UNIT 11 Audioscript

CONNECT to the topic page 102

Genetics counselor Dr. Navdeep Shan: Good morning. I'm Dr. Shan. So I understand you have some questions about genetic testing. How can I help?

Patient: Well, basically, I'm healthy now, but my father has heart disease. I was wondering if there's a genetic test that I could take to find out if I'll get it, too.

Dr. Shan: I understand. We call that type of testing "predictive testing" because we use it to predict risk.

Patient: How do you do the test?

Dr. Shan: We take blood samples from your father and from you. Then we analyze those samples to compare your genes with genes that are associated with heart disease.

Patient: So, will the test tell me if I will get heart disease like my father? That's what I want to know—will I get it?

Dr. Shan: No, no, no. The test won't really tell you that. The test determines if you have a gene mutation that increases your risk of getting heart disease. If you and your father both have this mutation, this doesn't mean you will definitely get heart disease—only that your risk is higher.

Patient: So, if the test can only tell me the risk, why would I do it?

Dr. Shan: That's a very fair question. We can use the test results to make decisions about your medical care so you can continue to be healthy. You don't need to decide today. Why don't you think about it, and then we can talk more.

Patient: Sounds good. Thank you.

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Speaker: So, let's say the police need to know if two people are brother and sister. What do they do? Well, they first conduct DNA testing on one of them, and then conduct DNA testing on the other one. Next, they compare the results and look for genetic similarities. After that, they draw some conclusions about whether the two people are, in fact, brother and sister, since siblings share some of the same genetic information. If they don't share any genetic information, they're obviously not brother and sister, are they?

WATCH the lecture page 106

Professor Robert Myers E01 Hello. Today I'd like us to concentrate on DNA. We'll focus on DNA testing—and specifically on DNA testing of people. **E02** Before I explain how it's done, I want to review a bit from the reading. Now, you'll recall that cells comprise every part of our body. Our DNA is in every cell. DNA contains genetic information like eye color, hair color, height, and many other traits passed down from a mother and a father to their child. So, each of us has our own DNA—our own combination of genetic information from our parents. For example, a brother and a sister may end up with the same color of eyes and hair. However, other genetic information received from the parents will be different, which is why they look different. For example, maybe the brother is short like the mother, and the sister is tall like the father. Keep in mind that DNA is in every cell in the body, and that all of these cells contain the same genetic information. **(COACHING TIP 1) E03** Now, let's look at how DNA testing is used to identify people. Scientists create a DNA profile, also called a DNA "fingerprint." To do this, they need DNA from the person. They take samples from different parts of the body—like hair, blood, skin, fingernails, and body fluids. **(COACHING TIP 2)** Next, they extract the DNA from the cells in these samples. Then they read the DNA with a computer. They use the data to create the DNA fingerprint. Statistically, it is very unlikely that any two people will have identical fingerprints. **E04** Now let's ask, how is DNA testing used? Well, there are many ways—for example, to identify an unknown accident victim, or to find out who the father of a child is. Now, here's an interesting one. In 1999, scientists used DNA testing to prove that the son of the French king, Louis the Sixteenth, and Marie Antoinette in fact died in prison—he didn't escape as some people had believed. DNA testing identified the son's body. People had been arguing about this for more than two centuries! **E05** Another use of DNA testing is by police to solve crimes. For example, say there's a murder. The police have a suspect they think did it. In the crime lab, scientists use DNA samples from the suspect and DNA samples from the evidence at the crime scene. Then they design what's called probes. When the probes are put in with the DNA samples from the suspect and the DNA samples from the evidence, the probes show if the two sets of samples match. **E06** DNA identification is very effective, but not 100 percent foolproof. For example, suppose the only evidence at the crime scene is blood from the suspect. If there's a match between a sample of the crime scene blood and the suspect's blood, this will help the police. However, a single match—from just blood, in this case—isn't very strong evidence. In contrast, let's say the crime lab has four samples from the crime scene and four samples from the suspect—hair, blood, fingernails, and skin samples. They design four probes, one for each sample, and

