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Over Twenty Years of International Foodborne Outbreak Data: How PAIFOD Continues to Support Activities Prevent Foodborne Illness in Canada

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Knowledge Synthesis

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Overview of PAIFOD

What is PAIFOD exactly

Publicly Available International Foodborne Outbreak Database (PAIFOD)

Currently have 16,000+ rows of outbreaks



Pre- 2000

2000

2023

Informal collection in
a descriptive format

Microsoft Access
database

Web-based no-code
relational database
program // *Baserow.io*

Where does PAIFOD get information?

- Primary studies
- Outbreak and recall aggregation sites
 - Food Safety News
 - eFood alerts
 - ProMED
- Annual reports
 - European Food Safety Authority (EFSA) country reports
 - National Outbreak Reporting Systems (NORS)
- Government alerts and reporting
 - Public Health Agency of Canada
 - Centres for Disease Control/ Food and Drug Administration
 - Staten's Serum Institute, etc



What we collect



- Global Outbreaks
 - Publicly reported
 - Causative agent & case number are reported



- Water outbreaks
- Consumption of poisonous plants or mushrooms
- Chemical or pesticide poisoning

Outbreak Information Extraction

Basic Information Collected

- Country where cases occurred
- Year and month of earliest illness onset
- Number exposed
- Number of cases
- Number of hospitalisations
- Number of deaths
- Major sequelae (hemolytic uremic syndrome, liver failure, Guillain barre, etc)
- Causative reasons
- Concentration of causative agent
- Detailed description of outbreak
- Source and links to outbreak information

Causative organism

T Microorganism	Genus	Speci...	Sub Spe...	Serotype/genot...	Phagetype/Definitiv...
Escherichia coli O157:H7	Escherichia	coli		O157:H7	
Salmonella Enteritidis PT 13	Salmonella	enterica	enterica	Enteritidis	PT 13
Escherichia coli O103, O121	Escherichia	coli		O103 O121	
Listeria monocytogenes ST...	Listeria	monocytogenes			ST1607
Salmonella	Salmonella				

- User editable text column, and pre-defined columns for searching
- Pick from list for Genus, species, sub-species, serotype or genotype, phage type/definitive type

Food levels

- Added three food hierarchy levels for filtering
 - Based the categorization scheme based on the CDC Interagency Food Safety Analytics Collaboration (IFSAC)
- Nine top level categories

Vehicle	Food level 1	Food level 2	Food level 3
Cilantro	Vegetables	Herbs	
Citrus juice, unpasteurized	Fruit	Citrus	
Clams	Seafood	Mollusks	Bivalve
Clover sprouts	Vegetables	Sprouts/microgreens	

Food safety failure point and Consumption setting*

- Food safety failure and consumption settings are broken in a higher-level group (level 1) and a secondary more specific level (level 2)
- Food safety failure captures any settings with evidence of introduction of, proliferation was allowed, or there was a failure to control/reduce causative organisms
- Consumption settings are where cases were exposed to the contaminated food

☒ Food safety failure level 1 ▾	☒ Food safety failure level 2 ▾	☒ Consumption setting level 1 ▾	☒ Consumption setting level 2 ▾
Commerical kitchen	Restaurant	Food service	Restaurant
Unknown	Unknown	Food service	Restaurant
Unknown	Unknown	Community settings	School
Unknown	Unknown	Community settings	Home
Unknown	Unknown	Food service	Restaurant

Food Tags*

- Introduced to quickly find common food attributes that were not necessarily included in the vehicle
- Fermented, Frozen, Canned, Dried, Smoked, Pasteurized, Unpasteurized, Infant foods, Low-moisture, Hunted, Imported, Beverages, Ground/puree/spreads, Pre-packaged, Hunted

Liquid egg whites	Pasteurized Imported
Raspberries	Frozen Imported
Corn	Imported
Powdered Infant For...	Infant food Low moisture food Dried Imported

AMR and Outbreak Investigation Methods*

- Antimicrobial resistance information columns
 - Binary yes or no information available
 - Reflects if there is any resistance information provided (resistance genes or phenotypic expression in either food or case isolates)
 - Details on what AMR information in outbreak details
- Outbreak investigation methods
 - Collects any or all methods reportedly used to investigate outbreaks
 - Hypothesis generation methods: interview, questionnaires
 - Analytical methods: case-case/case-control, binomial probabilities
 - Sampling and inspections: food/environmental sampling, facility inspections

Database limitations



- Quality of an outbreak record is only as good as reporting
 - Particularly an issue for causative reason and where food safety failures occurred
- Keeping up with new entries
- Minimizing locations bias
- Minimizing duplicate entries particularly for multi-county outbreaks
- Accessibility
 - Hosted within an internal government server which requires PAIFOD team member to query the database and make the report

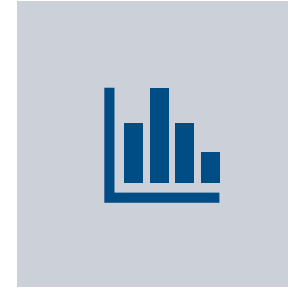
Use Cases



EVIDENCE BRIEFS



EVIDENCE
SUMMARIES AND
RISK ASSESSMENTS



OUTBREAK LEADS
AND ANALYSIS



POLICY ADVICE



PAPERS AND
PRESENTATIONS



EVIDENCE FOR
LITIGATION CASES

Case 1: STEC Risk Analysis

- **Requested data:** Shiga toxin–producing E. coli (STEC) related outbreaks
- **Analysis:**
 - Compared O157 vs non-O157 outbreaks
 - Criterion developed to rank food commodities
- **End-products:**
 - Risk analysis
 - Management strategies

Case 2: Consumer communications

- **Requested data:** multiple requests
 - Nut and seed outbreaks
 - Listeria outbreaks
- **Analysis:**
 - Development of recommendations
- **End-product:**
 - Consumer advice web page for people with weakened immune systems
 - Presentations to a round table
 - Responses to queries

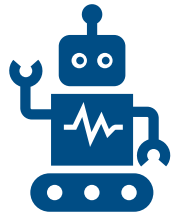
Case 3: Regulatory review

- **Requested data:** multiple requests
 - Salmonellosis in processed eggs
 - Bacillus cereus outbreaks in infant cereals
- **Analysis:**
 - Reviewed micro criteria
- **End-products:**
 - Updated guidance documents
 - Reference document in the food and drug regulations

Future Directions



Integrate routine checking for primary articles



Reduce human resources to extract data

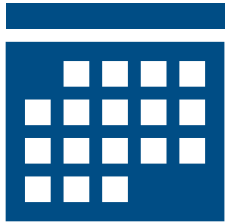


Develop a standard request form



Allow users to pull their reports

Conclusions



PAIFOD has been valuable for food safety & public health for 20+ years



Modernization efforts have improved the ease of finding relevant data



Further improvements are planned to make PAIFOD more accessible

Thank you

Contact for data requests and questions can be sent
to

paifod-bieaap@phac-aspc.gc.ca



Questions?