

# CHLORHEXIDINE/SILVER SULFADIAZINE VS. MINOCYCLINE/RIFAMPIN CATHETERS

## COMPARING ANTIMICROBIAL CATHETERS BASED ON SPECTRUM OF ACTIVITY, PREVENTING ADHERENCE AND LONGEVITY

A catheter-related infection starts with a potential pathogen adhering to the catheter. Adherence can occur on an antibiotic catheter when a zone of inhibition (ZOI) is present.<sup>1</sup> That's why an antimicrobial catheter's efficacy should be based on more than zone size. It should be based on *effectiveness against a broad spectrum of pathogens, ability to prevent colonization of the catheter, longevity of the antimicrobial agents, and protection of critical catheter surfaces.* (See comparison chart.)

To illustrate this, head-to-head comparisons of the performance of chlorhexidine/silver sulfadiazine (CSS) catheters and minocycline/rifampin (MR) catheters against three common sources of catheter-related bloodstream infection (CRBSI).<sup>2</sup> Charts show cultivation following daily transfers.

CSS VS. MR COMPARISON TABLE																											
CHARTS	DESCRIPTION	INCIDENCE	MORTALITY																								
<p><b>CANDIDA ALBICANS</b></p> <table border="1"> <caption>CANDIDA ALBICANS (ATCC 10231) ZOI (mm)</caption> <thead> <tr> <th>Day</th> <th>CSS (mm)</th> <th>MR (mm)</th> </tr> </thead> <tbody> <tr><td>1</td><td>9.5</td><td>0.0</td></tr> <tr><td>2</td><td>7.0</td><td>0.0</td></tr> <tr><td>3</td><td>6.5</td><td>0.0</td></tr> <tr><td>4</td><td>6.0</td><td>0.0</td></tr> <tr><td>5</td><td>4.5</td><td>0.0</td></tr> <tr><td>6</td><td>5.0</td><td>0.0</td></tr> <tr><td>7</td><td>5.0</td><td>0.0</td></tr> </tbody> </table>	Day	CSS (mm)	MR (mm)	1	9.5	0.0	2	7.0	0.0	3	6.5	0.0	4	6.0	0.0	5	4.5	0.0	6	5.0	0.0	7	5.0	0.0	<p>The MR catheter produces no ZOI against <i>C. albicans</i>; the CSS catheter does. <b>At least two studies have reported similar results—and found that antibiotic catheters may actually encourage <i>Candida</i>.</b><sup>3,4</sup> For example, Wright et al. notes, "... antibiotic-coated central lines were not associated with any benefit in this critically ill patient population. They were associated with increased <i>Candida</i> colonization and the development of rifampin resistance to <i>Staphylococcus epidermidis</i>."<sup>3</sup> While in a multicenter trial in Spain, León et al. found that MR catheters were associated with "a significant increase in <i>Candida</i> spp."<sup>4</sup></p>	8% <sup>7</sup>	40% <sup>7</sup>
Day	CSS (mm)	MR (mm)																									
1	9.5	0.0																									
2	7.0	0.0																									
3	6.5	0.0																									
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<p><b>STAPHYLOCOCCUS EPIDERMIDIS</b></p> <table border="1"> <caption>STAPHYLOCOCCUS EPIDERMIDIS (ATCC 35983) ZOI (mm)</caption> <thead> <tr> <th>Day</th> <th>CSS (mm)</th> <th>MR (mm)</th> </tr> </thead> <tbody> <tr><td>1</td><td>18</td><td>32</td></tr> <tr><td>2</td><td>13</td><td>25</td></tr> <tr><td>3</td><td>13</td><td>25</td></tr> <tr><td>4</td><td>12</td><td>25</td></tr> <tr><td>5</td><td>10</td><td>23</td></tr> <tr><td>6</td><td>10</td><td>22</td></tr> <tr><td>7</td><td>10</td><td>23</td></tr> </tbody> </table>	Day	CSS (mm)	MR (mm)	1	18	32	2	13	25	3	13	25	4	12	25	5	10	23	6	10	22	7	10	23	<p>Both catheters maintain a ZOI at day seven (the CSS catheter yields significant antimicrobial effect against <i>S. epidermidis</i> up to 46 days<sup>5,6</sup>), yet CSS's ZOI is smaller. Tambe et al. noted a similar phenomenon. In their study, CSS catheters prevented bacterial adherence; "... on the other hand, the antibiotic catheter showed adherence despite a larger zone size. These results indicate that unlike in the case of antibiotic catheters, the relatively smaller zones of inhibition with antiseptic catheters do not appear to be predictive of lack of efficacy."<sup>1</sup> There are other downsides to using MR catheters, including increased <i>Candida</i> colonization,<sup>4</sup> which has a higher mortality rate than <i>S. epidermidis</i> (see chart above) and encouraging rifampin resistance<sup>3</sup>.</p>	32% <sup>7</sup>	21% <sup>7</sup>
Day	CSS (mm)	MR (mm)																									
1	18	32																									
2	13	25																									
3	13	25																									
4	12	25																									
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<p><b>PSEUDOMONAS AERUGINOSA</b></p> <table border="1"> <caption>PSEUDOMONAS AERUGINOSA (ATCC 27853) ZOI (mm)</caption> <thead> <tr> <th>Day</th> <th>CSS (mm)</th> <th>MR (mm)</th> </tr> </thead> <tbody> <tr><td>1</td><td>11</td><td>5</td></tr> <tr><td>2</td><td>8</td><td>4</td></tr> <tr><td>3</td><td>7</td><td>1</td></tr> <tr><td>4</td><td>6</td><td>0</td></tr> <tr><td>5</td><td>5</td><td>0</td></tr> <tr><td>6</td><td>4</td><td>0</td></tr> <tr><td>7</td><td>4</td><td>0</td></tr> </tbody> </table>	Day	CSS (mm)	MR (mm)	1	11	5	2	8	4	3	7	1	4	6	0	5	5	0	6	4	0	7	4	0	<p>The CSS catheter maintains a ZOI through day seven, while the MR catheter does not. This is meaningful for three reasons. First, as a group, gram-negative bacilli (including <i>P. aeruginosa</i> and <i>Enterobacteriaceae</i>) account for 14% of CRBSIs.<sup>7</sup> Second, <b><i>P. aeruginosa</i> is noted for its resistance to antibiotics</b>; the few that are effective include fluoroquinolones, gentamicin and imipenem, and even these do not work against all strains.<sup>9</sup> Third, MR has no effect on <i>P. aeruginosa</i> growth.<sup>10,11</sup></p>	NA	NA
Day	CSS (mm)	MR (mm)																									
1	11	5																									
2	8	4																									
3	7	1																									
4	6	0																									
5	5	0																									
6	4	0																									
7	4	0																									

