

**ASTA 2009**

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# **Microbial Safety in Spices & Microbial Reduction Regulatory Update**

**ASTA Technical Committee**

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a ConAgra Foods® brand

# *Background*

Spices used for centuries for flavor and the preservation of some foods

Generally viewed by consumers as “Ready-to-eat”

Agricultural-based food ingredients may be contaminated with pathogens

Drying or dehydration may prevent pathogen growth, but is not a kill step

Sampling and Testing plays a key role in a comprehensive food safety system

Microbial reduction/kill steps are routinely utilized to ensure food safety

# Selected Spice Recalls

YEAR	PRODUCT	PATHOGEN	NUMBER OF ILLNESSES
2001	Paprika	<i>Salmonella</i> Ohio	0
2002	Oregano	<i>Salmonella</i> Bispbjerg	0
2002	Sesame Seeds	<i>Salmonella</i> Senftenberg	0
2002	Basil Leaves	<i>Salmonella</i> Haifa	0
2003	Cumin, Ground	<i>Salmonella</i> Onderstepoort	0
2003	Paprika	<i>Salmonella</i> Karlshamn	0
2003	Sage, Ground	<i>Salmonella</i> Gaminara	0
2003	Cumin, Ground	<i>Salmonella</i> Salford	0
2004	Red Pepper, Powdered	<i>Salmonella</i> Derby	0
2004	Paprika	<i>Salmonella</i> spp.	0
2004	Sesame Seeds, White	<i>Salmonella</i> spp.	0
2005	Basil, Ground	<i>Salmonella</i> spp.	0
2005	Basil, Extra Fancy	<i>Salmonella</i> Blockley	0
2006	Veggie Booty (Seasoning)	<i>Salmonella</i> Wadsworth	60 (mostly toddlers)
		<i>Salmonella</i> Typhimurium	
2007	Peppercorns <sup>b</sup>	<i>Salmonella</i> spp.	0
2007	Sesame Seeds <sup>b</sup>	<i>Salmonella</i> spp.	0
2007	Mojito Cocktail Garnish (Parsley Powder)	<i>Salmonella</i> spp.	0

<sup>b</sup> Recalls that occurred in Canada, all other recalls listed in table occurred in the U.S.

## *Case Scenario: Salmonella in Paprika*

### *April – September 1993 Outbreak*

- ~ 1,000 cases of salmonellosis in Germany
- Traced to paprika and paprika-powdered potato chips
- Majority of cases were in children aged 14 years or less
- *Salmonella* enumeration revealed levels of 0.04-0.45 organisms per gram
- Infective dose estimated at 4-45 organisms
- Attack rate of 1 in 10,000 exposed persons

# *Case Scenario: Salmonella in Paprika*

## *April – September 1993 Outbreak: Key Learnings*

- *Salmonella* present in low numbers in spices can present a human health hazard when no kill step is applied prior to consumption.
- *Salmonella* is very stable in dry environments and can survive through production, distribution, and eventually consumption.
- A person does not need to consume a large amount of contaminated spices or seasonings to become ill.

# *2009 Spice Recall*

- Salmonellosis outbreak linked to black & white pepper from California-based spice importer
- Recall expanded – all spices and oils
- Company ceased production/distribution of affected products while FDA and CDPH continue investigation
- Details regarding root cause have not been released

## *2009 Spice Recall Impact*

- As of April 2<sup>nd</sup>, over 1380 retailers and restaurants impacted
- Illnesses reported for 60 people in four states, including 45 in California, in 18 Central and Northern California counties
- No deaths have been reported
- Green Cardamom - *Salmonella*
  - Alert issued by CFIA April 8<sup>th</sup>
  - Importer voluntarily recalling bulk/retail; no illnesses have been reported

# **Government & Regulatory Changes**



# *US Government Focus*

- United States Congress increased their food safety focus via hearings in 2007, 2008 and 2009
  - CEOs from several U.S. food companies, food industry organization representatives, and regulatory representatives from the FDA and USDA testified
  - Several Food Safety bills pending in congress

