BBC NEWS

# Synthetic life 'advance' reported

By Helen Briggs
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**An important step has been taken in the quest to create a synthetic lifeform.**

A US team reports in Science magazine how it built the entire DNA code of a common bacterium in the laboratory using blocks of genetic material.

The group hopes eventually to use engineered genomes to make organisms that can produce clean fuels and take carbon dioxide out of the atmosphere.

Publication of the research gives others the chance to scrutinise it. Some have ethical concerns.

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> Dr Hamilton Smith, Nobel Prize winner

These critics have been calling for several years now for a debate on the risks of creating "artificial life" in a test tube.

But Dr Hamilton Smith, who was part of the Science study, said the team regarded its lab-made genome - a laboratory copy of the DNA used by the bacterium *Mycoplasma genitalium* - as a step towards synthetic, rather than artificial, life.

He told BBC News: "We like to distinguish synthetic life from artificial life.

"With synthetic life, we're re-designing the cell chromosomes; we're not creating a whole new artificial life system."

**Gene cassettes**

The team of 17 scientists constructed the bacterial genome by chemically synthesising small blocks of DNA.

These were grown up in a bacterium, and knitted together into bigger pieces, so-called "cassettes" of genes.

The researchers ended up with several large chunks of DNA that were joined to make the circular genome of a synthetic version of *Mycoplasma genitalium* .

They have named it *Mycoplasma JCVI-1.0* , after their research centre, the J Craig Venter Institute in Rockville, MD, US.

Dr Craig Venter, who was involved in the race to decode the human genome, believes tailor-made micro-organisms can become efficient producers of non-polluting fuels such as hydrogen. Other synthetic bacteria could be made to take up greenhouse gases, he believes.

"It sets the stage for what we hope is going to be a new approach to engineering organisms," said co-researcher Dr Smith.

**Operating systems**

To achieve this goal, the researchers must overcome a crucial, and tricky, obstacle.

They must transplant the synthetic genome into another cell so that it can use the existing machinery to "boot up" and start growing and reproducing.

STEPS TO SYNTHETIC LIFE
- **2002** : synthetic virus created - a lab version of polio
- **2007** : a genome from one cell is placed in another
- **2008** : publication of synthetic genome study

"It's installing the software - basically we have to boot up the genome, get it operating," said Dr Smith, who shared a Nobel Prize in 1978 for furthering knowledge on how to cut up segments of DNA.

"We're simply re-writing the operating software for cells - we're not designing a genome from the bottom up - you can't drop a genome into a test tube and expect it to come to life," he added.

This is the stage which raises the most concern among critics, and where a new lifeform could be said to be truly created. How precisely will it behave? What will its impact be on other organisms and the environment? Some say it is a step too far, but others argue that the new field of synthetic biology is an important science.

**Even bigger**

The UK's Royal Society is seeking views from the public on the issue.

Adviser on synthetic biology, Dr Jason Chin, said the increasing ability to design and construct DNA sequences would, in principle, allow the construction of organisms for particular purposes, such as biofuels production.

He added: "Understanding how you construct organisms artificially is an important first step. But scientists still need to understand what effect altering the DNA sequence of an organism - such as bacteria - will have upon their behaviour."

Dr Drew Endy of the Department of Biological Engineering at Massachusetts Institute of Technology, US, said that re-constructing a natural bacterial genome from scratch was a great technical feat.

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He said genomes 10 times larger than *Mycoplasma JCVI-1.0* had already been assembled from existing DNA fragments by a Japanese group.

Dr Endy added: "Given the work already done in Japan, building genomes almost 10 million base-pairs long - I would be surprised if by 2012 it were not technically possible to routinely design and construct the genomes of any bacteria or single celled eukaryote, which also means that it will be possible to construct some mammalian chromosomes."

Dr Simon Woods, a bio-ethicist at the Policy, Ethics and Life Sciences Research Centre at the University of Newcastle, UK, said scientists were acting in a regulatory vacuum.

"On the one hand it's an amazing piece of science but the real concern is that it's another example of science delving into matters that have potentially dangerous consequences," he said.

"It's not necessarily going to stay in the hands of well-intentioned scientists."

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