

**BACCALAURÉATS GÉNÉRAL ET TECHNOLOGIQUE**  
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THEME IA3: EVOLUTION  
SÉRIE: S,

**Study Finds Virus to Be Fast Learner on Infecting**

Viruses regularly evolve new ways of making people sick, but scientists usually do not become aware of these new strategies until years or centuries after they have evolved. (...) However, a team of scientists at Michigan State University describes how viruses evolved a new way of infecting cells in little more than two weeks. (...)

5 The Michigan researchers studied a virus known as lambda. It is harmless to humans, infecting only the gut bacterium *Escherichia coli*. Justin Meyer, a graduate student in the biology laboratory of Richard Lenski, wondered whether lambda might be able to evolve an entirely new way of getting into its host. The standard way for lambda to get into a cell is to latch onto its outer membrane, attaching to a particular kind of molecule on the surface of *E. coli*. It can then inject its genes and  
10 proteins into the microbe. Mr. Meyer set up an experiment in which *E. coli* made almost none of the molecules that the virus grabs onto. Now few of the viruses could get into the bacteria. Any mutations that allowed a virus to use a different surface molecule to get in would make it much more successful than its fellow viruses. (...) The scientists found that in just 15 days, there were  
15 viruses using a new molecule — a channel in *E. coli* known as OmpF. Lambda viruses had never been reported to use OmpF before. Mr. Meyer was surprised not just by how fast the change happened, but that it happened at all.

To see if this result was just a fluke<sup>1</sup>, Mr. Meyer ran his experiment again, this time with 96 separate lines. The viruses in 24 of the lines evolved to use OmpF. The researchers sequenced the genomes of the evolved viruses and were surprised to find that this transformation always required four  
20 mutations. In all the lines that could grab OmpF, those four mutations were identical, or nearly so. No single mutation could allow the viruses to start latching onto OmpF. Even three out of four mutations brought no change. Only after they developed all four mutations could the viruses make the switch.

(...) The new experiment provides a surprising glimpse at how easily viruses can evolve entirely  
25 new traits through new mutations — and thus give rise to new diseases.

By CARL ZIMMER, January 26, 2012 *The New York Times*

**Sum up this article and explain the main ideas using your scientific knowledge**

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<sup>1</sup> fluke = an accidental stroke of luck