AS PRESENTED AT IFTPS

(Abbreviated Presentation)

THE NATIONAL FOOD LAB

Where do we go from here?

IFTPS 2011

Acid - Acidified Foods Symposium

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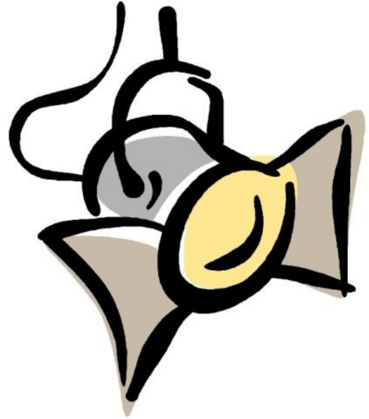
Presentation Outline

- Regulations / Food Safety Issues
- Spoilage / Processing Issues
- Thermal Process Optimization
- Process Validation
- Conclusions



Spotlight on the Industry

- Recent outbreaks involving fresh, minimally processed and low-moisture foods have placed spotlight on the whole industry
- Also, a couple of significant recalls in low-acid, shelf-stable products resulted from plant operations mistakes (retort and aseptic)
- Acidified foods have not been involved but…..

What is the industry to do?

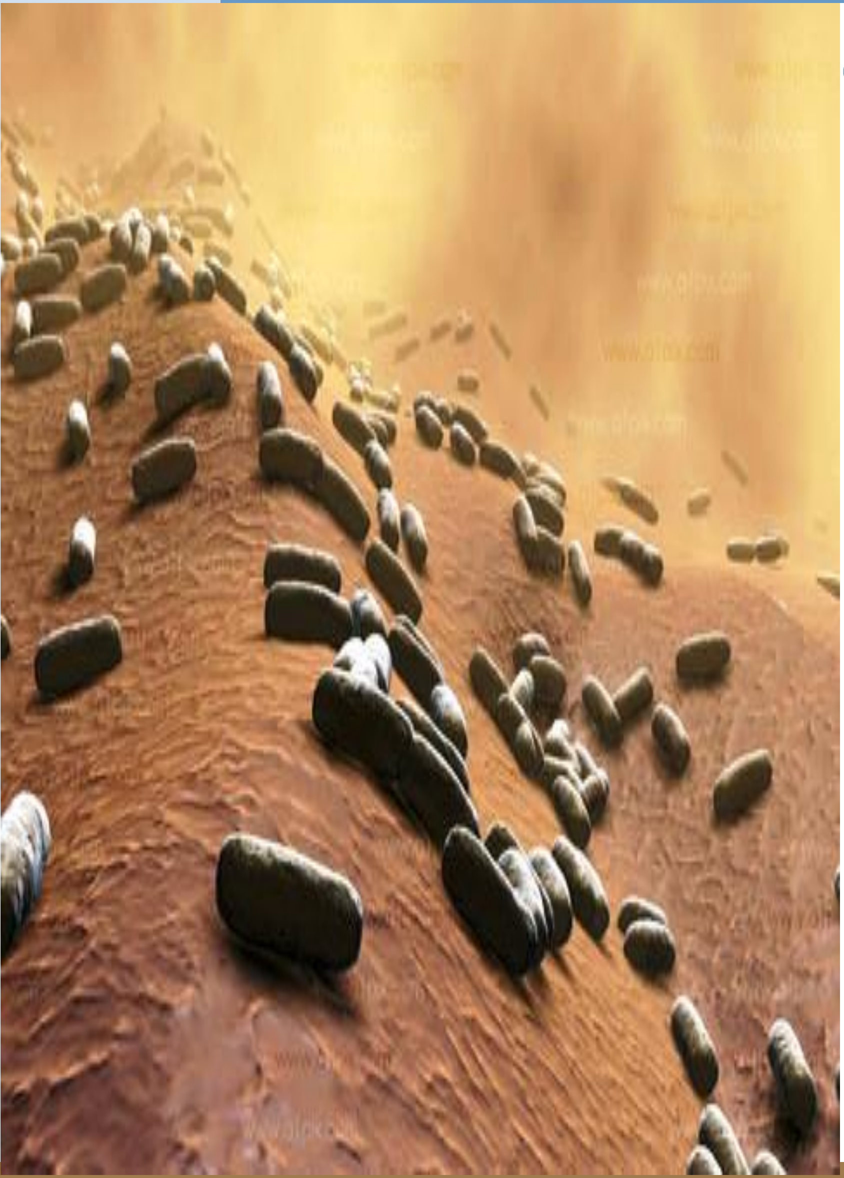
- Assume more foods will be classified as acidified
- Understand guidance is not yet finalized
- Assure safety and stability of acidified products
- Rely on solid science
- Rely on proper implementation, execution and documentation of food processing activities

Food Safety Considerations

What needs to be addressed?

- ***Clostridium botulinum***
  - Regulations original intent was to protect against *Clostridium botulinum*
  - pH 4.6 or lower is key to protection
  - Proper acidification procedures are a must
  - Equilibrium pH must be reached in center of every particle
  - Botulism in acidified foods exclusively associated to improper acidification

What needs to be addressed?



