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Artificial life is only months away, says biologist Craig Venter

Mark Henderson, Science Editor

Artificial life will be created within four months, a controversial scientist has predicted. Craig Venter, who led a private project to sequence the human genome, told *The Times* that his team had cleared a critical hurdle to creating man-made organisms in a laboratory.

“Assuming we don’t make any errors, I think it should work and we should have the first synthetic species by the end of the year,” he said.

Dr Venter, who has been chasing his goal for a decade, is already working on projects to use synthetic biology to create bacteria that transform coal into cleaner natural gas, and algae that soak up carbon dioxide and turn it into hydrocarbon fuels. Other potential applications include new ways of manufacturing medicines and vaccines.

Dr Venter’s prediction came after scientists at his J. Craig Venter Institute, in Rockville, Maryland, announced that they had developed a new method of transplanting DNA into bacteria, promising to solve a problem that has held up the artificial life project for two years.

The team took the first step in 2007 by implanting the genome of a bacterium, *Mycoplasma mycoides*, into cells belonging to a close relative, *Mycoplasma capricolum.* This transformed the host bacteria into *Mycoplasma mycoides.*

Last January the team built a bacterium’s entire genetic code from scratch. The next step was to transfer this synthetic genome into a host cell, using the 2007 transplant technique, to “reboot” it with genetic instructions written by humans. This has failed so far because the synthetic genome will not work when it is transplanted into host cells.

The new research, published in *Science,* has identified the probable reason for this failure and developed a new approach that should address it.

Natural bacterial genomes, such as the one that was successfully transplanted, are chemically modified by a process called methylation. When they are inserted into other cells this process appears to protect them against chemicals called restriction enzymes, which defend against viruses.

The synthetic genome, however, is not methylated, as it has to be grown in yeast, which does not provide the necessary chemical modifications, thus leaving it open to attack by the restriction enzymes.

In the new study, the Venter team grew the natural *M. mycoides* genome in yeast, under similar conditions to the synthetic genome, so that it had no methylation. These genomes failed to take when they were transplanted into host cells.

The team then remethylated the *M. mycoides* genome in the laboratory before placing it into the host cell. This time the transplants worked and the cells were rebooted as *M. mycoides.*

The success suggests that methylating the synthetic genome before transfer should allow it to take over host cells and reboot them with its DNA. Experiments in this have now begun.

Methylation should protect the synthetic genome against the host cells’ defences, much as drugs that suppress the immune system protect transplanted organs against rejection.

Hamilton Smith, a Nobel laureate who is another leader of the research, said: “I believe this work has important implications in better understanding the fundamentals of biology to enable the final stages of our work in creating and booting up a synthetic genome. This is possibly one of the most important new findings in the field of synthetic genomics.”

Dr Venter said the research was particularly important because it opened the door to altering algae and bacteria to perform useful functions.

“This could be one of the most powerful tools in biology,” he said.