# *US Government Changes*

- New FDA Leadership
  - Dr. Margaret Hamburg FDA Commissioner
- Food Safety Working Group Formed
  - Advise the President on improving coordination throughout the government
  - Examining and upgrading food safety laws
  - Enforcing laws that will keep the American people safe

# Food Safety Programs

# *Food Safety Programs*

- Good Agricultural Practices (GAPs)
- Good Manufacturing Practices (GMPs)
  - including pest management
- Third-party audits
  - GFSI (Global Food Safety Initiative)  
Food Safety Programs
  - SQF, BRC, Dutch HACCP, IFS

# Food Safety Programs

## HACCP GUIDE FOR SPICES & SEASONINGS



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# Food Safety Programs



## CONTROL OF *SALMONELLA* IN LOW-MOISTURE FOODS

February 4, 2009  
(Minor corrections March 16, 2009)

- Grocery Manufacturers Association Guidance Document
- “Control of Salmonella in Low Moisture Foods”
- Emphasizes processing environment

# **Micro Reduction Treatment Options**

# *Micro Reduction Treatment Options*

*In order to provide a greater assurance of food safety, a variety of microbial reduction techniques are employed within the spice industry*

- Steam
- Irradiation
- Fumigants
  - Propylene oxide
  - Ethylene oxide



# **Microbiological Testing Role & Sampling**

# *Microbiological Testing Role*

- Routine microbiological testing – often used to determine purchased ingredients, raw materials, and finished products acceptance...
- Microbiological contamination test protocols - need to be based on sound handling methods and statistically-guided sampling plans
- Spice pathogen testing may be useful to screen for high contamination rates entering a plant, but cannot completely eliminate risk.
- Due to a typically low contamination rate - testing as the lone measure of food safety may be misleading - negative results do not always ensure safety.<sup>(6)</sup>

# *Microbiological Testing Role: Sampling*

*A fundamental principle of lot acceptance sampling plans is that the samples collected will reflect the lot as a whole*

- Critical that samples be collected at various points throughout the entire lot
- Be aware of instances where the microbial population is not homogenous – one “lot” of imported raw spices may be comprised of many batches or sub-lots
- For non-homogenous lots, an increased number of samples may be required to properly evaluate the lot

# *Microbiological Testing Role: Sampling*

- Sampling plan effectiveness factors
  - Whether random samples can be collected from a lot
  - Sample preparation
  - Analytical method sensitivity and specificity<sup>(6)</sup>
- Lot acceptance sampling plans assume microbial population *random* distribution throughout the lot
  - This is often not true, especially for foods that are not liquids
  - Better estimation of the true microbiological population estimation within a lot can be obtained by analyzing more than one sample
- Sample number per lot is a balance between risk, accuracy, available resources, time, and cost

# *Microbiological Testing Role: Treated vs Untreated Spices*

- Untreated spices typically require a more stringent sampling plan than those that have undergone microbial reduction
  
- For treated spices, extensive testing post-treatment
  - adds little to ensure food safety
  - increases cost
  - and may be unnecessary

# *Microbiological Testing Role: Sample Collection*

- Sample collection technique is key to ensure accurate results
  - Scoops and bags - must be sterile to prevent cross-contamination
  - Proper hand washing techniques and glove use to prevent cross-contamination
- Potential cross-contamination in processing/packaging equipment if product samples collected prior to final processing and packaging

# *Microbiological Testing Role: Sample Result Evaluation*

- When more than one sample is analyzed for a microbiological attribute, a two- or three-class sampling plan may be applied to evaluate results.
  - Two-class sampling plan - when zero positives are permitted
  - Three-class sampling plan - when a proportion of sample units may yield test values in a marginally acceptable range without causing consequent problems.<sup>(6)</sup>
    - Consult a statistician
- Additional information on sampling plans is available from ICMSF <sup>(7)</sup> and the FDA.

