

# Lesson 7.1

# Darwin & Evolution

Name

Date

Period



## Engage I:

An E.coli case study: It is not uncommon for the DNA strand in an E. coli bacterium to get corrupted. An X-ray, a cosmic ray, or a stray chemical reaction can change or damage the DNA strand. In most cases, a particular E. coli cell with mutated DNA will either die, fix the damage in the strand, or fail to reproduce. In other words, most mutations go nowhere. But every so often, a mutation will actually survive and the cell will reproduce.

Imagine, for example, a bunch of identical E. coli cells that are living in a Petri dish. With plenty of food and the right temperature, they can double in number every 20 minutes. That is, each E. coli cell can duplicate its DNA strand and split into two new cells in 20 minutes.

Now, imagine that someone pours an antibiotic into the Petri dish. Many antibiotics kill bacteria by damaging one of the enzymes that the bacteria need to live. For example, one common antibiotic damages the enzyme process that builds the cell wall. Without the ability to add to the cell wall, the bacteria cannot reproduce, and eventually they die.

When the antibiotic enters the dish, all of the bacteria should die. But imagine that, among the many millions of bacteria living in the dish, one of them acquires a mutation that makes its cell-wall-building enzyme different from the norm. Because of the difference, the antibiotic molecule does not attach properly to the enzyme, and therefore does not affect it. That one E. coli cell will survive, and since all of its neighbors are dead, it can reproduce and take over the Petri dish. There is now a strain of E. coli that is resistant to that particular antibiotic.

A random DNA mutation created an E. coli cell that is unique. The cell is unaffected by the antibiotic that kills all of its neighbors. This unique cell, in the environment of that Petri dish, is able to survive.

E. coli are about as simple as living organisms can get, and because they reproduce so rapidly you can actually see the effects of these changes on a normal time scale. In the past several decades, many different types of bacteria have become resistant to antibiotics. In a similar way, insects become immune to insecticides because they breed so quickly. For example, DDT-resistant mosquitoes evolved from normal mosquitoes.

1. In your own words, explain what the mutation in the DNA strand of E. coli changed for the organism.
2. Is E. coli a prokaryote or a eukaryote?
3. Why did all of the unmutated E. coli die in the Petri dish?
4. Did the mutation in the DNA benefit or harm the E. coli? Explain your answer.
5. Do you think this mutation would be passed to the future generations of E. coli? Explain your reasoning.
6. Over time, some insects become resistant to insecticides. Why would this happen?



**Explore I** Answer the questions as you watch the video clip.

7. What theory did Darwin propose?
8. Natural selection favors genetic traits for survival in \_\_\_\_\_.
9. Over time, what occurs in all species on earth?
10. An elephant's trunk acts as what three things?
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11. What was the name of the ship Darwin traveled on?
12. What theory did he produce in the Galapagos Islands?
13. What did Darwin make a pro/con list for?
14. How many children did Darwin have?
15. What term did Darwin use to describe the selective breeding of faster racehorses?
16. What are the animals of the Galapagos Islands known for?
17. Swallow-tailed gulls have big red eyes that help them do what?
18. How many species of finches live in the Galapagos?
19. What do owls produce that scientist David Stedman was searching for?
20. David Stedman believes there was no \_\_\_\_\_ before the arrival of people. (What is the missing term?)