Respiratory Multiplex Array

Rapid, simultaneous detection of 22 bacterial and viral pathogens - of the upper and lower respiratory tract
Antibiotic resistance

In recent years, some pathogens, such as Staphylococcus aureus and Streptococcus pneumoniae have acquired resistance to antibiotics, rendering them ineffective in treating disease. This can largely be attributed to patient misuse of antibiotics as well as inappropriate prescribing by healthcare professionals. For example, antibiotics are ineffective against many respiratory tract infections, particularly viral infections, yet in the UK, RTIs account for 60% of antibiotic prescriptions in primary care. Correct identification and diagnosis of bacterial and/or viral pathogens is therefore critical to inform correct prescribing of antibiotics.

Introduction

Respiratory tract infections are caused by many viral and bacterial pathogens and are the second most common cause of morbidity and mortality worldwide. Acute respiratory disease (ARD) accounts for more than 4 million deaths annually and are the leading cause of death in developing countries.

Viral respiratory infections can occur in epidemics and can spread rapidly within communities across the globe. Every year, influenza causes respiratory tract infections in 5–15% of the population and severe illness in 3–5 million people. Upper respiratory tract infections can lead to acute asthma exacerbations, acute otitis media, and lower respiratory tract infection such as bronchitis, bronchiolitis and pneumonia. Particularly affecting the young, elderly and the immunocompromised, RTIs can result in prolonged hospital stays and represent a significant cost burden to public health systems worldwide.

Respiratory Multiplex Array

Rapid, simultaneous detection of 22 bacterial and viral pathogens within the upper and lower respiratory tracts
The Respiratory Multiplex Array

The Respiratory Multiplex Array is the most comprehensive screening test for infections of both the upper and lower respiratory tracts, simultaneously detecting 22 bacterial and viral pathogens from a single sputum, lavage or nasopharyngeal sample.

The assay is based on a combination of multiplex PCR and biochip array hybridisation. Innovative PCR priming technology permits high discrimination between multiple targets. A unique primer set is designed for each target which will hybridise to a complementary oligo-nucleotide probe spotted on a biochip discrete test region (DTR). This combination of priming and spatially organised biochip array technology enables enhanced specificity of the assay. Analysis can be completed from template DNA through PCR to data readout in ~6 hours. The array is CE marked for routine clinical use.

Respiratory Multiplex Array detects 22 bacterial and viral pathogens

Bacterial
- Moraxella catarrhalis
- Streptococcus pneumoniae
- Staphylococcus aureus
- Haemophilus influenza
- Legionella pneumophila
- Chlamyphila pneumoniae
- Mycoplasma pneumoniae
- Human bocavirus 1/2/3
- Human adenovirus A/B/C/D/E
- Human rhinovirus A/B
- Human metapneumovirus
- Human enterovirus A/B/C

Viral
- Influenza A
- Influenza B
- Human respiratory syncytial virus A
- Human respiratory syncytial virus B
- Human parainfluenza virus 1
- Human parainfluenza virus 2
- Human parainfluenza virus 3
- Human parainfluenza virus 4
- Human coronavirus 229E/NL63
- Human coronavirus OC43/HKU1

Respiratory Multiplex Array protocol

1. Extraction
   RNA and DNA is extracted from broncholoveolar lavage, nasopharyngeal swab or sputum samples

2. Amplification
   Single tube multiplex PCR reaction

3. Hybridisation
   Amplicon hybridisation to biochip array

4. Detection
   Imaging and results processing by Evidence Investigator analyser

~6 HOURS
Evidence Investigator - rapid, accurate and comprehensive molecular testing

The Evidence Investigator is a compact, semi-automated bench top platform consolidating immunoassay and molecular diagnostics on a single platform with protein and DNA biochips.

Utilising revolutionary Biochip Array Technology (BAT), the Evidence Investigator allows simultaneous detection of multiple analytes from a single sample for efficient and cost-effective testing.

The Evidence Investigator offers complete patient profiling with the most comprehensive test menu on the market.

Benefits of the Randox Respiratory Multiplex Array

**Product features**
- Rapid turnaround time of ~6 hours from extracted genomic DNA to result
- Compatible with various sample matrices including sputum, lavage and nasopharyngeal samples
- Semi-quantitative testing allowing determination of primary infection

**Benefits to the laboratory**
- Simultaneously identifying the most prevalent pathogens, both viral and bacterial, will provide a rapid and more cost-effective diagnostic tool than current tests that only look for single pathogens

**Benefits to the patient**
- A more complete infection profile allows identification of the infective agent and detection of co-infections, to inform correct therapeutic treatment, including the appropriate use of antibiotics, and/or physician advice to patients for optimal patient care
- Rapid result reporting reduces the time from presentation of infection to therapeutic intervention, and reduces length of exposure to infection
- Precise, rapid diagnosis allows for early treatment intervention and potentially avoids exacerbations or the need for hospitalisation
- Reduced sample requirement to perform the diagnostic test will be of particular benefit to infants, children and the elderly
Clinical data

