

Shaking Up Virus Detection

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[00:00:04] Welcome to The Sci-Files an Impact 89 FM series, focusing on student research here at Michigan state university, where your cohost Chelsie Boodoo, and Daniel Puentes.

[00:00:16] According to the CDC, the coronavirus as an illness caused by a virus that can spread from person to person. The virus that causes COVID-19 is a new Corona virus that is spread throughout the world. COVID-19 symptoms can range from mild or no [00:00:30] symptoms to severe illness. Diseases can make anyone sick regardless of the race or ethnicity.

[00:00:35] The underlying conditions can cause someone to be at higher risk for complications of COVID-19. Everybody is at risk of getting COVID-19. People have been wearing masks and practicing social distancing by staying at least six feet apart to try and decrease the chances of infection. And while there is currently no vaccine for COVID-19, there's still a lot of work that needs to be done on testing and treatment for COVID-19.

[00:00:59] Today, we're [00:01:00] joined by Zachary Morehouse, an osteopathic medical student with a background in biology and drug development. He's in a unique position where he can examine patients and work in the lab from the bedside to the benchtop to solve critical clinical problems. Welcome Zach, can you please tell us more about yourself?

[00:01:16] Hi guys. My name is Zach Morehouse. I'm a third year osteopathic medical student here at MSU with a background in virology. I did my graduate training training at Georgia state university in Atlanta prior to coming to Michigan state for medical school, that linked me up with [00:01:30] a biotech company based in Atlanta that was looking to get started on some virus related protocols to help out with the current COVID-19 situation we were released from classes in.

[00:01:41] Mid-March from MSU. And so I headed South to get involved with the research that I could there. Thanks for joining us today. Zach, could you tell us a little bit about the research that you're doing now in Georgia? Yeah, thanks for having me guys. I'm currently working with a biotech and laboratory equipment.

[00:01:57] Penny called Omni international based in [00:02:00] Kennesaw, Georgia, which is just North of Atlanta. The project that I'm working on with them to develop some testing protocols for virus based diagnostics. In short to develop protocols that we can use some of the devices that this company is making to assist in the testing shortage that we're seeing with COVID-19 or we're seeing with COVID-19 early in March and April is the virus was spreading across the U S you had mentioned that AMI is [00:02:30] developing devices that could help test for COVID-19.

[00:02:32] However, there's a shortage because a lot of people are trying to conduct testing in experiments for this. How has your experience been with the shortage? Like have you been able to overcome that hurdle? Well, that's actually one of the big things that we were

looking at with our tests. So Omni makes homogenizers, which are his equipment that kind of disrupts tissues.

[00:02:53] And so what we were looking at here was to see if our devices could be used in a test that wasn't [00:03:00] as reagent heavy. A big shortage that we're seeing with some of these tests is that the pieces that go into the test to do the detection of the virus off of the swabs, there's a national and international shortage as testing increases.

[00:03:14] And so our idea was to find a way to bypass some of those reagents, speeding up the process of the testing and reducing the cost in reagent burden on the testing. A term that people may not be [00:03:30] familiar with is the one that you had mentioned earlier called the reagent that's used for testing, whether or not people have COVID-19.

[00:03:37] Could you explain what a reagent is and how your work will minimize the need for reagents? Sure thing. So reagents are just chemical compounds or solutions that are used in any type of experiment or testing procedure. And so with the procedure that we've developed, We are completely bypassing about half of the reagents that are currently [00:04:00] used in viral testing.

[00:04:02] So the way that we minimize reagents in this process is that we take the swab that is typically taken from a patient and viral testing, and then goes through what we call an extraction procedure, where they take the RNA out of the virus on that swab. And then the RNA will go into what's. Called a preliminary chain reaction, which amplifies that RNA and shows the presence of the virus [00:04:30] in our procedure.

[00:04:31] We completely bypass that extraction method and go straight from a swab, homogenize it, which is we shake it very fast, opening up the virus and then taking the RNA straight into that PCR based reaction. Completely bypassing the extraction. I think it's great that scientists have this opportunity to use a homogenizer instead of having to spend a lot of money on kits and then wait so much longer to get.

