Study details bacterial communication

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(PhysOrg.com) -- If you think your family talks too loud at times, just consider what the noise level would be if you could hear what the bacteria around you are saying.

Arnold School of Public Health researcher Alan Decho, in collaboration with colleagues Rebecca L. Frey and John L. Ferry of the University of South Carolina's Department of Chemistry and Biochemistry, conducted an extensive review of emerging information on bacterial communication within natural environments.

The report, featured on the cover of the January issue of *Chemical Reviews*, is the most comprehensive to date about bacterial communication—a process known as quorum sensing—in the natural environment, said Decho, director of the Arnold School's Microbial Interactions Laboratory.

"Quorum sensing, which is the cell-to-cell communication among bacteria, occurs when bacteria produce, release, and respond to chemical signal molecules," Decho said.

While in-depth studies have been conducted on quorum sensing in the laboratory under controlled conditions, few studies have been done to understand what effects and challenges the natural environment might pose to communication among bacteria or unexpected avenues for cell-to-cell chemical signaling.

"Bacteria are incredibly adaptable, and we only understand a small

fraction of how they may act as a group either in nature or in our bodies. At times, they may appear to be acting as an organism, and not a single cell," Decho said.

Further, bacteria appear to work together at times to achieve common goals, such as the digestion of food in the intestines.

"This communication can allow bacteria to coordinate their expression of genes and enable them to glean information from their environment and coordinate behavior within their community," Decho said. "It operates like a highly efficient city (of bacteria) with excellent energy management, transportation of goods and food, and managing safety (against invaders), but always making minor adjustments to changing conditions."

Microbial communication might be quite similar to two people talking to each other, Ferry said.

In a crowded room, for example, two people having a conversation might have trouble hearing each other. In an echo chamber, the two also could find conversation difficult.

"In a quiet room, the ability to communicate may not be so bad," Ferry said.

Each environment produces different conditions, and those conditions might interfere with or promote the ability of bacteria to communicate, he said.

"The interactions can be very significant," Ferry said. "Some environments are more friendly. Bacteria may modify to improve communication or to be self-destructive."

Ultimately, understanding communication among microbes could lead to advances in biotechnology and the development of new drugs to treat diseases. Chemical communication is at the heart of solving bacterial infections and many forms of antibiotic resistance, Decho said.

The collaboration between public health and chemistry researchers was central to the understanding of the impact of the natural environment on the chemical cues affecting signaling among bacteria.

“Chemical signaling combines microbiology, chemical ecology, and chemistry,” said Ferry, who has a public health background. “Our research areas are a good fit for this study.”

Provided by University of South Carolina