Newfound hijacked proteins linked to salmonella virulence

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This is Dr. Herve Roy outside his lab at the University of Central Florida. Credit: UCF

Scientists have discovered that bacteria like E. coli and Salmonella have a sneaky way of making minor alterations to their genes to boost their chances for infection.

It's a fascinating discovery made at Ohio State University, which is featured in the Aug. 14 issue of *Nature Chemical Biology.* This discovery shows how bacteria make tweaks in their genes, and their proteins to gain strength.

The team includes research scientist Herve Roy, who joined the University of Central Florida faculty at the College of Medicine this month. He co-authored the paper after conducting research in OSU

Professor Michael Ibba's lab.

"Mother Nature tinkers a lot," Roy said from his new lab in Orlando. "Our recent findings illustrate that new proteins in living organisms often evolve from older pre-existing ones, and that evolution updates biochemical mechanisms of living cells by tweaking them a little by applying molecular patches."

The precise role of one protein in bacteria, EF-P, remains a mystery, but this team found that it plays an essential role in the virulence of Salmonella enterica typhimurium, a common foodborne pathogen causing diarrhea, fever, and abdominal cramps, and occasionally lifetime chronic arthritis. Salmonella also accounts for about 400 deaths each year in the United States.

EF-P is known to play a role in protein biosynthesis, which is a keystone mechanism present in all organisms. This process is the chain assembly line that decodes the blue prints stored in the genomes of living organisms, to make all the proteins necessary to sustain life.

The team's research identified a modification born by EF-P that acts as a molecular patch on protein synthesis. The patch seems to increase the bacteria's prowess. Interestingly, the modification on EF-P is made by a hijacked protein, normally involved in the protein synthesis machinery itself.

In the Aug. 14 issue of Nature Chemical Biology, Roy and co-authors identified the chemical nature of the modification that occurs on EF-P. This is critical because in the team's experiments, when the modified version of EF-P is absent, Salmonella doesn't spread.

Because the mechanism by which the modification occurs is unique to bacteria and this system is involved in virulence it could be a potential

drug target, Ibba said.

Roy's experience and interest in this area is what drew him to UCF. His lab in the Burnett School of Biomedical Sciences at UCF will use National Institutes of Health funding to explore how some other components of the protein synthesis machinery have been hijacked to accomplish alternate cellular processes. For instance, one process utilizes parts of the protein synthesis machinery to modify components of the bacterial membrane. This mechanism increases bacterial resistance to a large spectrum of antibiotics and presents a good avenue for new drugs that could potentially alleviate or cure many infectious diseases.

"That's why I came to UCF," Roy said. "There is a good team of scientists here working in infectious diseases. There is a good opportunity to collaborate and make a difference."

Provided by University of Central Florida