UCI biologists turn up the heat on bacteria, discover mutation pattern

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UCI biologists who spent a year growing 115 populations into 2,000 generations of E. coli at high heat discovered that the bacteria quickly adapted at the genetic level in two markedly different ways. The findings appear in the current issue of the journal *Science*.

The team included Brandon Gaut, chair of the Department of Ecology & Evolutionary Biology; Albert Bennett, dean of the School of Biological Sciences; and Anthony Long, professor of ecology & evolutionary biology.

"Temperature is a complex challenge for an organism to respond to because it can affect so many parts of the cellular process," Gaut said.

They chose to apply heat (108 F, 42 C) rather than cold because Bennett had previously done so with smaller populations.

"We knew it would work, but we wanted to do it on a much grander scale so we could see genetic patterns emerging," Gaut explained.

In the populations that survived, the team identified 1,331 mutations affecting more than 600 sites in the bacterial DNA. Few of the mutations were shared from population to population, suggesting little overlap among their evolutionary paths.

But when the scientists stepped back and analyzed the mutations at the level of functional gene groups, they were surprised to find a strong

pattern: E. coli populations adapted to the heat by mutating one of two pathways, but rarely both.

Long said the findings could - among other applications - aid in the development of microbes for better ethanol and other biofuels, as well as bugs designed to clean up various environments.

Provided by University of California, Irvine