

## Appendix 1. CARD determinant groupings

Table A1.1. Genetic determinants of antibiotic resistance as described in CARD were grouped by the antibiotic to which they are described as conferring resistance. If more than one antibiotic class was included for a single determinant, these determinants were grouped as “non-specific”. The exception is for resistances to Macrolide, Lincosamide, Pleuromutilin and Streptogramin (MLPS) antibiotics, as resistance determinants against these antibiotics can have cross-resistance to each other and are grouped together in a single, separate category.

Number of determinants	Custom group	CARD antibiotic class
1	Acridine dye	Acridine dye
9	Aminocoumarin	Aminocoumarin antibiotic
170	Aminoglycoside	Aminoglycoside antibiotic
2	Antibacterial free fatty acids	Antibacterial free fatty acids
51	Beta-lactam	Carbapenem
3	Beta-lactam	Carbapenem;cephalosporin
3	Beta-lactam	Carbapenem;cephalosporin;cephamycin
48	Beta-lactam	Carbapenem;cephalosporin;cephamycin;penam
85	Beta-lactam	Carbapenem;cephalosporin;cephamycin;penam;penem
194	Beta-lactam	Carbapenem;cephalosporin;penam
2	Beta-lactam	Carbapenem;penam
184	Beta-lactam	Cephalosporin
29	Beta-lactam	Cephalosporin;cephamycin
10	Beta-lactam	Cephalosporin;cephamycin;penam

Number of determinants	Custom group	CARD antibiotic class
347	Beta-lactam	Cephalosporin;penam
114	Beta-lactam	Cephameycin
31	Beta-lactam	Monobactam;carbapenem;cephalosporin
11	Beta-lactam	Monobactam;carbapenem;cephalosporin;cephameycin;penam
12	Beta-lactam	Monobactam;carbapenem;cephalosporin;cephameycin;penam;penem
18	Beta-lactam	Monobactam;carbapenem;cephalosporin;penam
7	Beta-lactam	Monobactam;carbapenem;cephalosporin;penam;penem
1	Beta-lactam	Monobactam;carbapenem;penam
11	Beta-lactam	Monobactam;cephalosporin
16	Beta-lactam	Monobactam;cephalosporin;cephameycin
8	Beta-lactam	Monobactam;cephalosporin;cephameycin;penam;penem
33	Beta-lactam	Monobactam;cephalosporin;penam
167	Beta-lactam	Monobactam;cephalosporin;penam;penem
29	Beta-lactam	Penam
24	Beta-lactam	Penam;penem
4	Beta-lactam	N/A
1	Bicyclomycin	Bicyclomycin
47	Chloramphenicol	Phenicol antibiotic
8	Elfamycin	Elfamycin antibiotic
31	Diaminopyrimidine	Diaminopyrimidine antibiotic
125	Fluoroquinolone	Fluoroquinolone antibiotic
28	Fosfomicin	Fosfomicin
6	Fusidic acid	Fusidic acid
77	Glycopeptide	Glycopeptide antibiotic
4	Isoniazid	Isoniazid
4	Mupirocin	Mupirocin

