



The Airway Microbiome Protects Against Bacterial Pneumonia

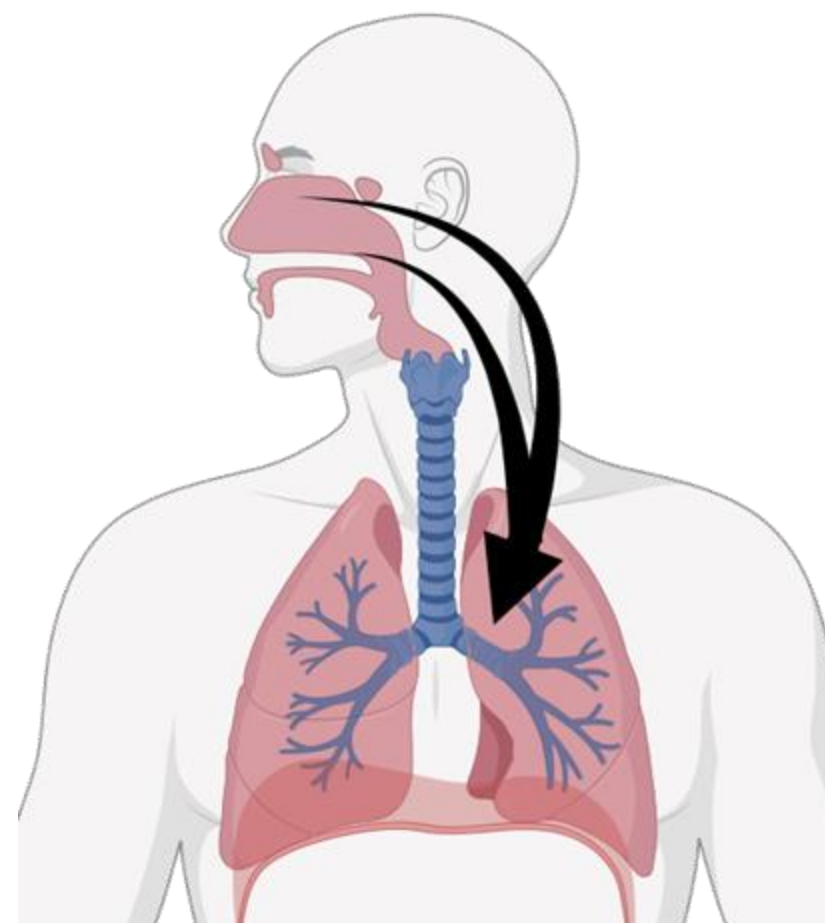
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What is the lung microbiome?

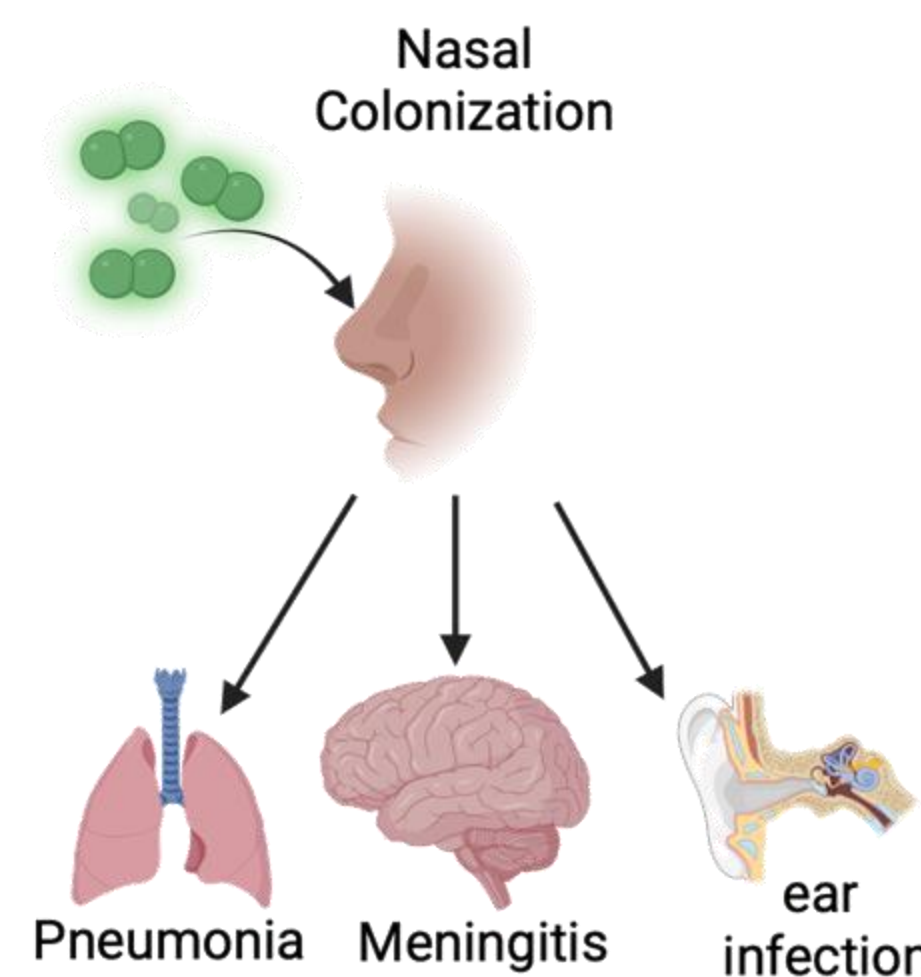
A **Microbiome** is the collection of microorganisms (bacteria, fungi, viruses) that live in a particular environment. These can also be called “**commensal**” bacteria.



- Your lungs are home to a diverse microbiome, even when you are healthy.
- These microbes come from bacterial communities that live in your mouth and nose and are seeded into your airway.
- This constant exposure is thought to contribute to a healthy functioning immune system in your lungs.

What is *S. pneumoniae*?

- *Streptococcus pneumoniae* is a common bacteria that lives in your nose, and asymptomatically lives in 20-30% of adults.
- *S. pneumoniae* can cause a wide variety of diseases, including **meningitis**, **ear infections**, and **bacterial pneumoniae**



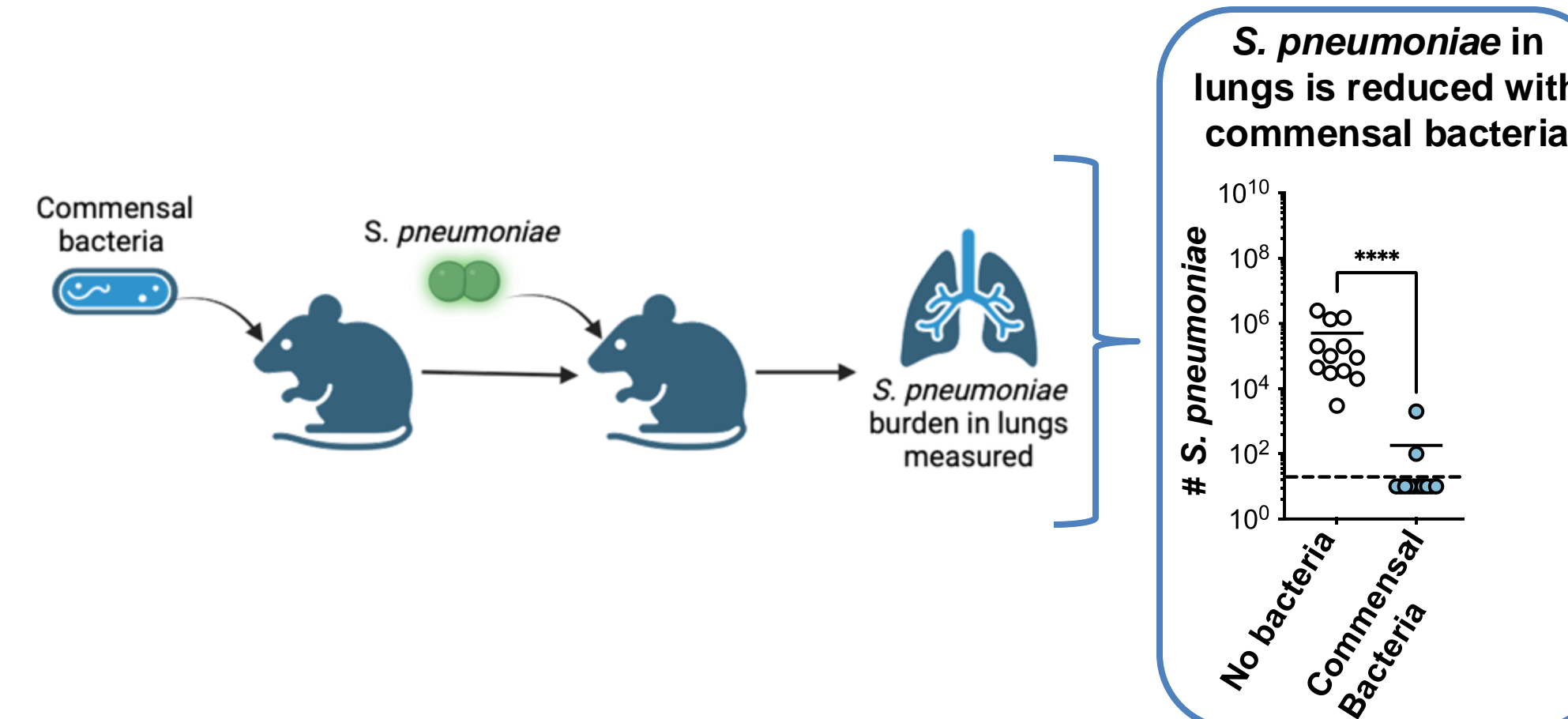
Why should we care?

- *S. pneumoniae* causes **5 million cases of pneumonia** per year in the US
- *S. pneumoniae* is the **leading cause of infectious death** in children under 5 globally
- **Antibiotic resistance** in *S. pneumoniae* is increasing, which makes it harder to treat infections

How do we study this?

We want to know how the healthy airway microbiome can protect us from *S. pneumoniae* infections and develop new treatment options

We can use mice to study how the airway microbiome protects against pneumonia

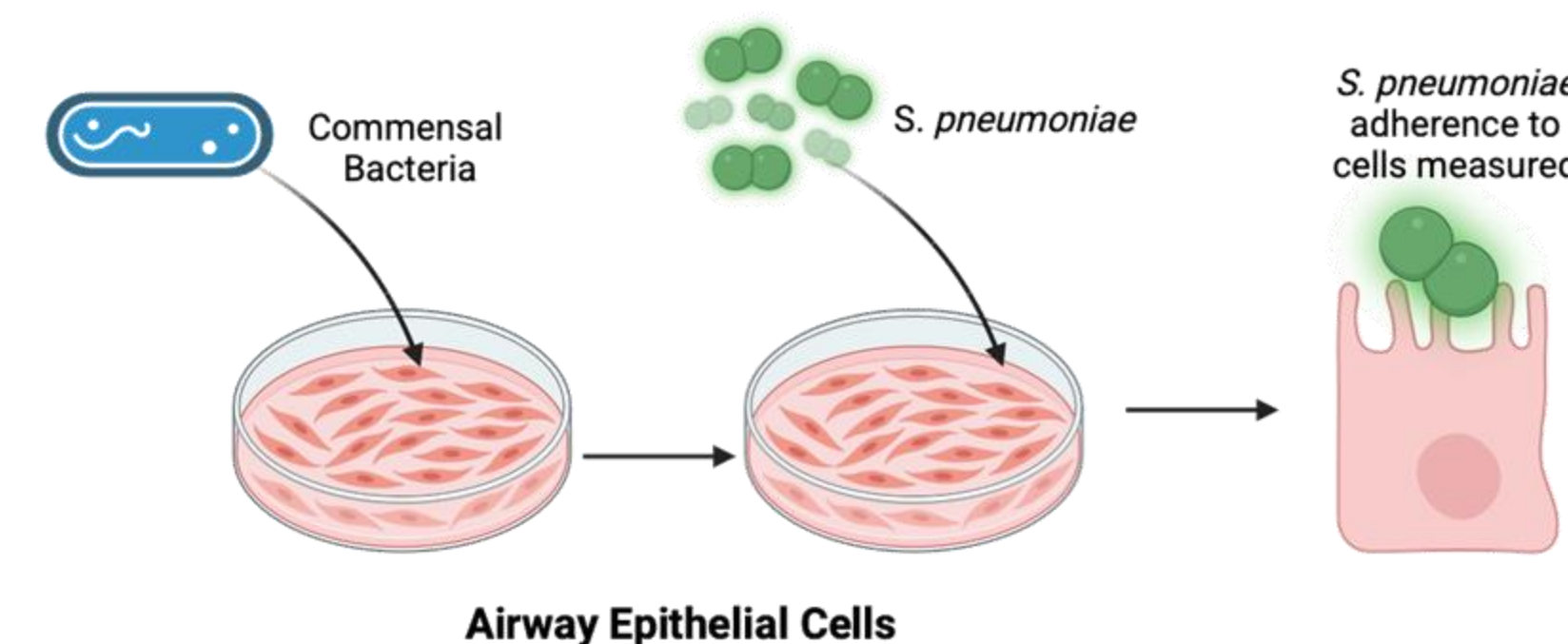


We can use cell culture to study how your airway epithelium impacts states of disease and health

Your **Airway Epithelium**—the cells that line the tissue of your nose, trachea, and lungs—play an important role in protecting against infection.

Airway cells play three major roles in protecting you:

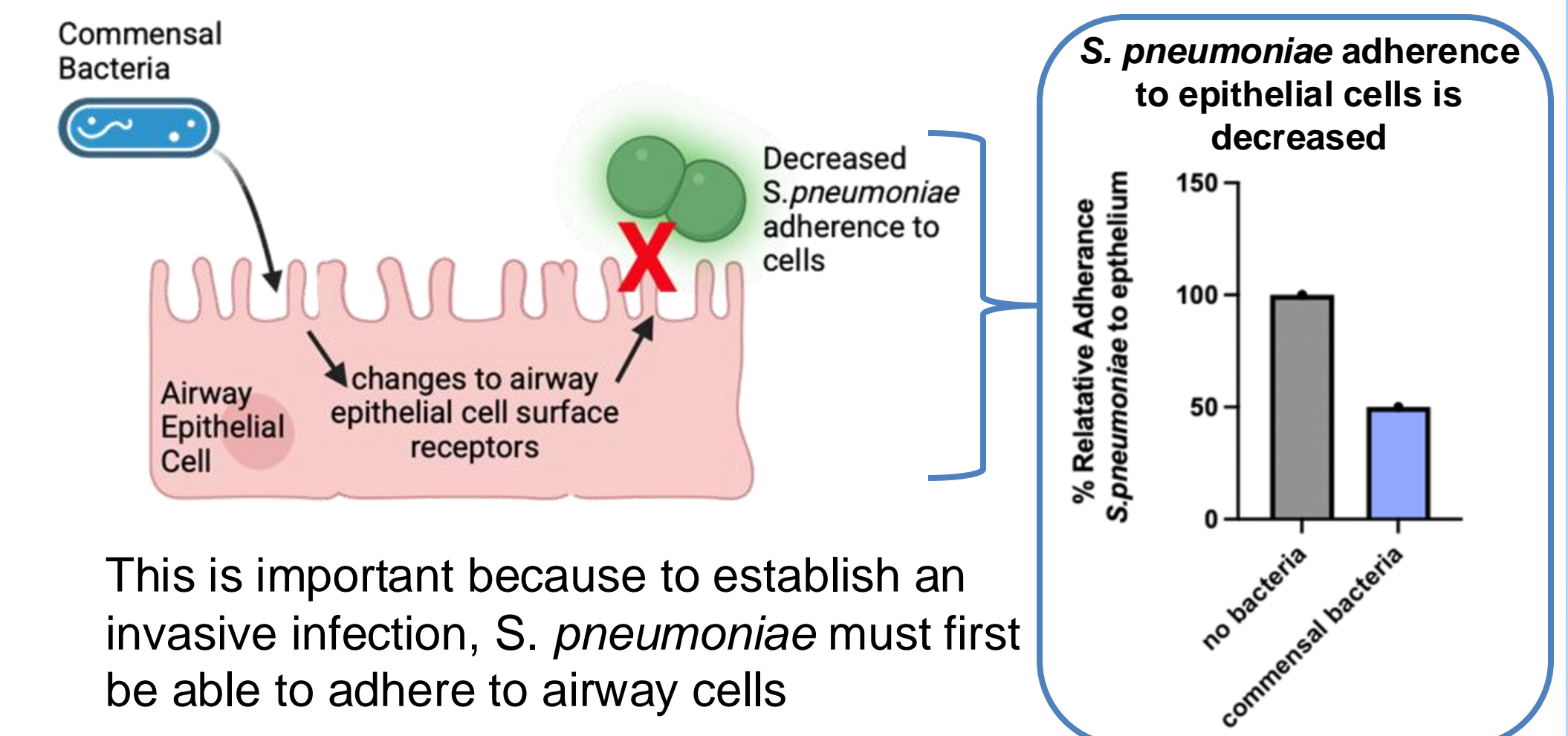
- 1) They form a physical barrier
- 2) There are specialized cell types that help keep pathogens away from your lung tissue
- 3) Epithelial cells have receptors that can detect and respond to the presence of pathogens, helping to initiate an immune response



We want to know how specifically the airway epithelium responds to commensal bacteria to protect against *S. pneumoniae*

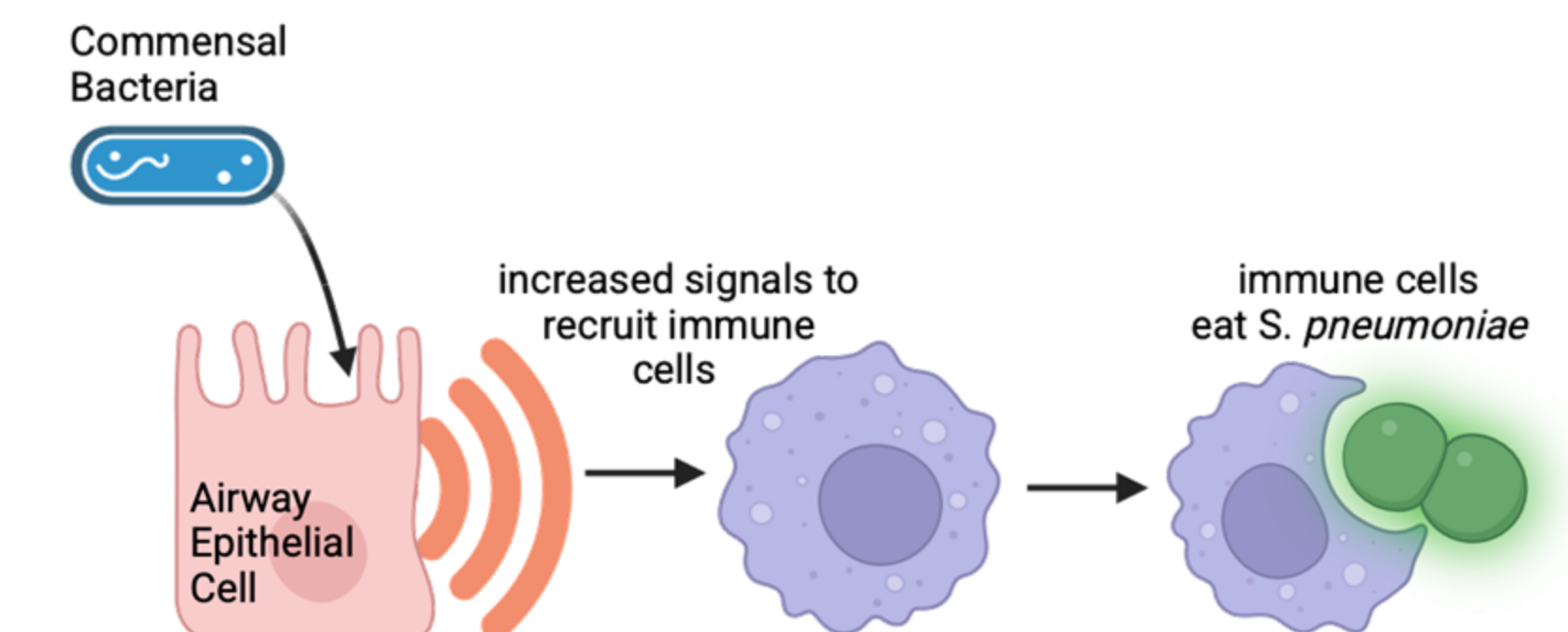
What have we found?

Airway cells primed with commensal bacteria have less adherence of *S. pneumoniae*



This is important because to establish an invasive infection, *S. pneumoniae* must first be able to adhere to airway cells

Airway cells primed with commensal bacteria send signals responsible for bringing immune cells to the lung to clear bacterial infections



This is important because some bacteria cause bad inflammation in the lungs, leading to disease, but these commensal bacteria are generating a protective inflammation that helps prevent *S. pneumoniae* from causing a worse disease

How does this help and where do we go next?

- This offers a new treatment strategy for treating and preventing *S. pneumoniae* infections
- We need to better understand what on the commensal bacteria generates this protection, and how it interacts with our cells, before we can consider making therapeutics

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