Witness: Angelynn R. Moore

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Examinations: Direct – David Harris

Day 1 of 2 for this witness

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Direct Examination by David Harris

D. HARRIS: Ms. Moore, can you tell us what your occupation is?

MOORE: I'm a criminalist with the Department of Justice DNA laboratory.

D. HARRIS: How long have you been working for the Department of Justice?

MOORE: Four years.

D. HARRIS: I want to go back in terms of your particular assignment as a criminalist. Do you have any background education or training that allows you to be a criminalist?

MOORE: I received a bachelor of science degree in forensic science from California State University Sacramento. And my courses there included classes in molecular biology, genetics and chemistry. And then I've received extensive training at the laboratory that I've been working at.

D. HARRIS: To go through this, what particular, you're talking about this as a laboratory, what is the DNA laboratory?

MOORE: We are under the Bureau of Forensic Services under the State of California and our particular laboratory does DNA testing.

D. HARRIS: And are you assigned to a particular unit as part of that DNA laboratory?

MOORE: Yes, I am, the Missing Persons DNA Program.

D. HARRIS: And as part of your assignment to the Missing Persons Program at this DNA unit, have you ever been involved in the extraction or analysis of DNA?

MOORE: Yes, I have.

D. HARRIS: About how many times, if can you estimate?

MOORE: I've done approximately 20 cases.

D. HARRIS: And in terms of DNA extractions, how many times?

MOORE: Well, between that program and my previous assignment at that laboratory, which was a convicted offender data bank program, I've done well over a thousand DNA extractions analyses.

D. HARRIS: When you were talking about kind of the educational program, when you first went to work for the Department of Justice, do they just instantly stick you into the DNA laboratory?

MOORE: No, we are given classes and basic DNA, the analysis of short tandem repeats, and extensive training as far as running practice samples and how to analyze those.

D. HARRIS: And is this, all you get, you just get kind of some classroom experience?

MOORE: No. Oh, no. Plenty of practical experience is actually extractions from blood stains and different types of tissues and samples and running them through the whole process, analysis, and how to analyze those samples and compare them.

D. HARRIS: Did you also have another assignment as part of your assignment with the DNA laboratory besides the offender database and missing persons, did you have another assignment involving DNA?

MOORE: For a short time I worked in the Cold Hit Program. And in that program we basically analyzed rape kits for sample from the male semen donor so that that can be compared to the offender data bank to see if a hit can be made to see who the profile came from.

D. HARRIS: Now with regards to the classroom work, besides the on-the-job experience and your prior background, do you go through a somewhat certification process or do you go through some kind of a training process where you get signed off on?

MOORE: Yes, we're always required to do a certain number of samples and have that work reviewed. And then once all that work has been reviewed, and then we are signed off or qualified as a DNA analyst or caseworker.

D. HARRIS: Now, in terms of your qualifications, did you at one point in time were you the only certified person that was running the Missing Persons Bureau, so to speak?

MOORE: Yes, I was.

D. HARRIS: Directing your attention to April 14th, were you assigned a particular case involving a, two unknown bodies at that point in time?

MOORE: Yes, I was.

JUDGE: Can I interrupt? Are you offering her as an expert now?

D. HARRIS: Yes.

JUDGE: Do you have any voir dire as to her qualifications to be a DNA analysis or do you want to submit the matter?

GERAGOS: Submitted.

JUDGE: All right. Then the Court will accept, based on Ms. Moore's qualifications, the Court will accept Ms. Moore as a qualifying DNA analyst. Okay. Go ahead.

D. HARRIS: Did you receive a particular case involving, try again, two unidentified bodies at that time?

MOORE: Yes, I did.

D. HARRIS: And was it assigned a particular case number for your laboratory?

MOORE: Yes, it was.

D. HARRIS: Did you, based on all this background that you've just been talking about, did you start to do a DNA analysis?

MOORE: Yes, I did.

D. HARRIS: Now before we get into that, can you explain to us a little bit, how do you do DNA analysis in the first place.

MOORE: Start with the Power Point presentation.

D. HARRIS: Did you prepare a Power Point presentation prior to coming to court?

MOORE: Yes, I did.

D. HARRIS: Would that help assist the jury in your explanation of how DNA works?

MOORE: I believe so.

D. HARRIS: What I'd like to do, judge, at this time is have marked a hard copy of the presentation.

JUDGE: This will be People's next in order, 161.

D. HARRIS: This is a packet of multiple sheets that's been stapled together. We will ask it be marked as a package.

JUDGE: 161, group exhibit.

D. HARRIS: Ms. Moore, I am going to show you 161 before we get started. Do you recognize this as a printout of the Power Point presentation?

MOORE: Yes, I do.

D. HARRIS: And does that all of those slides depict the slides that are in your Power Point presentation?

MOORE: Yes.

D. HARRIS: We can see projected up there at this point in time starting right at the top where it says "DNA," let's go through your presentation.

MOORE: Well, first, I just want to explain that I am going to be discussing nuclear DNA which has some different characteristics than the other forms of DNA such as mitochondrial, so I don't want to cause any confusion with that. So, first of all, what does DNA stand for. It stands for deoxyribonucleic acid which is basically just a fancy name for explaining what DNA is made of. Where does DNA come from? Well, with nuclear DNA, half is inherited from your mother and half from your father. And what does DNA do? Well, basically, it's a blueprint or code that tells your body how to grow and develop. There are two areas of DNA. There's the common areas that give us all the basic characteristics of looking like a human, and then there are the different areas, the highly variable regions, and those are the areas that we concentrate on to get a DNA profile because they differ from each person to the next.

D. HARRIS: If I can interrupt the presentation. And when you're talking about different or highly variable, that, you said that's something that you focus on in your particular work?

MOORE: Correct, because it is unique to the person. So where can DNA be found? Well, DNA can be found in virtually any cell in your body. And the different places you can find the different types of cells are blood, tissue, saliva, teeth, hair roots and bone. And for each individual, all of these types, no matter what cell you look at will be the same. So we can, we can look at any one of these types of cells, look at the DNA, and we will get the same type from each of those cells. Where in the cell can you find the DNA? Well, it's found in the nucleus. Well, it's basically the brain of the cell. It tells how cell is to function. And within that nucleus, you'll find the DNA in what is called a chromosome. Now this is how you inherit it from each parent. And there are two chromosomes found in that nucleus. One is a maternal chromosome, which you inherit from the mother and one is the paternal chromosome that you've inherited from the father. Now, the DNA is packaged in this chromosome, basically just a way to keep it all contained, like putting something in a box. So here you can see the chromosome, the outside package, and the DNA inside. And what does that DNA look like when you get out? Well, it's made of two strands that coil around one another, and that is called a double helix. And that outside strand is known as a sugar phosphate backbone. And inside those two strands are these bases or units and their

chemical names are adenine, thymine, guanine and cytosine. We call them A, T, G and C for short. And those units or bases all pair up in a certain manner; G goes with C and A goes with T. And that's how that complementary base pairing. So when we, to analyze DNA we actually take those two strands, we break them apart, and we look at the order of those basis, so, a combination of those basis. And what we're looking at is called a short tandem repeat. So we're looking at a certain basis to be repeated in a certain order. So as you can see on this side we wanted to see AGAT in that order and how many times that order of basis is repeated. So this will vary from person to person how many times you'll see those repeats. So as you see on the top one, it was repeated four times. We call that a 4 allele. That's only half of your profile. That could be what this person inherited from their mother. So we have to see what they inherited from their father. So we look at the other strand, which came from their paternal chromosome, and we see that's repeated six times. So that's a 6 allele. And the combination of those two alleles gives us the type for that location on the DNA.

