Introduction to IAFP's European Symposium

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5 May 2022

Welcome

- History
- So happy to be back in person, yet cautiously…
- What I'm looking forward to during this meeting…
- Student Travel Award recipient with us
  - Congratulations to Alessia Delbrueck from the ETH Zurich in Switzerland

Practical Application of Risk Assessment Outcomes Helps Ensure Food Safety

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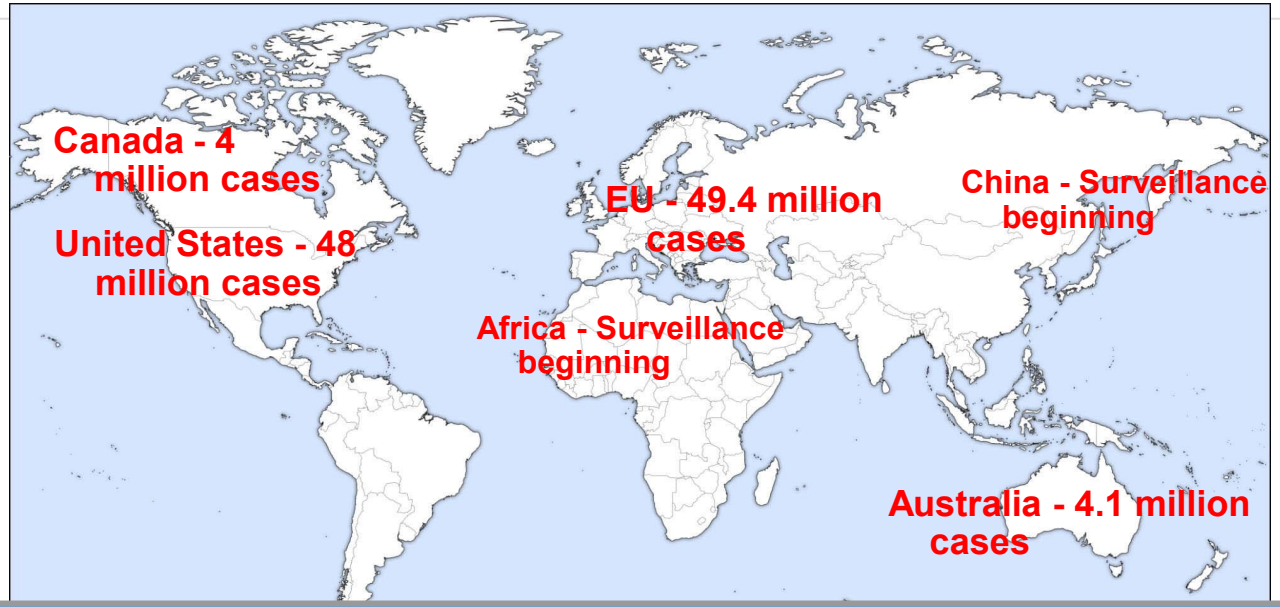
Topics

- There are many food safety risks in need of management
- Need to translate empirical and valid research information into practical approaches that can be reasonably implemented
- Practical examples
  - *Listeria monocytogenes* in manufacturing
  - Norovirus in food service
- Applying optimal control measures reduces overall food safety risks

Is The Food Supply Less Safe Than It Used To Be?

- No, but food safety incidents are increasingly more visible
- Improved detection & surveillance identifies broad issues
  - WGS identifies & differentiates organisms more precisely
- Good news for public health
- Must flawlessly execute food safety programs across supply chain
- Food safety facts can help direct efforts appropriately

Foodborne Illness Annual Estimates



Global foodborne illness estimate: 600 million cases & 420,000 deaths

Global Foodborne Illness Data

- WHO estimates of global burden of diseases from foodborne illnesses
  - 31 agents (bacteria, toxins, parasites, chemicals)
- African region has highest disease burden, then SE Asia
- Global Variability in What Causes Illness
  - Developed World - Norovirus, *Campylobacter*, *E. coli* and *Salmonella*
  - Developing World expanded to also include hazards from chemicals
- Agents responsible for most deaths
  - Typhoidal and non typhoidal *Salmonella*
  - Enteropathogenic *E. coli*
  - Norovirus
- 40% of affected people suffering were < 5 years old

