xTAG Gastrointestinal Pathogen Panel (GPP)

1 sample 15 answers

Gastroenteritis is a condition from inflammation and irritation of the gastrointestinal tract. It causes diarrhoea, abdominal cramps, nausea, vomiting and fever. The infectious diarrhoea can be transmitted via close contact with someone who are infectious, contaminated objects, food or water and also through unsanitary practices. The common types of bacteria causing this infection are Escherichia coli, Salmonella, Shigella and Campylobacter. The main types of viruses which account for 30-40% of gastroenteritis in children are rotavirus, norovirus and adenovirus.[1]

Diarrhoeal diseases continue to be a leading cause of morbidity and mortality in children in developing countries. In developed countries, they are an important cause of hospital admission although mortality rates may be lower.[2,3] It is estimated that approximately 440,000 annual deaths in children younger than 5 years worldwide are due to diarrhoea related illness, with rotavirus as the main cause, as they are more vulnerable to fluid and electrolyte losses.[4] In a study conducted at the paediatric unit of University of Malaya Medical Centre in 2002, rotavirus was the commonest pathogen identified, accounting for 22% of the total number of hospital admissions that year.[3]

Reduction in Overall Cost and Isolation Days

An eight-month parallel diagnostic study was conducted by Goldenberg and his team in King's College, London and Guys' & St Thomas' NHS Foundation Trust, to measure potential economic benefits of testing hospitalized patients with the Luminex xTAG Gastrointestinal Pathogen Panel (GPP) compared with conventional laboratory testing (based on a combination of culture, microscopy and enzyme immunoassay). Laboratory testing costs and patient isolation costs were measured or estimated for 800 patients. It found that the GPP testing pathway resulted in overall savings due to a significant reduction in isolation days required (a reduction of 755 days at a saving of £66,765) over the course of this study as per Table 2 & 3 as follows. The overall saving under the GPP testing pathway was £44,482. These savings are dependent upon being able to remove patients with negative GPP tests from isolation. The turnaround time of the GPP test must therefore be faster than the turnaround time for conventional testing. This was measured in their previous study, which found the median turnaround time for conventional testing ranged from 17.3 to 66.5 h and the median GPP turnaround time to be 41.8 h.[5] Others have reported faster turnaround times for the GPP test.[6]

Table 3 Economic analysis of conventional and GPP testing pathways.

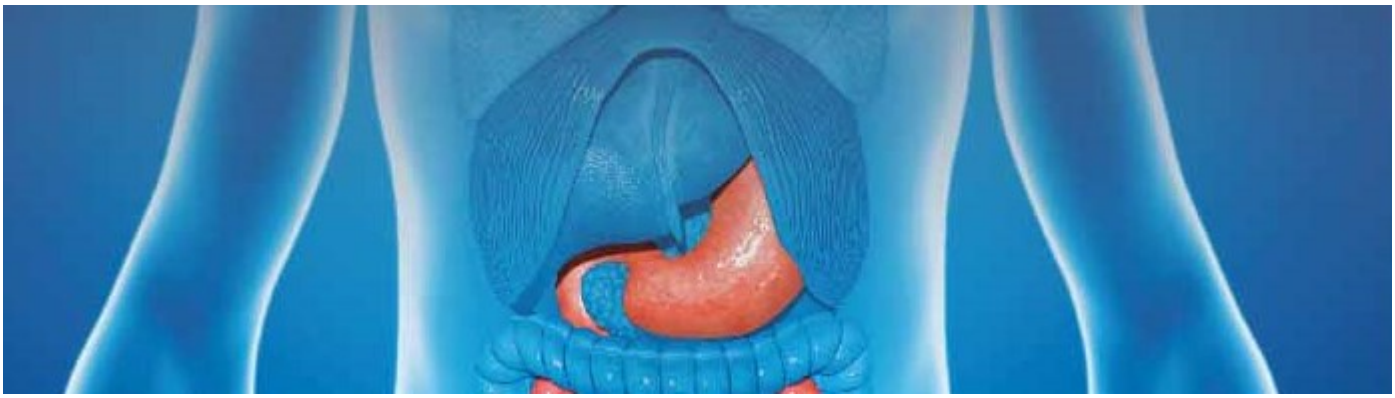
Conventional testing pathway	
Total number of isolation days	2202
Total isolation costs	£194,723
Total laboratory testing costs	£33,960
Total costs	£228,683
GPP testing pathway	
Total number of isolation days	1447
Total isolation costs	£127,958
Total GPP laboratory testing costs	£55,104
Total confirmatory testing costs[a]	£1139
Total laboratory testing costs	£56,243
Total costs	£184,201
Difference (GPP testing pathway – conventional testing pathway)	
Total number of isolation days	−755
Total isolation costs	−£66,765
Total laboratory testing costs	£22,283
Total costs	**£−44,482**

[a] Includes confirmatory culture and antimicrobial susceptibility testing for 51 samples positive by GPP for *Campylobacter*, *Salmonella*, *Shigella* and *E. coli* O157 (£11.30 per test) plus confirmatory toxin A/B enzyme-immunoassay for 45 samples positive by GPP for *C. difficile* (£12.50 per test).

Table 2 Patient isolation data under the conventional and simulated GPP testing pathways.

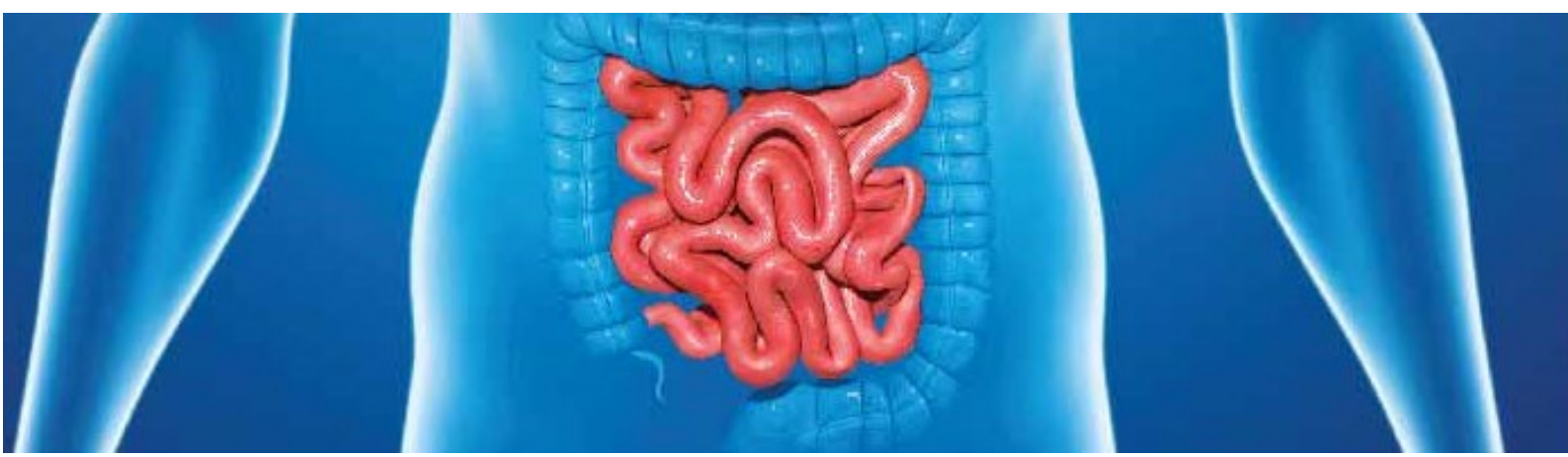
Patient status	Conventional testing pathway		GPP testing pathway	
	Total patients	Actual observed isolation days	Total patients	Actual observed or estimated isolation days
Communicable IG, patient isolated (a)	81	446	141	691
Non-communicable IG[a] detected, patient isolated (b)	0	0	11	22[c]
IG not detected, patient isolated (c + d)	328	1703	257	514[c]
Communicable IG detected, patient not isolated (e)	19	0	40	220
Non-communicable IG[a] detected, patient not isolated (f)	1	0	8	0
IG not detected, patient not isolated (g + h)	371[b]	53	343	0
Total (a to h)	800	2202	800	1447

IG = infectious gastroenteritis.
[a] Infections with *Giardia*, *Cryptosporidium* or *Entamoeba histolytica* were considered non-communicable and patient isolation was not required.
[b] 42 patients with ongoing symptoms were assumed to be remain in isolation with a total isolation time of 53 days.
[c] Estimated total isolation days cased on total isolation duration of 2 days per patient.



Influx of Co-infection Detections

On the other hand, Mengelle and his team back in the year 2013 collected 440 samples from 329 patients (male: female ratio of 1.2:1), including 102 immunosuppressed adults, 50 immunosuppressed children, 56 children attending the neonatal unit and 121 children attending the emergency unit to evaluate the multiplex molecular method xTAG Gastrointestinal Pathogen Panel (GPP) for detecting pathogens in stool samples in diarrheic patients (Graph No. 1).[6] The xTAG GPP method efficiently detected co-infections and the results are in agreement with those of previously published studies that detected rates of co-infections of 0.9% (0.02% by conventional methods)[8] and 6.8% (0% by conventional methods).[9] Other studies on patients with AIG requiring hospitalization have shown very high rates of co-infection (up to 22%).[10,11]



