Yale researchers discover Legionnaire microbe's tricks

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Yale University researchers have shed new light how bacteria like the ones that cause Legionnaires' disease and Q-fever raise such havoc in human patients.

In order to survive, the gram-negative bacteria use genes that have evolved in tandem with ones in their hosts to essentially disarm immune system cells trying to kill them, the scientists report Friday in the journal *Science*.

"Because of their life style, trying to identify how these organisms cause disease has been really difficult," said Craig Roy, professor at the Yale School of Medicine in the section of microbial pathogenesis.
Roy and his group described one innovative way the organisms inflict their damage with impunity.

Some gram-negative pathogens such as Legionella pneumophila, and Coxiella burnetii, the cause of Q fever, actually secrete proteins into eukaryotic cells, or cells with a nucleus. But exactly what those proteins did was not known.

Legionnaires' disease is a dangerous form of pneumonia often contracted by inhaling water droplets containing the organism. Q-fever in humans can cause high fevers, chills and can also develop into pneumonia. Both often go undiagnosed.

Previous genome scans of the gram-negative bacteria that cause these

diseases had identified a high prevalence of genes called Anks, for ankyrin repeat homology domains. These genes fascinated scientists because they appear very similar to numerous genes in eukaryotic cells that regulate a multitude of processes. These bacteria have "borrowed" or co-evolved genes from their hosts to survive in the cell. In fact, some species of these bacteria cannot exist outside of a eukaryotic cell.

Roy's lab showed that Ank proteins are secreted into immune system cells called macrophages, and once inside, turn off mechanisms within the cell designed to destroy the bacteria.

Roy believes that more such survival tricks of gram-negative pathogens will be found but adds, "this study at least gives us a foothold" for further study.

Because these bacteria tend to behave like viruses and actually invade cells, they might be susceptible to a vaccine that targets specific elements of the Ank protein and allow macrophages to complete the job, he said.

Source: Yale University