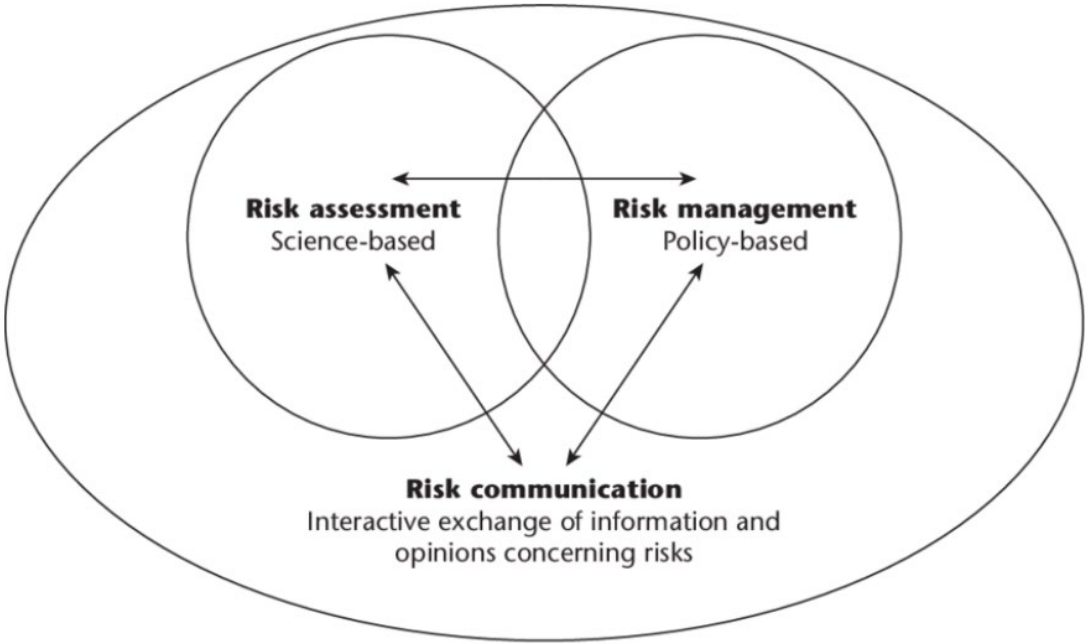
Source: http://www.who.int/foodsafety/areas_work/foodborne-diseases/ferg/en/

Approach is 3 Pronged…

- Awareness of risks – reliance on expert information
  - Many food safety and public health risks in need of management.
- Implementing risk management strategies
  - Translate scientific information into practical approaches that can be reasonably implemented.
- Verifying that risks are adequately managed
  - Role of inspection

Applying optimal controls reduce food safety and public health risks.

WHO Risk Analysis Framework



Risk Management

- From WHO, "The process of weighing policy alternatives in the light of results of risk assessment and, if required, selecting and implementing appropriate control options, including regulatory measures."
- More simply… "the practice of identifying potential risks in advance, analyzing them and taking precautionary steps to reduce/curb the risk."

What are the “Right” Food Safety Risks To Manage?

- Cause most deaths?
- Cause most illnesses?
- Most costly from an economic standpoint?
- Cause highest risks to brand?