D. HARRIS: What is an allele?

MOORE: It's just like, half of the type, it's kind of like an address on the DNA. And so when you look at that location and you have four, so we call it a 4 allele, it's kind of just a name we use to describe that component. Now how do we get the DNA? Well, we take a portion of whatever sample we have, the blood, tissue, saliva, and we put it in a tube and add a chemical that allows the cells to break open and us to get just the DNA alone. Once we have that DNA, since we have such a small amount, we like to use this process that gives us more copies. So we add a solution and put it in this instrument that you can see that is called a thermocycler. Basically that is an instrument that heats and cools the sample in a certain order, or what we call cycle, and allows these copies to be made. So as you see in this slide, we start out with isolated DNA, we put it in the thermocycler, and it goes through different cycles and continually makes copies of that DNA in what is called a polymerase chain reaction or PCR for short. So we can start out with a small amount of DNA and end up with a large amount of those copies. Once we have the amplified DNA, we put it through this instrument called a capillary electrophoreses instrument. Basically what happens is the DNA is put through a very thin tube. You can see it on a white background, and that tube is called a capillary. And as it's pulled through by an electrical current, the DNA substrates by the substance in the capillary. ine1 So it's basically is like the shorter strands will go through faster and the longer strands will take longer to go through that substance. So take longer to go through. Towards the end there is a detector that will detect those strands and how many repeats are there, and then we'll get the data. So this is what the data looks like. And we just put it through a software program and it gives us these peaks and then it takes those fragment sizes and compares it basically to a ruler and tells us how long those fragments are and assigns that number like, on the top when you can see there's 15 repeats and 16 repeats, like I talked about earlier with the short tandem repeats. So, here, this is basically how we would go through and analyze this data. You're going to see the 15,16 at that particular location, which is called D3S1358, and then the next one, VWA would be a 16,17. And also note that the one that's called AMEL is short for amelogenine. That actually tests for the gender of a person so we can tell if the DNA came from a male or female. The male will have an XY and a female will have two X's. And, also, another thing to note on this profile, you'll see in D21S11 that they have two 30's. What happens is you end up inheriting the same allele from each parent, so you're going to have the same number twice. And that happens quite often. So when we get this DNA type, we've like tested all these different locations so we get a type. We have two methods of making a comparison and eventually making an identification. You can either make a direct comparison. And that would be if I had a bone and say they had collected hairs from a hairbrush and I got DNA type off that hairbrush used by the same person the bone came from, we can make a direct comparison. The types should be exactly the same. But sometimes we don't have that, so we have to do it by parentage. So we'll get a profile from each of the parents and then

compare it to our evidence sample. So you can see in this case, testing each area of the DNA, we have the mother's type and the father's type, and then you can compare them and see how they match up with the sample. So the mother has a 16,18 and the father has a 15,18, and I can see that the sample inherited the 16 from the mother and the 15 from the father. So you should see that happen in each area of DNA and, thus, you can make an identification that that sample came from a biological child of these two parents.

D. HARRIS: Is that the end of your Power Point presentation?

MOORE: Yes, it is.

D. HARRIS: Now, with that basic background of the understanding in this particular case, did you obtain some unknown samples that were brought in from Contra Costa for you to examine?

MOORE: Yes, I did.

D. HARRIS: I'm going to show you what's been marked 105 A through G and see if you recognize these.

MOORE: Yes, I do.

D. HARRIS: Now, are these the samples that you went through and processed?

MOORE: Yes, they are.

D. HARRIS: To go through this, what was the, which was the first body that you attempted to identify?

MOORE: Baby Doe.

D. HARRIS: And when you did this did you obtain samples from Baby Doe?

MOORE: Yes, I did.

D. HARRIS: How did, what did you do, how did you go about doing that?

MOORE: I received a portion of muscle tissue and a left femur. The muscle tissue, I took a small cutting of, from that issue, isolated the DNA. And the femur bones, we have to go through a longer process because it's such a solid material. I took the bone, I sanded the outside of the portion I wanted to sample from just to remove any contaminating things that might be on the outside. And then took a cutting of the end of the bone. And then placed that piece of bone in a vile. We have an instrument called a freezer mill and it takes the bone and freezes it and crushes it. So we take that piece and put it in a vile that has two metal in-plugs and a metal bar that goes inside with the sample. It goes into the freezer mill. And then first it gets frozen by the liquid nitrogen in the freezer mill. And then that manually moves the pulverization bar around. And as that's happening, it crushes the frozen bone sample into a powder and then I'm able to take that powder and isolate the DNA from it.

D. HARRIS: From these samples of this Baby Doe of the muscle and the bone were you able to obtain DNA?

MOORE: Yes, I was.

D. HARRIS: And how do you do that, what do you go through?

MOORE: It's a chemical process. We add a reagent that kind of stabilizes the PH and opens the cell walls and we add another reagent that breaks down the proteins. And then from that we take it and add more chemicals that isolate just the DNA alone in a septical layer of the chemical, and then put it through what we call centricon. And basically it's just a strainer and just eliminates all the other junk material from the cells and gives us the DNA alone.

D. HARRIS: Going through that process were you successful in extracting the DNA from this baby?

MOORE: Yes, I was.

D. HARRIS: What's the next step that you take?

MOORE: We quantitate it.

D. HARRIS: What does that mean?

MOORE: We want to find out how much DNA we got from the sample, so we take it through a process that compares the, a portion of the DNA to standards which are known amounts of DNA so we can find out how much DNA we obtained from those samples.

D. HARRIS: And were you successful in quantitating the DNA?

MOORE: Yes, I was.

