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## SPEAKERS

Ilaria Capua, Ricky Telg, Phillip Stokes



Ricky Telg 00:04

This is science by the slice, a podcast from the University of Florida's Institute of Food and Agricultural Sciences, Center for Public Issues Education. In this podcast, experts discuss the science of issues affecting our daily lives, reveal the motivations behind the decisions people make, and ultimately provide insight to solutions for our lives.



Phillip Stokes 00:31

Hello, everyone, and thanks for joining us for our very first episode of Science by the Slice. My name is Phillip Stokes, and I'm the Education Coordinator at the UF/IFAS PIE Center, and I'll be the host of the podcast. So for our very first topic, we created a three part series that we're releasing all at once. It's the topic that's been on all of our minds over the past year or so. I'm talking about COVID-19. Over the next three episodes, you'll hear from four different experts addressing different aspects of the pandemic, a pandemic that has affected every one of us so deeply, and the impacts have not just been on our physical health, but our mental well-being. It's changed the political atmosphere and caused so much financial stress. It's pretty complex. And what I hope is that this series will deepen your understanding of the pandemic. Our first guest is a phenomenal scientist and researcher. And what's pretty unique about her is that a decision she made about 15 years ago has changed science in a pretty drastic way. In fact, it's fair to estimate that if she did not make that decision, we probably wouldn't have a COVID-19 vaccine right now and

we'd all be even worse off from the pandemic than we actually are today. So who is our guest and what did she do 15 years ago? Her name is Dr. Ilaria Capua and she is currently the Director of the One Health Center of Excellence at the University of Florida. Prior to coming to the University of Florida in 2016, she was a member of the Italian Parliament for over three years. Needless to say Dr. Capua is Italian and was born and raised in Italy. And it was in Italy during 2006 when she worked at a government lab in Padova, where her story gets pretty interesting. The lab where she was working received a sample of the H5N1 virus, a subtype of avian influenza, from Nigerian health authorities. The virus had just attacked birds in Nigeria, and this was the first confirmed case of the disease in Africa. Her lab went to work and isolated the virus. Within days, she received a request to enter the sequence, or genetic information, into a private database run by the World Health Organization, but it didn't make sense to her that only a restricted number of labs would be able to see the information. Around that time when she was interviewed, she said, if I had agreed it would have been another secret sequence. Instead, she submitted the sequence to GenBank, a publicly accessible database run by a center based out of Bethesda, Maryland, and it is part of the National Institutes of Health. In less than two weeks, her submitted sequences had been downloaded more than 1000 times. What followed was what she referred to as an absolutely gigantic mess. I mean, on one hand, she received several esteemed awards like the Scientific American 50 Award in 2007, a few years later, the most prestigious award in veterinary medicine, and she was even bestowed upon her the rank of Knight by the Italian president. And it wasn't without any scrutiny, including some legal accusations. And while we don't have time to go into everything that happened, you can learn more about it in her book, *Circular Health, Empowering the One Health Revolution*. So that is where I want to pick up my conversation with Dr. Ilaria Capua, as she's discussing the significance of these events and how they relate to COVID-19 today.



**Ilaria Capua 04:19**

I have always been working with emerging viruses, and I worked with avian influenza, both in Italy with Italian strains as a national and then international reference laboratory, but I was very heavily involved in the bird flu crisis, which was caused by H5N1 and this happened around 2005 2006. My group provided international leadership to break a procedure, which seems really obvious now that wasn't obvious at the time and basically we championed sharing of genetic sequences of pre pandemic viruses between the veterinary and the medical community. And so this led to the development of open databases in which these viruses can be shared, the sequences can be shared. And so if nowadays, and this brings us to COVID-19, we have platforms to look at those sequences, it is because of the debate that was ignited back in 2006 on another emerging disease.

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Phillip Stokes 05:51

And I think that is, like you said, it brings us to COVID-19. Because as this was sort of becoming underway in China, it was Chinese researchers that were able to share the genetic material with, you know, other scientists throughout the world, right, to start understanding, to start coding the gene, right, and start working on things like the vaccine today, is that correct?