All can be valid determinants…

Examples of Identified Risks

- *Listeria monocytogenes*
  - High mortality rate – 20-30%
  - 90% of cases are hospitalized
  - Annual cost of illness - $2.8B
- Norovirus
  - Top global cause of acute gastroenteritis = 685M cases
  - Causes half of all outbreaks of food-related illness
  - Annual cost of illness - $2.2B

Source: *https://www.fda.gov/animal-veterinary/animal-health-literacy/get-facts-about-listeria#:~:text=Compared%20to%20other%20foodborne%20illnesses,often%20in%20intensive%20care%20units* and *https://www.ers.usda.gov/data-products/cost-estimates-of-foodborne-illnesses.aspx* and *https://www.cdc.gov/norovirus/trends-outbreaks/worldwide.html#:~:text=Global%20Trends&text=Norovirus%20is%20the%20most%20common,year%2C%20mostly%20in%20developing%20countries.* and *https://www.cdc.gov/norovirus/trends-outbreaks/outbreaks.html* and *https://www.foodsafetymagazine.com/magazine-archive1/junejuly-2018/the-costs-of-foodborne-illness-product-recalls-make-the-case-for-food-safety-investments/#:~:text=And%20what%20about%20costs%20associated,United%20States%20was%20%2410%20million.*

Listeria monocytogenes Example

L. monocytogenes in Cantaloupe, 2011

- 147 cases, 143 hospitalizations, 33 deaths
- Cases significantly more likely to have eaten cantaloupe (OR=8.5; 95% CI=1.3-∞)
- Notable findings in processing facility
  - Melons washed in non-chlorinated water
  - Equipment had brushes and felt rollers
  - Outbreak strain found in 31% of environmental samples
  - Truck for hauling culled melons to animal feed close to processing area
- Owners sentenced to 5 years probation, 6 months home detention, and $150,000 each in restitution fees to victims.

Source: https://www.nejm.org/doi/full/10.1056/NEJMoa1215837

L. monocytogenes Risk Analysis Findings

(FDA/FSIS, 2003. Quantitative assessment of the relative risk to public health from foodborne *Listeria monocytogenes* among selected categories of ready -to-eat foods at www.cfsan.fda.gov)

Five key factors identified as contributing strongly to the risk of listeriosis associated with ready -to-eat foods

1. Amount and frequency of consumption of a food
2. Frequency and extent of contamination of a food with *L. monocytogenes*
3. Ability of the food to support the growth of *L. monocytogenes*
4. Temperature of refrigerated/chilled food storage
5. Duration of refrigerated/chilled storage

https://www.who.int/news-room/fact-sheets/detail/listeriosis

Applying L. monocytogenes Risk Assessment Findings

Potential For Contamination	• Implement GMPs and a valid HACCP plan • Hygienic design of equipment & processing area • Hygienic zoning to separation of raw foods from processed
Support The Growth	• Consider reformulation to a $_{w}$ <0.95 and pH <5.5 *
Are Ready To Eat	• Reformulate so growth is retarded
Temperature Control	• Store refrigerated items at <4.4 °C • Ensure integrity of entire cold chain
Stored For An Extended Time	• Post packaging treatments to eliminate *L. monocytogenes*

* U.S. Department of Agriculture, Food Safety and Inspection Service. 2002. Microbial sampling of ready-to-eat (RTE) products for the FSIS verification testing program. Directive 10240.3. U.S. Department of Agriculture, Food Safety and Inspection Service, Washington, D.C.

Applying this to Melons…

- Understand contamination sources:
  - Growing environment, soil
  - Poor sanitary design of equipment
  - Carryover from animal feed hauling
- Limiting growth
  - Use of valid antimicrobial in wash water
  - Refrigerated production area

Sounds *So Easy*, Yet Opportunities Exist…

- Top violations in inspections overwhelmingly highlight basic cleanliness issues…

Top Major Non-Conformances – FSSC, 2022

Rank	Clause number	Clause requirement
1	ISO 22000:2018; 8.5.4.3	Monitoring systems – CCPs and OPRPs
2	ISO 22000:2018; 8.7	Control of monitoring and measuring
3	ISO 22000:2018; 9.2.1	The organization shall conduct internal audits at planned intervals
4	ISO 22000:2018; 8.3	Traceability system
5	ISO 22000:2018; 5.1	Leadership and commitment

Verifying *L. monocytogenes* Risk Management Strategies is Key

A comprehensive Environmental Monitoring Program and Appropriately Directed Finished Product Testing.

