



'Virtual Cell' Models Essential Process of Bacterial Division

Description

For the first time, researchers have simulated nearly all the chemical reactions in a living bacterial cell. This simulation shows how a cell copies its DNA and divides into two new cells.

The simulation helps scientists understand how proteins, nucleic acids (molecules that store genetic information), fats, and other substances work together in a cell. Zane Thornburg, a scientist at the University of Illinois, co-led the study published on 9 March in *Cell*.

To create the simulation, Thornburg used a simple bacterial cell called JCVI-Syn3a. This cell has a very small genome of just 493 genes, as scientists removed over 400 non-essential genes.

Thornburg's model represents the DNA, proteins, and other important molecules in a three-dimensional space. Some molecules obey specific rules from real-world measurements, and reactions happen when they come close together.

The team's aim was to show how JCVI-Syn3a copies its DNA and divides, which is known as the cell cycle. After some early problems, they let the model run for the US Thanksgiving holiday in November. When they returned, they found that the whole cell cycle had completed.

The simulated cell took 105 minutes to divide, which is very close to the real-life timing. However, running the simulation took six days on a supercomputer, showing how complex this type of model is. Bernhard Palsson, a bioengineer, says this simulation is important because it captures many cellular activities.

Comprehension Questions

Multiple Choice

1. What type of cell was used for the simulation?

Option: JCVI-Syn3a

Option: E. coli

Option: Bacillus subtilis

Option: Streptococcus pneumoniae

2. How many genes does the JCVI-Syn3a cell have?

Option: 493



- Option: 400
- Option: 300
- Option: 600

3. What was the publication date of the study?

- Option: 9 March
- Option: 1 February
- Option: 15 April
- Option: 10 May

4. How long did the simulated cell take to divide?

- Option: 105 minutes
- Option: 120 minutes
- Option: 90 minutes
- Option: 150 minutes

5. Who co-led the study published in Cell?

- Option: Bernhard Palsson
- Option: Zane Thornburg
- Option: James Watson
- Option: Francis Crick

6. How many days did it take to run the simulation on a supercomputer?

- Option: 6 days
- Option: 3 days
- Option: 12 days
- Option: 9 days

True-False

7. The simulation includes the study of only nucleic acids.

8. The research was aimed at understanding the process of how JCVI-Syn3a divides its DNA.

9. Zane Thornburg is a scientist at Stanford University.

10. The whole cell cycle was found to have completed after the Thanksgiving holiday.



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11. Thornburg's model operates in a two-dimensional space.
 12. Bernhard Palsson is a biologist with a focus on bioengineering.

Gap-Fill

13. The simulation shows how a cell copies its DNA and divides into _____ new cells.
14. Zane Thornburg co-led the study published in _____
15. The JCVI-Syn3a cell has a genome of just _____ genes.
16. The team let the model run for the US Thanksgiving holiday in _____
17. The simulated cell took _____ minutes to divide.
18. Running the simulation took _____ days on a supercomputer.

Answer

Multiple Choice: 1. JCVI-Syn3a 2. 493 3. 9 March 4. 105 minutes 5. Zane Thornburg 6. 6 days
True-False: 7. False 8. True 9. False 10. True 11. False 12. True
Gap-Fill: 13. two 14. Cell 15. 493 16. November 17. 105 18. six

CATEGORY

1. Sci/Tech - LEVEL2

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