'Dawning of a new age' in bacteria research

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Lowly bacteria are turning out to be much more complex than previously thought.

In the July, 2010 issue of the journal Molecular Microbiology, Loyola University Health System researchers describe an example of bacterial complexity, called "protein acetylation," which once was thought to be rare in bacteria.

This discovery that protein acetylation is common in bacteria has led to the "dawning of a new age" in bacterial research, senior author Alan Wolfe, PhD. and colleagues wrote.

Protein acetylation is a molecular reaction inside the cell. It modifies and thus affects the function of proteins, including the molecular machinery responsible for turning genes on or off.

Bacteria make up one of the three domains of life. The other two domains are archaea (single-cell organisms distinct from bacteria) and eukaryotes (which include plants and animals). Bacteria evolved before eukaryotes, but they are not as primitive as once thought.

"Bacteria have long been considered simple relatives of eukaryotes," Wolfe and colleagues wrote. "Obviously, this misperception must be modified."

For example, protein acetylation historically had been considered mostly a eukaryotic phenomenon. But recent research indicates that acetylation

also has a broad impact on bacterial physiology.

"There is a whole process going on that we have been blind to," Wolfe said.

Wolfe's laboratory works with intestinal bacteria called Escherichia coli, commonly called E. coli. While some strains of E. coli can cause serious food poisoning, most strains are harmless or even beneficial.

E. coli and its 4,000 genes have been extensively studied for decades. Consequently, researchers now have the ability to quickly determine what happens when a gene is deleted or made more active. "We're explorers with lots of tools," Wolfe said.

Studying protein acetylation will improve scientists' basic understanding of how bacterial cells work. This in turn could lead to new drugs to, for example, kill or cripple harmful bacteria.

"We're in the very early days of this research," Wolfe said. "We're riding the front of the wave, and that's exhilarating. The graduate students in my lab are working practically around the clock, because they know how important this is."

Provided by Loyola University