they get four matches—bingo! The police can now feel more confident that they have the right suspect. Why? Remember, I said DNA is in every cell in our body, and each cell contains all of our unique genetic information. **(COACHING TIP 3) E07** Now, let's turn to how DNA testing is used in the medical field. Here, let's consider how genetics is being used to diagnose diseases. With diseases, most DNA tests are given for one of two reasons: either to find out if someone has a certain disease, or to see if the person is at risk for developing it. **E08** Researchers have found more than 6,000 genetic disorders. A genetic disorder means something isn't normal in the person's genes: a mutation. A change in one gene can cause a disease. And a DNA test can show if someone has a mutation in a gene that puts them at risk for the disease. Notice I'm not saying that a change in one gene will cause a disease, only that the risk is higher. We're learning more and more every day about genetic diseases. For example, it now appears that the disease Alzheimer's, which damages memory in older people, is linked to our genes. **E09** So, we have to ask: What are the pros and cons of DNA testing in medicine? On the positive side, testing might save lives. If a doctor can diagnose a disease in its early stages, the patient can get treated earlier. Or if a couple wants to have a baby, they can use DNA testing to find out beforehand if any risks for problems or diseases exist. On the negative side, there's the issue of fairness. What happens if DNA testing reveals that we have a genetic disorder that could cause a disease and that information becomes known? **E10** This brings us to some concerns about privacy. A DNA profile contains a lot of personal information. So I'd like you to think about the following questions: One: Who should own the DNA fingerprint once it's made? Two: Who should have access to it? Three: How should genetic information be used? And four: Would you want people, especially people you don't know, to have access to your DNA fingerprint? These are some of the ethical questions we face about how to use the scientific knowledge we have. So, please give these questions some thought as you review the lecture. That's all for now. **(COACHING TIP 4)**

HEAR the language page 108

1 Keep in mind that DNA is in every cell in the body, and that all of these cells contain the same genetic information.

2 They use the data to create the DNA fingerprint.

3 Statistically, it is very unlikely that any two people will have identical fingerprints.

4 In the crime lab, scientists use DNA samples from the suspect and DNA samples from the evidence at the crime scene.

5 When the probes are put in with the DNA samples from the suspect and the DNA samples from the evidence, the probes show if the two sets of samples match.

6 For example, suppose the only evidence at the crime scene is blood from the suspect.

7 They design four probes, one for each sample, and they get four matches—bingo!

8 And a DNA test can show if someone has a mutation in a gene that puts them at risk for the disease.

9 For example, it now appears that the disease Alzheimer's, which damages memory in older people, is linked to our genes.

10 Would you want people, especially people you don't know, to have access to your DNA fingerprint?

TALK about the topic page 109

Mia: You guys know the part of the lecture on DNA profiling? It totally reminded me of this movie that I saw last weekend—this murder mystery ...

Manny: Oh, the one with Jodie Foster? I love her!

River: Yeah, isn't she great? Have you seen her in *Silence of the Lambs?* She is ...

Hannah: Hey, hey! Sorry guys. That's interesting. But that's not really why we're here. We're supposed to consider the pros and cons of DNA testing.

River: Oh, right. Well, in my opinion, I mean, it doesn't really matter. Doctors, the government, they already have all your personal information anyway.

Manny: Come on. That's not true. If I have a DNA test, it's nobody's business but my own.

Hannah: Well, I do think sometimes that it's good information for the police to have access to, like in the example of crime.

Mia: I agree. Did you guys see the documentary about that guy who got freed after like 20 years in prison because his DNA didn't match the evidence at the crime scene? I think it's called *Freed*.

Manny: You watch a lot of films don't you?

Hannah: Hey ...

Mia: But they're good films!

Hannah: Hey, back to DNA, OK?

Manny: Sorry! OK. Here's my fear: What if I learn from a DNA test that I'm at risk for some disease—but it's not for sure. What then? I'm supposed to spend my whole life worrying about it?

River: I think you're going to spend your whole life worrying about something anyway.

Mia: I think we're all going to worry about something.