D. HARRIS: So did you have sufficient DNA to test at that time?

MOORE: Yes.

D. HARRIS: What's the next step did you go to?

MOORE: Amplification. As I described earlier, add the chemicals with the DNA and make the copies.

D. HARRIS: And that's that PCR process that you were describing?

MOORE: Correct.

D. HARRIS: Now do you, how long of a process is it when doing the PCR? Do you do it one copy, two copies, I mean how does that work?

MOORE: Well, you just put on the instrument, the thermocycler, and it goes through a set amount of cycles and makes a lot of copies of the DNA, a good enough amount to analyze from.

D. HARRIS: Was that step successful?

MOORE: Yes, it was.

D. HARRIS: And what do you do after you obtain this amplification?

MOORE: Put it on the capillary electrophoreses instrument that I described earlier.

D. HARRIS: And did you do that?

MOORE: Yes, I did.

D. HARRIS: What happened?

MOORE: You get the type, you get some, what we call raw data, which is the peaks where it detected those different short tandem repeats or alleles, and then that data is put through a couple software programs that, that compare it to say like a ruler, like how big, how many repeats are there, and then assigns that type to it so we end up with data like I showed you earlier.

D. HARRIS: When you say you ended up with data, do you end up with data for each particular sample or is it just kind of one giant thing there?

MOORE: Data for each sample.

D. HARRIS: So you have a sample for muscle and for bone?

MOORE: Yes.

D. HARRIS: Now you indicated it's raw data, at that point in time did you have anything to compare it to?

MOORE: Do you mean the reference samples or --

D. HARRIS: Let me ask you reference samples, what are reference samples?

MOORE: They're like the samples you would get to compare the parents. So you have samples from parents. Or, like I said before, a direct comparison like a, if they had gotten a toothbrush from the person or a hairbrush and gotten hairs. So something that's directly from that person that's their known type to compare it to this unknown evidence sample.

D. HARRIS: When you're doing this, you were talking about alleles when you're running these chemicals in, do these chemicals just test one particular thing?

MOORE: No, they test several areas of the DNA for those alleles that are located in each of those areas.

D. HARRIS: So when you're testing a particular sample, say, take for example the femur bone, how many particular areas do you have for comparison if you are successful in getting DNA?

MOORE: Thirteen.

D. HARRIS: And the 13, does that include the XY that you were describing for us?

MOORE: Yes, it does. No. Sorry about that.

D. HARRIS: So it's 13 then plus the XY?

MOORE: Yes.

D. HARRIS: So when you're doing this extraction and running through the chemicals, as you described, you have 14 points of comparison?

MOORE: Yes.

D. HARRIS: Did you run it through the bone and the muscle of this Baby Doe through all of those steps?

MOORE: Can I refer to my notes?

JUDGE: Sure.

MOORE: Thanks. For the muscle tissue I wasn't able to do one set of tests so I was only able to obtain nine of the areas.

D. HARRIS: So you had nine for the muscle and you had all 14 for the bone?

MOORE: Correct.

D. HARRIS: This process that you go through you've been describing for us for Baby Doe, did you also do it for the Jane Doe, the adult?

MOORE: Yes, I did.

D. HARRIS: What, what sample did you use?

MOORE: I had a right tibia and a portion of muscle tissue.

D. HARRIS: When you go through this process of doing that, are some samples better to take samples from than others?

MOORE: It depends on the decomposition process. Bone typically won't break down as fast so we'll have a better chance of getting a better profile as muscle tissue will decompose and the DNA will degrade or breakdown so you won't be able to get a full profile.

D. HARRIS: Did you go through the process of describing with the Jane Doe for the muscle and the bone?

MOORE: Yes.

D. HARRIS: Did you, was one better than the other, so to speak?

MOORE: The bone.

D. HARRIS: Was that that decomposition process that you were talking about?

MOORE: Yes.

D. HARRIS: Of the muscle, how many tests were you able to perform?

MOORE: Just the one, the same as I did for the muscle tissue for the baby.

D. HARRIS: So that gives you how many points of comparison?

MOORE: It would have been nine, but when I actually ran the sample, I only got results in a few of the areas. We weren't, I didn't get peaks or alleles in several of the locations.

D. HARRIS: Now the bone for the Jane Doe, were you able to run all of the points of comparison?

MOORE: Yes.

D. HARRIS: And did you do that?

MOORE: Yes.

