NAME _____ CLASS _____ DATE _____

Concepts of Biotechnology 3

Forensics: How DNA Profiles Can Be Applied to Legal Matters

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News reports often describe how genetic evidence is being used to decide legal issues. Genetic evidence, in the form of DNA *fingerprinting,* is used to solve immigration disputes, convict or acquit suspects, and to establish identity. DNA fingerprinting has nothing to do with actual fingerprints. Instead, DNA fingerprinting is a series of tests performed on a person's DNA that make a unique genetic profile. The DNA profiles are often called "DNA fingerprints" because, like a traditional fingerprint, each person's profile is unique. The term DNA fingerprint has recently been changed to DNA *profile* because people often confuse genetic and physical fingerprints.

VARIATIONS IN DNA In 1985, Dr. Alec Jeffreys, a British scientist, invented DNA profiling and coined the term DNA *fingerprint.* Although the DNA of all humans is 99.9 percent similar, Jeffreys found that some regions of human DNA vary greatly between people. The variations result from people having different numbers of repeated DNA sequences. When a sample of DNA is cut with restriction enzymes, some DNA fragments are longer than others. The sizes of the fragments depend on the numbers of repeated DNA sequences.

In his experiments, Jeffreys attached radioactive probes to the variable areas of DNA. When the images were developed, he saw a series of black and gray bands which resembled the bar codes on various products. Jeffreys observed a great variation in the banding patterns. Each person, except identical twins, had her or his own unique profile! Jeffreys also found that a child's DNA profile was a combination of the bands from each parent.

FIRST LEGAL USES OF DNA PROFILING Dr. Jeffreys was soon asked to use his technique to help solve an immigration case. This case was the first time that DNA profiling was used in a court of law. A woman had sent her son to Ghana to visit some relatives. When the boy returned to England, there was a question about his passport. British officials refused to let the boy enter the country, claiming that he was her nephew, not her son. The officials thought the boy was trying to enter the country illegally. With DNA profiling, Dr. Jeffreys proved that the boy was the woman's son.

Shortly afterwards, Dr. Jeffreys used DNA profiling to solve two murder cases in an English village. Jeffreys proved that the first man arrested for the crimes was innocent. To catch the real criminal, police collected blood samples from every man who lived or worked near the scenes of the crimes. Over 5,500 blood samples were tested, but none revealed the criminal.

The real criminal, Colin Pitchfork, was actually caught after police discovered that he had bribed a co-worker to give a blood sample for him. Pitchfork had forged identification papers enabling his friend to represent him. In time, Pitchfork was arrested for questioning. New DNA samples were taken from Pitchfork and compared with samples previously taken from both crime scenes. DNA profiling confirmed that Pitchfork had committed both crimes. Pitchfork was convicted and sent to prison.

OTHER LEGAL USES OF DNA PROFILING In the past few years, DNA profiling has gained wider recognition and has become a powerful forensics, or legal, tool. DNA profiling is routinely used to solve many kinds of crimes. Hunters have been arrested for poaching after genetic tests proved that the animals were killed and transported illegally across state lines. In the bombing of New York's World Trade Center, saliva from an envelope flap was used to link one suspect with the crime. DNA profiling can also be used to prove a person's innocence. Some people, including an inmate on death row, have been released from prison after genetic tests showed that they were innocent.

Performing DNA tests is not easy. It requires technical precision. DNA tests must be conducted and analyzed by trained laboratory personnel following standard procedures. Mistakes can occur, both in the chemical procedures and by human error. Care must be taken to prevent the contamination of samples, mislabeling, or other errors which would affect the results. Defense lawyers often attack DNA tests on the grounds of human error or human interpretation of banding patterns.

Despite occasional mistakes, genetic evidence will continue to be used in court rooms across the country. Lawyers on both sides agree that genetic evidence is extremely powerful. New regulations are being developed to govern the collection and analysis of samples. DNA profiling has proved to be a valuable addition to the traditional types of legal evidence.

NAME _____ CLASS _____ DATE _____

REVIEW *In the space provided, answer the following questions.*

1. What is a DNA profile?

2. Why are DNA profiles important in deciding legal issues?

3. Briefly describe two situations in which DNA profiling was used to resolve legal issues.

4. Why is the use of DNA profiles sometimes controversial?

CONSIDER THIS *On a separate sheet of paper, answer the following questions.*

1. Describe other situations where DNA profiling might be useful.
2. Imagine that you are a defense lawyer. What would you think about having DNA evidence used in the trial? Support your point of view.

