

Scientists equip bacteria with custom chemo-navigational system

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Using an innovative method to control the movement of *Escherichia coli* in a chemical environment, Emory University scientists have opened the door to powerful new opportunities in drug delivery, environmental cleanup and synthetic biology. Their findings are published online in the *Journal of the American Chemical Society* and will be published in a future print issue.

Justin Gallivan, PhD, assistant professor of chemistry, and graduate student Shana Topp successfully reprogrammed *E. coli*'s chemo-navigational system to detect, follow and precisely localize to specific chemical signals. In doing so, the scientists exploited *E. coli*'s natural chemotaxis, a microbe's ability to move toward specific chemicals in its environment.

"Equipping bacteria with a way to degrade pollutants, synthesize and release therapeutics, or transport chemicals with an ability to localize to a specific chemical signal would open new frontiers in environmental cleanup, drug delivery and synthetic biology," says Dr. Gallivan.

The researchers equipped *E. coli* with a "riboswitch," a segment of RNA that changes shape when bound to certain small target molecules, which can then turn genes on or off. Dr. Gallivan and Topp believe that the riboswitch can be used to equip other types of self-propelled bacteria with "chemo-navigation" systems to move them toward desired targets.

Chemotactic bacteria navigate chemical environments by coupling their

information-processing capabilities to powerful, tiny molecular motors that propel the cells forward.

Researchers have long envisioned reprogramming bacteria so that microbes capable of synthesizing an anti-cancer drug, for instance, can be used to target diseased cells while sparing healthy cells of side effects. Likewise, scientists are researching ways to use bacteria to clean up oil spills or remove other pollutants from soil, water and wastewater.

Source: Emory University

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