D. HARRIS: Now you're talking about reference samples, so at this point in time you told us about these two unknown or samples for an unknown or Jane Doe, two samples from Baby Doe, were you provided with reference samples to do this whole process with as well?

MOORE: Yes.

D. HARRIS: Were you provided with a sample from Dennis Rocha?

MOORE: Yes.

D. HARRIS: `what sample was that?

MOORE: A cheek swab.

D. HARRIS: Cheek swab, that's where somebody takes like a Q-tip or some cotton swab from the inside of someone's mouth?

MOORE: Yes.

D. HARRIS: How can you get DNA from that?

MOORE: Well, when you're swabbing from the inside of the mouth you're picking up cells from inside the cheek. So you got a cell, you get DNA.

D. HARRIS: And the sample, this cheek sample from Dennis Rocha, were you able to extract DNA from that?

MOORE: The first sample I got DNA, but when I went through the amplification process and then put it on the capillary electrophoreses instrument, I didn't, the peaks were low. I mean we have a certain level or height we want to see the peaks, and it was low, so I had to go back and set up a new amplification process and put that on the instrument.

D. HARRIS: After the second amplification were you able to obtain kind of this profile for the Dennis Rocha sample?

MOORE: Yes.

D. HARRIS: And how many points of comparison did you get for that sample?

MOORE: The 14.

D. HARRIS: Did you also receive a cheek swab sample from Sharon Rocha?

MOORE: Yes.

D. HARRIS: And, again, it's that same Q-tip or cotton swab in the mouth?

MOORE: Correct.

D. HARRIS: Were you able to obtain DNA from that particular sample?

MOORE: Yes.

D. HARRIS: Did you run it through the same process?

MOORE: Correct.

D. HARRIS: How many points of comparison?

MOORE: Fourteen.

D. HARRIS: Were you also provided a card with a blood stain from the defendant, Scott Peterson?

MOORE: Yes.

D. HARRIS: Did you, this card, can you describe that for us.

MOORE: It's a card, it's a certain kind of paper that helps preserve the DNA. And on that card is usually a, preprinted a circle to put the blood stain and then pertinent information about who the blood was collected from. It's a standard card made by the Bureau of Forensic Services. So you just get this card and within the circle they've spotted a portion of blood that's dried on there.

D. HARRIS: And were you able to run the DNA sampling from this particular card?

MOORE: Yes.

D. HARRIS: Now these particular reference samples that we're talking about, were they given to you with some type of identifying numbers?

MOORE: Yes.

D. HARRIS: Now, it's already been described for us, the samples that came into the Berkeley laboratory as DNA-1, DNA-2, DNA-3, DNA-4. To go through that, the femur for Baby Doe, what is the DNA number for that?

MOORE: DNA-1.

D. HARRIS: And for the muscle tissue from the baby?

MOORE: DNA-2.

D. HARRIS: The muscle tissue from the Jane Doe?

MOORE: DNA-3.

D. HARRIS: And the bone sample, the tibia sample from Jane Doe?

MOORE: DNA-4.

D. HARRIS: Was there a particular number assigned for the item from Dennis Rocha's cheek swab?

MOORE: Yes, DR-2.

D. HARRIS: And was there a particular number or identifying information for Sharon Rocha's?

MOORE: Yes, SR-2.

D. HARRIS: And was there a particular number for this blood stained card from the defendant?

MOORE: Yes, 18-A.

D. HARRIS: Besides these particular items, did you have other items available for you that you looked at or were provided to you for testing?

MOORE: Yes, I had eight hairs collected from a hairbrush, and that was 26 A-1. And also a pap smear from Laci Peterson, which was item No. 1.

D. HARRIS: Now the pap smear from Laci Peterson, did you use that at all?

MOORE: No.

D. HARRIS: Judge, at this time I'm going to have a series of photographs marked. I don't know if the Court wants to --

JUDGE: Yeah, pull them out.

D. HARRIS: Keep going?

JUDGE: Sure. This will be 162. I'll tell you, maybe since we're going to be ruminating over those pictures, should we send the jury home and you can pick it up tomorrow?

GERAGOS: That's okay. I'm done.

JUDGE: Are you done? Okay. How many have you got?

GERAGOS: Ten of them.

JUDGE: All right. A through J.

D. HARRIS: That's why I was just indicating there's so many to look at and mark.

JUDGE: Well, let's look at them and then we'll send the jury home.

D. HARRIS: All right. For the record, they've been marked, judge.

<evening recess>