidified food** → **21 CFR 114**, **21 CFR 108.25**

21 CFR 117 applies to all categories

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Identify Microbial Risks

Sources of Risk

- Ingredients
- Production Environment
- Processing and Storage
- Recontamination

Microorganisms of Concern

Pathogenic Microorganism
- E. coli O157:H7
- Listeria Monocytogenes
- Salmonella enterica

Spoilage Microorganism
- Lactic Acid Bacteria
- Yeast and Mold

Clean Label System Goals

Pathogenic Microorganisms

- Validated pathogen kill step
  - 5 Log reduction
  - For specific combination of formula and process
- Clean label system must deliver an **equivalent kill step**

Spoilage Microorganisms

- Inhibit and control microbial growth over shelf life
- Assess robustness of formula to environmental contamination
  - During processing
  - After opening and storage

Screening Formulation Options

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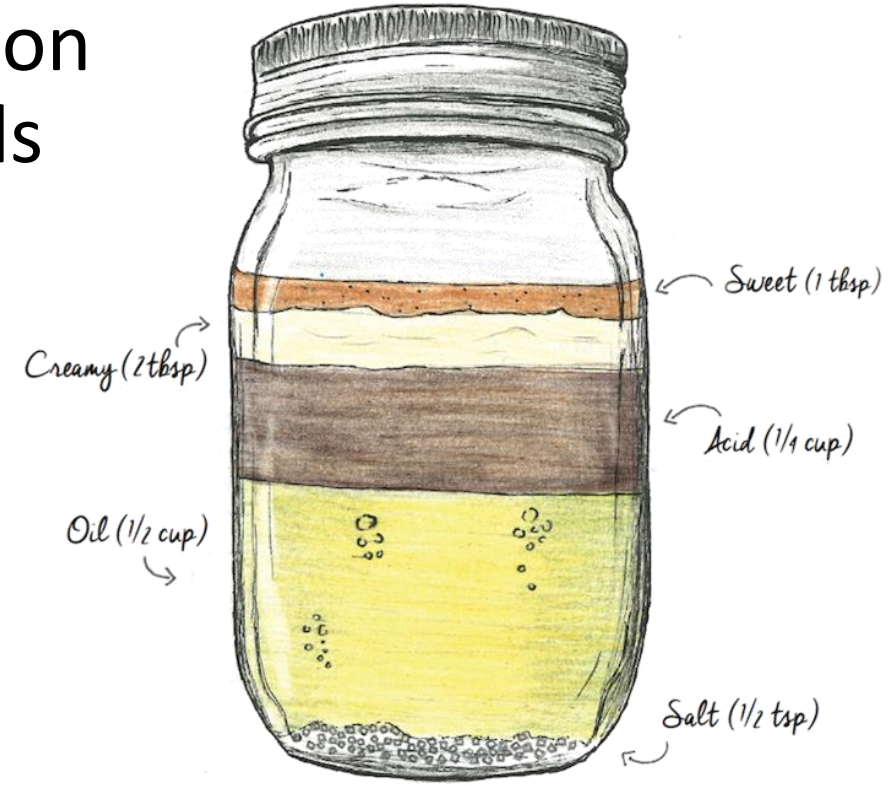
Formulation Parameters for Food Safety

As defined by The International Commission on Microbiological Specifications for Foods

- Acetic acid
  - 0.5% to 1.5% of the aqueous phase
  - To deliver pH of 3.0 to 4.2
- Salt concentrations of 1% to 4%
- Sugar concentrations of 1% to 30%
- Leading to an Aw of approximately 0.95



Clean Label Antimicrobials

Ingredient Type	Active Ingredient	Use level	Antimicrobial Spectrum	Sensory Impact	Labeling
Concentrated buffered acetic acid	Acetic Acid	0.5-2.5%	Lactic Acid Bacteria, Yeast and Mold	Additional acid/sour notes	Vinegar and Natural Flavoring
Lactic Acid	Lactic Acid		Gram negative	Additional acid/sour/fermented notes/dairy notes	Lactic Acid
Bacteriocins (Natamycin)	Natamycin	5-50 ppm	Yeast and mold	Very little flavor impact	Natamycin, Natural Antimicrobial, Food Protectant
Bacteriocin (Nisin)	Nisin	25-500mg/kg	Gram positive, Gram negative, Lactic Acid Bacteria	Cooked flavor note	Fermented Dairy
Fermented Dextrose	Cultured dextrose	0.2 - 1.5%	Yeast and Mold	Additional acid/sour/fermented notes	Cultured/Fermented Dextrose Fermentates
Rosemary Extract (antimicrobial and antioxidant)	Extract of Rosemary	200-1000 ppm	Gram positive	Herbal extracts can be overpowering	Natural extractives of Rosemary
Chitin (aminopolysaccharide biopolymer)	Chitosan	3.6 ml/ lb - 54ml/lb	Gram positive, gram negatives, fungi and viruses	May enhance umami notes	Mushroom extract

Assessment of Clean Label Formulations

Flavor

- Lipid Oxidation
- Off-Flavor Development

Visual

- Color Change
- Oil-Water Separation

Stability

- Food Safety
- Shelf Life

Assessing Food Safety and Shelf Life

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Food Safety Assessment

Pathogenic Microorganisms

- Processing authority review of your formula and process
- Determine if FDA filing is required
- Determine if validation via microbial challenge study is required

Pathogens Challenge Study

- Determines time needed to achieve a 5 Logs reduction under storage conditions
- This data can **support a Food Safety Plan**

Shelf Life Assessment

Spoilage Microorganisms

Determine effectives of your system to inhibit spoilage microorganisms growth

- Over the shelf life of your product
- Considering the storage conditions

Determine the robustness of the system to control post-opening spoilage

- Multi-serve

Spoilage Challenge Study

- Recommend running 1.5 times of desired shelf life under relevant storage conditions
- Can be use to measure robustness after opening
- Predictions cannot be made past the duration of study

Key Points - Clean Label Salad Dressings

21 CFR Part 169

Define Regulatory Space

Identify Microbiological Risks

Pathogenic and

Spoilage microorganisms

Screen Formulation Options

Flavor, Physical and Chemical Stability

Assess Food Safety and Shelf Life

Challenge Studies

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Tell us about your Clean Label Project Needs!

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Thank you!

Product Design

The NFL integrates consumer guidance, culinary ideation and protocepting, and product and process development to maximize speed to market and success once there. No other food consultant has our depth and breadth.

Consumer Insights & Sensory Science

Our market researchers, statisticians and sensory scientists develop and execute studies to focus your product attributes, meet market needs and beat the competition.

Product & Process Development

Our chefs, food scientists, and chemical engineers shepherd your concept from ideation through nutrition protocepts, final product and then to process scale up, trade show samples and test market products.

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