Scientists Discover Plants Lend Clues to Chlamydia Cure

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Researchers from the Uniformed Services University of the Health Sciences (USU) have discovered that Chlamydia, a bacterium that causes a sexually transmitted disease (STD), shares an evolutionary heritage with plants. That shared evolutionary heritage, which is not found in most other bacteria, points to a prime target for development of an effective cure for Chlamydia infections.

Diaminopimelate, or DAP, is an unusual amino acid that is only synthesized by plants and bacteria. Plants use DAP to make lysine, an essential amino acid, while bacteria use DAP both to make lysine and as a key building block of their cell wall.

In studying the genome sequence of Chlamydia trachomatis for the DAP synthesis pathway, Anthony Maurelli, Ph.D., professor of Microbiology and Immunology at USU, along with Andrea McCoy, Ph.D., a former USU Molecular and Cell Biology graduate student, and Nancy Adams, a scientist in Maurelli's laboratory, discovered that Chlamydia appeared to be missing genes for three of the eight enzymes needed to make DAP. They discovered that a single Chlamydia gene, encoding the enzyme L,L-diaminopimelate aminotransferase, filled this pathway hole and provided a new route for synthesizing DAP.

The gene that Maurelli's team discovered was similar to a sequence that Thomas Leustek of Rutgers University had reported in the mustard plant Arabidopsis earlier this year. Collaboration between the two groups allowed them to show that the Chlamydia enzyme was the same as the plant enzyme and that the pathway used by plants to produce the essential amino acid lysine is probably used by Chlamydia to synthesize DAP for its cell wall.

Chlamydia infections commonly cause urethritis in men, and in women (who are generally asymptomatic with it), if untreated, can lead to pelvic inflammatory diease, ectopic pregnancy and infertility. An estimated 2.8 million men and women each year are infected with Chlamydia making it the most common bacterial sexually transmitted infection in the United States. Chlamydia can be easily treated and cured with antibiotics. However, bacteria often develop resistance to antibiotics, and this discovery offers potential for new drug development. The discovery also suggests that inhibitors of this new enzyme may prove to be effective herbicides as well.

The latest work, which describes the similarities in the enzymes of Chlamydia and plants, was published in the *Proceedings of the National Academy of Sciences'* Online Early Edition this week. In addition to Dr. Maurelli's team, other authors include Thomas Leustek and Andre Hudson of Rutgers University and Charles Gilvarg of Princeton University.

Source: Uniformed Services University of the Health Sciences