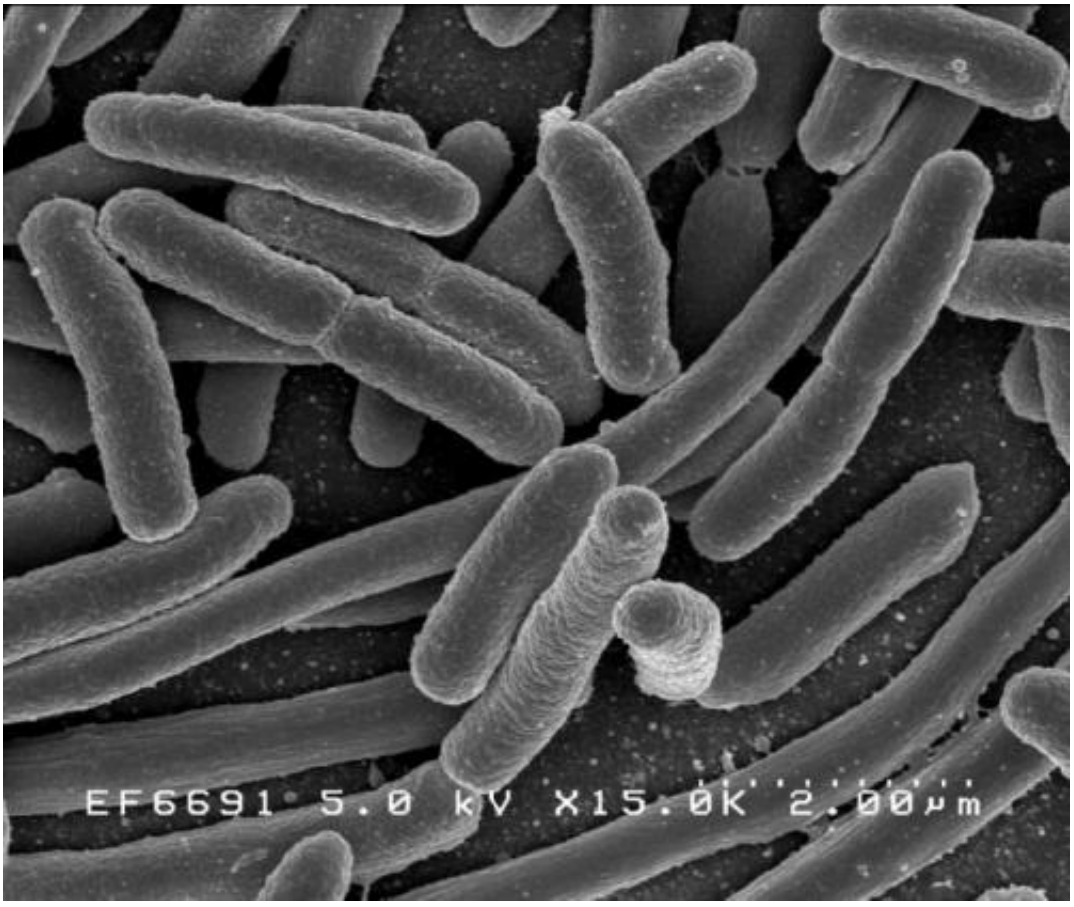
Researchers design and partially assemble a synthetic Escherichia coli genome

August 19 2016, by Bob Yirka



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

An international team of researchers working in a lab at Harvard University has taken a bold step towards the development of a bacteria with a completely rewritten genome. They describe their work in a paper

published in the journal *Science* and the reasons they believe the ultimate results will be safe for use in the real world. *Science* correspondent John Bohannon offers an In Depth piece on the work done by the team in the same issue and further discusses safety concerns tied to the new technology.

Scientists would like to be able to modify the genomes of creatures because they believe such creatures could offer benefits to us humans that are not available naturally. One example would be changing the genome of a certain type of bacteria to make it immune to viral attacks—this would be important because we humans use bacteria in a variety of applications and viruses tend to cause problems in many of them.

In this new effort, the researchers took a step into the future by eliminating redundant codons—triplets that represent four-letter DNA alphabet clusters—from the DNA of an *E. coli* bacterium, opening the door to the possibility of inserting new coding that would allow for the creation of new types of amino acids. To achieve this feat, they used machines to synthesize stretches of the genome (in its recoded form) and then inserted the chunks they had created into the genome of a living *E. coli* bacterium. The team managed to eliminate seven of the bacterium's 64 natural codons in the chunks they inserted and were able to test approximately 63 percent of them. They report that doing so resulted in very few interruptions to natural functions, which suggests the technique may prove a viable means for creating an entirely new genome for a given creature. Perhaps more impressive is the possibility of creating new types of codons to replace the redundancies that were removed, which could, for example, endow bacteria or other creatures with new capabilities, such as producing amino acids that could fight off new types of viruses.

The good news must be tempered with the bad of course as such

research is likely to stir fear in people who wonder what havoc might ensue should such bacteria make their way into the real world. The team has added a fail-safe, of course, and others will no doubt be developed, but because we humans are prone to error, no such fail-safe could ever be deemed 100 percent safe.

More information: N. Ostrov et al. Design, synthesis, and testing toward a 57-codon genome, *Science* (2016). DOI: 10.1126/science.aaf3639