[00:04:58] Yeah. I also think it's great [00:05:00] that there's an opportunity for medical students to actually go out and get experience in the field as well, working with different companies to gain practical experiences in this kind of work. Now that you have an optimized protocol for this, are you going to be able to share it with the world to other places that don't have access to these expensive kits can use it.

[00:05:20] Yeah, absolutely. So we're in the process of publishing this right now. Additionally, we've already filed and gotten a patent on this protocol. I think it is [00:05:30] important to note though, that we have, I found this using human Corona virus two 29 E. This is a relative of SARS Coke, two, which causes COVID-19. So human coronavirus, two to nine E is a common, cold based Corona virus.

[00:05:45] We chose to use this because you have to have very specialized facilities to work with the virus that actually causes COVID-19. But we feel that this was a very strong model for the current testing. That's out there. We're working right now with [00:06:00] some clinical collaborators to validate this test on patient samples and are looking to get involved with a few additional clinical collaborators in the coming month.

[00:06:08] Well, good luck with the patent application. I hope all goes successful. You had mentioned earlier that you can use PCR to test COVID-19 with different samples, such as blood or spit, but could you expand upon any other methods that are possible for testing the virus? As we learn more about COVID-19 the scientific and medical yeah.

[00:06:27] Communities are looking at testing as [00:06:30] many things as they can that potentially show this virus. Our method was done specifically on swabs. We're looking into other applications, as far as fecal testing and wastewater detection. Those are still in development for us. We have had success using our devices.

[00:06:50] In determining coronavirus presence in fecal samples and in simulated wastewater samples in the lab. And again are looking for other [00:07:00] collaborators moving forward on some of these projects that there's such a broad range of samples that you can use towards this application. You mentioned that you're using it on a different strain of the Corona virus.

[00:07:10] Will that has me wondering you can probably use it on other types of viruses. Am I correct? We only have tested it using coronavirus nine E we really are excited. They did, and hopeful that we can move forward with some validations on this protocol where we can expand it out into a lot of the [00:07:30] other swab based testing that we use for diseases, both in hospital and clinic, such as influenza, measles, and respiratory syncytial virus, which.

[00:07:39] All cause major health problems. Another interesting application that we hope to move forward with this since it is such a quick turnaround in comparison to the traditional methods and is cheaper as far as the reagents and manpower that needs to get done is that we hope that this technology can really be.

[00:07:57] Implemented into some medically [00:08:00] underserved and disenfranchised areas to help expedite the testing that they need and to just get the technology out there, because we see a lot of problems with supplies. Why chain of getting reagents to some medically underserved areas, both and out of the U S and especially with Omni being an international company.

[00:08:19] We're looking at expanding these devices into places like India, Europe, Africa, moving forward. And we really hope that we can get this technology out there to [00:08:30] make a difference with some of these tests. You're working with clinical companies and you want to expand this test to other countries, but how you validate if these tests are working.

[00:08:39] We're actually working with a company called true genomics based out of Maryland. They have access to COVID-19 positive swab samples, and they're going to be working with our protocol and device to validate this methodology. We're looking for a few other academic medical centers to maybe sign on and test some of this on [00:09:00] their samples that they've banked from.

[00:09:01] COVID positive patients. Once we validated that we have the robust testing results that we've seen on the laboratory side, then we'll feel confident and comfortable going forward to really expand this testing out to all of those areas. I think it's great that you're collaborating with so many other companies.

[00:09:20] And now you're trying to get this workout to even the academic setting as WAM, since you're trying to go through so many methods of validation. How do you know whenever it's ready and how do you go through the [00:09:30] process of getting this approved so that multiple facilities and other countries can use this?

[00:09:35] That's kind of a multipronged question. I think a big problem that we've seen with the COVID-19 tests and other medical tests that have come out is that they're kind of rushed to market. And so we run into a situation where there's a lot of false negatives and false positives, and in my opinion, that's doing a disservice to our patients.

