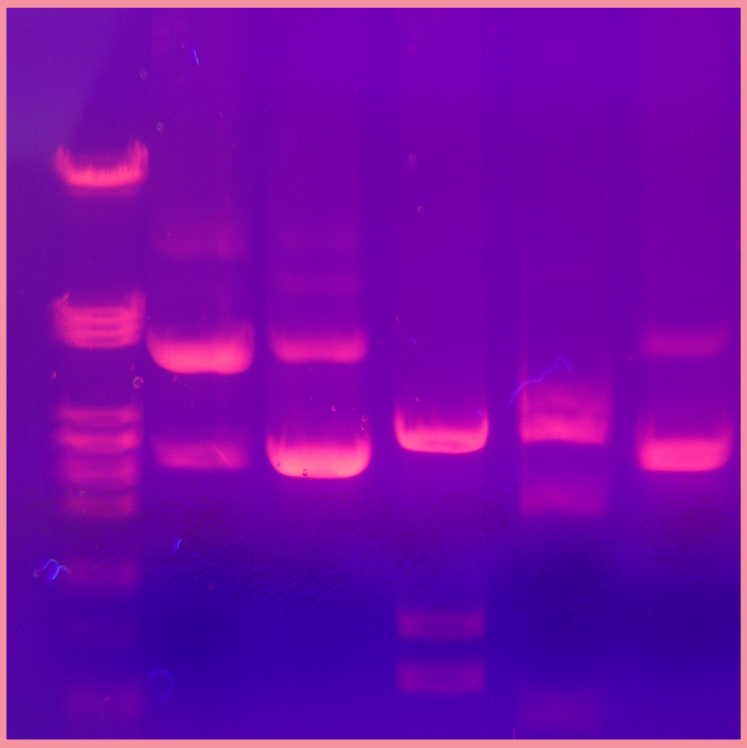
STEM Sims™

RFLP



STEM Sims™

RFLP

Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.

Start learning right now about the workings of restriction fragment length polymorphism (RFLP). Take the following brief quiz to see how much you already know about how special enzymes and gel electrophoresis help identify organisms and diseases. See the bottom of page 4 to check your answers.

1. About how many people in the United States have sickle cell disease?
   a. 1,000
   b. 10,000
   c. 100,000
   d. 1,000,000

2. About what proportion of African American babies are born with the sickle cell trait?
   a. 1 out of 13
   b. 1 out of 83
   c. 1 out of 833
   d. 1 out of 11,388

3. Sickle cell disease is most common in people who ancestors came from all of the following areas *except*:
   a. sub-Saharan Africa.
   b. the Nordic countries.
   c. India.
   d. the Caribbean.

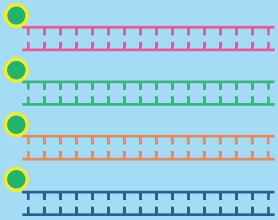
4. Light-color spotted and dark-color spotted jaguars are examples of polymorphism in a species.
   a. true
   b. false

5. The prefix “poly” means _____ while the root word “morphism” means _____.
   a. few; change
   a. few; same
   a. many; same
   a. many; forms

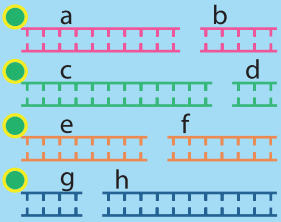
What's in My Water?

RFLP can be used for a variety of applications beyond determining the presence of disorders and diseases in a patient's genetic sample. The technique can also be used to identify which microbes are present in the water from a polluted site. In the first step, water is collected from the polluted site. Next, the DNA from the organisms in the water is isolated.

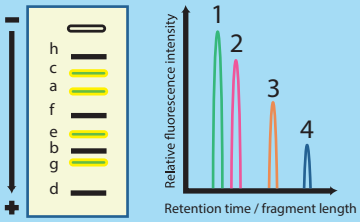
The amount of each DNA strand is then increased by PCR amplification and a fluorescent "dye" is added to highlight certain DNA segments.



The restriction enzyme is added to cut each DNA strand at specific locations. The DNA fragments are then sent through an electrophoresis gel to separate the fragments based on their size. The smaller the fragment, the greater distance traveled through the gel by the fragment.



The results of the electrophoresis gel and the electropherogram are shown below.



Match each DNA fragment with the corresponding band on the gel electrophoresis.

1	2	3	4	5	6	7	8

Match each DNA fragment with the corresponding curve on the electropherogram.

I	II	III	IV

RFLP

The Microbes in the Water

Water can look very clear and clean, yet still contain many organisms that cause illness. Cholera is one such microbe that has re-emerged in the waters of the world. The *Vibrio cholerae* bacteria found in polluted water due to unsanitary conditions causes severe intestinal problems that can lead to dehydration and eventually death if untreated.

New strains of the bacteria with different genotypes than the current strains have been documented, as well as the reappearance of older strains that have been unseen for many years. In Iran in 2011, the dominant strain of *V. cholerae* was called Ogawa. Over time the Inaba genotype pushed the Ogawa out as the dominant strain. However, in 2015 the Ogawa genotype again became the dominant genotype. This re-emergence of an older strain alarmed the virologists in Iran, since many of them thought this evolutionary change was not possible once a strain lost its position as being the dominant genotype.

The presence of older strains of the bacteria makes them more likely to show resistance to existing treatments. Since the use of antibiotics is recommended for cases of severe cholera, the possibility that the older strains of bacteria may not respond to these treatments becomes a real concern. The use of RFLP techniques to identify the specific genotype of the dominant and emerging strains of *V. cholerae* is an important tool in the fight against the disease that affects around 3 million people worldwide and causes around 100,000 deaths each year.

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STEMsims.com

Answers: **Page 2 Answers:** 1) c, 2) a, 3) b, 4) a, 5) d. **Page 3 What's in My Water?** 1 = h, 2 = c, 3 = a, 4 = f, 5 = e, 6 = b, 7 = g, 8 = d. I = c, II = a, III = e, IV = g.