

# The effects of purinergic signaling modulators on the survival of *Klebsiella Pneumoniae* (KPATCC-70063)

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## Introduction

- It is estimated that **4.95 million** deaths were associated with bacterial AMR (antimicrobial resistance) in 2019.
- The **overuse and misuse** of antibiotics has decreased its efficacy and has caused the emergence of drug-resistant bacteria.
- There is an urgent need for **new** ways to combat AMR and bacterial infections **without relying** on antibiotics.

## Objective of the Study

This project aimed to explore the effects of different purinergic signaling modulators on the survival of *Klebsiella Pneumoniae* (KPATCC-70063) in support of the development of a **novel** treatment for bacterial infections that do not rely on antibiotics and can effectively combat antimicrobial resistance.

## Methods

Internalization Assay Experiment:

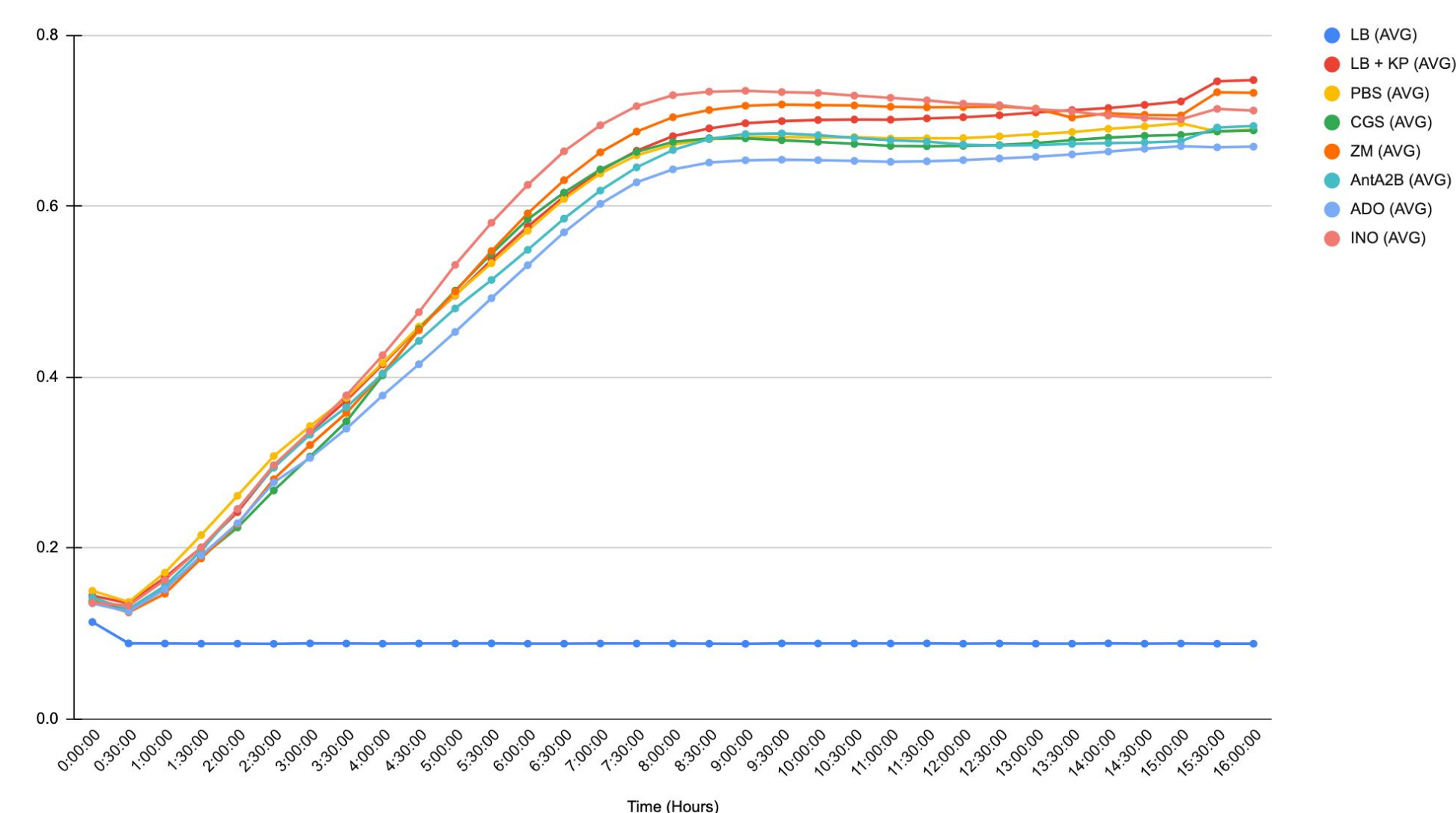
- Infection of Macrophages Cells and Preparing the Plates
- Removing Extracellular Bacteria from 4 Hour and 24 Hour Wells
- Lysing Macrophage Cells and Plating the Surviving Bacteria