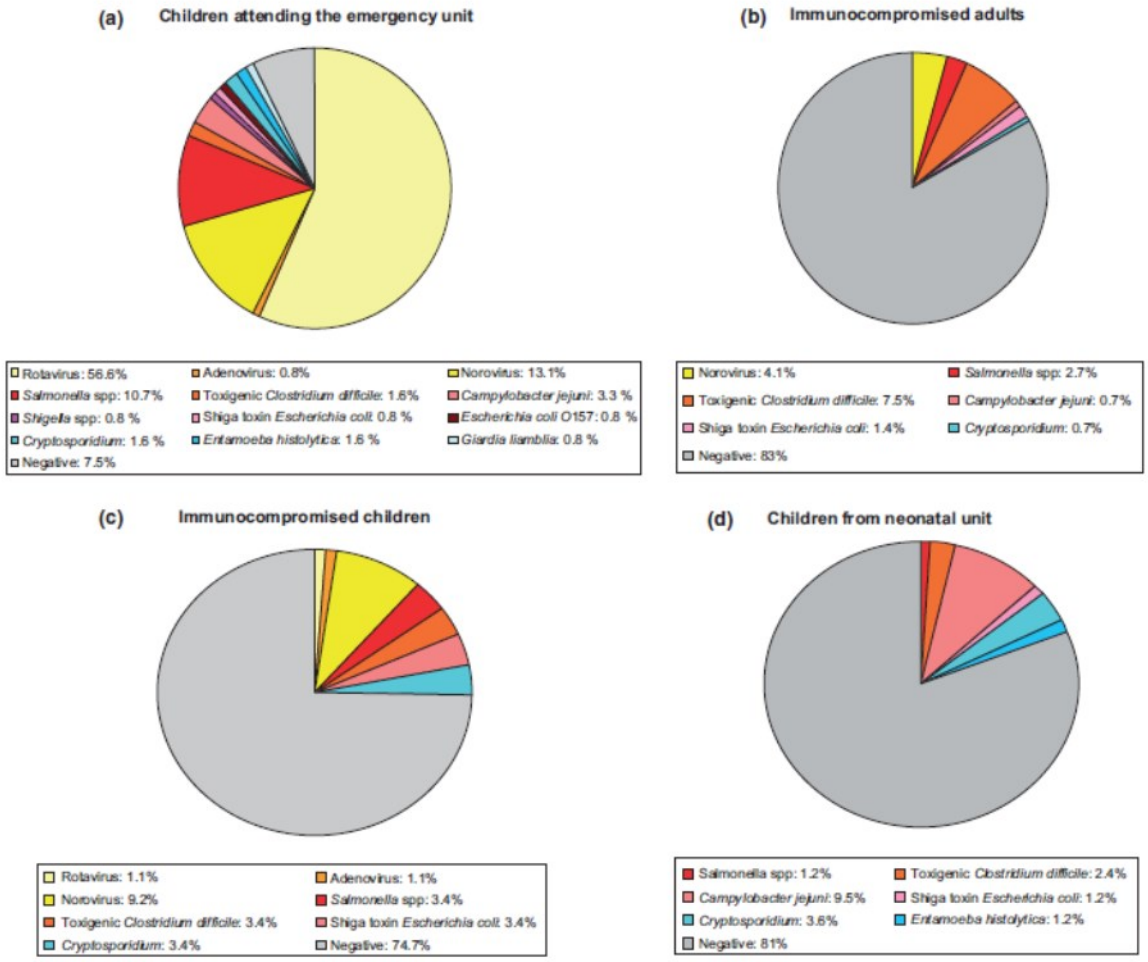


FIG. 1. (a) Pathogens in 113 samples collected from the 121 children (21 co-infections). (b) Pathogens ($n = 25$) detected among the 102 adult immunocompromised patients attending the emergency unit (three co-infections). (c) Pathogens ($n = 22$) detected among the 50 immunocompromised children (four co-infections). (d) Pathogens ($n = 16$) detected among the 56 children attending the neonatal unit (three co-infections).

The Test

The Luminex xTAG Gastrointestinal Pathogen Panel is **one test, with one stool sample and it can produce 15 results**. From this **single and simple laboratory test, one can get results for the 15 most common causes of infectious gastroenteritis from a single stool sample**. It is a qualitative multiples test intended for the simultaneous detection and identification of nucleic acids from multiple gastroenteritis-causing viruses, bacteria and parasites (including toxin gene detection) in human stool samples that are fresh, frozen or in a holding medium, from individuals with signs and symptoms of infectious colitis or gastroenteritis. The following pathogen types and subtypes are identified using the xTAG GPP:

Bacteria & Bacterial Toxins
Campylobacter
Clostridium difficile, Toxin A/B
Escherichia coli O157
Enterotoxigenic *E. coli* (ETEC) LT/ST
Shiga-like Toxin producing *E. coli* (STEC) stx1/stx2
Salmonella
Shigella
Vibrio cholerae, cholera toxin gene (ctx)
Viruses
Adenovirus 40/41
Norovirus GI/GII
Rotavirus A
Parasites
Cryptosporidium
Entamoeba histolytica
Giardia lamblia

Conclusion

In conclusion, one can get fast, comprehensive results of 15 most common pathogen targets of the causative bacterial, viral and parasitic agents of gastroenteritis with our Luminex xTAG Gastrointestinal Pathogen Panel (GPP) molecular testing. It is simplified because all 15 targets are included in one test hence requiring only one sample. As discussed earlier, co-infections can be detected and handled earlier when the Luminex GPP test is used. Apart from that, it can assist in reducing overall cost for both the patient and hospitals as well as decreasing isolation days.

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