# Microbiological Testing Role: Sampling

## Two-Class Plan Probability of Acceptance

Table 2. Probability of acceptance ( $P_a$ ) of defective product using a two-class sampling plan

PERCENT DEFECTS	NUMBER OF SAMPLES						
	1	5	10	15	20	30	60
1	0.99	0.95	0.90	0.86	0.82	0.74	0.55
2	0.98	0.90	0.82	0.74	0.67	0.55	0.30
5	0.95	0.77	0.60	0.46	0.36	0.21	0.05
10	0.90	0.59	0.35	0.21	0.12	0.04	<0.005
20	0.80	0.33	0.11	0.04	0.01	<0.005	<0.005

10 samples collected, lot with *Salmonella* in 1% of samples, 90% probability that *Salmonella* will not be detected and the lot will be accepted.

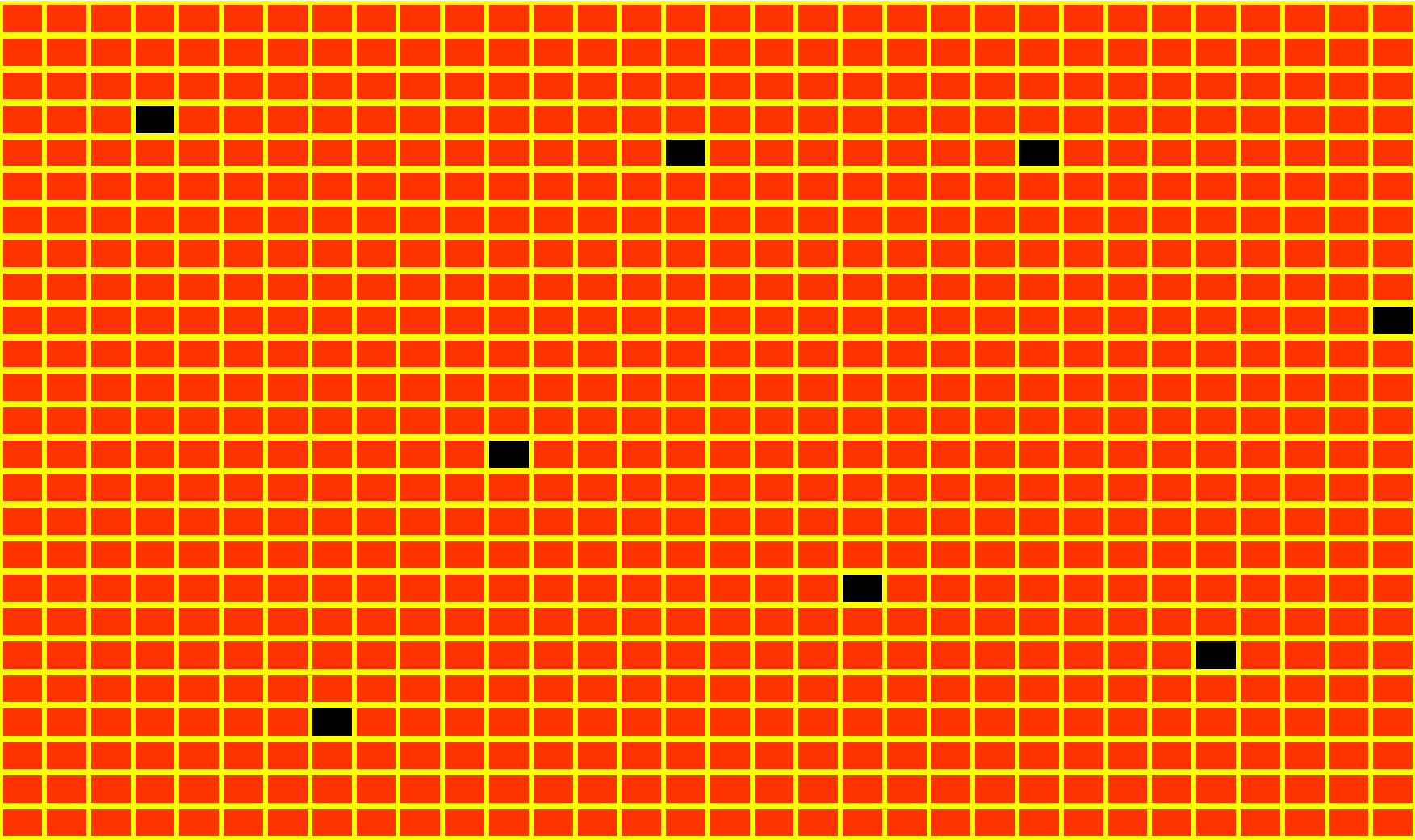
10 samples collected, lot with *Salmonella* in 10% of samples, 35% probability that *Salmonella* will not be detected and the lot will be accepted.