- **Vegetative Pathogens**
  - *Salmonella, E. coli* 0157:H7 and *Listeria monocytogenes* have tolerance to acidic conditions
  - Low infectious dose allow for infection without any growth
  - Caused outbreaks in high-acid products (apple and orange juice)
  - Shelf-stable, acidified foods not implicated but potential risk exist
  - Thermal process is normally required to eliminate risk

Cold Filling of High-Acid Foods

- Many "acid" foods are cold-filled
- Some may be reclassified as "acidified"
- Supporting data developed using preservatives
- Preservatives may be use in lieu of thermal process against spoilage organisms <u>but not against pathogens</u>
- Companies may have to repeat pathogen work
- **Experimental design of microbial challenge studies must be scientifically robust and address regulatory issues**

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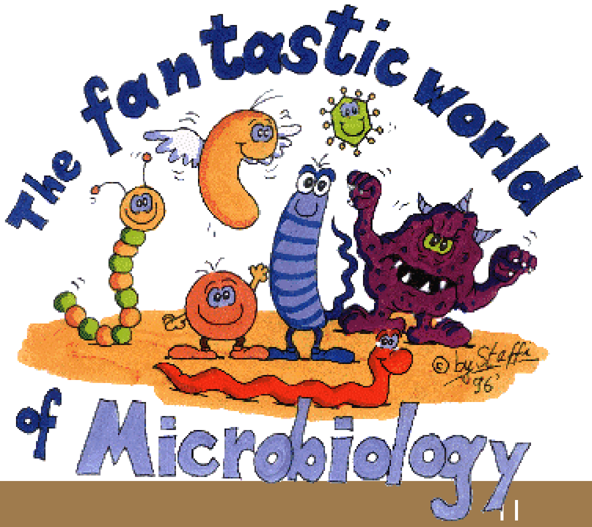
Processing / Quality Issues

Microbial Issues - Spoilage

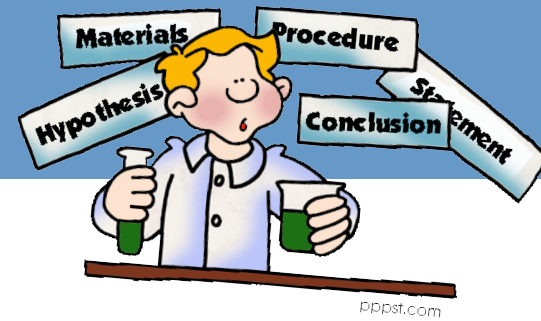
- Common Spoilage Organisms
  - Yeast and Molds
  - Lactic Acid producing bacteria
  - Other organisms (exotic ingredients)
- Common causes of spoilage
  - Leaks in cooling section of aseptic heat exchanger
  - Excessive condensation on filling area
  - Inadequate chlorination of cooling water
  - Inadequate sanitation in cooling tunnels
  - Insufficient treatment of closure and headspace
  - Hermetic seal failures

Microbial Issues - Spoilage

- Aciduric Heat Resistant Organisms
  - Heat resistant molds and Alicyclobacillus
    - Can grow at pH <4,0
    - Normally controlled by use of quality ingredients and preservatives
  - Other spore-forming bacteria (increase pH??)
    - *Bacillus coagulans*, *B. subtilis*, *B. licheniformis*, etc.



Microbial Issues - Spoilage



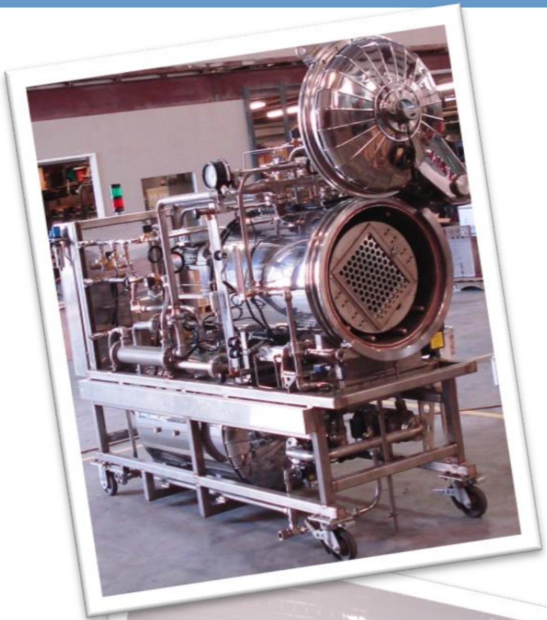
Aciduric Heat Resistant Organisms

- Can spores germinate and grow (spoilage issue)?
- If so, can they raise pH above 4.6 (food safety)?
- What to do?
  - Evaluate risk based on product characteristics
    - If pH <4.0 not a problem
  - Challenge product/formula via challenge studies
  - Establish evaluation criteria for challenge studies
    - Example: $\leq$ 1-log increase in counts; pH raises above 4.6
  - Based on above, determine if thermal process or product formula must be modified to curtail risk

Process Optimization

Thermal Process Optimization

- Tendency to over-process
- Results in poor quality
- Optimization is highly desirable
- Focus on spoilage organisms
- Confirm vegetative pathogens are killed by process or die quickly afterwards



Process Optimization – Proposed Approach

Select Quality Objective

Establish Performance Criteria

Fine Tune Process to Meet Performance Criteria

Process Optimization

- An additional note about optimization:
  - $F_{16/200}$ processes are not designed to destroy spore-formers but at lower pH's ($\leq$4.3) they may provide some lethality and/or severe injury to some microbial spores
  - Optimization may remove this protection, so confirming that spore germination is not an issue becomes more important

Conclusions

- Processes for acidified foods mostly developed by trial and error or by applying excessively conservative industry standards (i.e., $F_{16/200}$)
- Plenty of opportunity for optimization
- Emphasis should be on science to establish process that improve quality while maintaining safety
- Acidified foods posses a long history of safety which has been driven by industry and regulatory efforts
- Key to continued success is on practices at production facility level

Thank you!!

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