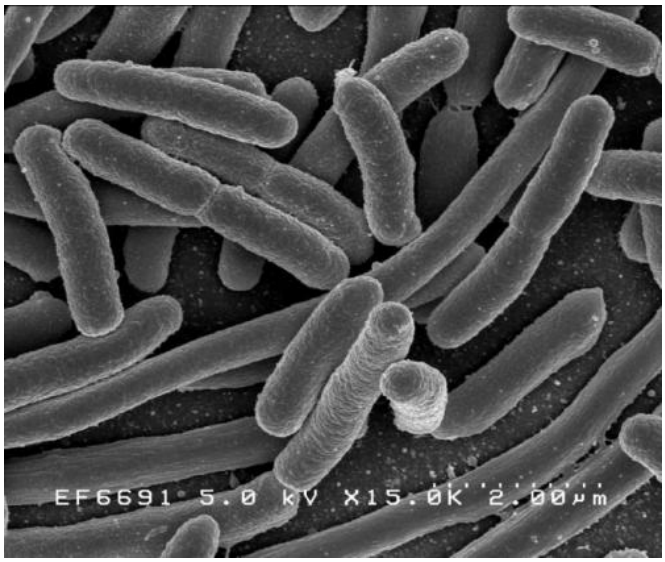
Experiment settles long time debate about evolution—in E. coli, at least

17 June 2022, by Bob Yirka



Escherichia coli. Credit: Rocky Mountain Laboratories, NIAID, NIH

A pair of researchers at Michigan State University has conducted an experiment with Escherichia coli bacteria meant to help settle a long-time debate in the evolutionary community. They have written a paper describing their experiment and results and have posted it on the *bioRxiv* website.

For many years, scientists in the evolutionary biology community have debated which has a bigger impact on the evolutionary process—diversity or random mutations. In this new effort, Minako Izutsu and Richard Lenski carried out an experiment involving evolution in E. coli bacteria over 300 days that included testing which—diversity or mutation—would have the greatest impact on their evolutionary development.

The experiment involved growing E. coli in their lab where the bacteria were allowed to reproduce under varying conditions for almost a year—long enough for them to produce approximately 2,000 generations.

At the outset, groups of bacteria with differing amounts of genetic diversity were placed into Petri dishes and fed glucose and amino acid D-serine. The degree of diversity ranged from zero, for cloned samples, to as widely diverse as the group could make them by mixing and matching samples prior to the experiment. All of the samples were tended the same as the bacteria grew and multiplied, and all of them were prodded to evolve by having them compete for food with a different strain of E. coli. Tests were conducted at multiple generation points, from 0 to 2,000.

In looking at the degree of adaption of the different groups, the researchers found that at generation point 50, those that had started out as more diverse had a clear edge—they evolved to better compete for food than those that started as less diverse. But as time passed and more generations were produced, the edge was reduced. By the conclusion of the study, the edge had disappeared altogether.

The researchers suggest that their experiment shows that benefits derived from initial diversity were soon lost over subsequent generations, suggesting that random mutations are the main driver of evolution—at least in E. coli.

The work by the researchers will not settle the debate of course, even after their paper is vetted and published in a respected journal. Similar experiments will have to be conducted in more complex creatures to see if their results hold.

More information: Minako Izutsu et al, Experimental Test of the Contributions of Initial Variation and New Mutations to Adaptive Evolution in a Novel Environment, *bioRxiv* (2022). DOI: 10.1101/2022.05.31.494207

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