15 samples collected, lot with *Salmonella* in 5% of samples, 46% probability that *Salmonella* will not be detected and the lot will be accepted.



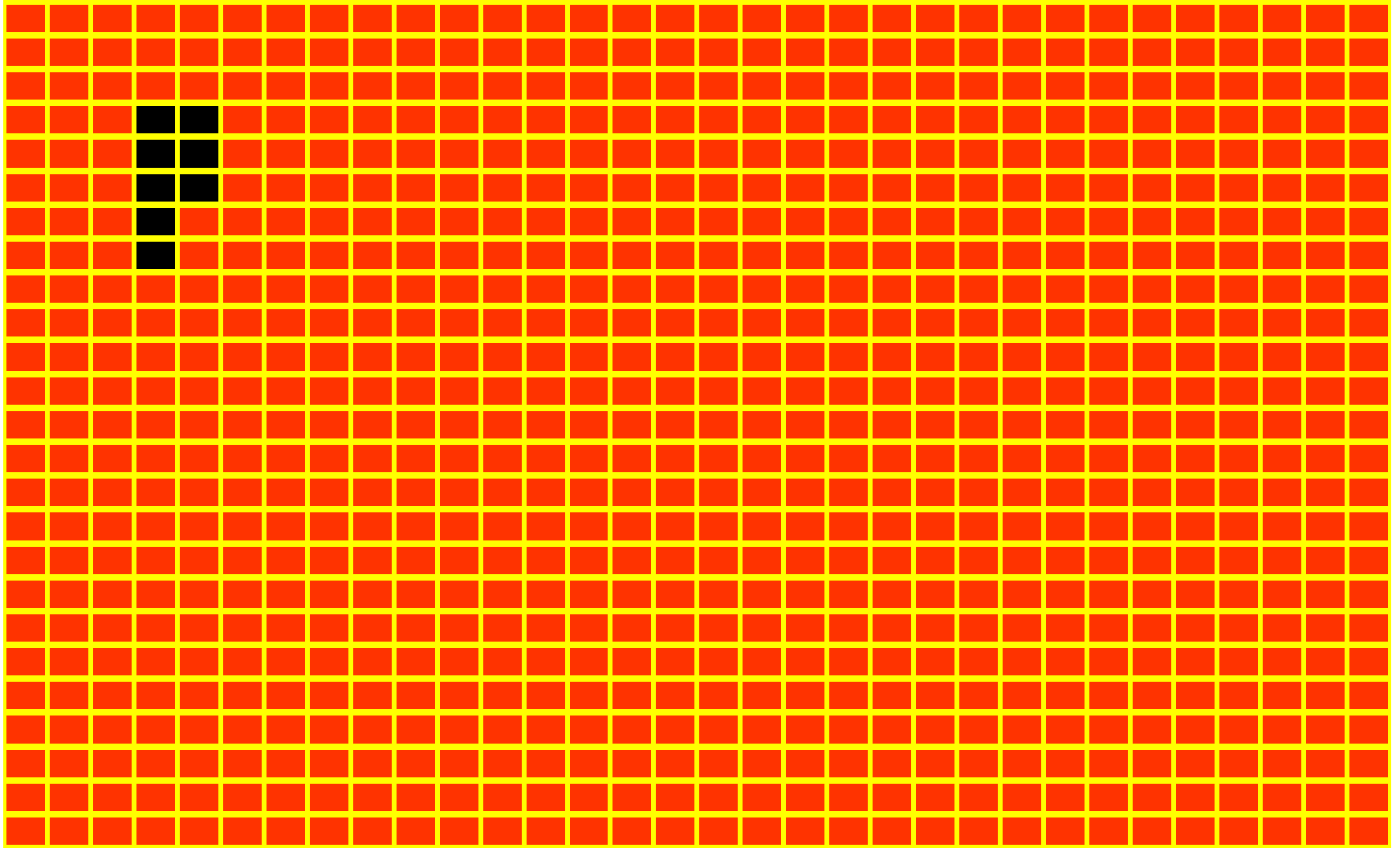
# *Microbiological Testing Role: Sampling*