- Root cause analysis
- Trend analysis
- Does not treat positive results as a failure in the system

Norovirus Example

Norovirus Outbreak at Restaurant

- At least 364 cases, among patrons, employees &their contacts
- Affected people more likely to have eaten antipasti platter (OR= 2.96; 95% CI=1.08-8.14 and garlic mashed potatoes (OR = 4.05; 95% CI = 1.37-11.99).
- Deficiencies noted:
  - Employees worked when ill with active GI symptoms
  - Inadequate cleanup of vomitus
  - Handwashing procedures not followed
  - Surface cleaning improperly done

Source: https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2019.24.18.1800511?crawler=true

Norovirus Risk Analysis Findings

- Estimated to cause >50% of all foodborne illnesses
- Most cases traced to food contaminated by infected employees in retail food or restaurant settings.
- Reduced transmission linked to
  - Excluding employees ill with vomiting or diarrhea when symptoms first appear
  - Handwashing efficacy
  - No bare hand contact with RTE foods
  - Proper sanitation of surfaces

Source: Quantitative Risk Assessment of Norovirus Transmission in Food Establishments: Evaluating the Impact of Intervention Strategies and Food Employee Behavior on the Risk Associated with Norovirus in Foods (wiley.com)

Employees working when ill

Scenario	% Baseline Number of Infected Customers (starting point = 1)
Employee never works while ill	0.13
EE works when ill	2.26
Sick EE excludes for 24h	0.75
Sick EE excludes for 48h	0.69

- Reality: > 60% of food employees have worked while ill and 20% while experiencing diarrhea or vomiting
- Why?
  - Don’t want to lose income
  - Illness is perceived as “not that severe”
  - Don’t want to leave co - workers short staffed

Sources:
- https://pubmed.ncbi.nlm.nih.gov/28247943/
- Carpenter LR, Green AL, Norton DM, Frick R, TobinD'Angelo M, Reimann DW, Blade H, Nicholas DC, Egan JS, Everstine K, Brown LG, Le B. Food worker experiences with and beliefs about working while ill. Journal of Food Protection, 2013; 76(12):2146–2154. AND Sumner S, Brown LG, Frick R, Stone C, Carpenter LR, Bushnell L, Nicholas D, Mack J, Blade H, Tobin-D'Angelo M, Everstine K. Factors associated with food workers working while experiencing vomiting or diarrhea. Journal of Food Protection, 2011; 74(2):215–220.

Impact of hand hygiene

Scenario	% Baseline Number of Infected Customers (starting point =1)
24h exclusion, No bare hand contact, 100% wear gloves	1.14
24h exclusion, 100% HW compliance	0.94
24h exclusion, 100% HW compliance and 100% wear gloves	0.58
Improved HW efficacy, additional 2 log reduction	0.53

- Wearing gloves alone is not enough
- Needs to be combined with physical removal of virus from hands through hand washing
- Improving efficacy through training, more friction in hand wash process, a sanitizer, etc. reduces risks further

