

## Statement of Purpose

The purpose of our Institutional Review was to analyze and evaluate all lower extremity diabetic limb cultures obtained from January 2016 through December 2016 and to critically examine our institution's common empiric antibiotic practice in order to assess whether it is optimal for our patient population.

## Background

It is estimated that in 2010 there were 285 million people worldwide with diabetes and is expected to double by 2030<sup>1</sup>. 15% of all diabetic patients will develop a diabetic foot ulceration in their lifetime. Diabetic foot infections (DFI) are often polymicrobial with may involve multidrug resistant organisms complicating treatment<sup>1</sup>. Staphylococcus aureus has been routinely shown to be the most common Gram-positive organism isolated from infected diabetic foot ulcers, whereas organisms such as Pseudomonas aeruginosa and Escherichia coli are among the most common Gram-negative isolates<sup>1,2</sup>. The Infectious Disease Society of America (IDSA) guidelines published in 2012 recommends classifying diabetic foot ulcerations by clinical signs of infection with further categorization of severity<sup>3</sup>. While clinically uninfected wounds should not be treated with antibiotics which promote the development of multidrug resistant organisms, empiric antibiotic therapy is in fact indicated for clinically infected wounds to decrease progression<sup>2,3</sup>. According to guidelines, mild to moderate infections may be treated targeting only Gram-positive organisms. Severe infections typically necessitate broad spectrum antibiotics with anti-pseudomonal activity, as the infections usually involve Gram-negative organisms and/or anaerobes. Ultimately, antibiotic selection should be tailored to the results of the cultures and susceptibilities, with the use of empiric treatment in the earliest stages to ensure broad coverage.

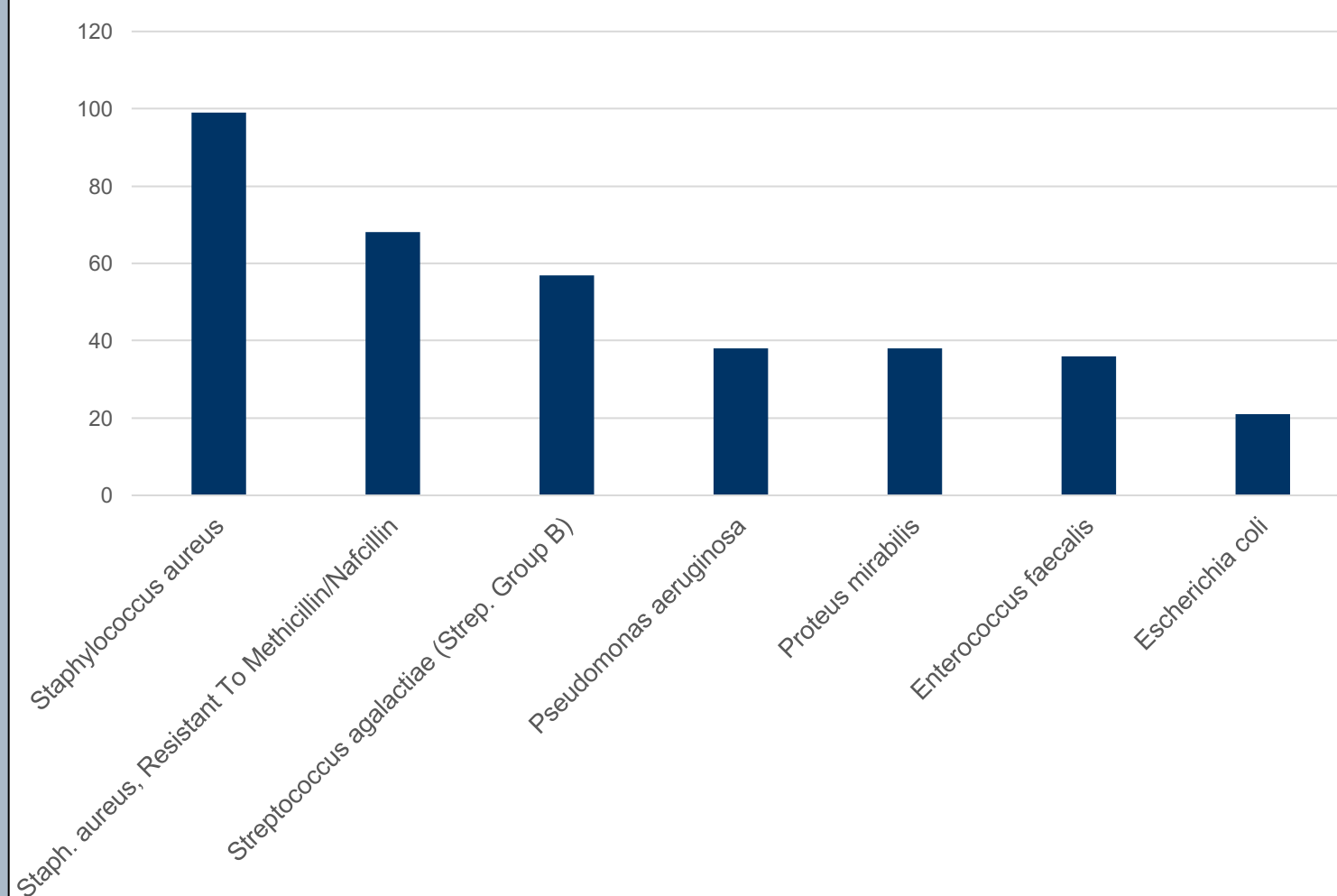
## Methodology

All lower extremity wound cultures from our institution from January 2016 through December 2016 were queried using the hospital LIS and EMR. All patients charts were reviewed. Patients were excluded if they had no documentation of diabetes or if they had a normal HbA1c. If a patient had multiple cultures performed during their admission on the same wound and an organism was isolated more than once, the organism was only counted as one positive culture for our data set.

## Results

Out of 851 sample results, 40 cultures were not further identified, leaving a total of 811 isolates. Gram-negative pathogens were predominant with 483 (56.75%) isolates, while there were 357 (41.95%) Gram-positive isolates. Only 11 of the total isolates were fungal. The most frequently isolated Gram-positive bacteria were Methicillin susceptible Staphylococcus aureus (MSSA) 99 (12.21%), followed by MRSA 68 (8.38%), Group B Strep 57 (7.03%), and Enterococcus faecalis 36 (4.43%). The most common Gram-negative organisms were Pseudomonas aeruginosa 38 (4.6%) and Proteus mirabilis 38 (4.6%) followed by Escherichia coli 21 (2.5%). Thus, the 7 most common organisms accounted for 43.75% of the total.

Top 7 Organisms



Graph 1: Top seven organisms isolated from all lower extremity cultures in 2016.

% of Gram Positive vs Gram Negative Organisms

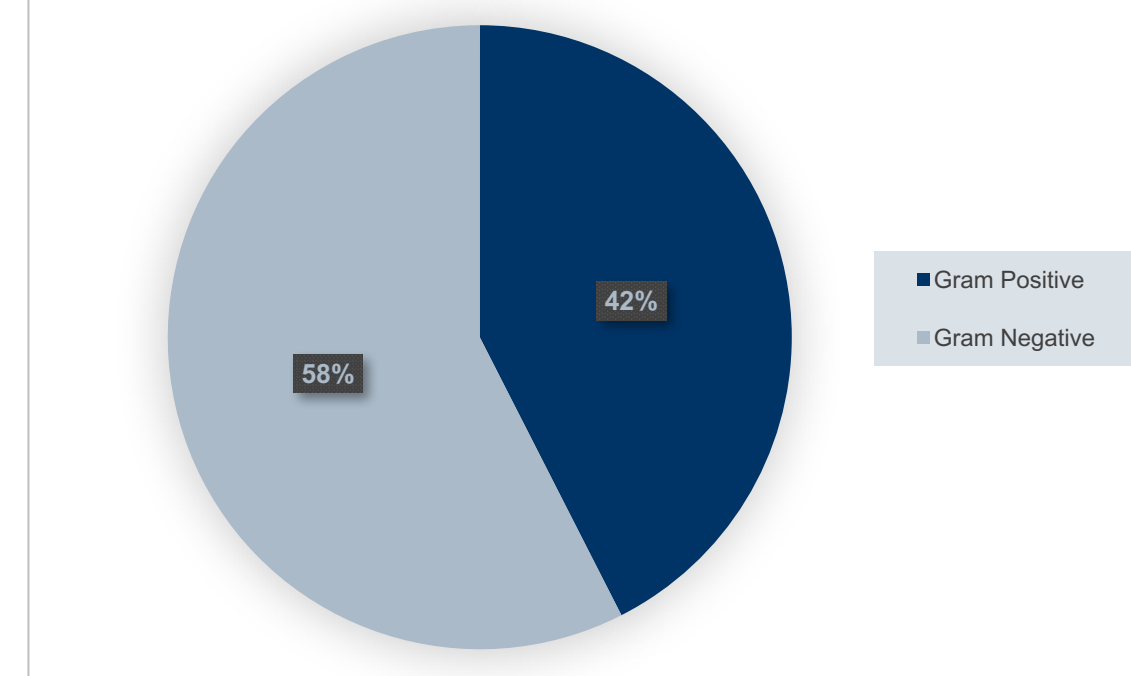


Chart 1: Percentage of Gram-positive and Gram-negative organisms isolated from all lower extremity cultures in 2016

Table 1. The susceptibility of the 5 most frequently isolated Gram-negative organisms to select antibiotics.

	Zosyn	Cefazolin	Ceftriaxone	Cefepime	Meropenem
<b>Pseudomonas</b>	84.21%	a	a	92.10%	89.47%
<b>Proteus</b>	100%	0%	97.36%	100%	*
<b>Escherichia</b>	100%*	52.38%	85.71%	85.71%	95.23%
<b>Enterobacter</b>	b	b	b	95.23%	100%
<b>Klebsiella</b>	86.66%	60%	80%	86.66%	93.33%

<sup>a</sup>: Cefazolin and Ceftriaxone do not cover Pseudomonas

<sup>b</sup>: Due to potential Amp-C B-lactamase, our hospital automatically assumes resistance to B-lactams except Cefepime and Meropenem

\*: Not reported due to testing limitations of our local laboratory equipment

## Discussion

Diabetic foot infections are a common problem. They are often complicated to treat due to polymicrobial involvement, drug-resistance and multiple co-morbidities. Empiric antibiotics at our institution for DFI usually includes Vancomycin and Zosyn, with an appropriate dose for Pseudomonas coverage.

Although Gram-positive are less common overall, they still make up the top 4 organisms cultured. If a DFI is Gram-positive only, broad spectrum antibiotics may not be needed. By decreasing the amount of broad spectrum antibiotic use, we can also limit the amount of antibiotic resistance.

We must consider cost to the patient and healthcare system as well as risk factors such as Clostridium difficile when prescribing multiple antibiotics with broader spectrum.

If a patient presents with a mild or moderate DFI, antibiotic coverage may be limited to Gram-positive organisms.

Further studies are needed to risk stratify patients for Gram-negative organisms. There is ample opportunity to further explore patients clinical status, epidemiology status, length of time the wound has been present, and other factors to assess need for Gram-negative antibiotic coverage.

There are multiple limitations to our study. Although we try to avoid culturing uninfected wounds, this data set may include cultures from non-infected wounds. This data set also does not differentiate between bone, abscess, tissue or wound cultures.

This review suggests that Zosyn remains an active option for Gram-negative coverage. However, changing organism epidemiology and susceptibility patterns may favor alternatives. Further longitudinal data is needed. We also recommend utilizing the antibiogram provided at each local institution.

## References

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