## *1% Failure Rate in 800 packages*

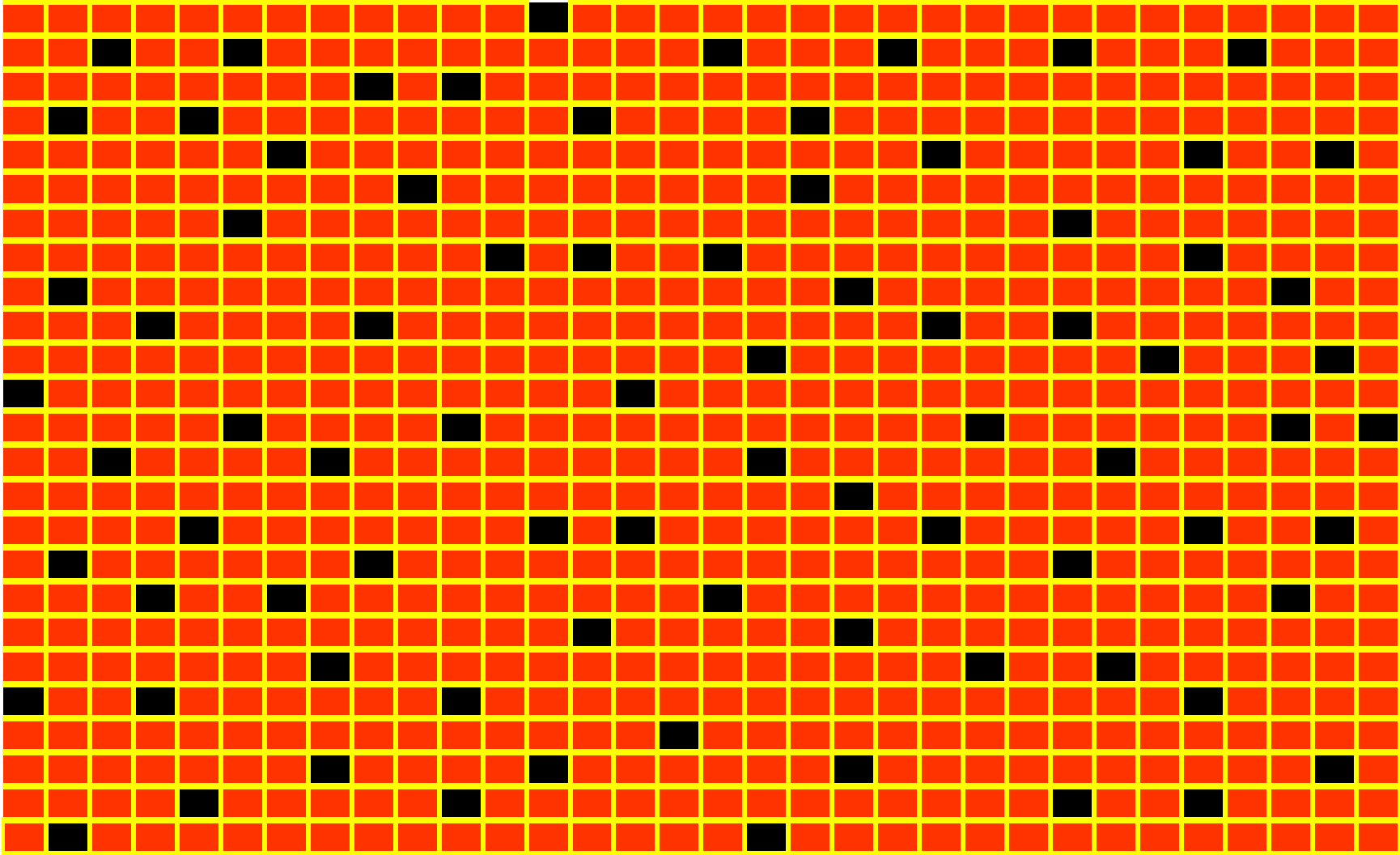


# *Microbiological Testing Role: Sampling*

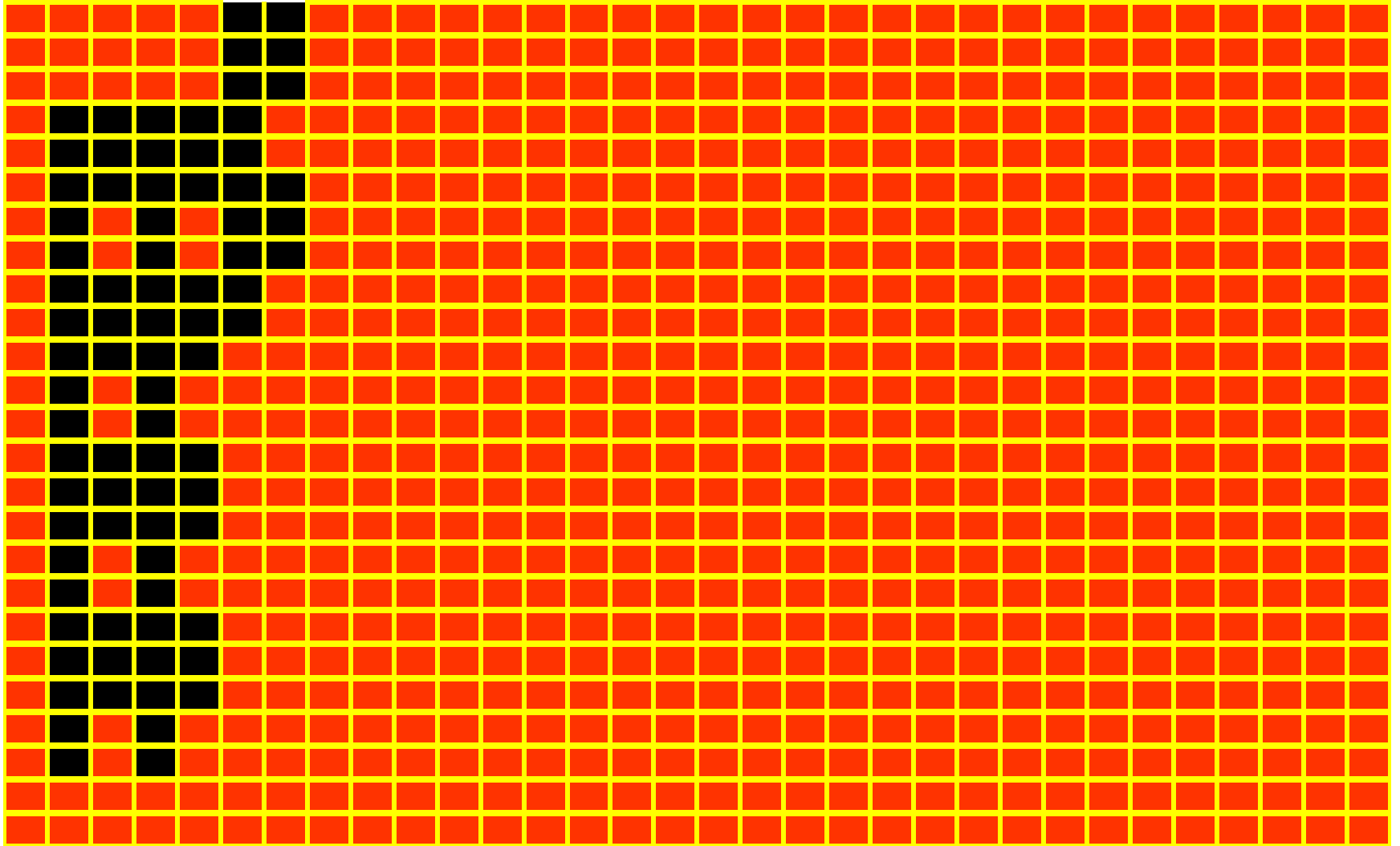
## *1% Failure Rate in 800 packages*



# *Microbiological Testing Role: Sampling 10% Failure Rate in 800 packages*



# *Microbiological Testing Role: Sampling 10% Failure Rate in 800 packages*



# Microbial Safety in Spices

## *Conclusions*

- Although it is clear that raw spices may be contaminated with microbial pathogens
- There are treatment and testing options available to ensure food safety and minimize risk.
- Comprehensive food safety plans must always include knowledge of ingredients, controlling the supply chain, auditing suppliers, and planning for supply chain interruptions.<sup>(11)</sup>
- Food manufacturers must then consider these programs when determining use of treated versus untreated spice.

# **Microbial Reduction Regulatory Update**

# Microbial Reduction Regulatory Update

- Steam Treatment
- Irradiation
- Propylene Oxide
- Ethylene Oxide

# Microbial Reduction Regulatory Update

## *Steam Treatment*

- Usage
  - No regulatory restrictions world-wide
