ABRx™ Antibiotic Resistance Panel

Diatherix's ABRx Antibiotic Resistance Panel provides detection for seventeen gene types and seven gene classes associated with resistance to three major groups of antibiotics: **β-lactams** (penicillins, cephalosporins, carbapenems, oxacillins), **quinolones,** and **macrolides**. The ABRx Panel is built on a nanofluidic real-time PCR OpenArray® platform which allows spatial assay multiplexing and simultaneous detection of resistance genes directly from a clinical specimen.

ABRx Panel Distinctions:

- *One day results**
- *Direct detection in clinical samples; bacterial isolation not required*
- *Validated on respiratory secretions, rectal/stool swabs, and urine samples*
- *Clinical isolates can be used for testing*
- *Inclusive for detection of multiple clinically relevant and prevalent gene variants within an individual gene family*
- *Detection results can be used to define an antibiotic class avoidance strategy*

In Gram-negative bacteria, production of extended spectrum **β-lactamases** (ESBLs) is the most important factor contributing to the resistance against **β-lactam** antibiotics including third and fourth generations of cephalosporins and monobactams. The ABRx Panel comprises the most comprehensive target list for detection of ESBLs, providing identification of clinically relevant and epidemiologically prevalent gene subtypes within the β-lactamase gene families.[1]

The common features of carbapenem-resistant *Enterobacteriaciae* (CRE) and ESBL-producers are:

- Quick dissemination which poses emerging threats across the globe
- "Urgent" or " Serious" public health threats based on CDC classification[2]
- Plasmid-mediated horizontal transfer of resistance genes across a variety of *Enterobacteriaceae*, including *Escherichia coli*, *Pseudomonas aeruginosa*, *Citrobacter freundii*, *Klebsiella* spp., *Acinetobacter* spp., and others
- Responsible for multiple hospital outbreaks and fatalities in the United States
- Phenotypic characterization via conventional susceptibility is hindered by presence of multiple resistance mechanisms within a single organism
- Potential failed empiric therapy if CREs or ESBL-producers are responsible for disease state
- Can be present in asymptomatic carriers

The plasmid-encoded genes, ***qnrA*** and ***qnrS***, confer resistance to **quinolones** through protection of DNA synthesis processes. Quinolones have been prescribed widely to treat different types of infections including respiratory and urinary tract, skin and soft tissue, and sexually transmitted diseases. The gene resistances to quinolones can be found in clinically common *Enterobacteriaceae*, *Salmonella* spp. and *Shigella* spp., *Staphylococcus* spp. and *Streptococcus* spp. The clinical impact of increasing quinolone resistance has contributed to the revision of several Infectious Diseases Society of America guidelines recommending the assessment of resistance rates to quinolones prior to the prescription of antibiotics.[3,4,5]

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** Determined by sample receipt.*

The ***ermB*** gene is responsible for methylation of the 23S ribosomal target site and is one of the two important mechanisms conferring resistance to **macrolides**. High-level macrolide resistance with [MIC90] >32 µg/mL and growth inhibition in 90% of organisms is usually associated with the presence of *ermB*, which can be frequently found in Staphylococci and Streptococci, both common causes of respiratory tract infections.

Antibiotic Class	Mechanism of Gene Resistance Action	Molecular Class	Panel Target	Antibiotic Class Avoidance
β-Lactam	Breaks β-lactam ring through hydrolysis, deactivating the molecule's antibacterial properties	Class A β-lactamase	CTX-M Group 1	cephalosporins, penicillins, aztreonam
			CTX-M Group 2	
			CTX-M Group 8/25	
			CTX-M Group 9	
			KPC	carbapenems, cephalosporins, penicillins, β-lactamase inhibitors, aztreonam
		Class B metallo-β-lactamase	IMP-1	carbapenems, cephalosporins, penicillins, β-lactamase inhibitors
			VIM	
			NDM	
		AmpC β-lactamase	FOX	cephalosporins, penicillins, β-lactamase inhibitors
		Class D oxacillinase	OXA-1	cloxacillin, oxacillin, penicillins
			OXA-48	carbapenems, extended spectrum cephalosporins, penicillins, β-lactamase inhibitors
		Minor ESBL	PER	extended spectrum cephalosporins, penicillins, aztreonam
			VEB	
			GES	carbapenems, cephamycins, extended spectrum cephalosporins, penicillins
Macrolide	Methylation on 23S ribosome affects antibiotic binding	Erythromycin ribosomal methylase	*ermB*	macrolides (erythromycin, clindamycin, azithromycin)
Fluoroquinolone	Binds to and reduces affinity of DNA gyrase and topoisomerase to antibiotic	Pentapeptide repeat protein	*qnrA*	fluoroquinolones (ciprofloxacin, gemifloxacin, levofloxacin, moxifloxacin, norfloxacin, and ofloxacin)
			qnrS	

References:

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2. https://www.cdc.gov/drugresistance/biggest_threats.html
3. Gupta et al. International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women: a 2010 update by Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. Clin Infect Dis. 2011 Mar;52(5):e103-e120.
4. Guerrant et al. Practice Guidelines for the Management of Infectious Diarrhea. Clin Infect Dis. 2001;32(3):331-351.
5. Solomkin et al. Diagnosis and management of complicated intra-abdominal infection in adults and children: guidelines by the surgical infection society and Infectious Diseases Society of America. Clin Infect Dis. 2010 Jan;50(2):133-64.

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