Introduction

Many swab transport systems have been developed to stabilise clinical bacterial and viral material prior to downstream microbiological testing. Increasingly downstream testing is represented by a rapid syndemic multiplex molecular assay. The advent of liquid collection devices raises the question of compatibility with these molecular platforms. One such platform is the FilmArray® from Biomerieux. It is an FDA, CE-IVD, and TGA certified multiplex PCR system that integrates sample preparation, amplification, detection and analysis. The FILMARRAY® system enables simultaneous testing for bacteria, viruses, yeasts and/ or antimicrobial resistant genes. It is designed to be used with comprehensive panels that each offer testing for sets of pathogens. The validation of a wide spectrum of liquid swabs is clinically beneficial as during the medical examination process multiple swabs are frequently collected simultaneously and mix-ups are not uncommon. The general prescriptive approach of devices being validated for one collection device is also counter intuitive. The broader the validation spectrum of collection devices, the simpler the process becomes for taking the specimen and builds in contingency if there are supplier issues with the collection devices.

The collection of Medical Wire and Equipment (MWE) liquid collection devices (Fig.2) are a convenient system for collecting samples and transporting specimens in small instrument-ready tubes, making it easier to transport the specimen to the laboratory. This investigation looks at the potential use of various liquid transport systems for the detection of bacterial and viral pathogens and the effect of bacterial contamination on the detection of viral DNA/RNA utilising the Biomerieux FilmArray® platform (Fig.1). Of particular importance was the validation of the MWE liquid faecal device as gastrointesti nent is one of the leading causes of morbidity and mortality in young children where it is not always possible to get a bulk sample within a reasonable time frame, particularly for outpatients and/or in resource limited settings. This inability to obtain a stool specimen at the time of the patient visit can delay the diagnostic process and contribute to inappropriate treatment (Schenker and Wiszniewski, 2009).

Methods

FilmArray® platform manufactured by BioFire Diagnostics and distributed by Biomerieux.
- **FilmArray® Blood Culture Identification panel**
- **FilmArray® Respiratory panel**
- **FilmArray® Gastrointestinal panel**
- **FilmArray® Yeast panel**
- **FilmArray® Parasites panel**
- **FilmArray® CNS panel**
- **FilmArray® Sexually Transmitted Infections panel**
- **FilmArray® Respiratory panel**
- **FilmArray® Viral panel**
- **FilmArray® Respiratory panel**
- **FilmArray® Blood culture identification panel**
- **FilmArray® Respiratory panel**
- **FilmArray® Yeast panel**
- **FilmArray® Parasites panel**
- **FilmArray® CNS panel**
- **FilmArray® Sexually Transmitted Infections panel**
- **FilmArray® Respiratory panel**
- **FilmArray® Viral panel**

**Controls obtained from HHC were:**
- **Amplicon Control** (Sigma-Aldrich)
- **Blood culture identification panel** (Sigma-Aldrich)
- **Respiratory panel** (Sigma-Aldrich)
- **Viral panel** (Sigma-Aldrich)
- **CNS panel** (Sigma-Aldrich)
- **Sexually Transmitted Infections panel** (Sigma-Aldrich)
- **Parasites panel** (Sigma-Aldrich)
- **Yeast panel** (Sigma-Aldrich)
- **Blood culture identification panel** (Biomerieux)
- **Respiratory panel** (Biomerieux)
- **Viral panel** (Biomerieux)
- **CNS panel** (Biomerieux)
- **Sexually Transmitted Infections panel** (Biomerieux)
- **Parasites panel** (Biomerieux)
- **Yeast panel** (Biomerieux)

**The controls are purified intact organisms chemically modified to be non-infectious and mimicking clinical samples.** Controls were vortexed for 10 seconds and utilised to seed a range of liquid swabs.

**The targets of each panel are displayed below:**

<table>
<thead>
<tr>
<th>Panel</th>
<th>Swab product number</th>
<th>Swab description</th>
<th>Run</th>
<th>Results</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood culture identification panel</td>
<td>Sigma GBS swab</td>
<td>1</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
<tr>
<td>Blood culture identification panel</td>
<td>Sigma GBS swab</td>
<td>2</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
<tr>
<td>Blood culture identification panel</td>
<td>Sigma GBS swab</td>
<td>3</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
<tr>
<td>Blood culture identification panel</td>
<td>Sigma GBS swab Flocked</td>
<td>1</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
<tr>
<td>Blood culture identification panel</td>
<td>Sigma GBS swab Flocked</td>
<td>2</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
</tbody>
</table>

**The results of the FilmArray® panel are displayed below:**

<table>
<thead>
<tr>
<th>Panel</th>
<th>Swab product number</th>
<th>Swab description</th>
<th>Run</th>
<th>Results</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal panel</td>
<td>Sigma GBS</td>
<td>1</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal panel</td>
<td>Sigma GBS</td>
<td>2</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal panel</td>
<td>Sigma GBS</td>
<td>3</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal panel</td>
<td>Sigma GBS Flocked</td>
<td>1</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal panel</td>
<td>Sigma GBS Flocked</td>
<td>2</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal panel</td>
<td>Sigma GBS Flocked</td>
<td>3</td>
<td>Staphylococcus aureus</td>
<td>Detection</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion**

All MWE liquid swabs demonstrated compatibility with the FilmArray® system. This is of particular clinical use for the diagnosis of gastrointestinal disease as a simple rectal swab enables the rapid collection of a sample coupled with diagnostic power of the FilmArray®. The faecal swab system operates by mixing the collected and transport of GI pathogens with the rapid diagnosis of gastrointestinal diseases. The liquid collection swab system from MWE, particularly Focal Transwabs® is a great example of where two solutions meet in the middle, picking up where the other left off, to get to the right result fast. It provides a more sensitive and compact workflow solution. Additional research on improved sensitivity and specificity of rectal swabs is promising utilising the MWE faecal device would be of interest. Previous studies have shown to offer superior test accuracy for bacterial pathogens as compared to bulk stool testing on other multiplex PCR assays (Goldfarb et al., 2014).

There was no indication of inhibitory substances being present in the swab types tested. Timely sampling is critical to take advantage of rapid diagnostic testing of the FilmArray® especially should targeted antimicrobial therapy be indicated (if available). This study has shown that a wide range of liquid collection devices can be used for the FilmArray® giving more flexibility within the patient to diagnostic pathway.

References: