

Antibiotic-Resistant Bacteria on Wrestling Mats

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Biology 222: Majors Cell/Molecular

Discussion

Abstract

Antibiotic-resistant bacteria pose a significant health risk in sports like wrestling, where skin-to-skin contact and shared surfaces facilitate excessive bacterial transmission. Wrestling mats already serve as reservoirs for bacterial outbreaks of skin infections among athletes. As these infections become more serious and harder to treat, we wonder, are wrestling mats a consistent source of antibiotic-resistant bacteria? The evidence of our research suggests so, despite the sanitary practices of different high schools.

Introduction

Wrestlers are known to catch all different types of bacterial infections. A 2017 study highlighted that approximately 20% of wrestling injuries between 1988 and 2004 were due to skin infections, with MRSA being a notable contributor (Young et al. 2017). On a wider scope, we found that athletic mats in general have the potential to harbor "antibiotic resistant germs", likely due to the presence of antimicrobial chemicals like triclosan in "cleaning supplies, deodorants, and toothpaste" (Akpan, 2018).

Our sources imply that this could be happening anywhere in the world depending on the cleaning supplies, practices, and activities on athletic mats. This led us to question the capabilities of local wrestling mats and ask, Is the bacteria on local mats resistant to cleaning procedures, and do wrestling mats serve as a breeding ground for antibiotic resistant bacteria?

Methods

Materials & Location

Our materials were gathered from the Biology 108 lab class. We used TSA plates, nutrient broths, TET3 plates, swabs, gel electrophoresis that included blue dye, ladders, and TAE buffer solution. We also used PCR materials that included, nuclease free water, RNA primers, and GOTAQ. Samples were collected from Squalicum and Bellingham High school wrestling mats.

Procedure

We swabbed 3 different locations on wrestling mats from 2 different local high schools. We grew them on TSA plates, incubated them for 48 hours and then transferred the colonies into nutrient broths and incubated them for 48 hours. We took the bacteria from the nutrient broths and put them on different Tet3 plates using streak for isolation technique. We incubated them and grew the colonies. Some plates grew and some didn't which represented antibiotic resistant bacteria. We harvested the antibiotic-resistant bacteria and ran them through PCR and gel electrophoresis and sent them out for gene sequencing to see what antibiotic-resistant bacteria was on the mats.

Bellingham High School Wrestling Mat Layout



Figure 1. Bellingham High School's Wrestling room and where we collected samples. We collected samples in the middle (Area 1), left (Area 3), and right (Area 2) of the mats. These are the areas we think are most likely to have the most bacteria based off which area most people would likely practice.

