

Food Safety and Security In the 21st Century

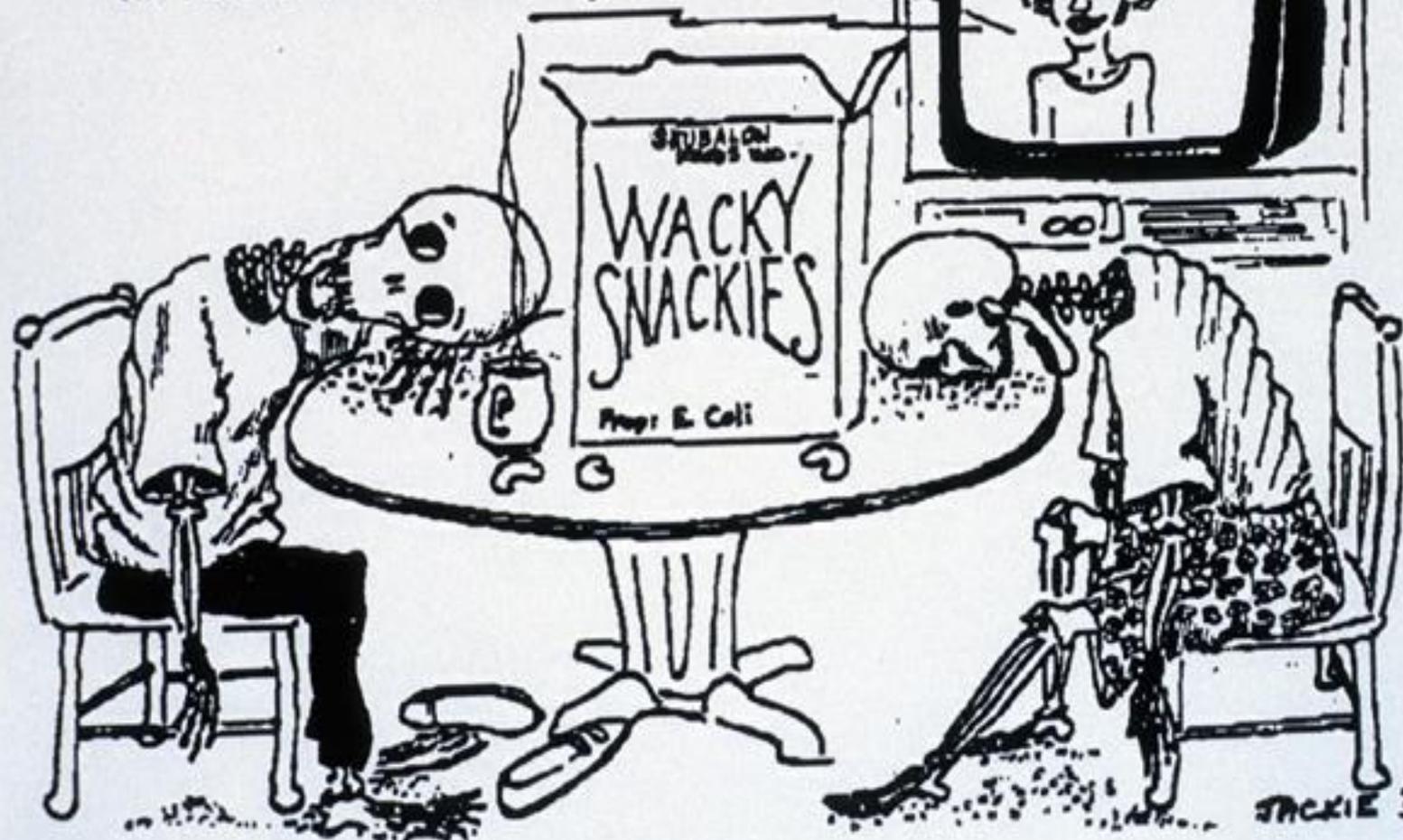
Michael Brodsky
Brodsky Consultants

Emerging Issues in Food Safety- Locally, Nationally, Globally

Objectives

- Causes of foodborne illness
- Differentiate inadvertent vs. intentional contamination of food
- Threats and realities of food as a weapon
- Compare HACCP and HARPC
- Working together to mitigate the risk

----OUTBREAK OF
FOOD POISONING
WACKY SNACKIES HAVE BEEN
TAKEN OFF THE SHELVES
AUTHORITIES SAY THERE IS
NO CAUSE FOR ALARM----



Microbiological Foodborne Incidents

CDC Annual Estimates:

Incidents:

- 9.4 million illnesses in USA
- 128,000 hospitalizations
- 3000 deaths

Outbreaks

- 800 outbreaks
- 15,000 illnesses
- 20 deaths

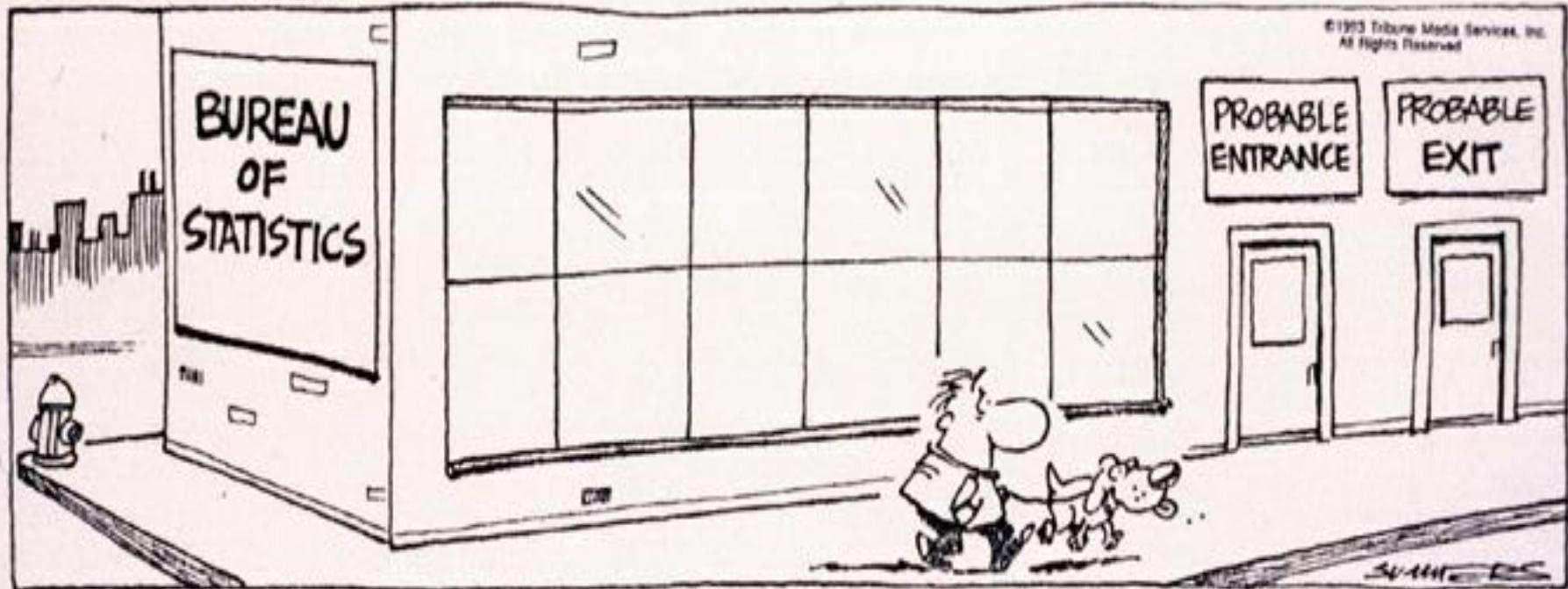
PHAC Annual Estimates

- 1.6 million illnesses from 30 known pathogens
- 2.4 million illnesses from unspecified agents

WHO Emphasizes Global Burden of Foodborne Diseases

- At least 600 million people, or one in 10 worldwide, fall ill from contaminated food each year
- 420,000 die, many of them young children,.

Bound & Gagged



Reliability of Foodborne Statistical Data

- Majority of incidents are single cases
- Virtually impossible to investigate
- Information technology is helping investigators in many places work together.
- Rely on outbreaks for data
- Source attribution data is out-of-date by the time it is published

Beetle Bailey



© 1983 King Features Syndicate, Inc. World rights reserved



Underlying Causes of Foodborne Illness

- Food is “naturally” contaminated at source
- Food is Inadvertently contaminated:
 - Cross-contamination (raw/cooked)
 - Poor personal hygiene
 - Inadequate sanitation in processing
- Food is intentionally contaminated (fraud or bioterrorism)

Pathogens of Concern

- Traditional Bacterial Foodborne Pathogens
 - Require time-temperature abuse to multiply
 - Enterotoxin producers in food
 - Exotoxin producers in gut
- Virulent Foodborne Bacterial Pathogens
 - Low infectious dose
- Food Transmitted Viruses
- Food Transmitted Parasites

Foodborne Illness

- Contaminated food is consumed by a susceptible host
 - Development of symptoms
- Onset and Severity of symptoms:
 - Amount of contaminated food consumed
 - Virulence characteristics of the organism
 - Infectious dose
 - Health status of host

Common Bacterial (Pathogens) Risks

- Salmonella
- Campylobacter jejuni
- Listeria monocytogenes
- Enteroadherent, Enteroinvasive, Enterohaemorrhagic & Enterotoxigenic E. coli

Additional Foodborne Bacterial Pathogens of Concern

- Enterotoxigenic *Staphylococcus aureus*
- *Clostridium botulinum* (neurotoxigenic)
- *Clostridium perfringens* (enterotoxigenic)
- *Bacillus cereus* (entero & emetic toxins)
- *Yersinia enterocolitica*
- *Vibrio parahaemolyticus*
- *Vibrio* sp.

