Medical Xpress

Decade-long study raises new questions about antibiotic use for cystic fibrosis

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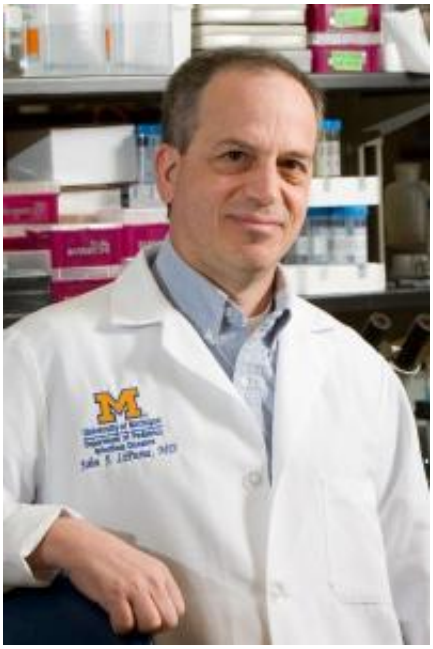

John J. LiPuma, M.D., of the University of Michigan Health System, was the senior author of a decade-long cystic fibrosis study that found aggressive use of antibiotics to treat cystic fibrosis may not always be the best answer. Credit: University of Michigan Health System

When it comes to treating cystic fibrosis, the current standard of aggressive antibiotic treatments may not always be the best answer, a decade-long study led by researchers at the University of Michigan has found.

Traditionally, bacteria-blasting antibiotics are used to suppress infection in CF patients' lungs to the lowest level possible, but maintaining a diversity of bacterial communities may help some patients stay healthy longer, says the study's senior author, John J. LiPuma, M.D.

The findings appear today in the Proceedings of the National Academy of Sciences.

"The conventional wisdom has been that as patients with CF age and become sicker, as their lung disease progresses, more and more bacteria move in," says LiPuma, the James L. Wilson, M.D., Research Professor of Pediatrics and Communicable Diseases at the U-M Medical School. "But our study – which was the first to examine the bacterial communities in CF patients' lungs over a long period of time – indicates that's not what happens."

Instead, aggressive use of antibiotics – rather than a patient's age or disease progression – is responsible for lowering the diversity of lung bacteria, leading to infections that become increasingly hard to treat. A diverse community of bacteria may encourage competition that keeps the most virulent strains in check, the researchers found.

"What we normally do is essentially carpet bombing with antibiotics," continues LiPuma, who is also an associate chair of the pediatrics department at U-M. "However, what we found is that over time this ultimately helps treatment-resistant bacteria by getting rid of their competition."

LiPuma says the results may mark a first step toward developing new therapeutic approaches, such as more narrowly tailored use of antibiotics or even a probiotic approach.

Cystic fibrosis is a chronic, life-threatening disease that leaves one

vulnerable to repeated, ever-more-serious infections. It causes the body to produce thick, sticky mucus that clogs the lungs and provides the perfect breeding ground for bacteria. CF, which affects 30,000 people in the United States, is usually detected in early childhood and thanks to medical advances in recent decades, patients often survive into their 30s and 40s.

Even as bacterial diversity declines over time, the researchers found the overall level or "load" of bacteria remains fairly constant – meaning that as diversity declines, a small number of organisms multiply to take the place of those that have been destroyed.

Previous studies have collected samples from individual patients at a single point in time, which makes it difficult to examine relationships between the progression of the disease, antibiotic treatments and other variables, LiPuma explains. This study examined the bacteria from six patients collected over a period of eight to nine years. Three patients had a relatively stable type of the disease and three had the more typical, faster progressing form. DNA analysis was conducted on bacteria in 126 sputum samples.

The researchers were also surprised that exacerbations couldn't be linked to any specific changes in bacterial communities. Additional research is underway to look for more subtle signals that may precede or accompany flare ups, says LiPuma, who is also a professor of epidemiology at the U-M School of Public Health.

"Increasing our understanding of the relationship between bacteria in the lung and the progression of cystic fibrosis is critical to developing new treatments and prolonging patients' lives," he notes.

More information: "Decade-long bacterial community dynamics in cystic fibrosis airways," *Proceedings of the National Academy of*

Sciences, March 26, 2012.

Provided by University of Michigan