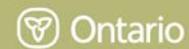


## **Laboratorians to the Rescue!! Ontario Team Presentation**

*John Jessop –Co Chair Lab Group GLBHI*



### **Ontario Public Health Laboratory (OPHL) Team**

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- **Laboratory Structure**  
Peter McEwan, Manager – Thunder Bay RPHL
- **Ontario Public Health Lab System & it's role in outbreak management**  
John H. Jessop, Manager - Sault Ste Marie & Timmins RPHL's
- **Foodborne outbreak testing**  
Dr Abdul Chagla, Manager – London & Windsor RPHL's
- **Reference testing**  
Bruce Ciebin, Manager-Hamilton RPHL

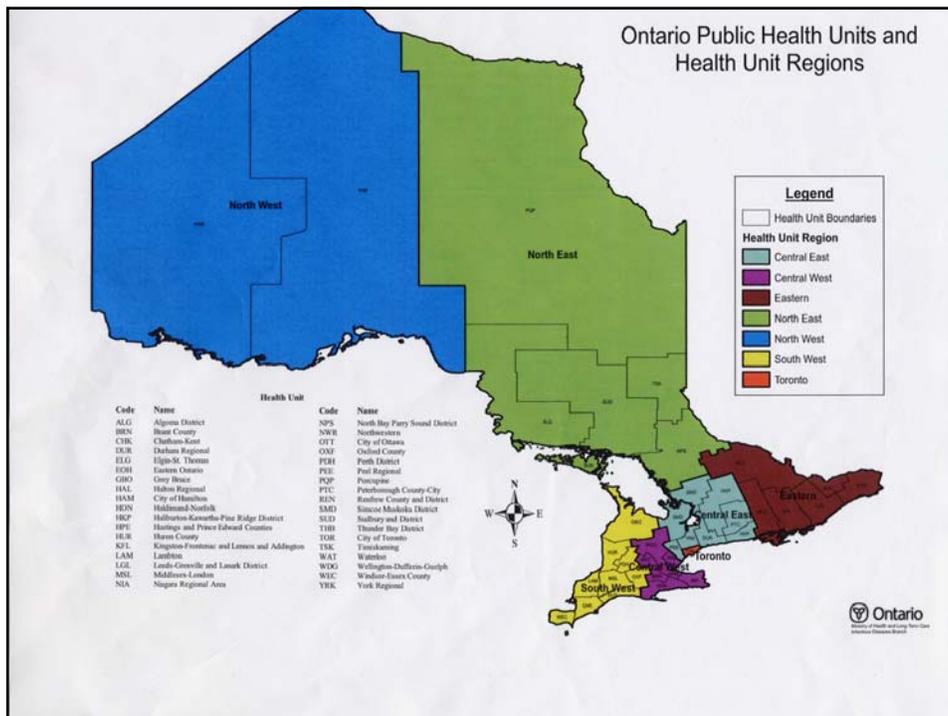


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## Public Health in Canada

- Federal
  - Health Canada
  - Public Health Agency of Canada (PHAC)
  - Chief Public Health Officer for Canada
- Provincial
  - Provincial Ministry of Health and Long-Term Care (MOHLTC)
  - Provincial Infectious Diseases Advisory Committee (PIDAC)
- Municipal
  - Public Health Units with Medical Officers of Health (36)





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## Health Labs in Canada

- Hospitals
  - General labs
  - Specialty labs usually associated with University Hospitals
- Private/Community
  - Several private companies
  - Some general, some specialty
  - Some offer testing outside of the healthcare system
- Public Health Labs
  - Federal
  - Provincial



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## Public Health Labs in Canada

- Federal
  - Canadian Science Centre for Human and Animal Health
    - National Microbiology Lab (NML)
    - National Centre for Foreign Animal Disease
- Province of Ontario
  - Ontario Provincial Health Lab System (OPHL's)
    - Central Public Health Lab in Toronto (CPHL)
    - Eleven Regional Public Health Laboratories (RPHL's)



## Ontario Public Health Laboratory (OPHL) System

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- Focus: OPHL system provides lab services that assist in the diagnosis, prevention and treatment of infectious diseases, conduct bacteriological testing of water and aid in the protection and promotion of public health.
- Funded: Totally by Province of Ontario, MOHLTC
- Staffing: 600
- Locations: 1 Central Lab in Toronto
- 11 Regional Labs spread throughout the province.
- (Hamilton, Kingston, London, Orillia, Ottawa, Peterborough, Sault Ste Marie, Sudbury, Thunder Bay, Timmins & Windsor)



