Researchers bring new meaning to the term 'computer bug'

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US researchers have created ‘living computers’ by genetically altering bacteria. The findings of the research, published in BioMed Central’s open access *Journal of Biological Engineering*, demonstrate that computing in living cells is feasible, opening the door to a number of applications including data storage and as a tool for manipulating genes for genetic engineering.

A research team from the biology and the mathematics departments of Davidson College, North Carolina and Missouri Western State University, Missouri, USA added genes to Escherichia coli bacteria, creating bacterial computers able to solve a classic mathematical puzzle, known as the burnt pancake problem.

The burnt pancake problem involves a stack of pancakes of different sizes, each of which has a golden and a burnt side. The aim is to sort the stack so the largest pancake is on the bottom and all pancakes are golden side up. Each flip reverses the order and the orientation (i.e. which side of the pancake is facing up) of one or several consecutive pancakes. The aim is to stack them properly in the fewest number of flips.

In this experiment, the researchers used fragments of DNA as the pancakes. They added genes from a different type of bacterium to enable the E. coli to flip the DNA ‘pancakes’. They also included a gene that made the bacteria resistant to an antibiotic, but only when the DNA fragments had been flipped into the correct order. The time required to reach the mathematical solution in the bugs reflects the minimum

number of flips needed to solve the burnt pancake problem.

“The system offers several potential advantages over conventional computers” says lead researcher, Karmella Haynes. “A single flask can hold billions of bacteria, each of which could potentially contain several copies of the DNA used for computing. These ‘bacterial computers’ could act in parallel with each other, meaning that solutions could potentially be reached quicker than with conventional computers, using less space and at a lower cost.” In addition to parallelism, bacterial computing also has the potential to utilize repair mechanisms and, of course, can evolve after repeated use.

Source: BioMed Central