

Mechanism that prevents lethal bacteria from causing invasive disease revealed

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An important development in understanding how the bacterium that causes pneumonia, meningitis and septicaemia remains harmlessly in the nose and throat has been discovered at the University of Liverpool's Institute of Infection and Global Health.

Streptococcus pneumoniae is a 'commensal', which can live harmlessly in the nasopharynx as part of the body's natural bacterial flora. However, in the very young and old it can invade the rest of the body, leading to serious diseases such as pneumonia, sepsis and meningitis, which claim up to a million lives every year worldwide.

However, the conditions that drive this bacterium from harmless commensal to major pathogen are not understood.

Scientists at the University have now uncovered the mechanisms by which this occurs and how it is regulated by the host immune system.

They found that a specialised group of white blood cells called T [regulatory cells](#) are activated by the pneumococcus and move to dampen down a damaging pro-inflammatory response from the host immune system.

When [white blood cells](#) attack bacteria they cause inflammation and, if this inflammation is uncontrolled it can become excessive and damage host tissues, allowing the bacteria to spread into the rest of the respiratory system and other organs in the body.

The first author of the study, immunologist Dr Daniel Neill said: "These bacteria are quite happy to live in your nose and it's not in their interests to spread and kill their host. This is why they activate T regulatory cells: to keep the immune system in check and ensure their own survival.

"Our findings suggest induction of T regulatory cell responses in the upper airways reduces the risk of inflammatory damage that could lead to bacterial invasion and the development of disease.

"Understanding this process can now lead us to investigate how the bacteria go from this state to causing lethal infections."

The senior author of the study, Professor Aras Kadioglu said: "Vaccines are an essential part of our fight against this disease and have been highly successful.

"However, they do not protect us against all strains of pneumococci. Therefore, understanding the key immunological interactions with the pneumococcus, in the very first site they enter and colonise the human body is crucial to future development of better vaccines.

"In this study we have revealed how there is a delicate balance between the ability of the [pneumococcus](#) to colonise the host nasopharynx and the critical need of the immune system to prevent damaging inflammation in this key site.

"We hope that this will lead to developing novel therapies based on modulating the host [immune system](#) to prevent subsequent invasive disease."

The paper 'Density and Duration of Pneumococcal Carriage Is Maintained by Transforming Growth Factor b1 and T Regulatory Cells', was published in the *American Journal of Respiratory and Critical Care*

Medicine.

Provided by University of Liverpool

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