[00:09:55] And so I think this is a unique situation where being. Both a medical [00:10:00] student and a researcher. I can use mine. You're standing up. Wow. This is a really cool technology and something that we want to drive, but also look at the other side and go, okay, I'm going to see these patients. I'm going to be telling them yes or no.

[00:10:13] This works. Trust this test. So from my opinion, we do want to do a lot, a lot of testing before we bring it out there. We've proven this well in the lab. And I think when you, you prove it in the lab, you have to prove proof of concept. When you get ready to prove it, to [00:10:30] put something into patients or take a test to market, you have to prove that it is not going to fail.

[00:10:36] And so that's what we're kind of at right now is we're looking at thousands of samples that we're going to want to test before we. Toss it out. They were like, yes, this works. And then once we do have those thousands of samples and confirmatory tests, we'll have to go through the approval process with the FDA currently around COVID based testing.

[00:10:56] There's what's called the emergency use authorization, [00:11:00] an EUA, which kind of expedites the FDA approval process for any test or methodology that goes out there. So Omni is kind of in a unique situation because the device we're doing this protocol on the device that we're making this method with. Is a standard laboratory equipment.

[00:11:21] So we don't have to go through the same rigorous testing that someone who is putting out an antibody test or something like that goes [00:11:30] because it's not necessarily the device that is doing the test. It's the device that is shaking the virus up, breaking it open, and then allowing us to implement it into a PCR test.

[00:11:42] That's already been validated and approved. So for us, it's going to take. Validating that the method works going through this emergency use authorization for a approval of our workflow and registering our device with the FDA as laboratory equipment. [00:12:00] That makes complete sense to me, Zack in, order to be able to put something out in the market that involves people's lives.

[00:12:05] You need to have a lot of samples, thousands and thousands of samples may sound like a lot to people when people's lives are at stake. It's not too many. As you said earlier, you went down to Atlanta to perform this research with Omni international, but you're still a student here at Michigan state university.

[00:12:21] What does the future look like for your academic pathway? I'll be returning to Michigan in mid July to start clinical rotations [00:12:30] at St. Joe's Mercy in Ypsilanti, as a consultant with this group, I really hope to continue to drive some of this research. The leadership here has been really wonderful when it comes to working with them.

[00:12:44] I've been working with them for the last six months or so. Doing consulting remotely on some of the stuff I hope to continue doing the consulting with them remotely and continue to drive this project, potentially setting up some research collaborations with [00:13:00] individuals here at Michigan State, or even at St.

[00:13:02] St. Joe's as I move forward with my career and my last two years of medical school up here. Okay. So you'll be returning back to Michigan State soon, and that you'll be working in the hospitals around here. Will all of this be applied towards your degree? Like how does this go towards your program? This was completely independent of the requirements towards our degree research has just something that I've been involved with.

[00:13:24] Particularly virus based research since graduating undergrad is something that I want to [00:13:30] continue to develop my skillset in. So going forward in my career, I can work both at the bedside, treating my patients, seeing those needs that come up that are unmet in the clinic and being able to go back into the lab to figure out how we can come up with novel solutions for these.

[00:13:47] So I think really having experiences like this while they aren't required for us as medical students, I think they're very meaningful and impactful going forward to give us these skillsets to really best serve our patients [00:14:00] kind of on both sides of the fight. I think it's really inspirational that you had the ambition to take this opportunity when it revealed itself when you were in Atlanta, Georgia to perform this research on such an important topic.

[00:14:11] Thank you for joining us today and good luck on the rest of your research. Thank you guys for having me. The Sci-files is hosted by Chelsie Boodoo and Daniel Puentes for Impact 89 FM. Thank you to our news director, Sophie Sagan program director, Amber Konecky, station manager, Joe [00:14:30] Dandron and general manager, Jeremy Whiting, as well as the entire Impact 89 FM podcast lineup can be found online and impact a nine fm.org or by searching for the sci-files on your favorite podcast directory.

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