

# The Effects of Climatic and Seasonal Patterns on Cell Wall Structure and the Frequency of Appearance on Acquired Microbial Air Samples

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## ABSTRACT

The majority of studies on the movement of living or once-living materials through the atmosphere have focused on insect pest species. Over the past 10 years however, these studies have expanded to include investigations of the movement of fungal spores and pollen through the atmosphere, and a few have focused on bacterial species present in the air that we breathe. Gram positive organisms from an environmental aspect can be harmless or cause harm to humans, plants, and agriculture life. Gram negative organisms can cause disease when they become pathogenic. They also play a significant role in nitrogen fixation. In this study, previously collected bi-weekly air samples from August 2007 through January 2008, with a sampling filter apparatus stationed on the South Main campus of Howard University in Washington, DC., were screened and analysis all 16S rDNA bacteria isolates was performed by cultural methods. Climatic screening and weather analysis was observed and recorded.

A total of three hundred and sixty two bacterial isolates cell walls were identified to three hundred and thirty four Gram positive microbials, and 28 Gram negative microbials. The presence of a very high Gram positive population is suggestive of methicillin resistant organisms and community acquired pneumonias that are occurring in the urban communities. The presence of Gram positive organisms frequently appeared during the high temperature seasons, and well as the low seasons. However, the presence of Gram negative organisms appeared during the high temperature and humid conditions. Although the isolates were not analyzed for possible virulence factors, they were analyzed for antibiotic resistance. The results provide critical insight of microbial biodiversity in the Washington DC, Metro Area. The microorganisms identified, have the potential for impacts on humans, plants, and agricultural life as well as other human and animal disease conditions.

## INTRODUCTION

As the rate of Americans suffering from respiratory illnesses and asthma continues to increase, Washington, DC has been named in the top five challenging places for asthma sufferers to reside, by the American Lung Association. Approximately, ten percent of DC's population is currently suffering from asthma, according to the AAFA (Asthma and Allergy Foundation of America). These statistics have shown that the relationship between atmospheric microbials and disease has yet to be well understood. During the course of our research, we set out to gain a better understanding of bacterial populations present in the air, and ultimately, to determine whether or not these organisms are the cause of elevated levels of respiratory illnesses and diseases.

Our experimental data and results have led us to believe that there could be reason to suspect that the air in Washington, DC metro area contains pathogenic microbials, which may cause harm to the human population.

## MATERIALS AND METHODS

\*Media Preparation \*Culturing \*Inoculation \*Gram Staining



## RESULTS

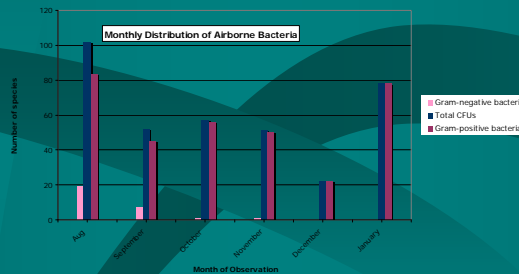


Figure 1. Shows the monthly distribution of Airborne Bacteria

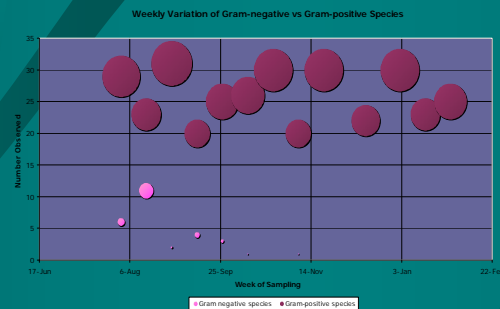


Figure 2. Shows Weekly Variation of Gram-Negative vs. Gram-Positive Species

## RESULTS

Total CFUs and Temperature Distributions

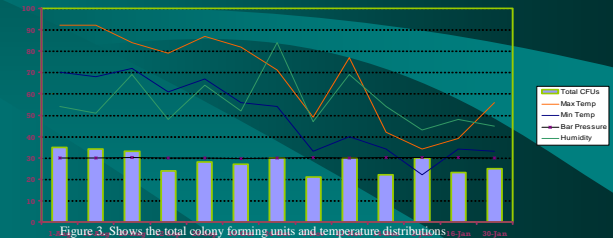


Figure 3. Shows the total colony forming units and temperature distributions. 6-Jun - 26-Jan

## CONCLUSION

Over the course of the past ten weeks, 362 organisms were cultured, inoculated, and isolated, in an attempt to classify them as Gram negative organisms vs. Gram positive organisms.

At the conclusion the research, it was discovered that only twenty-eight of these organisms were Gram negative, while the other 334 isolates were Gram positive. The presence of a very high Gram positive population is suggestive of methicillin resistant organisms and community acquired pneumonias that are occurring in the urban communities. We discovered that the most favorable conditions for Gram-positive growth occurred when temperature and humidity was at its highest.

The results provide critical insight of microbial biodiversity in the Washington DC, Metro Area. The microorganisms identified, have the potential for impacts on humans, plants, and agricultural life as well as other human and animal disease conditions.

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