In the Bacterial World, Genetic Messengers Work Close to Home

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(PhysOrg.com) -- In a fundamental shift in the view of how bacteria proliferate and survive, Yale scientists report online June 20 in the journal *Nature* that most of the genetic action within a cell takes place close to home.

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Since bacteria lack internal compartments such as a nucleus, scientists had long assumed that the genetic activity - or more precisely the workings of messenger RNA that translates the genetic information contained within DNA into proteins - occurred randomly throughout the entire cell.

“Bacteria were originally viewed as simple bags, where activity is diffused throughout the entire cell,” said Christine Jacobs-Wagner, professor of molecular, cellular & developmental biology, investigator for the Howard Hughes Medical Institute and senior author of the paper. “Instead, it turns out they have exquisite spatial and temporal mechanisms that govern their behavior.”

Using the advanced microscopy technology and computational tools, the Yale team was able not only to identify many different mRNAs within bacteria but where in the cell this genetic activity was taking place. They found that mRNAs were not nomads at all, but homebodies, staying

close to the genes from which they arose.

“We anticipate that this spatial organization has broad ranging effects on cellular behavior,” she said.

The Yale scientists studied two widely divergent species of bacteria - Escherichia coli and Caulobacter crescentus suggesting that the localization of mRNA is a common feature in all bacteria.

These new insights into the cell biology of bacteria obtained from tracking the location and timing of molecular events will lead to greater ability to understand their behavior, including those that cause human disease, she said.

Provided by Yale University