PUBLIC HEALTH AGENCY *of* CANADA
AGENCE DE SANTÉ PUBLIQUE *du* CANADA

Weight of Epidemiological Evidence in a Foodborne Illness Outbreak
Ontario Symposium - March 2, 2010

Public Health Agency of Canada | Agence de santé publique du Canada

Canada

Outline

- Purpose
- Background
- Framework
- Criteria for weighing the epidemiological evidence

Purpose

- To guide epidemiological assessments
- To make the process more systematic and transparent
- To develop common understanding of evidence necessary and sufficient for action

Background

Epidemiological evidence:

- Data demonstrating an association between a food and human illness
- **Descriptive:** increase in cases in a population, place &/or timeframe with exposure to a plausible vehicle of infection
- **Analytical:** epidemiological study to demonstrate statistically significant association between illness and food

Background

Epidemiological data sources:

- Relevant research literature
- Pathogen surveillance data (environment, animals, food)
- Enteric disease surveillance data
- Previous published and unpublished reports of outbreaks
- Population food consumption surveys
- Outbreak cases and well comparison groups

Weight of Epidemiological Evidence Framework

Hill's criteria for causation[1]:

1. Plausibility
2. Temporal relationship
3. Consistency
4. Strength
5. Dose-response
6. Specificity
7. Consideration of alternate explanations

1) Hill AB. Proceedings of the Royal Society of Medicine. 1965;58:295-300)

Weight of Epidemiological Evidence Framework

- Question posed for each criterion
- Statements regarding the nature of the evidence are weighted weak to strong
- Overall weight of evidence is composite of weights within each criterion

Weight of Epidemiological Evidence
Plausibility

- Is food item a plausible vehicle of infection?
  - Food associated with previous outbreaks
  - Pathogen previously isolated from food
  - Supports growth of pathogen
- Usually assessed in early hypothesis-generating stage of investigation

Weight of Epidemiological Evidence
Plausibility

E.g., Cantaloupe as vehicle of infection for *S*. Poona

- Melons associated with 5 previous outbreaks in Canada and US since 1991
- Pathogen previously isolated from cantaloupes
- Not commonly isolated from other foods

Weight of Epidemiological Evidence
Temporal Relationship

- Do cases report eating food in accepted exposure period?
  - Cases ate food in exposure period – rarity of food increases strength

    (e.g., pistachios vs eggs)
  - Cases ate food but not within accepted exposure period

    (e.g., food consumed 7 days prior to symptom onset of Salmonellosis)

Weight of Epidemiological Evidence
Consistency

- Is association consistently reported in different populations?
  - Association observed in multiple independent case clusters (e.g., restaurant, weddings)
  - Association observed in single cluster only – stronger if cases from varied populations

Weight of Epidemiological Evidence Consistency*

- Is temporal and spatial clustering of cases consistent with distribution of food?
  - Tight temporal and spatial correlation
    (e.g., RTE Greek pasta salad in ON, short shelf life, one lot)
  - Geographic OR temporal correlation only
    (e.g., almonds in ON, QC and Atlantic provinces, long shelf life, ongoing contamination)

Weight of Epidemiological Evidence Strength

- How strong is the statistical association between food and illness?
  - Well designed analytic study
  - Strong, significant association
  - Strong OR significant association

    (e.g., strong, non-significant association due to small sample size)
  - Results doubted due to flaws in design of study

Weight of Epidemiological Evidence Specificity*

- Does the information provided implicate a single specific food product?
  - Specific lot code, brand of food item
  - Specific food item (e.g., RTE Greek pasta salad in small plastic container)
  - Non-specific food type (e.g., cantaloupe, lettuce)

Weight of Epidemiological Evidence Consideration of Alternate Explanations

- To what extent have other possible hypotheses been ruled out?
  - No other food item reported with greater than expected frequency based on analytic study
  - Extensive list of foods ruled out in hypothesis-generating process
  - Limited information available regarding other exposures

Weight of Epidemiological Evidence Conclusions

- More clear but still not straightforward
- Further review and input required