Direct Bacterial Plate Assay Experiment

## Results

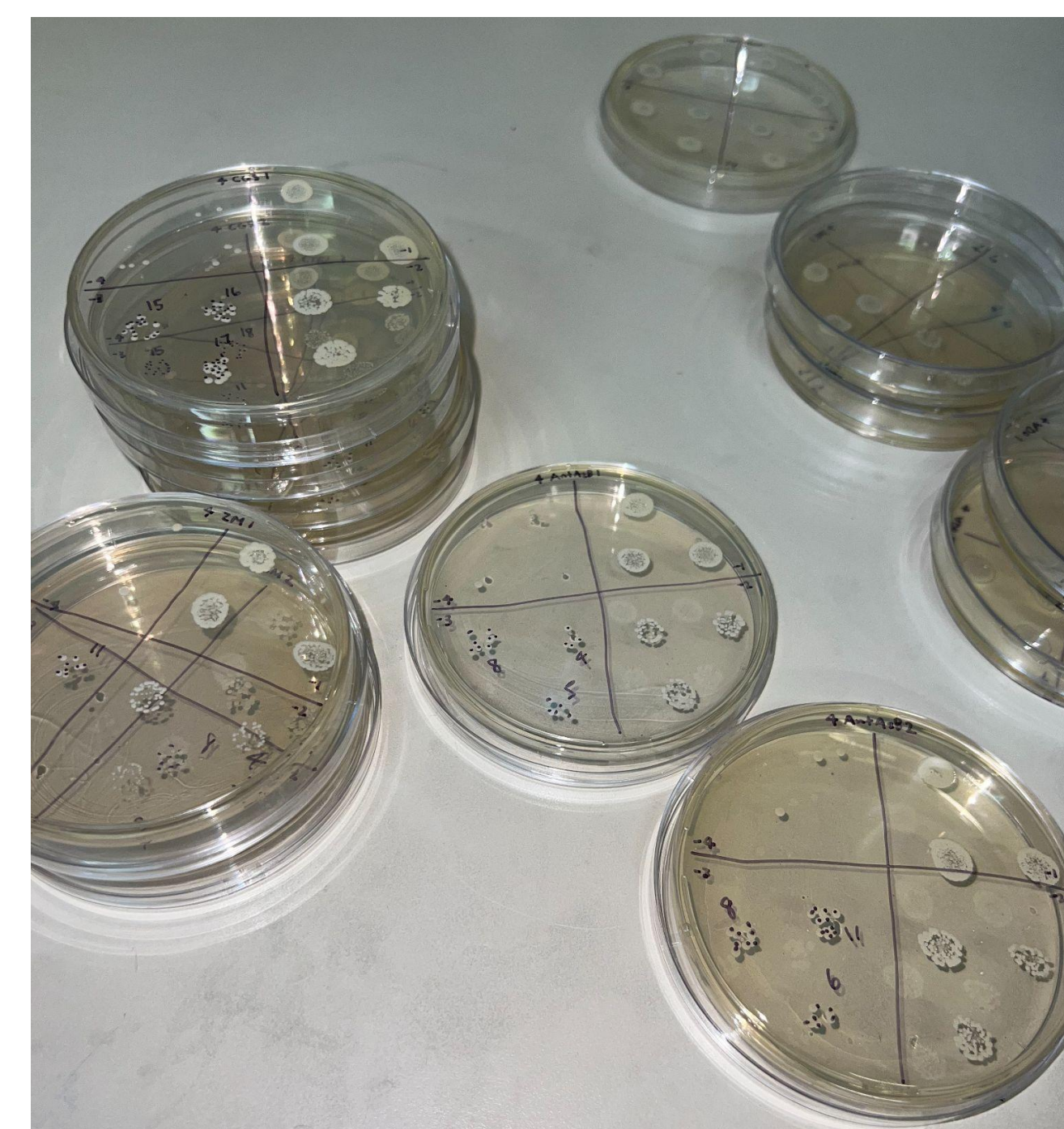
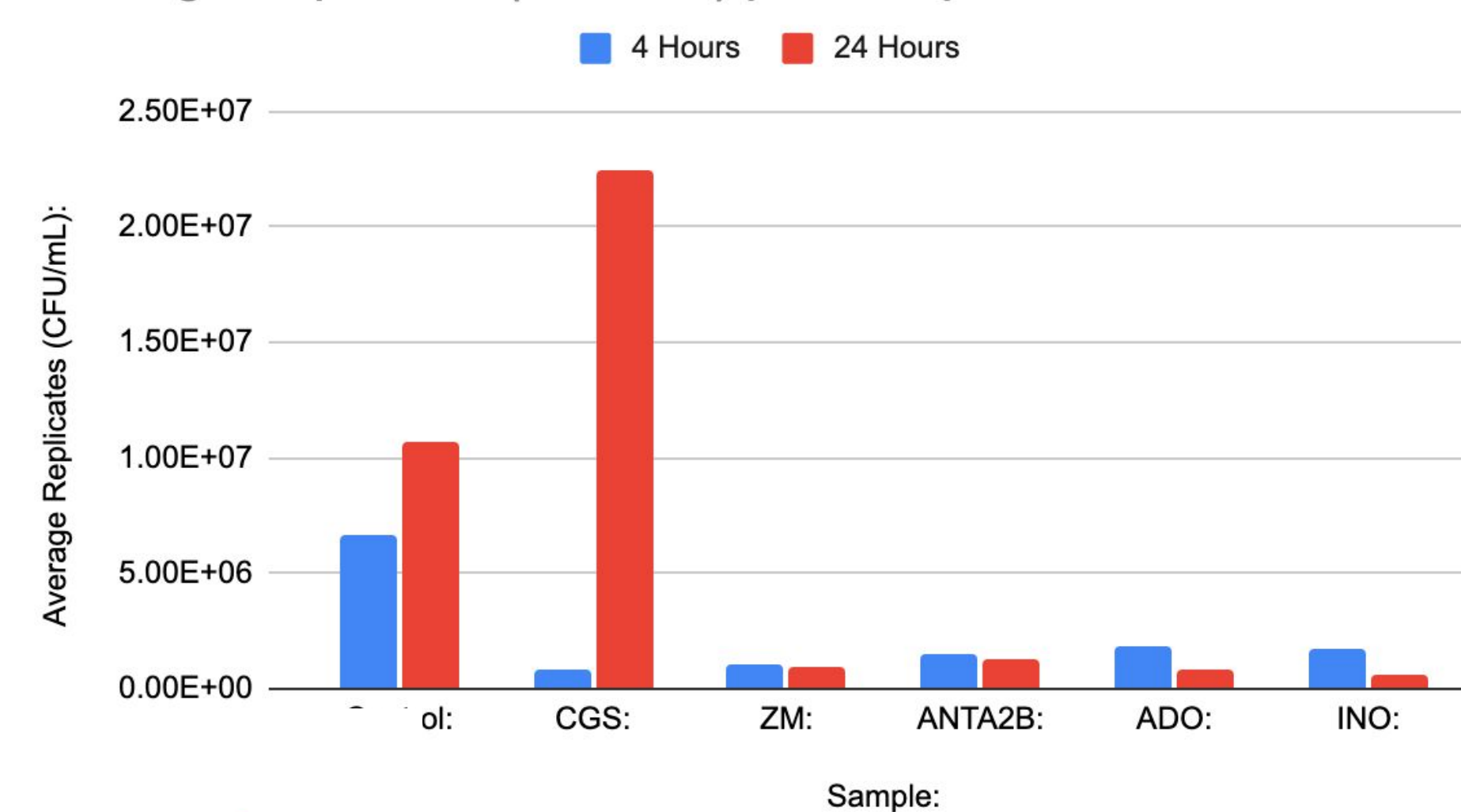
- The results for the first and most successful run of the **internalization assay** experiment are to the right.
- This run most clearly shows that each modulator **effectively decreases** the infection of KP with a notably drastic and **unexpected rise** of bacterial growth in CGS from 4h to 24h.

Direct Bacterial Plate Assay



- The results for the **direct bacterial plate assay** experiment are above.
- The results corroborate with literature and previous findings. As time of infection increased, all conditions and modulators **generally** showed the **same** trend.
- These results support that modulation **occurs in host cells** such as macrophages as receptors for modulator molecules lie on them and not inherently on bacteria themselves. As such, there should **not** be any **direct effect**.

Average Replicates (CFU/mL) per Sample



## Discussion

- Moving on, I will be developing research on purinergic signaling at Princeton in order to fulfill the completion of my Senior thesis.
- Unfortunately, some runs did not yield ideal results. As such I would like to continue to develop research and collect more data, not exclusive to KP.

## Questions

- I would like to see how purinergic signaling can affect other bacterial species as well as the effects of different modulators and concentrations as well as address the rise in bacteria in 24h of CGS.

## Conclusion

- It can be concluded that there are several purinergic signaling modulators that can effectively lower the survival of bacteria, providing a potential alternative for antibiotics.

## Acknowledgements

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