

Rule No.	Organism(s)	Indicator Agent	Agents Affected	Rule	Remarks	Grade	References
<b>Beta-lactams</b>							
1	<i>Streptococcus pneumoniae</i>	oxacillin (disk diffusion) screening test	phenoxymethylpenicillin, benzylpenicillin, aminopenicillins, cephalosporins, carbapenems	<p>IF the oxacillin screening test is negative (susceptible), THEN report beta-lactam agents with breakpoints for <i>S. pneumoniae</i> susceptible.</p> <p>IF the oxacillin screening test is positive (resistant), THEN refer to the flowchart in the Breakpoint Tables.</p>		A	Dixon et al., 1977; Swenson et al., 1986; Jetté & Sinave, 1999;
<b>Macrolides, lincosamides and streptogramins</b>							
2	<i>Streptococcus pneumoniae</i>	erythromycin, clindamycin	clindamycin	<p>IF resistant to erythromycin AND susceptible to clindamycin, THEN test for inducible MLS<sub>B</sub> resistance;</p> <p>IF negative for inducibility THEN report clindamycin susceptible;</p> <p>IF positive for inducibility THEN report clindamycin resistant</p> <p>IF susceptible to erythromycin and clindamycin, THEN report as susceptible to all macrolides and lincosamides</p>	Streptococci resistant to macrolides but susceptible to clindamycin produce Erm ribosomal methylases conferring the inducible MLS <sub>B</sub> phenotype or express efflux pumps. In the case of inducible MLS <sub>B</sub> resistance, constitutively resistant mutants can be selected by clindamycin.	A	Lewis et al., 2014
<b>Fluoroquinolones</b>							
3	<i>Streptococcus pneumoniae</i>	norfloxacin screening test	levofloxacin moxifloxacin	<p>IF the norfloxacin screening test is negative (susceptible), THEN report levofloxacin as "susceptible, increased exposure" and moxifloxacin as "susceptible"</p> <p>IF the norfloxacin screening test is positive (resistant), THEN isolates should be tested for susceptibility to levofloxacin and moxifloxacin OR report them as resistant.</p>	<p>Acquisition of at least one target mutation in e.g. <i>parC</i> and/or <i>parE</i></p> <p>First step mutations can be more reliably detected in tests with norfloxacin.</p>	C	Varon, et al., 2006; Kays et al., 2007; de Cueto et al., 2008

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				IF the norfloxacin screening test is positive (resistant) AND "susceptible increased exposure" to levofloxacin and/or moxifloxacin, THEN report agent as tested with a warning of risk for development of resistance during therapy with the agent.			
4	<i>Streptococcus pneumoniae</i>	levofloxacin, moxifloxacin	All fluoroquinolones	IF resistant to levofloxacin or moxifloxacin, THEN report as resistant to all fluoroquinolones	Acquisition of combined mutations in e.g. <i>parC</i> and <i>gyrA</i> leads to complete or partial cross resistance to all fluoroquinolones.	A	Kays et al., 2007
<b>Tetracyclines</b>							
5	<i>Streptococcus pneumoniae</i>	tetracycline	doxycycline, minocycline	IF susceptible to tetracycline, THEN doxycycline and minocycline can be reported susceptible  IF resistant to tetracycline, THEN report doxycycline and minocycline resistant OR test the individual agents and report as found	Implicit rule from breakpoint table	C	
<b>Glycopeptides and lipoglycopeptides</b>							
6	<i>Streptococcus pneumoniae</i>	vancomycin	dalbavancin oritavancin telavancin	IF susceptible to vancomycin, THEN report dalbavancin, oritavancin and telavancin as susceptible	Dalbavancin, oritavancin and telavancin do not have breakpoints for pneumococci; however, if for any reason activity of the drugs towards pneumococci needs to be known, the rule may provide guidance	C	

**References**

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- Dixon JMS, Lipinski AE, Graham MEP. Detection and prevalence of pneumococci with increased resistance to penicillin. Can Med Assoc J 1977; 117: 1159-61.
- Jetté LP and C Sinave. Use of an oxacillin disk screening test for detection of penicillin- and ceftriaxone-resistant pneumococci. J Clin Microbiol 1999; 37: 1178-81.
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- Swenson JM, Hill BC, Thornsberry C. Screening pneumococci for penicillin resistance. J Clin Microbiol 1986; 24: 749-52.
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