Ask A Biologist Vol 063 (Guest: Susan Holechek)

Young Women in Science Part 2

Young scientists, Farah Eltohamy, Amanda Benedetto and Sarah Sakha, three of the top winners at the Arizona Science and Engineering Fair talk about their work and interview ASU biologist Susan Holechek. Pauline Davies hosts the show as Dr. Biology is exploring the Panama rainforest to bring back fun and exciting stories.

The event was sponsored by the Central Arizona Chapter of the Association for Women in Science.

Pauline Davies: This is "Ask a Biologist," a program about the living world, and I'm Pauline Davies standing in for Dr. Biology, who is trekking around the rainforests of Panama recording the sounds of animals to bring to you in a future program. Today, though, we're honoring young people who've been given awards by the Association of Women in Science, and I'm delighted to have with me three of those young people. Tell me about yourselves. Farah?

Farah Eltohamy: I'm 12 years old, and I go to BASIS Chandler. The project I did, which I won the award for, was using nitrifying bacteria to clear out ammonia and nitrate from lake water to help the fish.

Pauline: Wow, Farah, and what's your second name, just so that everyone knows who you are.

Farah: Farah Eltohamy.

Pauline: OK, and Amanda?

Amanda Benedetto: Hi, I'm Amanda Benedetto, and I'm 11 years old. My project was "Can Roaches Learn?" I ran roaches in a maze that I constructed myself. It looks almost like a pitchfork. It's a Y with another endpoint in the middle. I wanted to see if they learned, because I put food in one of the endpoints and I ran them through. Learning would be if they went in faster each time and found the food. But some roaches also went to different endpoints without the food. They called that their favorite spot, and went there faster and faster.

Pauline: That sounds absolutely fascinating and a lot of fun. Did you enjoy doing that project?

Amanda: Yes, I did. I like bugs a lot.

Pauline: Well, let's see what Sarah has to say.

Sarah Sakha: I am a sophomore, 16 years old, at Xavier College Prep. I did my experiments by creating an alternative emergency food product by using lentil rice, what is a traditional Middle Eastern dish, and I tested the anti-microbial activity of three different spices -- cinnamon, allspice, and cardamom -- on the shelf life of the EFP [Emergency Food Products]. I ran it over six weeks, and stored it at room temperature at my own house, and tested.

Pauline: What did you find? What was the answer?

Sarah: Cinnamon yielded the greatest anti-microbial activity, and the EFP, it's still going strong after six weeks. I hope to test it in a food lab one day.

Pauline: Do you think I should add cinnamon to things that I've got at home if cinnamon is the right sort of flavor?

Sarah: For palatability, sure, and for shelf life, it depends.

Pauline: Well, it's a good thing to try, I think, anyhow. Together, we're going to be interviewing one of the most inspiring young researchers in the School of Life Sciences here at Arizona State University. Welcome, Susan Holechek.

Susan Holechek: Welcome, girls. I am very happy to see some of you again. Welcome back. I just graduated in December with a PhD degree in molecular and cellular biology, so now I move from one biologist's lab to an immunology lab. I'm very happy to talk about my research with you, so if you have any questions, please come at.

Pauline: First of all, Susan, what do you think of the girls' projects?

Susan: They are amazing. I already heard so many things about you. I, unfortunately, didn't have the time to be a judge this year, but I was a judge last year. The projects are just unbelievable. I already know that some people in Biodesign are very interested in your results, so if you're looking for any high school internships, yes, let us know. You girls are welcome. You're already stars.

Farah: I plan on becoming a biologist, so maybe I could go and do an internship.

Susan: Perfect.

Pauline: How did you think of your projects? Was it the school that advised you, your teachers, or did you all come up with them, yourself?

Farah: Well, I was always inspired by environmental projects, but our school science fair project, they would only give us one week or a couple of days so we could get the idea, so I had to do it really quickly. My mother and I, we found the idea online. Even though it looked really complicated, I thought I would take the chance to do it because I was always interested in environmental projects, as I said before, and I want to make a big change. I decided to choose it.

Pauline: And Amanda?

Amanda: I've always liked bugs ever since I was four, and when I was a baby. I've always played with bugs, and when I grow up, I would like to be an entomologist. I've always been inspired by them, so every science fair I've used bugs with my projects. Last year, I used mealworms and beetles, and used their metamorphosis, but this year I used Madagascar hissing cockroaches.