Potential Food Transmitted Parasites

Protozoa (7)

- Cyclospora cayetanesis
- Cryptosporidium parvum
- Giardia lamblia?

+

Nematodes (6)

Trematodes (4)

Cestodes (5)

Potential Food Transmitted Viruses

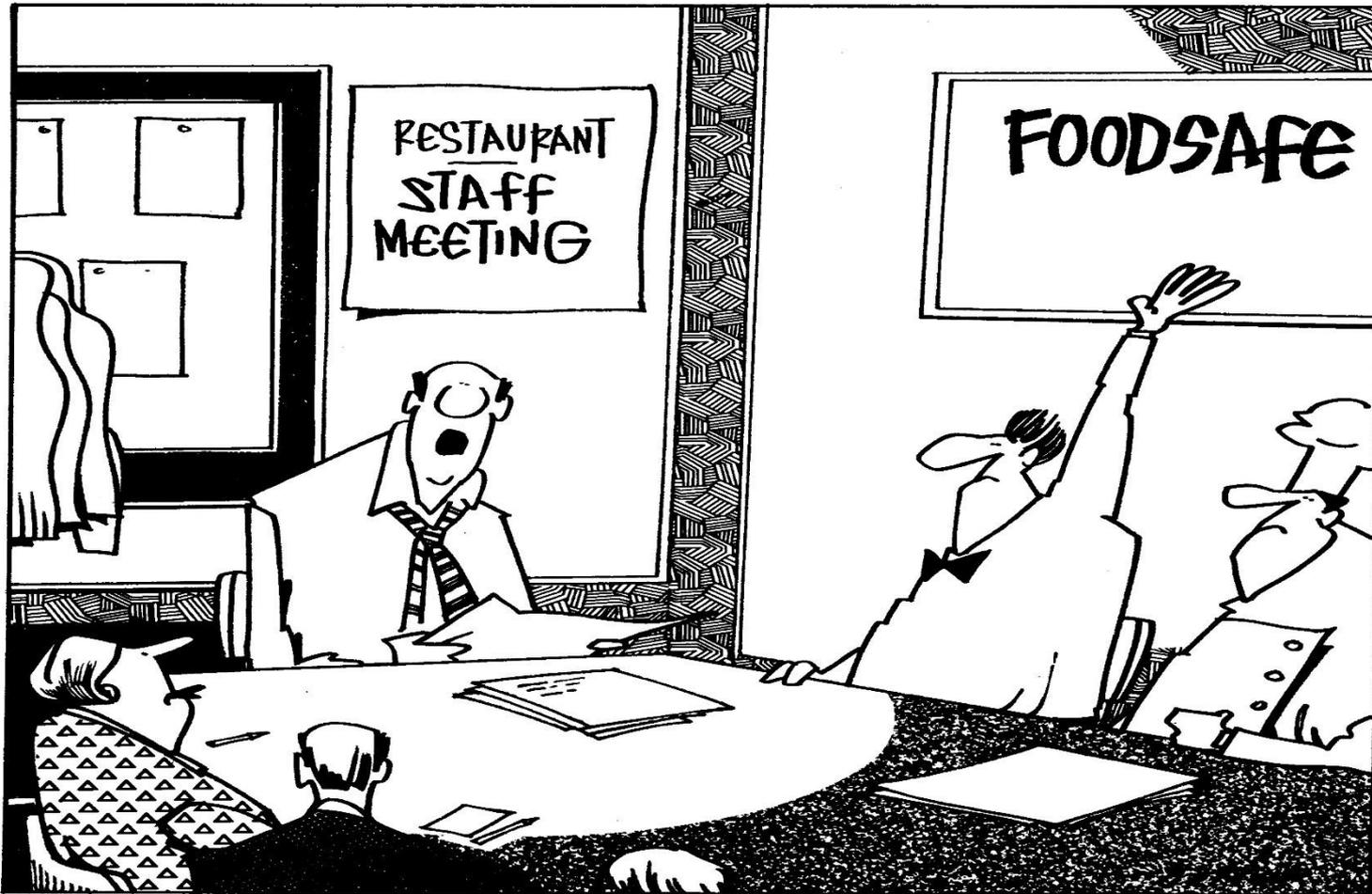
- Norwalk virus
- Hepatitis A
- Rotavirus
- Calicivirus
- Adenovirus
- Astrovirus
- Coronavirus

COVID-19 and Food Safety

- Currently there is no evidence of food or food packaging being associated with transmission of COVID-19.
 - It may be possible that a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their mouth, nose, or possibly their eyes
 - However, it's always critical to follow the 4 key steps of food safety—clean, separate, cook, and chill – to prevent foodborne illness.

