Elusive microorganism may cause urethritis

Researchers have been trying to figure out the disease-causing role of the mysterious microbe *Mycoplasma genitalium* for more than a decade. Now, a team of British scientists has evidence that this bug may underlie certain cases of urethritis, an infection of the tube (urethra) that drains urine from the bladder. They report their findings in the Sept. 4 LANCET.

The history of this research effort traces back to the discovery of a previously unknown microorganism in the genitourinary tract of two men suffering from nongonococcal urethritis (NGU). NGU, as its name suggests, is an infection with no link to the sexually transmitted *Neisseria gonorrhoeae*. In the June 13, 1981 LANCET, a U.S.-British research team, led by Joseph G. Tully of the National Institute of Allergy and Infectious Diseases in Bethesda, Md., and David Taylor-Robinson of the Clinical Research Center in Harrow, England, reported culturing this new mycoplasma, which they later named *M. genitalium*.

NGU is typically caused by another organism — *Chlamydia trachomatis*. Yet, the researchers knew that in many men, *C. trachomatis* doesn't cause this painful condition. They speculated that in such cases, the newly discovered *M. genitalium* might prove responsible. But since the mycoplasma was extraordinarily difficult to culture, the researchers could only wonder about their hypothesis.

With the advent of new molecular techniques for studying tricky organisms, the British contingent, led by Taylor-Robinson, decided to take another look at *M. genitalium*. He and his colleagues recruited 103 men who had NGU and compared them to 53 controls, men who had no such infection. The scientists collected samples of urethral fluid and used a powerful new technique called polymerase chain reaction (PCR) to locate DNA from any *M. genitalium* that might be present in those samples. PCR uses DNA probes to home in on and amplify tiny fragments of genetic material from the target organism.

The team's study shows a statistically significant association between the presence of *M. genitalium* and NGU, says coauthor Patrick J. Horner, also at the Clinical Research Center. Indeed, 23 percent of the men with this type of urethritis were infected with *M. genitalium*, as opposed to just 6 percent of the controls. That association holds whether or not *C. trachomatis* is present, Horner says.

"These findings suggest that the association of *M. genitalium* with NGU is likely to be causal," the researchers say.

Further evidence that this bug actually causes NGU comes from a 1986 study, also conducted by Taylor-Robinson and Tully. When the researchers exposed the urethras of chimpanzees to *M. genitalium*, the animals developed an infection that resembles the NGU that afflicts humans. The researchers used chimpanzees as a model because it would be unethical to infect humans with a microorganism thought to cause disease, Tully notes.

However, it remains possible that the association between *M. genitalium* and urethritis is due to chance, Horner cautions. Further study must prove that this organism actually causes urethritis in men, he says.

Because *M. genitalium* has been so difficult to study, not much is known about this organism or how it spreads from person to person, Horner says. "The epidemiology of this organism needs to be properly defined," he adds, noting that it is possible that *M. genitalium* is spread via sexual contact.

M. genitalium might also play a role in pelvic inflammatory disease (PID), a sexually transmitted infection of the pelvic organs in women that is usually caused by *C. trachomatis*. Some women with PID show no evidence of *C. trachomatis* infection, and Horner wonders whether *M. genitalium* will prove the culprit in such cases, as it has in male urethritis. Left untreated, PID can cause scarring of the fallopian tubes and infertility.

— *K.A. Fackelmann*

Neutron stars: New link to gamma repeaters

The heavens often unleash flashes of gamma rays, but nearly every such burst of high-energy radiation occurs just once, vanishing without a trace. Astronomers have found only three sources that flash off and on at irregular intervals.

Scientists have suspected that these recurring emissions, known as soft gamma-ray repeaters because they have lower energy than the standard bursts, might stem from the activity of neutron stars. That's because researchers several years ago found that the location of one of the repeaters coincided with a supernova remnant, the shell of gas and dust ejected when a massive star collapses to form a neutron star. But with a source for only one repeater identified, the origin of these flashes remained uncertain.

A new study now links a second repeater with a supernova remnant, helping clinch the association between this recurring radiation and neutron stars. Shrinivas R. Kulkarni of the California Institute of Technology in Pasadena and Dale A. Frail of the National Radio Astronomy Observatory in Socorro, N.M., report their work in the Sept. 2 NATURE. Some researchers hope the new link may bolster the case that neutron stars produce the standard gamma-ray bursts, which have proved far more mysterious than repeaters (SN: 5/15/93, p.319).

Kulkarni and Frail began their study by searching astronomy catalogs for a radio-emitting counterpart to the soft gamma-ray repeater SGR1806-20. They found such a match, and an analysis of radio images indicates that the radio-emitting object is almost certainly a young supernova in the Milky Way. Kulkarni cautions that astronomers don't know the location of SGR1806-20 as precisely as that of another repeater, which researchers in 1982 linked with the youthful supernova remnant N49 in a neighboring galaxy, the Large Magellanic Cloud.

Nonetheless, he says, the new study strengthens the link between neutron stars and repeaters. "Taken together, these two associations argue strongly in favor of a neutron-star origin for the repeaters," Frail and Kulkarni note in their report.

In a commentary accompanying the NATURE article, Kevin Hurley of the University of California, Berkeley, notes that our galaxy contains hundreds of young supernova remnants, far outnumbering the three known repeaters. This mismatch, according to Kulkarni and Frail, suggests that only certain neutron stars can produce the gamma signals. These stars would have special properties, such as an unusually intense magnetic field or a particular rotation rate.

Kulkarni also notes an alternative possibility: Perhaps all neutron stars can produce recurring bursts of soft gamma rays, but only during a brief period — less than 500 years — of their lifetime. Thus, he speculates, at any given time in our galaxy, only a few neutron stars happen to be at the stage in which they become repeaters. In an upcoming ASTROPHYSICAL JOURNAL, Hurley and a team of French and Russian colleagues suggest that this scenario may best explain the small number of repeaters.

Although standard bursts may originate from far outside our galaxy and differ in several other ways from repeaters, some researchers theorize that neutron stars might explain both phenomena. In the May 1 ASTROPHYSICAL JOURNAL, Fulvio Melia of the University of Arizona in Tucson and Marco Fatuzzo of the University of Michigan in Ann Arbor speculate that it's all a matter of geometry. If a neutron star is oriented so that Earth-bound observers look directly along the star's axis of rotation, they will see a single, energetic burst of high-energy gamma rays. But if observers are not so aligned, they will record a more frequent event: repeated pulses of gamma rays that have lost energy when scattered by charged particles.

Though all neutron stars emit both types of radiation, repeaters from the multitude of distant stars are too weak to be recorded on Earth, Melia suggests.

— *R. Cowen*