Food Safety Risk Analysis

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Education & Experience

- 2008 PhD in Food Technology
  - Polytechnic University of Valencia (Spain)
  - Institute of Agrochemistry and Food Technology (IATA-CSIC)
- 2009-2011 Postdoctoral fellow
  - ERRC, ARS, USDA (Philadelphia, PA)
- 2011 Assistant Professor
  - University of Minnesota

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Foodborne illness

- Each year 1 in 6 Americans (or 48 million people) gets sick, 128,000 are hospitalized, and 3,000 die of foodborne diseases
- Way way way underestimated….
- Difficult to estimate:
  - Not all sick people go to the doctor
  - Not all the diseases are reportable
  - Not all the samples are tested
- Usually the number of cases reported should be multiply by 2-150x to get the exact number
- Direct medical costs and indirect costs
  - Work absenteeism

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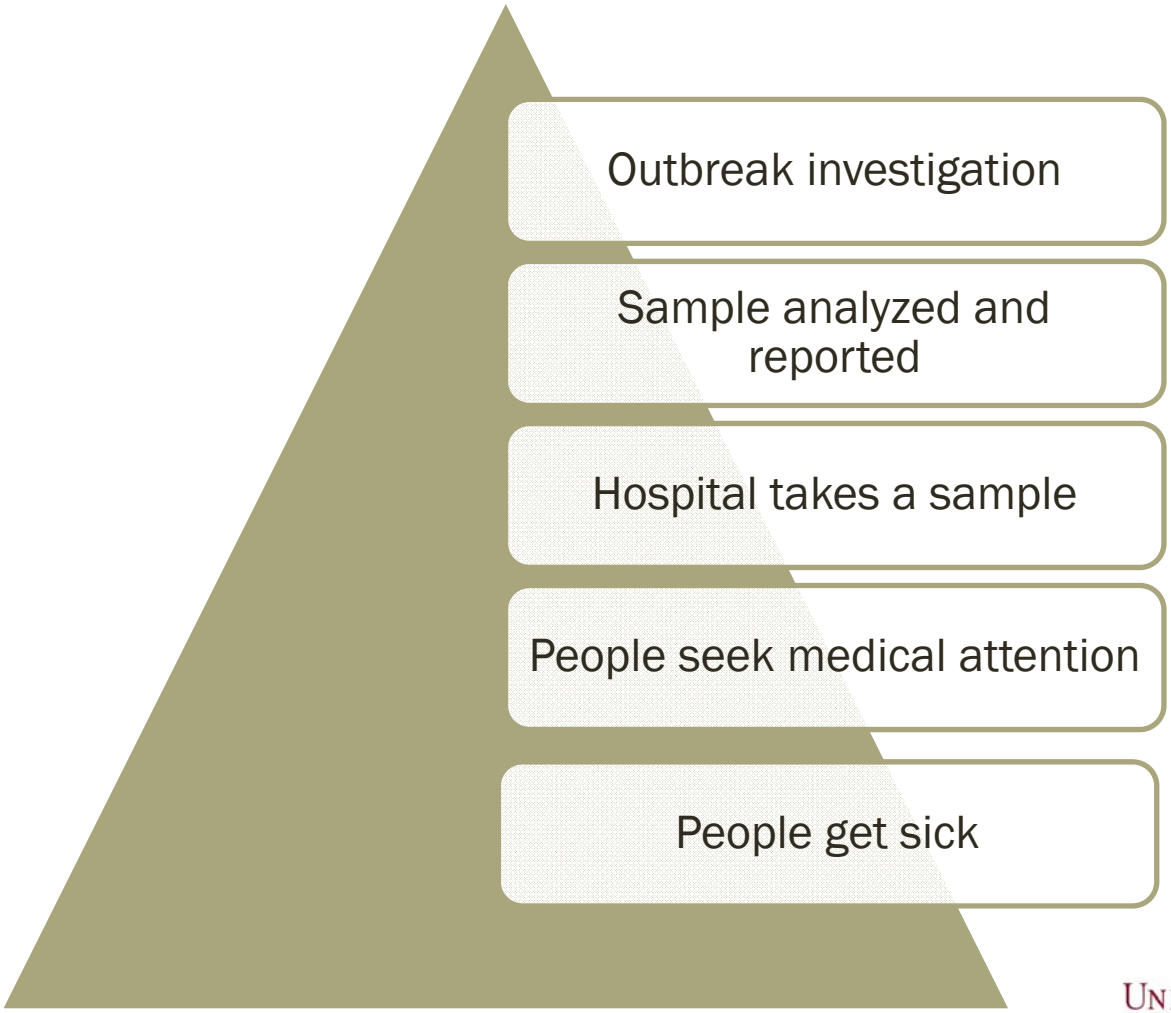
Foodborne illnesses notification pyramid