Hazard Analysis Critical Control Point (HACCP)

- a prevention-focused food safety tool
- identification, monitoring and control of specific foodborne hazards that are biological, chemical or physical in nature
- CCP: A step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level).
- allows safety and quality to be built into each step in the process



ANYBODY ELSE THINK A CRITICAL CONTROL POINT IS WHEN THE CUSTOMER IS ADDING THE TIP....?

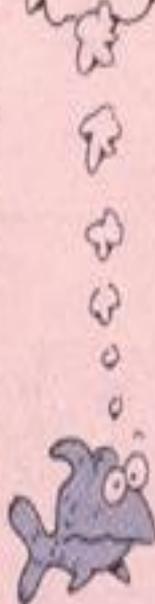
MAKES GOOD
FOOD
SAFE™
FOOD BETTER

THE EVOLUTION OF NUTRITION

DRIFT
AND
ABSORB



SWIM
AND
FILTER



SEARCH
AND
SWALLOW



PLUCK
AND
GRAZE



HUNT
AND
GATHER



SHAKE 'N' BAKE!



Factors Contributing to the Ongoing Dilemma

- New populations at risk
 - Aging society
 - Medical practices and procedures
 - immunocompromised
- Growing populations & overcrowding
- Mobility and exposure to risks
 - asymptomatic carriers/unsuspecting hosts
- Globalization of food supply
- Animal Husbandry & Feeding Practices

Emerging Lifestyle Issues

- Extended shelf-life foods
- Eating outside the home
- Cultural differences and experimentation

Changing Eating Habits

- The Organic Food Movement
- The Raw Food Movement
- The Local is safer Movement
- The Vegan Food Movement

