

Friendly Microbes: How Your Lung Microbiome Helps Protect You from Pneumonia

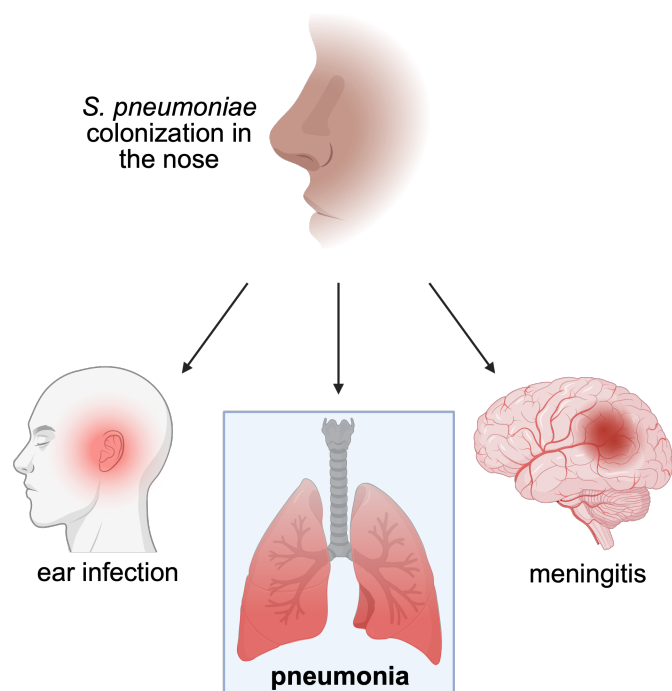


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What is *Streptococcus pneumoniae*?

- S. pneumoniae* is a bacteria that lives in the noses of a large percentage of healthy humans.
- In certain individuals, *S. pneumoniae* can migrate to the lungs and cause a severe lung infection, known as bacterial pneumonia.



Why is studying bacterial pneumonia important?



1,000,000 hospitalizations and 50,000 deaths per year

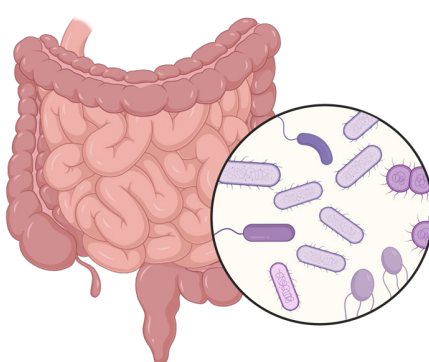


\$19 billion in healthcare costs

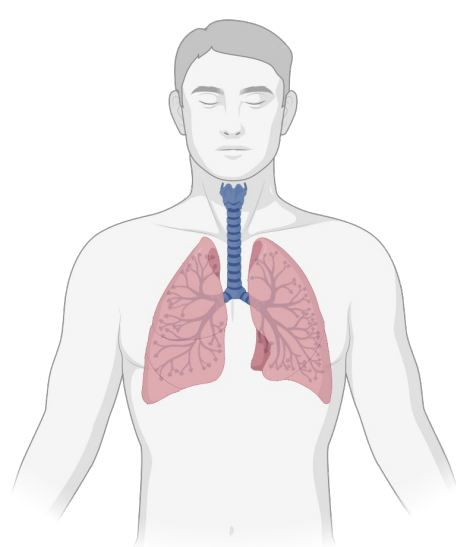


Antibiotics becoming less effective

What is the microbiome?

