Epidemiology of Infectious Pediatric Gastroenteritis in Salt Lake City, Utah in 2010-2012

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INTRODUCTION

Determining the etiology of pediatric diarrhea is difficult due to the large number of diarrheagenic agents, overlapping clinical symptoms, and the need to select from among multiple diagnostic tests. More sensitive tests that can detect a broad range of pathogens could improve diagnosis and surveillance for infectious diarrheas.

The objective of this study was to assess the etiology of diarrhea in children in Salt Lake City and compare the diagnostic yield of standard testing selected by the treating clinician to the enriched yield from multi-target testing using the FilmArray™ Gastrointestinal (GI) Panel, a multiplex PCR diagnostic system that detects 22 bacterial, viral, and parasitic agents.

THE FILMARRAY GI PANEL

Simultaneous detection of 22 targets:

**Bacteria**
- Campylobacter jejuni, and coli
- Chlamydia
- Clostridium difficile
- Enterococcus faecalis
- Salmonella
- Shigella

**Diarrheagenic E. coli/Shigella**
- E. coli (ETEC)
- E. coli (EIEC)
- E. coli (STEC) O157
- Shiga toxin-producing E. coli (STEC) O157

**Viruses**
- Adenovirus
- Astrovirus
- Norovirus
- Rotavirus

**Protozoa**
- Cryptosporidium
- Cyclospora
- Entamoeba histolytica
- Giardia lamblia

Sample Processing and Pouch Loading Instruction

**Step 1**

- Pouch loading information

**Step 2**

- Testing of stool samples with the FilmArray GI Panel requires minimal pre-processing of specimens. The stool is diluted in Cary Blair medium (1:4) and loaded into the FilmArray GI pouch using a novel filter-rejection vial. The user identifies the sample and vial type (using a barcode reader) into the software and initiates a run. The result of the test is ready in about one hour.

Pathogen Detections by Age

- **All pathogens**
- **Viral pathogens**

Means for Higher Diagnostic Yield

- FilmArray GI Panel identified 890 pathogens in 633 episodes (51%).
- Standard of care practice using available methods identified 273 pathogens in 267 episodes.

Materials and Methods

A random sample of 1252 frozen stool specimens collected from 255 children in Salt Lake City was tested using the FilmArray GI Panel.

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ACKNOWLEDGMENTS

The FilmArray GI Panel was used to test residual frozen stool specimens from 1252 individual diarrhea episodes collected from symptomatic children (0-18 years) admitted to the Primary Children’s Hospital (PCH) laboratory for standard-of-care testing between October 2010-September 2012. A few selected samples collected through March 2013 were added to the analysis. Samples were preserved in Cary Blair transport medium and stored at -70°C until FilmArray GI Panel testing.

Standard laboratory tests were performed by PCH according to the requests of the treating clinician. Each specimen was tested in the lab for 1 to 15 pathogens, whereas the FilmArray GI Panel assessed each specimen for 22 pathogens with a single test. Testing was done according to manufacturer’s instructions. The FilmArray GI reports were compared with PCH lab detections for concordance when available.

The most prevalent pathogens:
- **C. difficile** in 16% (192/1252) of episodes
- **Norovirus** in 11% (136/1252) of episodes
- **Enteropathogenic E. coli** in 7.7% (97/1252) of episodes

Conclusions

The use of the FilmArray GI Panel more than doubled the identification of possible etiologic agents in pediatric diarrheas. This highlights the potential importance of multiplex testing and of including tests for emerging pathogens such as diarrheagenic E. coli and enteric viruses. Broader and more accurate pathogen detection may additionally improve patient treatment and reduce inappropriate antibiotic use and associated complications.

Public health may benefit from more rapid detection of GI pathogen-related outbreaks and hospital acquired infections and, overall, a broader understanding of the epidemiology of enteric illness.

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