SUNTOON

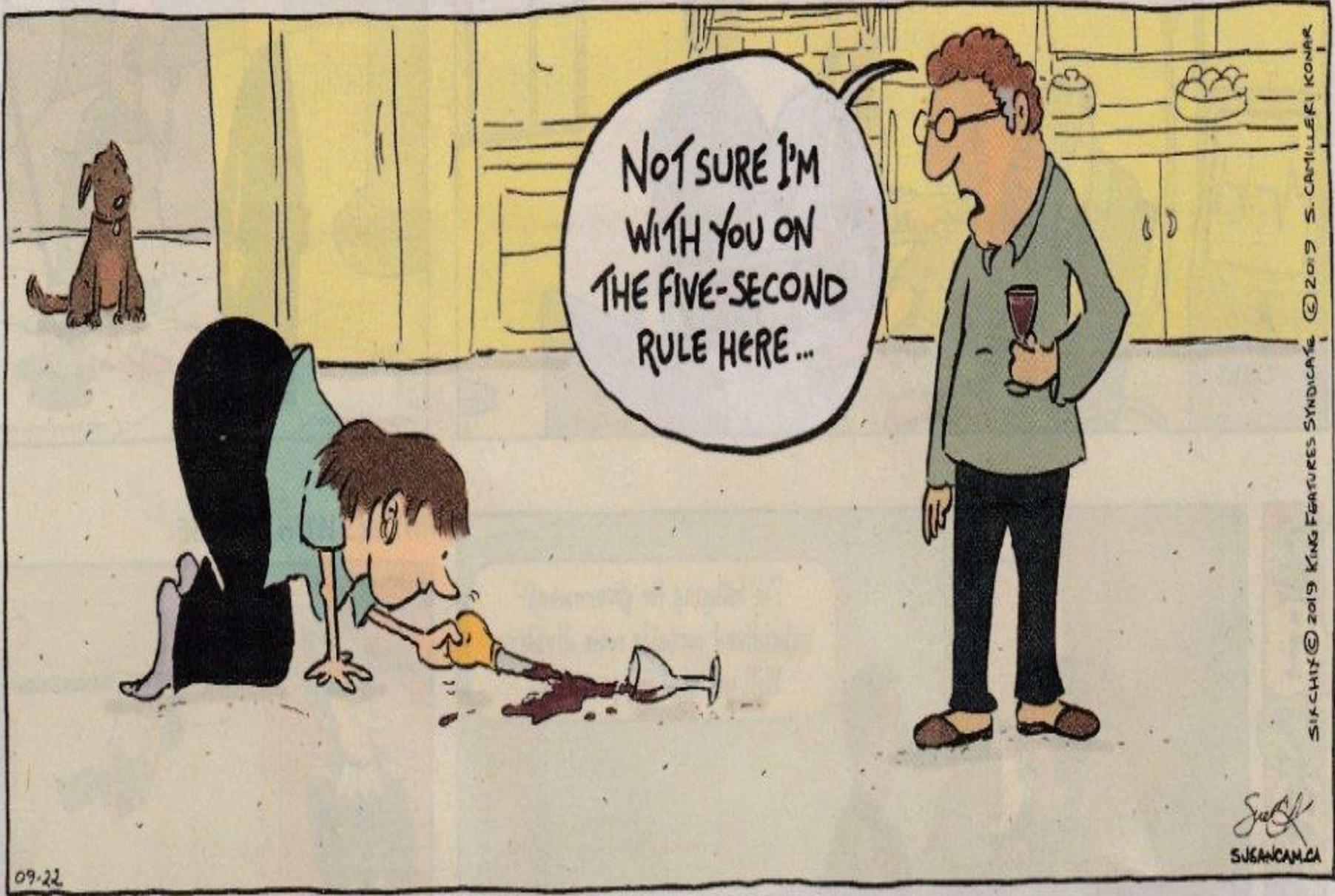
by Jim
Phillips

NICE TRY WITH THE
"TOXINS IN THE FOOD CHAIN"
EXCUSE... BUT THIS IS
ORGANICALLY GROWN
BROCCOLI ... EAT!!



Misguided Beliefs

- by selling directly to the consumer, they are assuring food quality and safety. Bad products will kill off repeat business from locals.
- Also, the food passes through fewer hands with such direct sales, also improving food safety.



09-22

SUGARCAM © 2019 KING FEATURES SYNDICATE © 2019 S. CAMILLERI KONAR

Sugarcam
SUGARCAM.CA

Maine Law Gives Local Control Over Local Foods, Food Safety

- law, LD 725, called “[An Act to Recognize Local Control Regarding Food and Water Systems](#),”
 - Exempts farmers from licensing and inspection for face-to-face sales
 - Would permit direct-to-consumer sale of raw milk and fruit juices and home kitchen canned goods

An Act to Recognize Local Control Regarding Food and Water Systems

- defines a local food system as a community food system within a municipality that integrates food production, processing, consumption, direct producer-to-consumer sales, and other traditional foodways.
- a municipal government may regulate by ordinance local food systems...and the state shall recognize such ordinances.”

“Raw Water™”

- Trademarked in 2012 by Maine’s Tourmaline Springs
- Sells its water for \$2.99 per liter

Live Water

- A California company that sells untreated spring water under the brand name Fountain of Truth,
- 2.5 gallons of its water in a custom-made glass carafe sells for \$38.49, with refills running at \$14.99.

Emerging Food Issues

- New reservoirs of contamination
- Dwindling supplies of uncontaminated water
- Enhanced virulence characteristics
 - Low infectious dose
 - Genetic mutation
 - Transfer of virulence factors
- Invasion and destruction of established ecosystems

The Changing Landscape of at-Risk Foods

- Meat , Eggs, Poultry
- Peanut Butter
- Spices
- Dried cereal
- Produce (lettuce, watermelon, cantaloupe, raspberries)
- Sprouts
- Outbreaks associated with Norovirus in frozen raspberries and strawberries are an emerging public health risk, according to the European Food Safety (June 2104)
- Pet food (Raw)

August 2020

- Cyclospora cases from bagged salad mix continue on the upswing
- Hundreds more sick in outbreak traced to Thomson International onions
- Outbreak Investigation of Salmonella Enteritidis: Bagged Peaches (August 2020)

COVID-19 and Food Safety

- Currently there is no evidence of food or food packaging being associated with transmission of COVID-19.
 - It may be possible that a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their mouth, nose, or possibly their eyes
 - However, it's always critical to follow the 4 key steps of food safety—clean, separate, cook, and chill – to prevent foodborne illness.

OH, NO, THIS ISN'T ONE OF
SADDAM'S PALACES. THIS IS JUST
THE MINISTRY OF CULTURE...

ANTHRAX
CULTURES

BOTULISM
CULTURES

©1997
FEVER *Illustration* JOURNAL



Food Safety Department World Health Organization

- The malicious contamination of food for terrorist purposes is a real and current threat.
- Deliberate contamination of food at one location could have global public health implications.

Abrin – Another Poison Being Experimented with by Terrorists

- Abrin is a natural poison, derived from the seeds of a noxious weed found in many parts of the world.
- The seed yields a purified toxin that is similar in action to ricin.
- Death from abrin poisoning could take place within 36 to 72 hours of exposure, depending on the route of exposure (inhalation, ingestion, or injection)
- abrin will never be a weapon of mass destruction but could be used by a terrorist group as a weapon of “mass disruption”
- abrin scenarios are likely to involve a small number of victims, but that is enough to cause panic in the marketplace.

Food as a Weapon

- FBI Says Terrorists May Target Food Sector
- Lone wolf attacks are far more likely to happen
- Industry targets for terrorism:
 - Food processing facilities;
 - Food storage and distribution;
 - Restaurants,
 - Grocery stores and markets;
 - Commercial facilities;
 - Cruise lines.

Impact of (Bio)terrorism

- Physical
 - Illness and/or Death
- Psychological
 - Fear Factor, Panic
- Health Care System
 - Analytical Laboratory Services, Hospital Services, Health Care Providers
- Economic
 - Agriculture, Food Service System, Stock Market

The Insider Threat

- The threat posed by an individual who exploits his/her position, credentials or employment to achieve trusted access to the means, processes, equipment, material, location, facility and/or target necessary to carry out a terrorist action.