- Labeling
  - No special labeling requirements



# Microbial Reduction Regulatory Update

## *Irradiation Usage on Spices*

- US
  - 30 kGy max
- Canada
  - 10 kGy max
- EU
  - only permitted in EU approved irradiation plants
  - New UK Regulations – responses due Apr. 27 '09
    - Aligns “spices and condiments” to “dried aromatic herbs, spices and vegetable seasonings” per 1999/2/EC

# Microbial Reduction Regulatory Update

## *Irradiation Labeling*



- US
  - Wholesale - whole product or component
  - Retail - whole product
- Canada
  - Wholesale - whole product or components
  - Retail - whole or if irrad. components  $\geq 10\%$  of final product
- EU
  - Always - wholesale & retail, whole product or component
- Verify local regulations, labeling and customer requirements

# Microbial Reduction Regulatory Update

## *Propylene Oxide*

- Usage
  - US – 300 ppm residue limit
  - EU – not permitted
  - Japan – 300 ppm residue limit
- Labeling
  - No special labeling required
- Verify local regulations, labeling and customer requirements

# Microbial Reduction Regulatory Update

## *Ethylene Oxide*

- Usage
  - US, Canada, India, China, Mexico
  - Banned in many countries – EU countries, Japan
- Labeling
  - Labeling is currently not required for EtO treated spices where treatment is permitted

# Microbial Reduction Regulatory Update

## *Ethylene Oxide Re-registration Status*

- Dec. 31, 2008 – EPA published proposed residue tolerances in Federal Register, comments due Mar. 2, 2009
  - EtO: 7 ppm in Crop Group 19
  - ECH: 940 ppm Crop Group 19 and dried vegetables
  - Basil not included as EtO treatment no longer permitted as of August 2007
- Crop Group 19 does not include all spices on ASTA spice list, expansion to full list requested
- Comments are under review by EPA
- Date of final ruling is not yet known

# Spice Microbiological Safety & Microbial Reduction Regulatory Update

- Spice Micro Safety
  - Pathogen risk in untreated spices
  - Measured via sound sampling and testing
  - Mitigated via comprehensive food safety programs and validated treatment processes
- Treatment Regulatory Status
  - Acceptance and use varies by treatment type and country
  - Verify acceptance of treatment with customer to ensure meets expectations and local regulations