

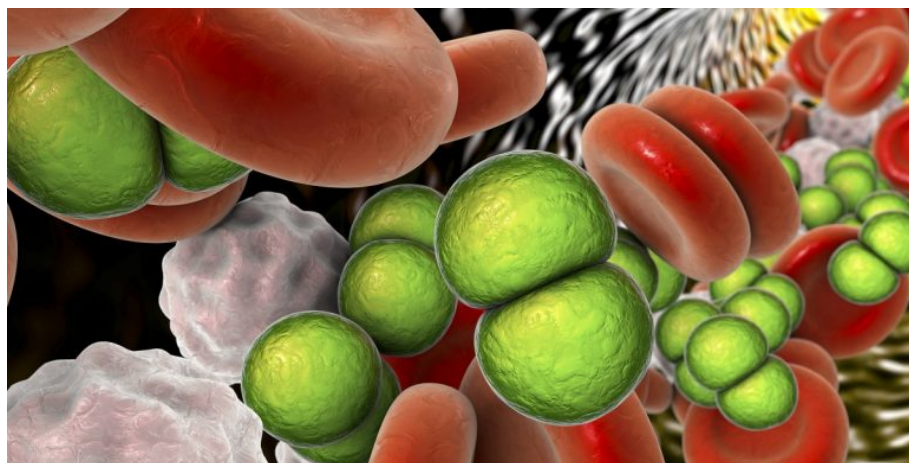
News and information for the treatment and management of meningitis for Healthcare Professionals



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Double Trouble

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Two potentially deadly meningitis-causing bacteria can outmaneuver immune defenses, study says

Despite breakthroughs in treatments and vaccinations, bacterial meningitis remains a serious threat, responsible for 200,000 deaths annually and holding the dubious honor of placing



Bacterial meningitis and COVID-19: a complex patient journey

sixth among the world's deadliest infectious disease killers.^{1,2} So it was significant news when a recent study, published in the journal *PLoS Pathogens*, identified two meningitis-causing bacteria that can dodge the immune system's natural fever response to infection.²

In laboratory tests, conducted at Sweden's Karolinska Institutet, researchers found that two specific bacteria—*Streptococcus pneumoniae* and *Haemophilus influenzae*—that can cause meningitis sense increasing temperature and respond with a protective shield that prevents them from being killed off by the immune system.

Streptococcus pneumoniae and *Haemophilus influenzae* primarily live in a healthy person's nose and throat without causing illness or harm. In some cases, however, the pathogens break loose, spread into the bloodstream, and cause invasive diseases.

This new study, said the study authors, may explain how the bacteria are able to stay alive and transition into the bloodstream. And the hypothesis is attracting significant attention. That's because *Streptococcus pneumoniae* and *Haemophilus influenzae* are two major agents that cause bacterial meningitis.

Jumping to the study's conclusion, this data suggests that these bacteria have independently co-evolved thermosensing abilities with different RNA sequences but distinct secondary structures to evade the immune system natural attack against bad bacteria.

Applying this theory to the human body, here's how *Streptococcus pneumoniae* and *Haemophilus influenzae* may be able to cause bacterial meningitis:

- The body's immune system elevates the body's temperature with a fever to kill these two respiratory pathogens.
- These bacteria sense the fever and respond with a protective shield that the immune system cannot penetrate.
- Safe from harm, the bacteria move into the bloodstream and wreak havoc.

"This discovery helps to increase our understanding of the mechanisms these bacteria use to evade our normal immune defenses," says co-corresponding study author Edmund Loh, researcher in the Department of Microbiology, Tumor and Cell Biology at Karolinska Institutet. "It could be an important piece of the puzzle in examining what turns this usually

harmless bacterium into a lethal killer.”³

The authors explained that this mechanism of the bacteria involves four specific temperature-sensitive non-coding RNA molecules known as RNA thermosensors (RNATs). These RNATs enabled the heightened production of larger protective capsules and Factor H binding proteins — components that protect these pathogens from the immune system’s onslaught.

The research revealed the mechanism that allows these two bacteria to ward off the immune system’s advances, which involves four specific temperature-sensitive non-coding RNA molecules called RNA thermosensors (RNATs). These RNATs helped boost the production of bigger protective capsules and immune modulatory Factor H binding proteins, which help shield these bacteria from immune system attacks.

At this point, all data from this study have been conducted under laboratory conditions and the study authors recommend additional research to understand what triggers these pathogens to move into the bloodstream and on to the brain. In addition, a solid next step should include in vivo infection models to better understand the role of these

RNATs during colonization and invasion.

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3. Karolinska Institutet. Study shows how meningitis-causing bacteria may sense fever to avoid immune killing. Published: 2021-04-29 20:00; Updated: 2021-04-29. Available from <https://news.ki.se/study-shows-how-meningitis-causing-bacteria-may-sense-fever-to-avoid-immune-killing> Accessed June 28, 2021