bilities for monitoring health as well as attitudes about health-related issues, including, say, what people are thinking about vaccines, are open-ended and potentially powerful, he says. Feedback from this system might help public officials in better tailoring their messages, he contends. “It’s a critical area of research—learning how to generate more positive attitudes.”

Jeffrey L. Fox is the Microbe Current Topics and Features Editor.

RESEARCH ADVANCES

Microbial Diversity in Lungs May Stabilize Health for CF Patients

David C. Holzman

Losses in bacterial biodiversity in the lungs of cystic fibrosis (CF) patients correlate with worsening disease, according to George A. O’Toole of Geisel School of Medicine at Dartmouth in Hanover, N.H., and his collaborators. Until recently, the numbers of colonizing microbial species in the lungs of such patients were thought to be relatively few, he says, “The explosion of [findings from] culture-independent sequencing technology changes that thinking.” Details appear in the September 2012 Journal of Bacteriology (194:4709 – 4717).

O’Toole and his collaborators relied on deep DNA sequencing to profile the bacterial communities in sputum samples collected from adult CF patients. The cohort included 22 patients whose disease was considered stable and another 13 patients undergoing acute exacerbations. It is one of the largest studies so far to use deep sequencing technology for so many samples.

Disease stability among CF patients correlates not only with the diversity of microbial species but also with a high prevalence in their lungs of Streptococcus species, including both commensal oral species and the S. milleri pathogenic species. This finding was “a surprise,” O’Toole says, noting that other researchers report S. milleri species being associated with CF patients experiencing exacerbations. Perhaps even more surprising, O’Toole and his collaborators report that the presence of Pseudomonas aeruginosa negatively correlates with the clinical status of such patients, despite other reports to the contrary. Additionally, P. aeruginosa was predominant in only about half the CF patients who were part of this cohort, according to O’Toole.

These findings point to the complexity of microbial communities in the lungs of patients with chronic CF, O’Toole continues. That complexity sharply contrasts with the conventional and rather simple approach being followed in managing such patients, in which “an antibiotic treatment regimen is typically dictated by the findings of plate-based culture results looking at a handful of pathogens historically identified in cystic fibrosis,” he says, “To improve patient treatment, we must fully understand the polymicrobial lung communities, their dynamics, and interactions.”

Taking that idea a step further, he says “We propose that increased bacterial diversity is important for [CF] patient stability and that Streptococcus may play an important role in promoting such diversity.”

Knowledge from this and similar studies may make it possible to mold the bacterial community into one that is more favorable to patients with CF, according to John LiPuma of the University of Michigan in Ann Arbor, who was not involved in the research. “These analyses are difficult due to the confounding of disease progression, antibiotic use, and decreased diversity,” he says, “Although associations are found, the linear causality is unclear. Studies that carefully quantify and control for antibiotic use are needed to sort this out.” The research also is important because the field has hit a plateau with its dependence on antibiotics, and needs new management strategies to further extend the life expectancy of CF patients, he points out.

David C. Holzman is the Microbe Journal Highlights Editor

PUBLIC HEALTH

Deadly Resurgence of West Nile Virus Puzzles U.S. Health Officials

Marlene Cimons

The United States is experiencing an unusually high number of human infections from West Nile virus (WNV). The number of reported cases is the highest through the third week of October since 2003, according to officials at the Centers for Disease Control and Prevention (CDC) in Atlanta, Ga.
Moreover, the toll likely will rise, possibly exceeding 2002 and 2003, when about 3,000 cases of neuroinvasive disease and more than 260 deaths occurred each year, according to CDC. Of 4,531 cases through mid-October, 2,293 were neuroinvasive and 2,238 were non-neuroinvasive. Thus far, 183 people have died this year from those infections. While 48 states reported WNV in people, birds, or mosquitoes (Alaska and Hawaii report no activity), almost 70% of the human infections were confined to eight states—Texas, California, Mississippi, Louisiana, Oklahoma, South Dakota, Michigan, and Illinois—with one-third of them (1,438 cases, 54 deaths) in Texas.

CDC officials say that numerous factors are involved in the current outbreak, but point to excessive heat affecting much of the country as likely a major reason for increases in WNV infections in mosquitoes and birds. Additionally, March was the warmest on record for the 48 contiguous United States, with more than 15,000 warm temperature records broken, according to the officials from the National Oceanic and Atmospheric Administration.

“Arboviral amplification depends on several critical factors differentially influenced by weather,” says Lyle R. Petersen, director of the CDC division of vector-borne diseases. “In particular, mosquitoes become more infectious faster when ambient temperature is increased. Heat could have also condensed pools of water, producing the small, nutrient-rich pools of water that Culex mosquitoes like to breed in. Thus, WNV outbreaks variably have been related to heat waves—including the outbreaks in 2002 and 2003, which didn’t have a heat wave as severe as this year, but temperatures were above normal. However, most areas experiencing heat waves do not have outbreaks, suggesting the influence of many other factors. Too much rainfall washes out breeding sites.”

While Texas is suffering a drought that began in October 2010 and continued through 2012, “many areas hard hit by the WNV outbreak had near normal rainfall,” Petersen continues. “In addition, artificial irrigation throws a monkey wrench into any analysis such as this. Cities have lots of water, even in droughts. Thus, we see outbreaks in places like Phoenix. Bottom line—it’s complicated!”

Other important factors include the number of birds, both susceptible and immune to the virus. Furthermore, although scientists are trying to determine whether WNV mutated, there is no evidence “to suggest that this outbreak was caused by a change in the virus itself,” Petersen says.

Marlene Cimons lives and writes in Bethesda, Md.

MINITOPIC
Not “Strads,” but Fungus-Treated Violins Sound Good

Treating wood from spruce and sycamore trees with two species of fungi, Physisporinus vitreus and Xylaria longipes, improves the tonal quality of modern stringed instruments that are made with that wood, making them sound more like the renowned violins that were made by Antonio Stradivari and his coworkers during the 17th and 18th centuries in Italy, according to Francis W. M. R. Schwarze of the Swiss Federal Laboratories for Materials Science and Technology in St. Gallen, Switzerland. He says that these fungi gradually thin the cell walls of such trees, but leave intact a scaffold structure through which “sound waves can still travel directly.” Whether that activity yields wood that rivals material found in much-revered “Strads,” however, remains an unsettled debate. Schwarze spoke last September during a symposium convened at the Max Delbrück Center for Molecular Medicine and Charité-Universitätsmedizin in Berlin-Buch, Germany.

Dallas, Tex., Mayor Mike Rawlings talks about aerial spraying for mosquitoes to curb the spread of West Nile virus, in front of one of the aircraft used to administer the insecticide, on 16 August 2012. Dallas began dropping insecticide from the air for the first time in more than 45 years, to combat the nation’s worst outbreak of West Nile virus, which had killed 18 people in the area by early October. (AP Photo/The Dallas Morning News, Brad Loper)