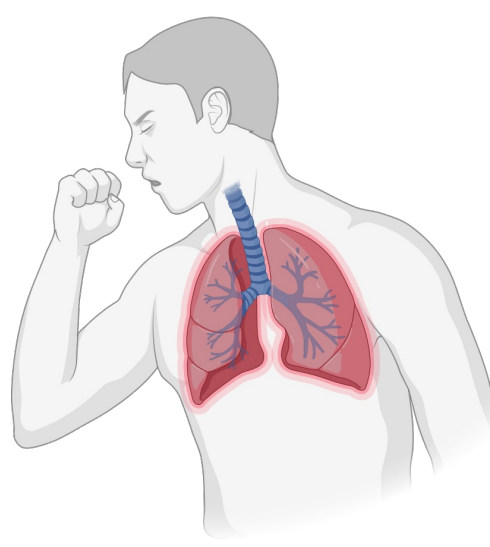


Healthy Lungs



↑ More *Prevotella* bacteria

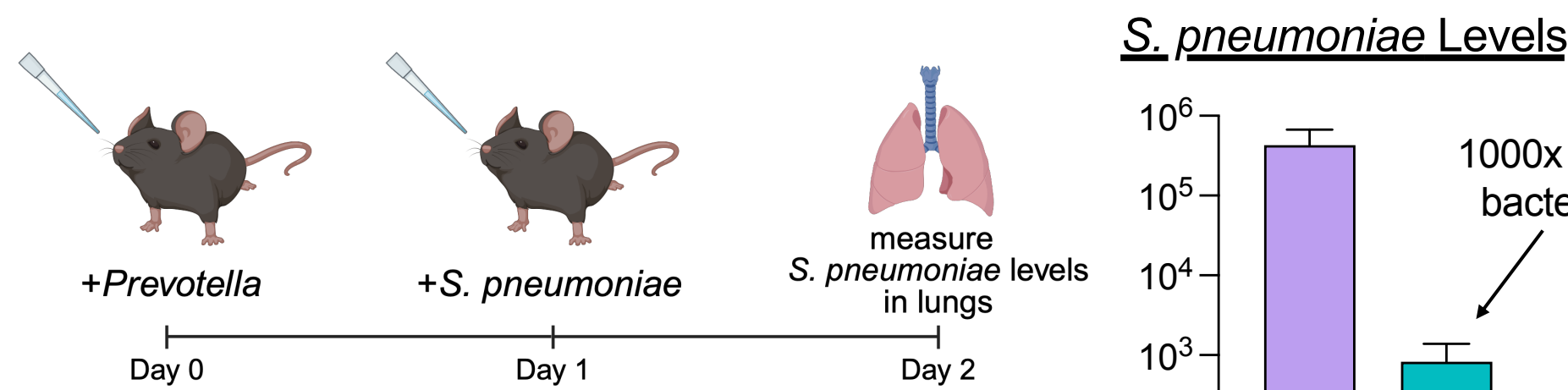
Pneumonia Lungs



↓ Less *Prevotella* bacteria

Why is *Prevotella* presence in the lungs linked to lower chances of getting pneumonia?