Number of determinants	Custom group	CARD antibiotic class
13	MLPS	Lincosamide antibiotic
1	MLPS	Lincosamide antibiotic;pleuromutilin antibiotic
5	MLPS	Lincosamide antibiotic;streptogramin antibiotic;pleuromutilin antibiotic
3	MLPS	Macrolide antibiotic
4	MLPS	Macrolide antibiotic;lincosamide antibiotic
33	MLPS	Macrolide antibiotic;lincosamide antibiotic;streptogramin antibiotic
5	MLPS	Macrolide antibiotic;streptogramin antibiotic
1	MLPS	Pleuromutilin antibiotic
11	MLPS	Streptogramin antibiotic
6	MLPS	Streptogramin antibiotic;pleuromutilin antibiotic
2	Nitrofuran	Nitrofuran antibiotic
1	Nitroimidazole	Nitroimidazole antibiotic
3	Non-specific	Aminoglycoside antibiotic;aminocoumarin antibiotic
5	Non-specific	Aminoglycoside antibiotic;cephalosporin;cephamycin;penam
2	Non-specific	Aminoglycoside antibiotic;tetracycline antibiotic;phenicol antibiotic
1	Non-specific	Cephalosporin;penam;peptide antibiotic
6	Non-specific	Fluoroquinolone antibiotic;acridine dye
1	Non-specific	Fluoroquinolone antibiotic;acridine dye;triclosan
5	Non-specific	Fluoroquinolone antibiotic;aminocoumarin antibiotic
5	Non-specific	Fluoroquinolone antibiotic;aminoglycoside antibiotic
2	Non-specific	Fluoroquinolone antibiotic;cephalosporin;cephamycin;penam
1	Non-specific	Fluoroquinolone antibiotic;cephalosporin;glycylcycline;cephamycin;penam;tetracycline antibiotic;rifamycin antibiotic;phenicol antibiotic;triclosan
1	Non-specific	Fluoroquinolone antibiotic;cephalosporin;glycylcycline;penam;tetracycline antibiotic;acridine dye;rifamycin antibiotic;phenicol antibiotic;triclosan
15	Non-specific	Fluoroquinolone antibiotic;cephalosporin;glycylcycline;penam;tetracycline antibiotic;rifamycin antibiotic;phenicol antibiotic;triclosan

Number of determinants	Custom group	CARD antibiotic class
1	Non-specific	Fluoroquinolone antibiotic;cephalosporin;penam;tetracycline antibiotic;peptide antibiotic;acridine dye
6	Non-specific	Fluoroquinolone antibiotic;diaminopyrimidine antibiotic;phenicol antibiotic
2	Non-specific	Fluoroquinolone antibiotic;glycylcycline;tetracycline antibiotic;diaminopyrimidine antibiotic;nitrofurantoin antibiotic
1	Non-specific	Fluoroquinolone antibiotic;lincosamide antibiotic;nucleoside antibiotic;acridine dye;phenicol antibiotic
1	Non-specific	Fluoroquinolone antibiotic;monobactam;carbapenem;cephalosporin;cephamycin;penam;tetracycline antibiotic;phenicol antibiotic;penem
4	Non-specific	Fluoroquinolone antibiotic;monobactam;carbapenem;cephalosporin;glycylcycline;cephamycin;penam;tetracycline antibiotic;rifamycin antibiotic;phenicol antibiotic;triclosan;penem
3	Non-specific	Fluoroquinolone antibiotic;monobactam;cephalosporin
1	Non-specific	Fluoroquinolone antibiotic;nucleoside antibiotic;acridine dye;phenicol antibiotic
16	Non-specific	Fluoroquinolone antibiotic;nybomycin
5	Non-specific	Fluoroquinolone antibiotic;tetracycline antibiotic
4	Non-specific	Fluoroquinolone antibiotic;tetracycline antibiotic;acridine dye
1	Non-specific	Fluoroquinolone antibiotic;tetracycline antibiotic;nitroimidazole antibiotic
10	Non-specific	Glycylcycline;tetracycline antibiotic
1	Non-specific	Isoniazid;ethionamide
3	Non-specific	Isoniazid;triclosan
1	Non-specific	Macrolide antibiotic;aminocoumarin antibiotic
3	Non-specific	Macrolide antibiotic;carbapenem;tetracycline antibiotic;acridine dye;diaminopyrimidine antibiotic;phenicol antibiotic
1	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic
3	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;aminoglycoside antibiotic;carbapenem;cephalosporin;cephamycin;penam;tetracycline antibiotic;acridine dye;phenicol antibiotic
1	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;aminoglycoside antibiotic;carbapenem;tetracycline antibiotic
4	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;aminoglycoside antibiotic;cephalosporin;penam;tetracycline antibiotic;aminocoumarin antibiotic;diaminopyrimidine antibiotic;phenicol antibiotic
4	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;aminoglycoside antibiotic;cephalosporin;tetracycline antibiotic
1	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;cephalosporin;cephamycin;penam;tetracycline antibiotic