▲ CSS: Chlorhexidine Silver Sulfadiazine    ■ MR: Minocycline/Rifampin

## WHAT MAKES THE DIFFERENCE

### ANTISEPTICS

Teleflex uses antiseptics in its Arrow® products, rather than antibiotics, providing cidal activity and eliminating the potential for antibiotic resistance. As stated in a recent review of commercially available antimicrobial catheters, co-authored by one of the inventors of the MR technology, the authors state, "...there is a potential for these devices to select for resistant gram-negative bacteria and *Candida* organisms, leading to breakthrough bacteremias and fungemias."<sup>13</sup>

### SPECTRUM OF ACTIVITY

The use of two powerful antiseptic agents in Arrow products, chlorhexidine and silver sulfadiazine, result in a spectrum of activity against a wider range of clinically significant potential pathogens.<sup>2,13,14</sup> While MR catheters perform well against gram-positive bacteria, many investigators have found that there was limited or no activity against gram-negative bacteria and *Candida* organisms, and even resulted in the emergence of rifampin-resistant *Staphylococcus epidermidis*.<sup>1,2,3,4,13,14</sup>

### UNIQUE HUB PROTECTION

Arrow AGB+® catheters are unique in protecting all critical catheter surfaces both outside and inside the catheter. In addition to intraluminal protection, AGB+ catheters alone offer broad spectrum chlorhexidine protection for the entire fluid path, including both the extension lines and the hubs.<sup>14</sup> Over 20% of CRBSIs are derived from intraluminal contaminants, and since hubs are repeatedly accessed during catheter use, they pose a significant risk of becoming colonized with pathogens.<sup>15</sup> Arrow AGB+® catheters are the only antimicrobial catheters currently available with hub and extension line protection.<sup>14</sup>

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exhibits antimicrobial  
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days<sup>5,6</sup> and provides a  
broader spectrum of  
antimicrobial activity  
than MR catheters<sup>3,4,10,11,12</sup>  
against two of the most  
common and virulent,  
potentially pathogenic  
organisms.<sup>7,8,9,10,12</sup>**

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