The Insider Threat

Likelihood of an employee becoming an insider threat increases with a variety of personal factors including:

- financial need,
- feelings of anger or revenge,
- being a sympathizer with terrorist ideology,
- having problems at work,
- compulsive and destructive behavior, ego, and
- family issues.

Once suspicious activity is observed, the facility security officer or manager should be notified, and a decision can be made on whether external parties need to be involved.

Assessing The Insider Threat

Suspicious Behaviour:

- Taking a photograph or video, or notes/sketches, of food processing operations or sensitive areas
- Attempting to gain information about company operations, especially related to security and personnel, in person, or by phone or email
- Conducting surveillance of self services areas such as salad bars, condiment stands or open bulk containers
- Shipping area: Unscheduled deliveries, driver who is unfamiliar with facility delivery protocols, items left on dock at unusual hours, illegally parked or unattended vehicles, or shipping documents that don't match

Food Safety Department World Health Organization

- Outbreaks of both unintentional and deliberate foodborne diseases can be managed by the same mechanisms.
- Sensible precautions, coupled with strong surveillance and response capacity, constitute the most efficient and effective way of countering all such emergencies, including food terrorism.

You might have HACCP...but do you have HARPC?

- FDA issued a final rule on Mitigation Strategies to Protect Food Against Intentional Adulteration in May 2016.
- Hazard Analysis Risk-Based Preventative Controls (HARPC)
- HACCP alone won't cover you for key rules under the [Food Safety Modernization Act](#)

Operational Risk Management

- Management of Food Security
- Employees
- Data Systems
- Physical Security
- Product Security
- Security Plan
- Ref. Lee, R.V., R.D. Harbison and F. A, Draughon. Food as a Weapon. Food Protection Trends . 23(8): 664-674.

Managing the Risk of Food Bioterrorism

- Risk Analysis
- Risk Assessment
- Risk Communication
- Enhanced HACCP
- Food Security Plan

The Food Defense Plan Builder

Guides the user through the following sections:

- Facility Information
- Product/Process Descriptions
- Vulnerability Assessments
- Mitigation Strategies
- Food Defense Monitoring Procedures
- Food Defense Corrective Actions Procedures
- Food Defense Verification Procedures
- Supporting Documents
- Food Defense Plan Signatures

Food Defense Plan Builder Ver. 2.0

- A user-friendly software program designed to assist owners and operators of food facilities with developing personalized food defense plans for their facilities.
- <https://www.cfsanappsexternal.fda.gov/scripts/fdplanbuilder/default.cfm>

Preventive Steps

- Monitoring products for evidence of tampering, resealing or damage
- Securing open containers of food or ingredients in storage areas
- Controlling access to specific areas of facility by delivery personnel, employees, vendors and contractors, and general visitors
- Securing loading dock area, and standardize delivery and pickup protocol
- Developing a written food defense plan
- Training employees, contractors and vendors to recognize suspicious activity and report it accordingly

11 Ways to Challenge Your Food Defense Program

February 16, 2016/ AIB International

- **1. Card access system.**
- **2. Seal program.**
- **3. Lighting**
- **4. Visitor control program**
- **5. Camera system**
- **6. Food Defense Training**
- **7. Food defense manuals**
- **8. Key entry protocol**
- **9. Crisis management program**
- **10. Audit sensitive or high risk areas**
- **11. Visitor/contractor bags and equipment**

- Food safety Tech, Volume 5 Issue No. 27

FSMA Preventive Controls: Are You Prepared?

By Bill Bremer

Question	Response	
1. In determining the preventive controls under FSMA for your food operation, have you evaluated your compliance requirements and categories?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2. Have you assessed hazards outside or not part of your existing HACCP flows for determining preventive controls?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
3. Are the preventive controls you have identified supported by science-based justification?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
4. Is the science-based information supported by means including statistical methods, published reports, peer review, industry/second-party verification, or other documentation?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
5. Have you determined the program requirements for preventive controls for implementation in your Food Safety Management System, as required by the FSMA Food Safety Plan requirement?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
6. Have the cGMP-based policy, procedure, work instruction, test/validation, forms, and records criteria been established for preventive controls at your food operation(s)?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
7. Have you determined the functional organizational responsibilities of preventive controls, your preventive control Food Safety Plan, and Qualified Individual?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
8. Does organizational responsibility include oversight by process owners of preventive controls and comprehensive FSMA management?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
9. Will completion of your program, as documented with cGMPs and a validated Food Safety Plan, meet FSMA and customer deadlines as early as September 19, 2016?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
10. Will internal auditing of program elements meet established timing and allow for preventive control and Plan verification and management review?	<input type="checkbox"/> Yes	<input type="checkbox"/> No

The Guide To Protecting and Defending Food and Drink from Deliberate Attack” (PAS 96), updated in 2017 (British Standards Institution)

“Procedures adopted to assure the security of food and drink and their supply chains from malicious and ideologically motivated attack leading to contamination or supply disruption”

1. Form a team

- Put together a team, which could include individuals from different areas, such as security, human resources, food technology, production and operations.
- In small companies is likely that one person has to assure all these roles or that external assistance is required.