Number of determinants	Custom group	CARD antibiotic class
4	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;cephalosporin;fusidic acid
1	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;cephalosporin;glycylcycline;cephamycin;penam;tetracycline antibiotic;aminocoumarin antibiotic;rifamycin antibiotic;phenicol antibiotic;triclosan
1	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;cephalosporin;penam;tetracycline antibiotic;aminocoumarin antibiotic;diaminopyrimidine antibiotic;phenicol antibiotic
4	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;lincosamide antibiotic;carbapenem;cephalosporin;tetracycline antibiotic;rifamycin antibiotic;diaminopyrimidine antibiotic;phenicol antibiotic;penem
1	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;monobactam;aminoglycoside antibiotic;carbapenem;cephalosporin;cephamycin;penam;tetracycline antibiotic;peptide antibiotic;acridine dye;aminocoumarin antibiotic;diaminopyrimidine antibiotic;sulfonamide antibiotic;phenicol antibiotic;penem
2	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;monobactam;aminoglycoside antibiotic;carbapenem;cephalosporin;cephamycin;penam;tetracycline antibiotic;peptide antibiotic;aminocoumarin antibiotic;diaminopyrimidine antibiotic;sulfonamide antibiotic;phenicol antibiotic;penem
6	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;monobactam;carbapenem;cephalosporin;cephamycin;penam;tetracycline antibiotic;peptide antibiotic;aminocoumarin antibiotic;diaminopyrimidine antibiotic;sulfonamide antibiotic;phenicol antibiotic;penem
5	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;penam
2	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;penam;tetracycline antibiotic
2	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;rifamycin antibiotic
2	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;tetracycline antibiotic;acridine dye;phenicol antibiotic
3	Non-specific	Macrolide antibiotic;fluoroquinolone antibiotic;tetracycline antibiotic;phenicol antibiotic
6	Non-specific	Macrolide antibiotic;lincosamide antibiotic;streptogramin antibiotic;oxazolidinone antibiotic;phenicol antibiotic
1	Non-specific	Macrolide antibiotic;lincosamide antibiotic;streptogramin antibiotic;oxazolidinone antibiotic;phenicol antibiotic;pleuromutilin antibiotic
1	Non-specific	Macrolide antibiotic;lincosamide antibiotic;streptogramin antibiotic;tetracycline antibiotic
4	Non-specific	Macrolide antibiotic;monobactam;tetracycline antibiotic;aminocoumarin antibiotic
4	Non-specific	Macrolide antibiotic;penam
1	Non-specific	Macrolide antibiotic;penam;antibacterial free fatty acids
4	Non-specific	Macrolide antibiotic;peptide antibiotic
3	Non-specific	Macrolide antibiotic;tetracycline antibiotic;triclosan

Number of determinants	Custom group	CARD antibiotic class
4	Non-specific	Monobactam;carbapenem;cephalosporin;cephamycin;penam;phenicol antibiotic;penem
1	Non-specific	Monobactam;carbapenem;cephalosporin;cephamycin;penam;tetracycline antibiotic;penem
3	Non-specific	Nucleoside antibiotic;acridine dye
1	Non-specific	Peptide antibiotic;polyamine antibiotic
6	Non-specific	Peptide antibiotic;rifamycin antibiotic
1	Non-specific	Rifamycin antibiotic;isoniazid
1	Non-specific	Rifamycin antibiotic;polyamine antibiotic
1	Non-specific	Tetracycline antibiotic;benzalkonium chloride;rhodamine
7	Non-specific	N/A
4	Nucleoside	Nucleoside antibiotic
1	Oxazolidinone	Oxazolidinone antibiotic
3	Para-aminosalicylic acid	Para-aminosalicylic acid
56	Peptide	Peptide antibiotic
8	Polyamine	Polyamine antibiotic
1	Pyrazinamide	Pyrazinamide
13	Rifamycin	Rifamycin antibiotic
1	Sulfonamide	Sulfonamide antibiotic
6	Sulfonamide	Sulfonamide antibiotic;sulfone antibiotic
52	Tetracycline	Tetracycline antibiotic
7	Triclosan	Triclosan