## Clients served by OPHL System

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- Health Units (Environmental samples, Infection Control/Communicable diseases, Outbreaks, STI clinics )
- Physicians
- Community/Private & Hospital Labs - (Reference Testing)
- Student Health Centres
- First Nations/Native Reserves
- Federal & Other Provincial Public Labs
- Provincial Government Ministries & Agencies
- General Public – Water Testing



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## Role of OPHL System in Foodborne Outbreaks

- Advise on collection and transportation of appropriate specimens
- Isolate and identify etiological agent
- Rule out as many agents as possible
- Co-ordinate transfer of cultures/specimens to reference laboratories as required
- Communicate lab results to Public Health Unit



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## Outbreak Information Report (OIR)

- Outbreak number assigned by the local Public Health Unit
- Location of the outbreak (name and address of the institution/facility)
- Health Unit/Institution Outbreak Coordinator contact information
- Source or event associated with the outbreak
- Date of onset
- Number of persons ill/at risk/hospitalized/deceased
- Number of residents/patrons/staff
- Most common symptoms
- Incubation period, if known
- Duration of illness
- Reports of any pathogens isolated by other laboratories, related to same outbreak
- Suspected mode of transmission
- Suspect meals and interval between the meal and symptoms
- Travel or other history, if pertinent
- Number of stool samples that will be submitted.
- Number and type of food or environmental samples that will be submitted



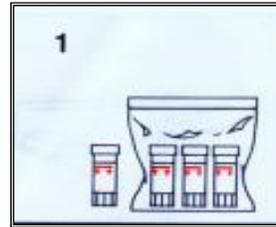
## Outbreak Investigation --- Sample Collection Kits

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- Clinical Sample collection
  - Dry Vial – Virology & Bacterial toxin testing.
  - Enteric Transport Medium Vial – Bacterial Enteropathogens
  - SAF preservative Vial – Parasitology testing

### Environmental Sample Collection

- Water
- Food
- Environmental Swabs



 Ontario

## Fecal Examination Looking for Bacterial Agents

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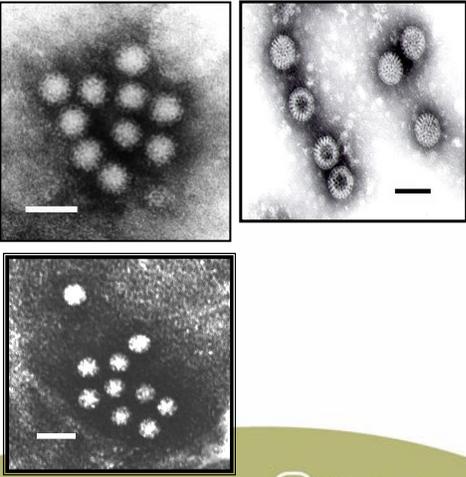
- *Bacillus cereus* (food submissions only)
- *Campylobacter* species
- *Clostridium difficile* (antibiotic-associated/pseudomembranous colitis)
- *Clostridium perfringens* (enterotoxigenic)
- *Escherichia coli*
  - Enterohaemorrhagic *E. coli* (O157:H7 and other verotoxigenic serotypes)
  - Enteroinvasive *E. coli*
  - Enteropathogenic *E. coli*
  - Enterotoxigenic *E. coli*
  - Enteroadherent *E. coli*
- *Salmonella* serotypes
- *Shigella* species
- *Staphylococcus aureus* (enterotoxigenic - food submissions only)
- *Vibrio* (*V. cholerae*, *V. parahaemolyticus*, *V. fluvialis* and other species)
- *Yersinia enterocolitica* (pathogenic bio/serotypes)
- *Yersinia pseudotuberculosis*

 Ontario

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### Fecal Examination Looking for Viral Agents

- *Adenovirus*
- *Astrovirus*
- *Calicivirus*
- *Coronavirus*
- *Norovirus*
- *Rotavirus*
- *Torovirus*

