

News & Comments

The Final Answer about Pre-Existing Variation in a Sexual Population

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A 34 yearlong experiment settles the debate about pre-existing variation in asexual populations. Experiments with bacteria conducted over 2000 generations suggest that existing variation contributes to evolution to a smaller extent than previously believed. Existing variation versus new mutations is the subject of a long-standing debate in biology. The theory has been tested in a study running 2000 generations of bacteria, and the new mutations quickly won out.

Minako Izutsu from Michigan State University explains that around 50 generations into the experiment, the diversity of the initial population was critical to adaptation. But after 500 generations, preexisting variation does not affect the evolution of a species, all evolution is due to new mutations.

The *E. coli* samples were collected as part of the Long-term Experimental Evolution Project, which was started by evolutionary biologist Richard Lenski, one of the co-authors of the recent paper. From 500th and 2,000th generations, the fitness was almost the same, despite the variation in fitness in the beginning. They observed a short-lived advantage of pre-existing variation in asexual populations, due to the purging of variations by mutations that sweep to fixation.

This long-standing experiment and its findings are one of a kind and more studies are needed to vet these results. But as of now, there is no 'correct' answer between, standing variation and new mutations for adaptation, according to the study author. It is mainly because researchers who study different models tend to "emphasize one source of genetic variation or the other."

Because it can be impractical to wait around for hundreds of years for mutations to mix things up, those who study animals and plants emphasize the 'diversity of genes' as the primary source of evolutionary capacity. While mutations are seen as the principal cause of evolution in bacteria and viruses. The study author commented that, in reality, there is no single precise answer, because both mutations and existing genetic diversity can equally, instantaneously, and synergistically contribute to the process of adaptation by natural selection.

KEYWORDS

Adaptation, bacteria, convergent evolution, *Escherichia coli*, experimental evolution, fitness, genetic diversity, standing variation