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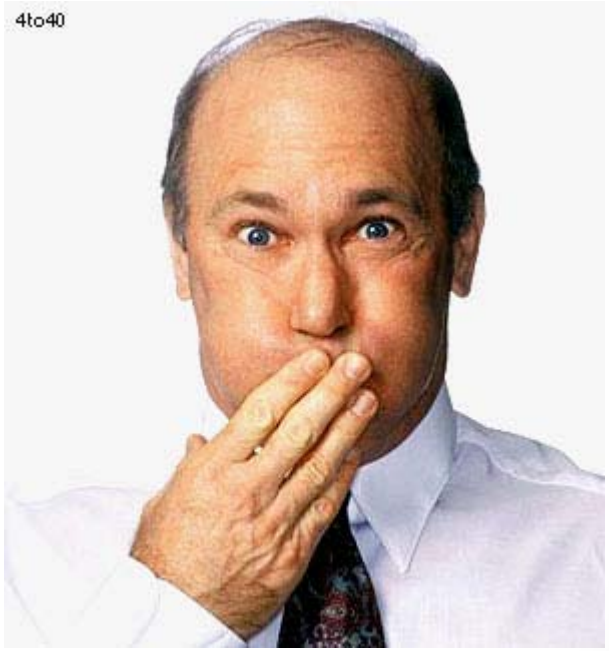
Factors contributing to foodborne outbreaks

- They may occur by:
  - poor personal hygiene
  - cross-contamination
  - poor storage practices
  - poor cleaning & disinfection
  - mistake during processing
- Often exist in the raw material before it is processed
- Does not include yeast or mold; primarily spoilage organisms unlikely to cause illness or death if consumed

Foodborne illness outbreak

- More than 250 foodborne diseases have been identified.
- Most of them will produce:
  - Vomiting
  - Diarrhea
  - Fever
  - Stomach pain
- Some of them will produce:
  - Uremic syndrome
  - Severe illness
  - Death



What is Risk?

- Food safety Risk = likelihood x severity of a hazard to be present in the food

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What is food safety risk analysis?

- Set of tools to aid decision-makers to provide with more science-based decisions
- It takes into account the food safety risks among the whole food chain