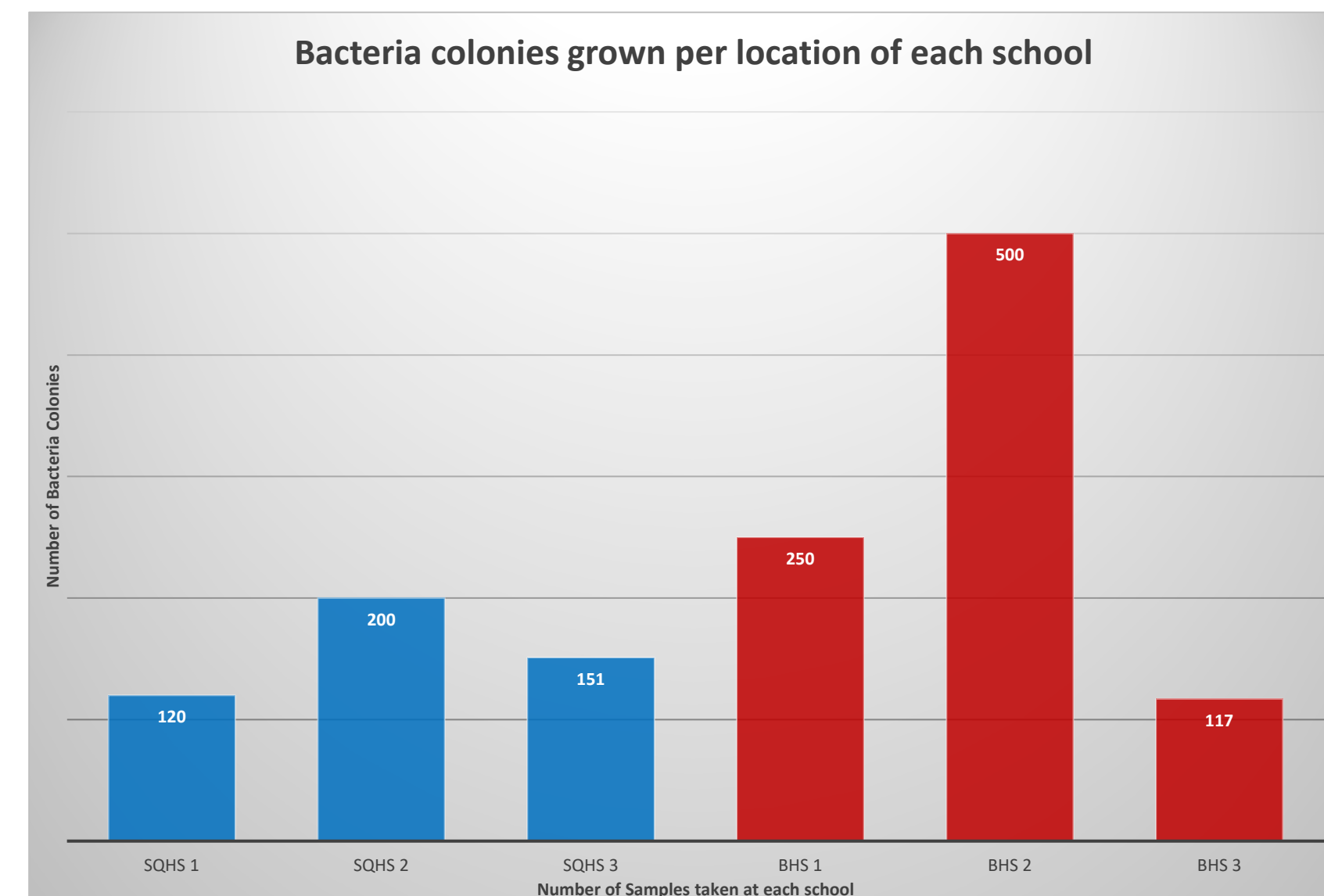


Figure 2. Number of bacteria colonies on each spot of the mats for different schools. Red bar is for Bellingham High School and blue bar is for Squalicum High School.