Mass gatherings, such as the Hajj increase the likelihood of the spread of infectious diseases. The Kingdom of Saudi Arabia annually hosts over 2 million Muslim pilgrims from around 184 countries during the Hajj pilgrimage, making it one of the largest and most culturally and geographically diverse mass gatherings in the world. Respiratory tract infections (RTIs) are the most common infection transmitted between pilgrims during Hajj, and most pilgrims develop RTIs during their few weeks stay in Makkah and Madinah. The Randox Respiratory Multiplex Array was used to screen for the presence of bacterial and viral upper and lower respiratory tract infections during the 2013 Hajj:

Paper 1


This study examined the presence of co-infections in patients admitted to healthcare facilities in Makkah and Medina, Saudi Arabia, with a primary diagnosis of severe community-acquired pneumonia (CAP) during the 2013 Hajj, using the Randox Respiratory Multiplex Array. The study highlighted the frequency of co-infections in respiratory infections and the importance of using multiplex technology to detect both bacterial and viral pathogens.

- 68.4% of patients were confirmed to have bacterial and/or viral co-infections
- 65.3% of co-infected patients were positive for both bacteria and viruses

Study results revealed the wide range of infections present in the patient cohort.

- The most common respiratory virus was human rhinovirus, detected in 57.7% of the positive samples, followed by influenza A virus (23.1%), and human coronaviruses (19.2%)
- The predominant bacteria detected in positive samples were *Haemophilus influenza* (57.7%) and *Streptococcus pneumoniae* (53.8%), followed by *Moraxella catarrhalis* (36.4%)

Paper 2


This study sampled the environment in the King Abdul Aziz International (KAAI) Airport, Pilgrims City, Jeddah, during Hajj season to detect respiratory pathogens, using the Randox Respiratory Multiplex Array.

- 58 environmental samples (18 air samples and 40 surface samples) were tested for the presence of infectious pathogens, of which 8 samples were positive for at least one of the pathogens detectable by the assay.
- Air samples were negative with the exception of one (5.5%), which tested positive for influenza B virus.
- Of the 40 surface samples, 7 (17.5%) were positive for pathogens
- The most common pathogen contaminants of surfaces were adenovirus (3 of 7, 42.8%) and coronavirus OC43/HKU1 (3 of 7, 42.8%)
- Potentially pathogenic bacteria (e.g., *H. influenza, M. catarrhalis*) were also present on environmental surfaces
## References

### Respiratory Multiplex Array


### Antimicrobial Resistance in Infectious Diseases


## Ordering Details

<table>
<thead>
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<th>Description</th>
<th>Size</th>
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<td>EV3801A &amp; EV3801B</td>
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<tr>
<td>Evidence Investigator Analyser</td>
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Since their discovery last century, antibiotics have revolutionised modern medicine. In recent years, some pathogens have acquired resistance to antibiotics, rendering them ineffective in treating disease.

WHAT CAN BE DONE TO PREVENT ANTIMICROBIAL RESISTANCE?

Patient misuse
- Asking GPs to prescribe antibiotics unnecessarily
- Obtaining antibiotics without a prescription
- Saving antibiotics for future use
- Sharing antibiotics with other people
- Unnecessarily repeating courses of antibiotics due to non-compliance

Inappropriate prescribing
Antibiotics are ineffective against many RTIs, particularly viral infections, yet in the UK, RTIs account for 60% of antibiotic prescriptions in primary care.  

RESIST ASKING FOR OR USING ANTIBIOTICS UNNECESSARILY
DESIST PRESCRIBING ANTIBIOTICS INAPPROPRIATELY
UTILISE MULTIPLEX DIAGNOSTIC ASSAYS FOR RAPID DETECTION OF PRIMARY, SECONDARY AND ASYMPTOMATIC CO-INFECTIONS, ENABLING ACCURATE, FIRST-TIME DIAGNOSIS AND APPROPRIATE PRESCRIPTION OF ANTIBIOTICS

Randox Respiratory Multiplex Array
- Simultaneously detects up to 22 bacterial and viral upper and lower respiratory tract infections
- Multiplex technology differentiates between viral and bacterial infection and identifies secondary and asymptomatic co-infections

Randox STI Multiplex Array
- Simultaneously detect up to 10 bacterial, viral and protozoan pathogens
- Multiplex technology allows identification of multiple asymptomatic co-infections
Understanding drivers of disease is vital in delivering effective patient care. Through the unravelling of the genetic code, healthcare practitioners are able to predict and prevent disease and prescribe appropriate targeted treatments to specific subgroups, for optimal patient outcomes.

Randox Molecular offers a range of assay formats including SNP genotyping, gene expression, pathogen detection and mutation detection across infectious diseases, cardiovascular disease and oncology. Utilising innovative Biochip Array Technology (BAT) for multi-analyte screening of biological samples, our assays provide a complete patient profile from a single sample for rapid, accurate result reporting.