Bacterial communication encourages chronic, resistant ear infections

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Ear infections caused by more than one species of bacteria could be more persistent and antibiotic-resistant because one pathogen may be communicating with the other, encouraging it to bolster its defenses. Interrupting or removing that communication could be key to curing these infections. Researchers from Wake Forest University Baptist Medical Center publish their findings today in *mBio*, the online open-access journal of the American Society for Microbiology.

"In this study we show that communication between bacterial species promotes bacterial persistence and resistance to antibiotics, which are important considerations in the diagnosis, preventions and treatment of otitis media (OM)," says W. Edward Swords, an associate professor of microbiology and immunology and senior author of the study. Chelsie Armbruster, a Ph.D. student working in Swords' lab, co-authored the study.

OM is one of the most common childhood infections and is the leading reason for pediatric office visits and new antibiotic prescriptions to children. OM infections often persist for long periods of time and are often resistant to antibiotics. These chronic and recurrent cases of OM involve the persistence of the bacteria within a biofilm community, a state in which they are highly resistant to both natural clearance by the immune system and antibiotic treatment.

Epidemiological data indicate that the majority of chronic OM infections are polymicrobial in nature, meaning they are caused by more

than one species of bacteria. *Haemophilus influenzae* and *Moraxella catarrhalis* are frequently found together in samples obtained from patients with chronic and recurrent OM.

"Interestingly, a recent study found *M. catarrhalis* to be more frequently associated with polymicrobial OM infections than from single-species OM infections. This suggests that the presence of other bacterial pathogens may impact the persistence of *M. catarrhalis* or the severity of disease caused by this species," says Swords.

In examining the dynamics between these two bacteria in culture and animal models, Swords and his colleagues discovered the *H. influenzae* secreted autoinducer-2 (AI-2), a chemical involved in an interbacterial method of communication known as quorum sensing, that promoted increased biofilm formation and antibiotic resistance in *M. catarrhalis*.

"We conclude that *H. influenzae* promotes *M. catarrhalis* persistence within polymicrobial infection biofilms via inter-species quorum signaling. AI-2 may therefore represent an ideal target for disruption of chronic polymicrobial infections," says Swords. "Moreover, these results strongly imply that successful vaccination against the unencapsulated *H. influenzae* strains that cause airway infections may also significantly impact chronic *M. catarrhalis* disease by removing a reservoir for the AI-2 signal that promotes *M. catarrhalis* persistence within biofilms."

More information: mbio.asm.org

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