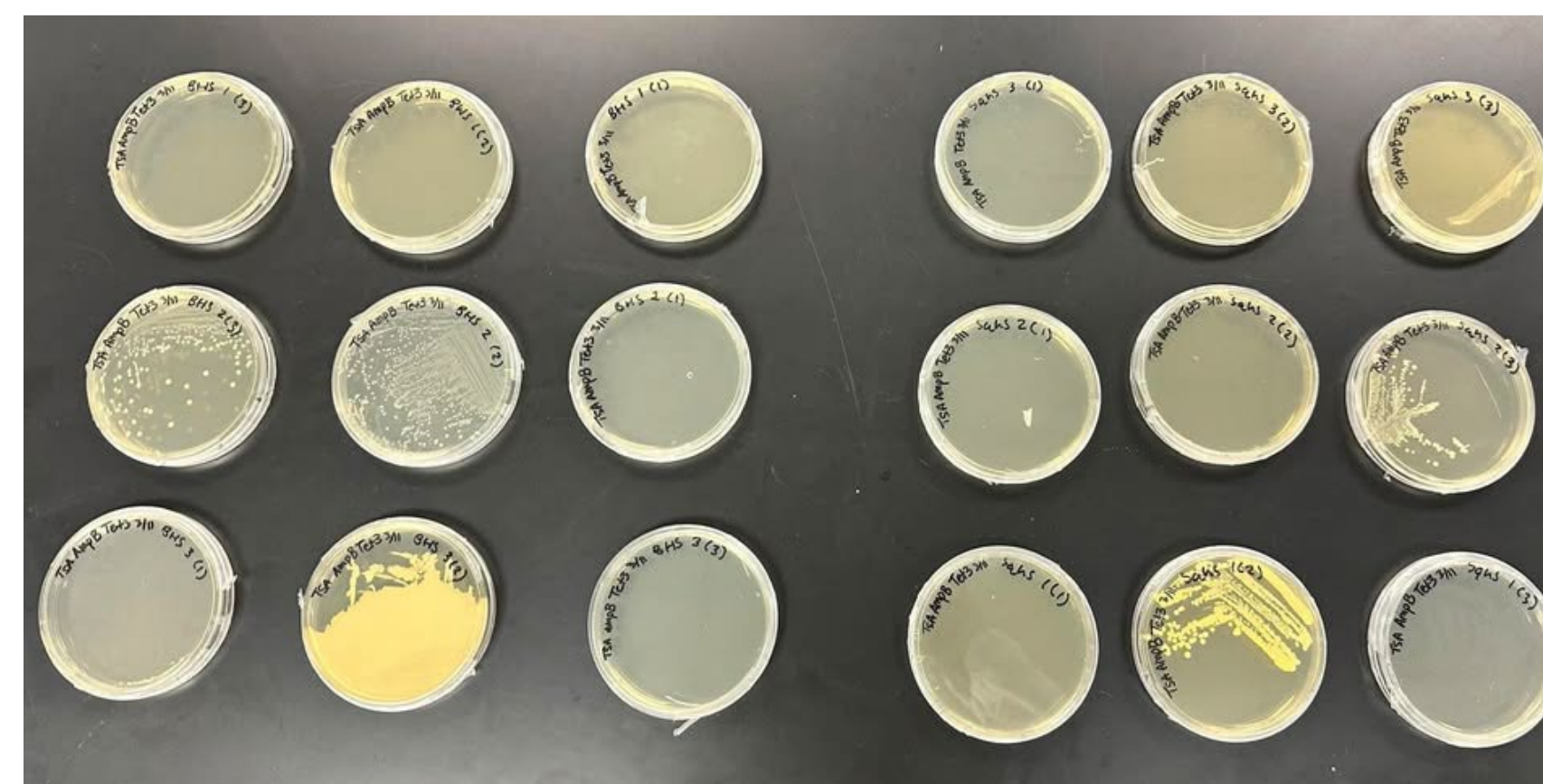


Figure 3: Growth of Bacteria of nine swab samples from Bellingham and Squalicum High School.

After swabbing our bacteria on antibiotic plates, we had significant growth on multiple plates, proving our hypothesis of antibiotic-resistant bacteria being present on wrestling mats.

The bacterial species that we found on those four antibiotic resistant plates had a result of *Staphylococcus epidermidis*, *Staphylococcus saprophyticus*, and *Enterococcus faecium* for Bellingham High School; and *Bacillus stercoris*, *Staphylococcus sp.*, and *Bacillus subtilis* for Squalicum High School. Unfortunately, our 2nd BHS antibiotic bacterial plate had a colony with no BLAST results.

All the bacterial species do not have a high risk of infection rates unless the wrestlers have cuts, abrasions or weakened immune systems while in contact with the mats. Just like the study where wrestling injuries were caused by skin infections (Young et al. 2017), large amounts of the bacterium above could result in worse infection such as bloodstream infections from *Staphylococcus epidermidis* or *Staphylococcus saprophyticus* (Gomez et al. 2024).

For BHS, we were told that they cleaned their mats recently, and the results show an abundance of antibiotic-resistant bacteria, with more clinically concerning pathogens. Knowing that the mats are also for general student use, they would be oblivious to the mat's bacterium present. We are unsure of the cleaning of SQHS mats in proximity to when our samples were taken, but they had generally less dangerous pathogens compared to BHS (Gomez et al. 2024).

Differences in our results when compared to similar studies may be due alternate methods and locations of sampling. Our samples were taken directly from the mats whereas other researchers took samples from dust in similar settings (Akpan, 2018).

Our findings suggest that common commercial cleaning products increase the risk of antibiotic-resistant bacteria growing on any athletic mat regardless of cleaning frequency. To future students who may replicate our experiment, we recommend taking samples from a wrestling mat cleaned with the same cleaning products frequently and comparing them to samples taken from a mat that isn't regularly cleaned and a mat that is cleaned with different methods and products.

Acknowledgements

We would like to thank professor Tealia Slagle for guiding us through our CURE project. We would also like to thank Bethany Lolkema for helping us harvest bacteria and set up each of our labs as a class. Additionally, we thank Whatcom Community College for funding our research.

References/ Work Cited

- Gomez, Amy A, et al. "Staphylococcus Epidermidis ST2 Strains Associated with Bloodstream Infections Contain a Unique Mobile Genetic Element Encoding a Plasmin Inhibitor." *mBio*, U.S. National Library of Medicine, 11 Dec. 2024, pmc.ncbi.nlm.nih.gov/articles/PMC11633098/.
- Young, Linda Mull, et al. "Recommendations for Best Disinfectant Practices to Reduce the Spread of Infection via Wrestling Mats." *Journal of Athletic Training*, U.S. National Library of Medicine, Feb. 2017, www.ncbi.nlm.nih.gov/pmc/articles/PMC5343532/.
- Akpan, Nsikan. "Your Gym Mats May Be Breeding Antibiotic-Resistant Germs." PBS, Public Broadcasting Service, 12 Dec. 2018, www.pbs.org/newshour/science/your-gym-mats-may-be-breeding-antibiotic-resistant-germs.