2. Identify and assess threats

- Identify individuals and/or groups which may be a threat to the company, premises or a product and assess their motivation, capability and determination. E.g. dissatisfied employees and former employees, suppliers under financial stress, commercial competitors, terrorist organizations, criminals and local pressure groups.

3. Identify vulnerable points

- Identify the organization vulnerabilities where an attacker can act, what are the most important areas, products or documents, for example. The organization should have special attention to areas or machines that have direct impact on food safety or facilities like energy or water.

4. Implement necessary controls

- Implement proportionate preventative actions (critical controls) and keep confidential reports and procedures that allow management action on decisions. Restrict access to the premises by installing a perimeter alarm system, install a fence or use a Closed-Circuit Television (CCTV) to increase safety. To control the access of people, to internal areas, use electronic card or PIN's system.

Food Safety 101

With due respect to the Sound of Music:

- Let's Start at the Very Beginning, a very good Place to start
- The first three notes just happen to be PIP, PIP?

Prevention

Intervention

Protection

What's Wrong?

- Prevention of contamination in the field
 - Contaminated agricultural water
 - Birds and other animals?
- Ineffectiveness of Intervention Strategies during processing, production, packaging and distribution
- Making decisions based on unreliable baseline data

Food Safety Culture

- clear food safety expectations
- food safety education and training of employees at all levels of the organization
- great communication - ongoing conversations around food safety
- measurable food safety goals
- clear consequences for food safety (positive and negative).

A Strong Food Safety Culture

- Employees, senior-level management and everyone associated with food production:
 - recognizes food safety as the priority,
 - understands that there is no room for underhanded practices,
 - takes pride in maintaining high food safety standards, and
 - is willing to do the right thing, even without supervision.

Food Safety Modernization Act

- Section 103 of the FSMA Preventative Controls, includes:
 1. Preventative Controls for Human Food
 2. Preventative Controls for Animal Food
 3. Mitigation Strategies to Protect Food from Intentional Adulteration
- To comply with rule #1 and 2 you need HARPC

U.S. PIRG (Public Interest Research Group) Education Fund.

- Common sense protections from farm to fork
- Require irrigation water to be tested for pathogens
- Make it illegal to sell meat that is contaminated with Salmonella.
- identifying that there was a contamination only scratches the surface of the problem.

Resolving Trace Back Problems

- The PIRG suggests:
- Implement network-based food tracking technologies from farm to fork.
- Amend the federal Food Safety Modernization Act to require the collection of data during every part of the food supply chain.
- Employ the “Wisdom of the Crowd”

To prevent cross-contamination from animal operations,

- PIRG suggests:
- Establishing and setting bacterial load for agricultural water
- Testing water that is in the proximity of CAFOs or used for agricultural water or crop irrigation for pathogenic bacteria with molecular-based technology instead of the standard culture-based technology to shorten time needed for detection and increase accuracy.



Reaching the Elusive Goal

How do we inculcate a food safety culture ?

Everyone must take responsibility!

*Federal Governments **Must**:*

- Make food safety decisions based on science
- Implement stringent and enforceable microbial specifications for the safety of irrigation water
- Approve and encourage irradiation and other post-processing food treatment technologies for pest control, pathogen control and extending the shelf life of produce

The Federal government can also:

- Harmonize performance standards for food processing and analysis with other countries
- Continuous public education
- Don't be totally reliant on statistical data to assess impact of intervention strategies
- Consistent messages to consumers

...Anything
but
meat...

...Anything
but
vegetables.

FDA
MEAT
INSPECTION

EPA
PESTICIDE
RESEARCH

2 EGGS
BACON

LUNCH
MENU

MENU

REFILL

State and local public health agencies

- ✓ Encourage industry actions that focus on preventing foodborne disease.
- ✓ “Control of *Listeria monocytogenes* in Ready-To-Eat Foods” is applicable to most pathogens:
 - Emphasis on environmental monitoring
 - find and eliminate the source
 - corrective actions
 - recommendations for controls involving personnel, cleaning and maintenance of equipment, and sanitation

Food industries:

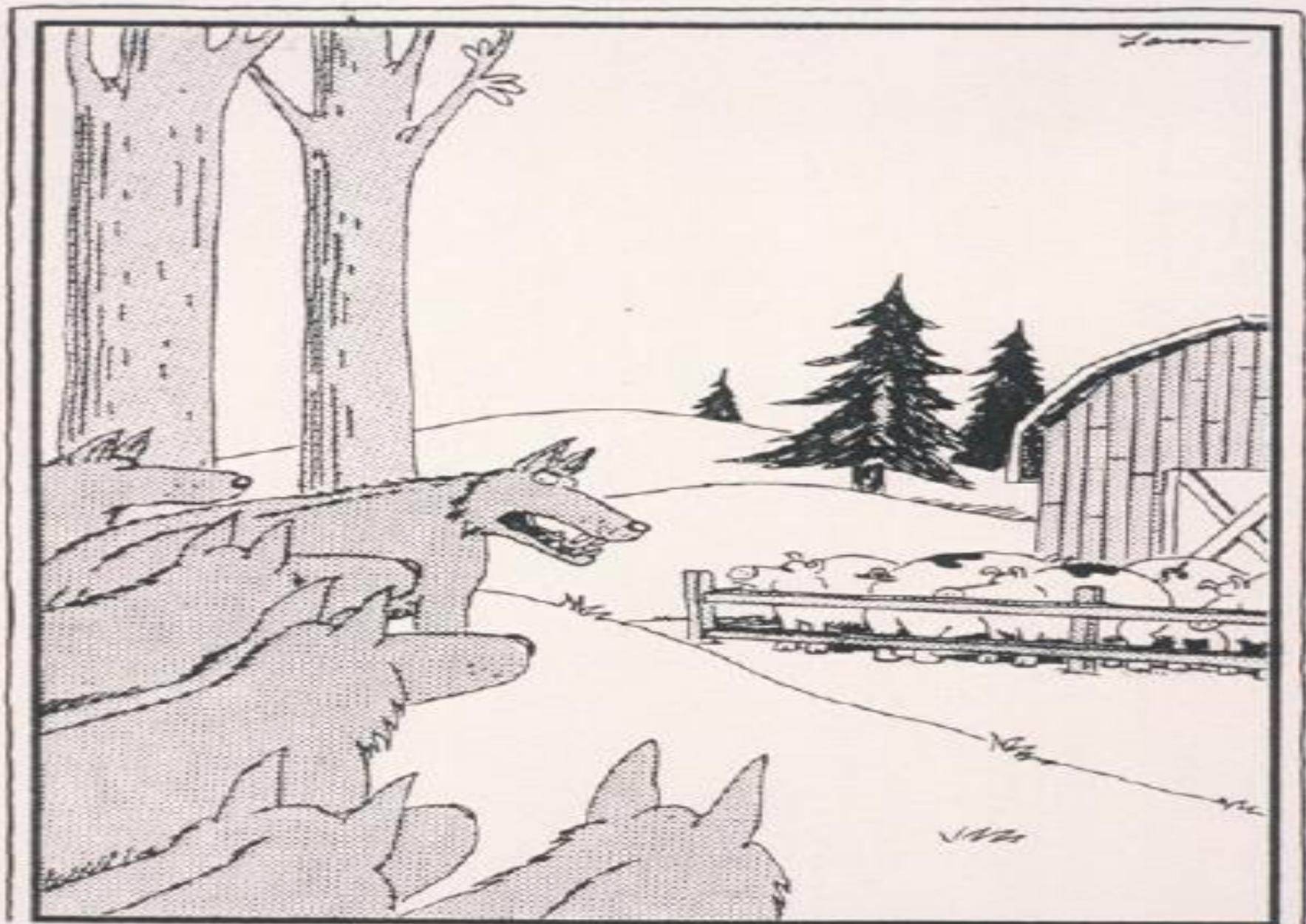
- Choose only suppliers that use food safety best practices.
- Share proven food safety solutions with others in industry.
- Make food safety a core part of company culture.
- Strive to meet or exceed new food safety) laws and regulations
- Implement scientifically validated and regulatory approved food safety intervention strategies
- Develop a Supply Chain Management System

Scientific Responsibilities

- Global harmonization of analytical methods or methods' validation
- Accreditation of laboratories to international standards of performance
- Certification of analyst competency
- Cooperation and Sharing of data
- Consistent messages to consumers

Individual Responsibilities

- Focus on the children
 - Proper personal hygiene
 - Basic food sanitation
- Habitualize food safety practices
- Develop a food safety culture
- Listen to the science
- Avoid social media for “false information”
- Practice what we preach!
- Walk the Talk!



"I say we do it ... and trichinosis be damned!"

Teens ingesting laundry
detergent in what's dubbed the
Tide pod challenge

Conclusion

- Every foodborne incident represents a failure of our food safety programs
- Every food recall represents a failure of our intervention strategies
- Investigation is too late!
- Prevention is the Key!

A Guide for Conducting a Food Safety Root Cause Analysis

Mar 24, 2020

- The Pew Charitable Trusts, an independent non-profit, non-governmental organization (NGO)
- to encourage more companies and government agencies to make root cause analysis a priority in order to halt future outbreaks of foodborne illnesses.
- Changes that result should help stop outbreaks from happening in the first place.

Thank you for your attention

Any Questions?

mhbrodsky@rogers.com