Pauline: Where did you get those?

Amanda: There was a store in Mesa called the Reptile Center, and I got them there. A buck each.

Pauline: Right, so your parents don't mind you having these strange bugs at home?

Amanda: No. My dad actually approves of it, and my mom, she's kind of scared of them but she says it's OK.

Pauline: Great project. And Sarah?

Sarah: I was watching a late-night CNN special on Anderson Cooper about the food famine and droughts in Somalia, and they were showing the EFPs that they used, which is a paste-like substance that must be very unpalatable.

Pauline: EFPs, what are they?

Sarah: Emergency food products that they use in times of low food supply in remote areas. So, I got to thinking. I'm in the accelerated science program in my own school, so I started working on a project.

Pauline: Cool. Now, have you got some questions for Susan?

Amanda: Yes.

Pauline: Go on, Amanda.

Amanda: What's the difference between the dengue fever and the hemorrhagic fever?

Susan: Both are diseases, and both of them are transmitted by the same virus, dengue virus. Now, we have four different kinds of dengue. We call it dengue serotypes, dengue-1, -2, -3 and -4. Dengue fever would be somebody that gets bitten by a mosquito, so it's a mosquito-transmitted disease. The mosquito bites you, and then you may have a mild fever. What happens is that then, maybe one month later, there's another mosquito that bites you, with another dengue. Let's say, in this case, dengue-2. Now you have both serotypes in your body, right? They are dengue-1 and dengue-2, so the probabilities that you're going to get dengue hemorrhagic fever are higher, especially for children under 15 years old. That's what's the big, big problem.

Pauline: You're obviously a specialist on dengue fever. What are the consequences of getting hemorrhagic fever?

Susan: I'm from Peru, and when I was working there in '98 we have the first dengue-hemorrhagic fever dengue outbreak, ever. I was overseeing thousands of people getting the disease. There were a lot of children that get the disease, and there was even a six-year-old girl that died with complication. The problem with hemorrhagic fever is when you're so young, you don't have a lot of immune defenses and you can die in four days, so it's a big problem.

Farah: Were there scientists in Peru that were planning on curing dengue fever, like you did, that inspired you?

Susan: It was my intention. I did my biologist degree in Peru, and then I was invited to work at NIH at a very young age. When you're at NIH, you have to work with assistance and make an impact in your country. So being in Peru and dengue was a very important disease. Although at the time we didn't have any hemorrhagic fever, it was still very important because we didn't know what kind of dengue it was and we didn't know the genotype, so yes, more going into the genomic sequence of the virus. When the dengue hemorrhagic fever appeared for the first time ever in 2000, I was part of the multidisciplinary group that went. We looked at the people that were in the hospitals. It was just crazy.

Unfortunately, here in the States, we have the mosquito that transmits the virus in more than 28 states, and Mexico has dengue-1, -2, -3 and -4. So, you girls do the math, we better be aware and have to have a prevention plan in place, because when the disease hits you there is no way back. And there is no vaccine. That's the problem. There is no vaccine for dengue.

Farah: You're going to work on the vaccine?

Susan: We're working, right now. I just finished my PhD. There are not a lot of scientists working with dengue in the States, and that's because we don't have the disease. I think there was an outbreak a couple of years ago in Florida with dengue-1, but there were not many people. In order for us to start really working on the project, we need to get a lot of approval. We need to get the virus. We need to get the animal models or whatever it is that we need. That takes some time, and I just graduated. I'm doing my best.

Sarah: I've noticed that you're working with both molecular biology and advanced mathematics, and I was just wondering how you can integrate these two in order to predict the outcomes of dengue fever and outbreaks.

Susan: That's an excellent question, and that's something that I would like to advise to you. Right now, we are in the world of interdisciplinary work, so you girls, if you can team up with somebody that's...If you are interested in ecology, you should team up with somebody in molecular biology. These interdisciplinary roles are very valuable. The way I started working with math, although I'm not a mathematician, was when I met an ex-collaborator and David Murillo. He already left ASU, but I am still working with the math department here. He had a big interest in dengue. I have a huge interest in dengue. He was doing mathematical models. I used to do molecular biology in Peru. That was what I did for five years there.