Source – https://pubmed.ncbi.nlm.nih.gov/28247943/

Applying Norovirus *Risk Assessment Findings*

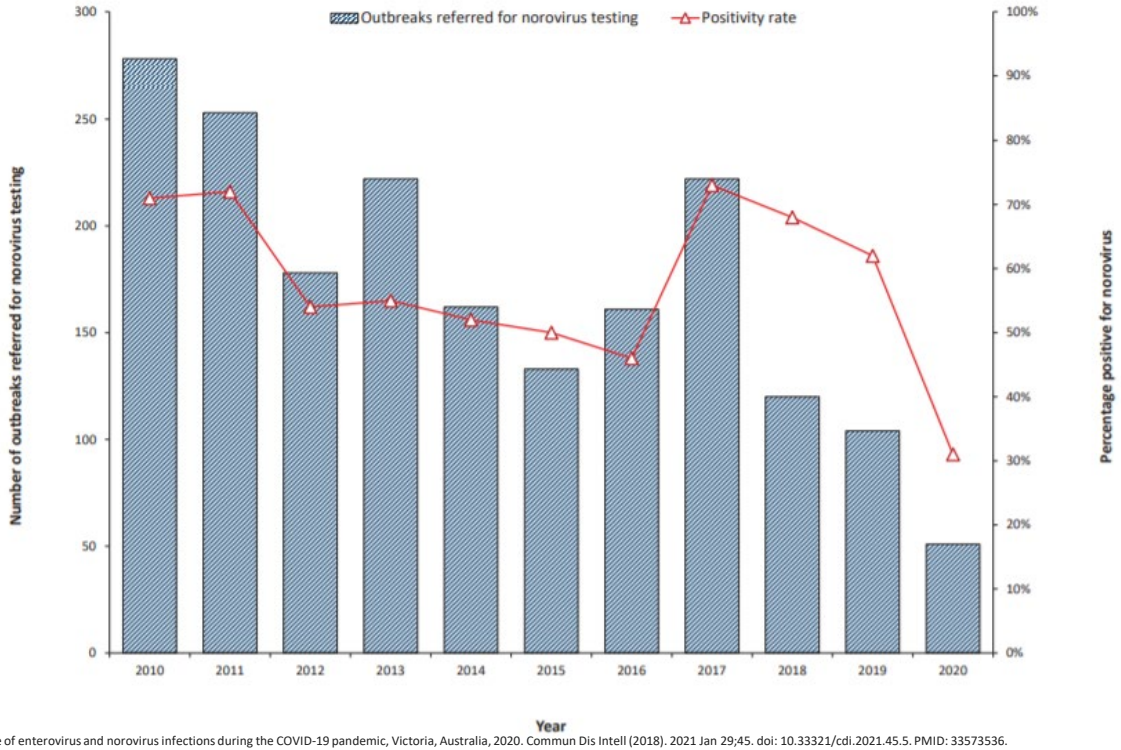
Excluding ill employees at first sign of symptoms	• Ill employees report illness and stay away from work • Reported symptom resolution • Followed post symptomatic exclusion period of ≥24h
Handwashing Efficacy	• Wash after toilet usage • Wash hands for 20 sec with soap and warm water
No bare hand contact with RTE food	• Glove usage • Utensils to handle food
Proper sanitation of surfaces	• Following established protocols and product directions • Routine cleaning and sanitizing • Proper disinfection when and where needed

Verifying Norovirus Risk Management Strategies

- Examine for presence of valid procedures for illness exclusion, hand washing, cleaning & disinfection.
- Monitor hand soap or disinfectant usage.
- Audit/inspect for proper compliance with procedures for illness exclusion, handwashing, cleaning & disinfection.

Reductions in Norovirus Positive Specimens in 2020, Australia

Figure 3: Number of gastroenteritis outbreaks with specimens tested and the norovirus RNA positivity rate for January to September each year from 2010 to 2020



Source: Bruggink LD, Garcia-Clapes A, Tran T, Druce JD, Thorley BR. Decreased incidence of enterovirus and norovirus infections during the COVID-19 pandemic, Victoria, Australia, 2020. Commun Dis Intell (2018). 2021 Jan 29;45. doi: 10.33321/cdi.2021.45.5. PMID: 33573536.

Likely Contributors to Reductions

- Fewer specimens analyzed and restaurant meals
- Physical distancing
- International and domestic border closures in response to the COVID-19 pandemic

- BUT…Personal hygiene awareness may have played a role as well!

Benefits of Risk Management Aimed at *L. monocytogenes* and Norovirus

- Reduced morbidity and mortality
- Reduced healthcare costs
- Enhanced brand and establishment reputation

Concluding Point:

Optimally Apply ***and*** Verify the Appropriate Risk Management Practices to Effectively Manage Many Risks

Any questions?

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