Prevotella pre-exposure leads to decreased *S. pneumoniae* infection in the lung

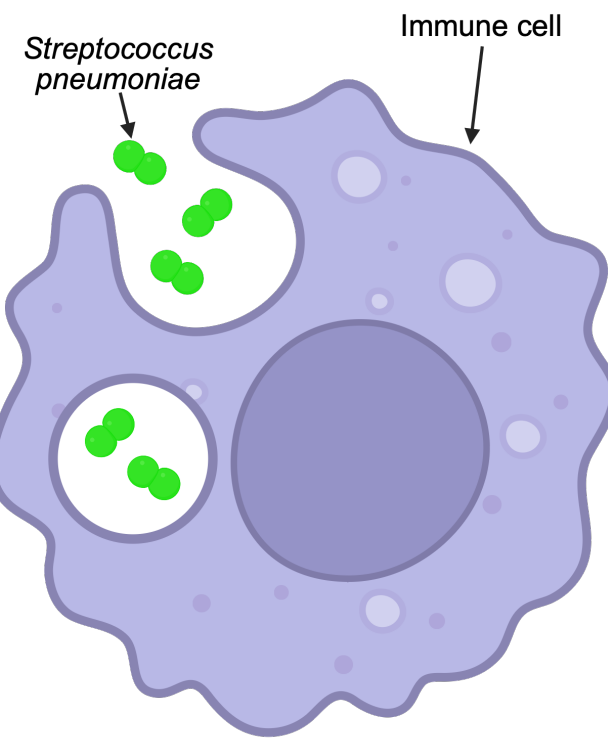
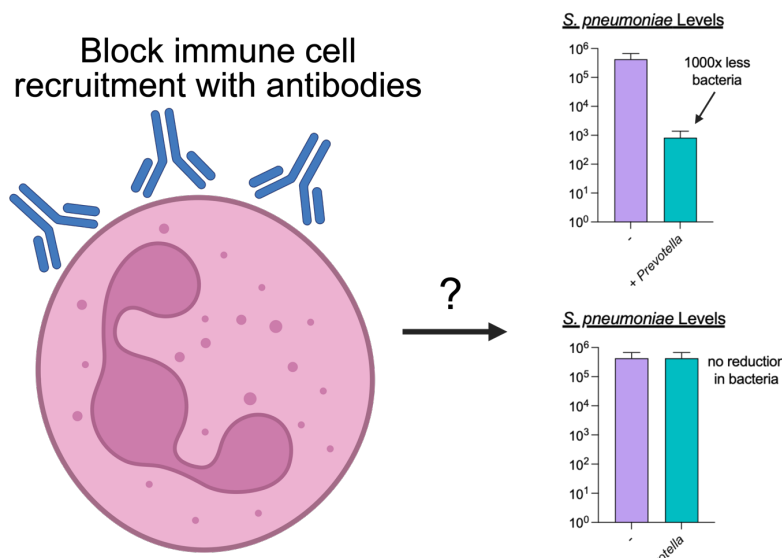


Mice exposed to inactive *Prevotella* before *S. pneumoniae* infection are much better at clearing the infection from their lungs compared to mice who aren't exposed to *Prevotella* before infection.

How is *Prevotella* helping the immune system to fight off infection?

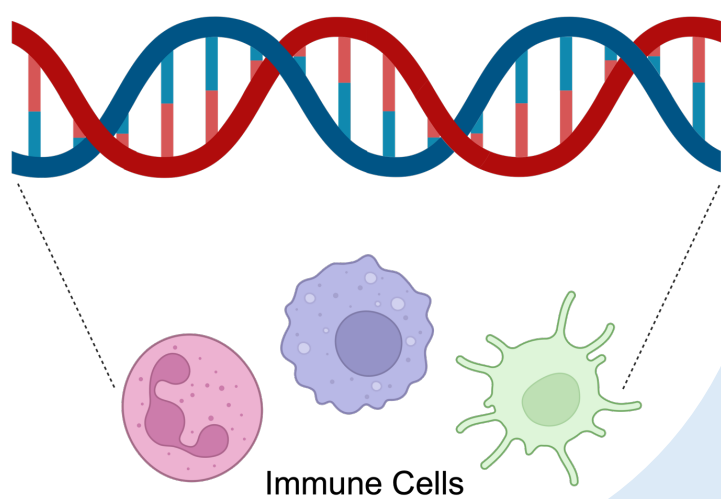
How do we study the immune system in our lab?

We can measure how well *Streptococcus* infects the lungs when a specific type of immune cell isn't present. The results tell us whether this immune cell population is needed to fight off infections.

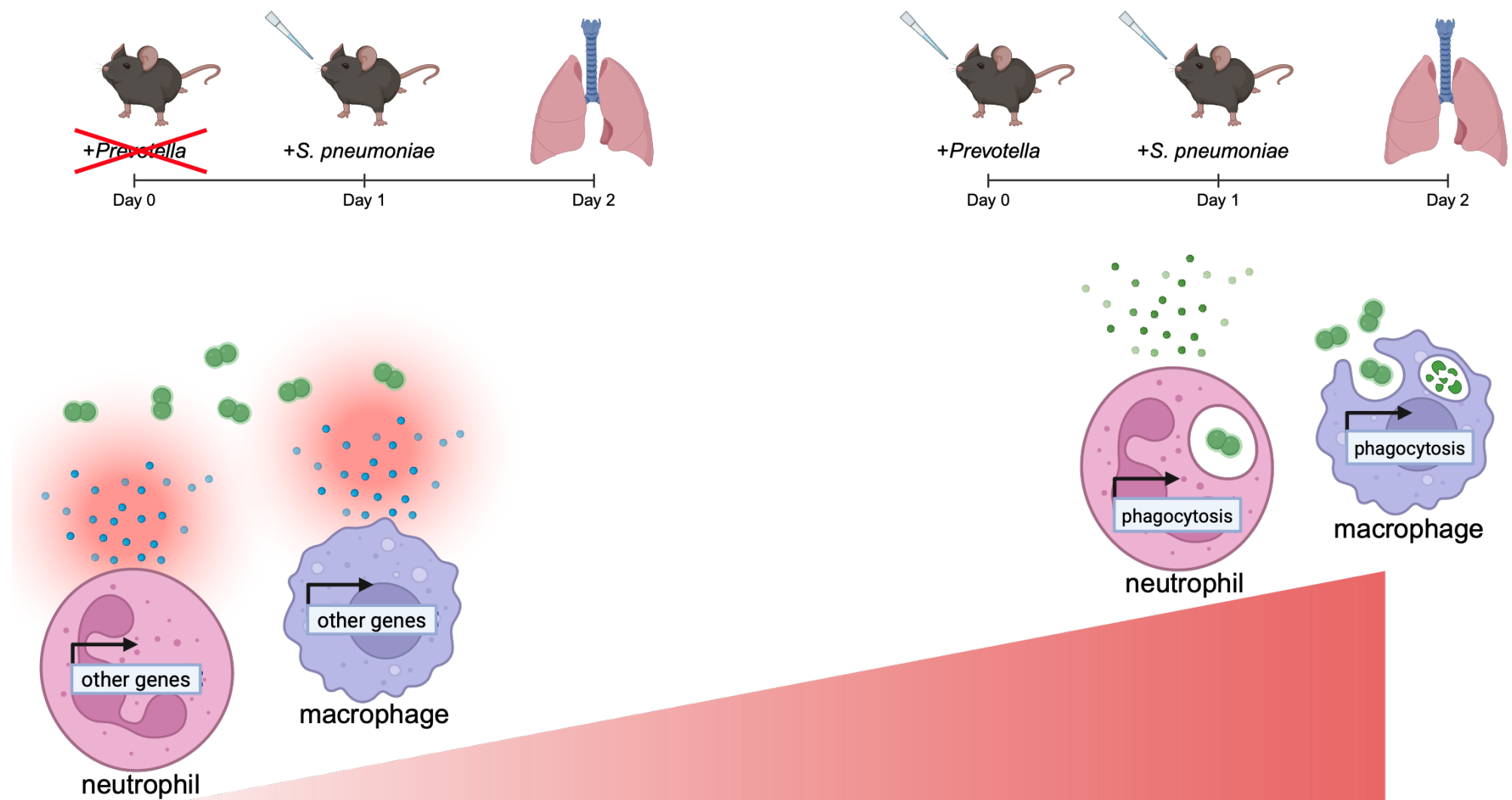


We can measure how well immune cells are able to phagocytose, or "eat", the *Streptococcus* bacteria in mice who have been exposed to residential *Prevotella* beforehand.

With advanced technology, we can read the genetic code of individual immune cells to capture their behavioral "blueprint". This allows us to understand how they function differently in mice that are exposed to *Prevotella*.



What have we learned from these experiments?



Streptococcus pneumoniae killing by immune cells

Neutrophils and macrophages are the cells responsible for the enhanced immune response to *S. pneumoniae* in the lungs of *Prevotella* exposed mice. Additionally, these immune cells are better at fighting off infection after *Prevotella* exposure, due to changes in their genetic code.

Why are these findings important?

These findings:

- Have identified immune cells and defense pathways within these cells that are important for fighting off pneumonia, giving insight for future therapies that target the immune system.
- Can lead to the development of microbiome-based therapeutics for the prevention and treatment of pneumonia.
- Can further inform doctors about antibiotic treatment for pneumonia patients

Acknowledgements and Funding Sources

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