We decided, OK, what if we can look into whether the variables -- what mosquitoes, and is there a different serotype, as I mentioned, 1, 2, 3, and four -- if there is a predisposition for a specific serotype to be transmitted at a higher rate. That's when mathematics go into place. You should see these complicated models that they created. We're going to publish a paper -- we are working on it -- in maybe three months for a conference.

It gives me a different perspective, and I think that was a very valuable trade, because that was what got me my post-doc right now. Because my advisor, Dr. Blackman, he's very interested also in immunology and the math part. It's because of my background, because I'm not afraid of math, that's how I got the position.

It's very valuable for you girls to try to collaborate with other people in different fields.

Pauline: What's the best thing about your work? What do you enjoy most?

Susan: OK, this is great. Every day is different. Every day is a challenge. In science, you have to be ready to fail. That's how you learn is when you experiment, it won't work the first time. It may not work the second, it may not work the...but when it works, you celebrate. Every day is different. It's not sitting down at the desk and doing the same job every day. You're in the lab, then you're on the computer. You're running your samples. You're ordering. You're planning ahead. You're writing a grant or you're writing your paper, your results. It's so exciting. Every day is so different, so I love it about it.

Farah: Do you find being a scientist is very unique and not boring in the job? Were there any hobbies that motivated you to being a scientist?

Susan: Well, I was funny because I told my dad I wanted to be a scientist, I think, when I was six years old. He kept buying me these microscopes and science books and stuff, so I didn't have the time to go into music when I was little. I wish, but I love painting, and I think being an artist as a hobby helped me a lot. Because when you're working with tiny things, you have that art in your fingers. You had a nice strife, [?] yes.

Farah: Yeah. Since art is also my talent, whenever I do science it reminds me of art, since art is unique and it's your way. You can think of any idea you want. You can turn it to reality.

Susan: Exactly. It's your way of expressing what you want, and you're going to be fine in that art. It's a great hobby to have when you're a scientist.

Pauline: If you weren't a scientist, what would you be?

Susan: Oh, my gosh. When I was little, I was between being an astronaut, was scared that, because I now...and I was very interested in archaeology. The country where I'm from, Peru, is so rich. If you hear about Machu Picchu, those ruins are amazing. I've been there five times. It's so rich. The culture is so rich there that if you are an archaeologist in Peru, that would be great. That was my second choice.

Pauline: Sarah, what would you like to be?

Sarah: I do not know. My dad is in internal medicine, but I'm in between integrating social issues and biology. I don't know. I have a few years to decide.

Pauline: Right. Amanda?

Amanda: I just want to stick with being an entomologist because I think that bugs are interesting. They can transmit diseases, and sometimes they can cure them if you get the right motivation. Because I heard that there was a certain type of ant, and if they took some of the venom out and injected it into a person that was sick with something. I forget what it was, but it cured them. They used the venom from the ant on one person, and then on the other person, they added a few things to the venom to make it an antidote.

Pauline: Well, I think that's a fantastic motivation for your career in the future. Don't you agree, Susan?

Susan: It's perfect, because in dengue, as I mentioned before, it's transmitted by mosquitoes. I've had one year of entomology, also training. I just went to Costa Rica last year. That was very useful because I had to determine is this the right species of mosquito or not, so I had to use my entomology skill. That's amazing. I love it.

Amanda: Thank you.

Pauline: Thank you all, Susan and some girls.

Susan: Thank you so much.

Pauline: It was great fun talking to you.

Sarah: Thank you.

Amanda: Thanks.

Farah: Thank you.

Pauline: You have been listening to "Ask a Biologist." In the studio have been award-winning youngsters Farah Eltohamy, Amanda Benedetto, and Sarah Sakha. We've been chatting with infectious disease biologist Dr. Susan Holechek. The "Ask a Biologist" podcast is produced at the campus of Arizona State University and is recorded in the Grassroots Studio housed in the School of Life Sciences, which is a division of the College of Liberal Arts and Sciences. And remember, even though our program is not broadcast live, you can still send us your questions about biology using our companion website. The address is AskaBiologist.asu.edu, or you can just Google the words "Ask a Biologist." I'm Pauline Davies.