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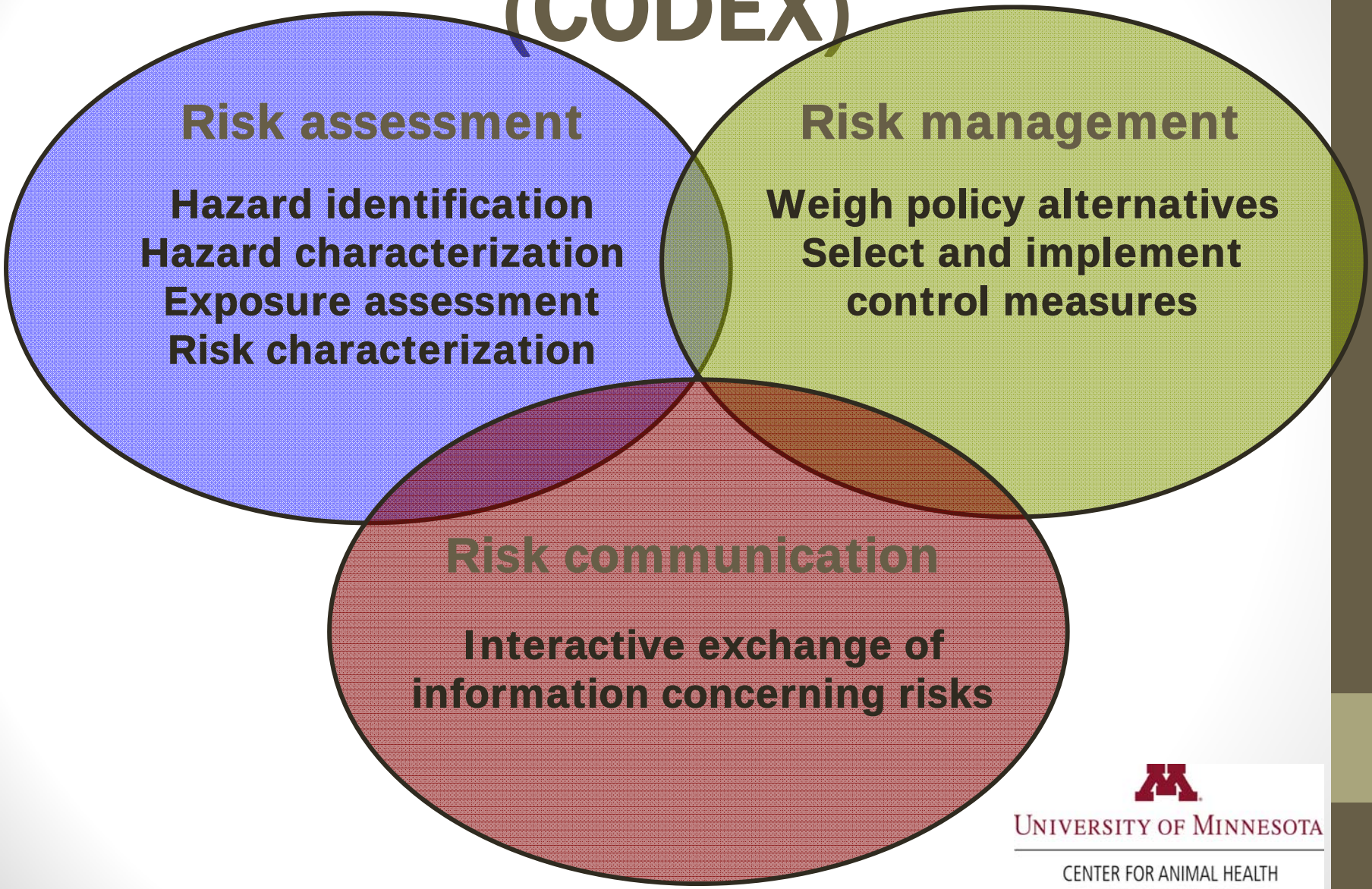
Food Safety Risk Analysis- (CODEX)



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What RA can do?

- Prioritize risks (impact and probability)
- Identify gaps of information
- Estimate the risk of my process based on the presence of a hazard
- Evaluate different control measures to reduce the risk

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In other words….

- How likely is to have Salmonella/allergen/chemical in the final product?
- If present, how likely is Salmonella/allergen/chemical would be in such quantity to produce an outbreak/recall?

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How risks are assessed?

- Decision matrices
- Decision trees
- Quantitative models

Decision matrices

- Tables that allow to estimate the risk based on a qualitative/semi-quantitative scale
- Define the levels for probability and severity
- Assign numbers/letters to each one
- Establish the ranges to be considered a risk
  - Negligible
  - Low
  - Medium
  - High

FDA-Approach for designating High Risk Foods

- Identify the high risk foods by assigning scores
- 7 criterion
  1. Frequency of outbreaks
  2. Severity of illness
  3. Likelihood of contamination
  4. Growth potential
  5. Manufacturing process intervention
  6. Consumption
  7. Economic impact

http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm380210.htm

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Risk ranking of local foods

- List of all local foods
- For each of the foods list all possible pathogens
- Characterize the main steps during manufacturing
- Estimate the risk for each food/process by assigning scores

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Factors that affect food safety of local foods

- Contamination of raw material
- Killing step during process (raw vs. cooked)
- Shelf-life
- Cross-contamination
- Training and education
- GAP, GMP, HACCP

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- Contamination of raw material

Contamination of raw materials	Likelihood
Very likely (>50%)	4
Likely (>10%)	3
Rare (<1%)	2
Very rare (<0.1%)	1

- Manufacturing steps

Killing step	Likelihood
The production process eliminates the hazard	1
The step eliminates the hazard only partially	2
The step only eliminates the pathogen slightly	3
There is no killing step	4

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- Severity

Symptoms	Severity
The pathogen can cause death	4
The pathogen can cause life disabilities	3
The pathogen can cause hospitalization	2
The pathogen causes mild symptoms (vomit and diarrhea)	1

- To assess the overall risk we will use the following equation:

Risk = likelihood x severity

For example:

Pathogen-Food combination	Risk score
Chicken	12
Lettuce	10

Identify the high risk foods and apply additional risk mitigation measures

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