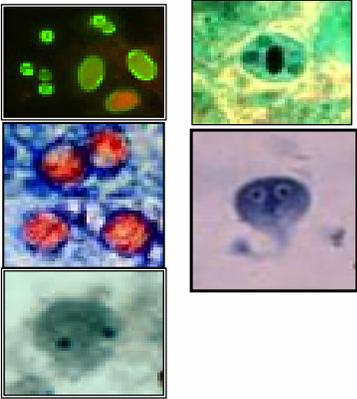


 Ontario

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### Fecal Examination Looking for Parasitic Agents

- *Cryptosporidium*  
*species*
- *Cyclospora*  
*cayetanensis*
- *Dientamoeba fragilis*
- *Entamoeba histolytica*
- *Giardia lamblia*



 Ontario

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## Food-Borne Bacterial Disease (Infection/toxin)

Food samples are examined for indicators of poor sanitation:

Heterotrophic Plate Count (HPC)

- Total Coliforms
- *E.coli*
- Total Gram Negatives

Enteric pathogens

- Salmonella
- Campylobacter
- Yersinia
- E.coli 0157 H7
- *Staphylococcus aureus* and toxin
- *Bacillus cereus* and toxin.
- C. perfringens
- Other pathogens: If strong implication & positive clinical isolates

Referred to National Micro Lab:  
*Clostridium botulinum*  
*Listeria monocytogenes*

 Ontario

## ROLE OF REFERENCE TESTING IN THE LABORATORY DIAGNOSIS OF FOOD BORNE DISEASE

- Submission of samples
- Serology
- Toxin detection
- Phage Typing
- Antibigrams
- PFGE
- PCR

 Ontario

## SUBMISSION OF SAMPLES/SPECIMENS

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- Culture isolates
- Stool specimens
- Food/water samples
- Health Unit submissions to Regional Public Health Laboratories (RPHL)
- RPHL to Central Public Health Laboratory (Toronto)
- Submissions from other Government Institutions including Hospitals
- Special Investigations



## SEROLOGY

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- *Salmonella*
- *Shigella*
- *E. coli O157*
- *Yersinia enterocolitica* (CPHL National Reference Centre)
- Results reported weekly to National Micro Laboratory in Winnipeg and Public Health Division (Ontario)



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## TOXIN DETECTION

- Stool
  - *E. coli* O157 verotoxin
  - *Bacillus cereus* enterotoxin (capability needed)
  - *Clostridium perfringens* enterotoxin
  
- Foods
  - *Staphylococcus* enterotoxin
  - Verotoxin (*E. coli*)
  - Botulism – referred to National Botulism Centre in Ottawa



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## PHAGE TYPING

- *E. coli* O157:H7
  - All isolates tested
  - CPHL, Toronto
  - National Microbiology Laboratory, Winnipeg
  
- *Salmonella*
  - All *S. enteritidis* isolates tested
  - PFGE not always useful
  - Other serotypes submitted for PT as warranted
  
- Phage typing is a useful screening tool to identify outbreaks
  
- Valuable adjunct to PFGE with common profiles



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## ANTIBIOGRAMS

- Resistance patterns to antibiotics can be a useful marker to distinguish bacterial strains
- Proven useful in outbreak investigation
- Participate in Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)
  - Compares antimicrobial resistance in enteric pathogens from human and agri-food sectors
- First 15 *Salmonella* isolates sent monthly to National Microbiology Laboratory for Susceptibility Testing



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## PULSED FIELD GEL ELECTROPHORESIS (PFGE)

- Conducted at CPHL, Toronto
- All *E. coli* O157 isolates tested on a continual basis to determine clusters
- Certain *Salmonella* serotypes tested as warranted based upon epidemiological information
- Member of PulseNet North
  - PFGE profiles forwarded to National Microbiology Laboratory, Winnipeg and given special national file identity
  - National Microbiology Laboratory networked with CDC (PulseNet)
  - Other provincial laboratories able to review PFGE profiles
- PFGE proven invaluable for recognizing early detection of outbreaks



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## **POLYMERASE CHAIN REACTION (PCR)**

- Proven useful for detection of certain pathogens in food and water, especially where cultural methods are not reliable
- PCR used to detect *E. coli O157* in well water during Walkerton outbreak
- Interferences with sample matrix can be problematic
- Further refinement in procedure needed, but has promising future in outbreak investigations



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## **Other Issues, Questions?**

- - informal information-sharing between laboratories
- - surge capacity, sharing of resources between laboratories
- - certification/licensure of laboratory staff
- - import/export permits for cross-border shipment of specimens
- - impact of climate & geography on shipment of specimens