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Ilaria Capua 06:16

Yes. And actually, that was not what happened in previous crises. So it is truly and and this was acknowledged by the WHO. If you look at the press conferences, around, let's say, the end of January, you'll see that this is acknowledged, the fact that it is totally unheard of, it was unheard of before that a country would share the sequence of the of the virus in in virtually real time. And that is what allowed us to have a vaccine today. Because if governments had to agree on whether, you know, on the intellectual property rights and on whether to share with one country with another country, we wouldn't have been able to have a vaccine nowadays.

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Phillip Stokes 07:10

So let's, let's go ahead and talk a little bit about the vaccine. I do want to talk a little bit about kind of what are zoonotic diseases, but I think that was a good segue. So previously, the quickest vaccine that was developed took about four years, this one, the ones we've had for Pfizer, and Moderna, and I know there are others, have taken less than a year. And we talked a little bit about the sharing of, you know, research and that genetic information. But what, why one, why are vaccines so challenging to develop? And why do they take such a long time to develop? And how was this one able to be developed rather quickly?

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Ilaria Capua 07:49

Well, because technology evolves, and scientists do better things every day. And so the technology that we have now, is incredibly more sophisticated than the technology we had 10 years ago or 15 years ago. Why has it taken so long to produce vaccines in the past? Well, you know, like polio vaccine was obviously extremely important. But it had to be, you know, it had to be made. This was a live attenuated vaccine. And so it needed to be created from scratch with no molecular tools, the only tools they had were, basically attenuation of the viruses in laboratory systems. And that takes time. It takes time. So and also, you know, the level of checks and controls and tests that need to be put in place

nowadays, are much different from the ones that we would only put in place 50 years ago, because we live in a completely different world. And actually, what I think that is particularly interesting about this campaign, is that the technology that is being used has been used, never has never been used on such a large scale, and I'm referring mainly to the mRNA vaccines and all the work on mRNA vaccines comes from animals, from vaccines in animals. And so what am I doing at the One Health Center and what is the One Health Center at UF doing? It is actually trying to develop a vision a new vision which recognizes even more the ties that there are between the health of humans, of animals of plants and of the environment. And it tries to identify strategies to co-advance the health of humans, animals, plants and the environment. And so COVID-19 is actually one of the reasons why we have to move in this direction. I, before the pandemic, I published a book called Circular Health, and this book is really exactly about the things we were talking about, you know, how everything is so interconnected, these viruses come from the animal reservoir. And something which is on the other side of the world can be in your back garden in, you know, two weeks, actually, one week, actually 24 hours. And so we really need to recognize that COVID-19 is, is, is showing us that we live in a world that is probably much more interconnected than what we thought it was. And therefore, we have to, we can't ignore it, can we, we need to, we need to look at new solutions. And that's what we do at the UF Center or One Health Center of Excellence.



Phillip Stokes 11:30

And that is a great point. So, so COVID-19, it's believed, right, that it It originated in bats, is that is that correct?



Ilaria Capua 11:40

Yes. All the evidence we have points to horseshoe bats.



Phillip Stokes 11:47

And this would be referred to as a zoonotic disease and right?



Ilaria Capua 11:51

It is a zoonotic virus, more than disease because we don't know. A zoonotic disease is a disease that is established in both populations. Like rabies causes this both in, like raccoons and dogs and cats and foxes and in people at the same time, in this case, we don't know what's happening in the jungle. So we don't know if you know, there can be spillover, and there will be continuous spillover? Yeah, we don't know yet.

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Phillip Stokes 12:21

And so there have been other zoonotic viruses right like HIV and others, and it it seems like some of these pandemics or epidemics, or are these, when viruses kind of cross over from animals to people? It It seems like it's almost a cyclical event. And what I mean by that is, you know, we can look back in our history, and we can see where this has happened. I mentioned HIV, and and others. I don't know if influenza originally was a zoonotic virus or not. But what are kind of the drivers in this what is kind of making this happen? I mean, I almost think about it, like other natural disasters, where it's, it's not a matter of if it'll happen, it's almost a matter of when, when that's gonna happen when that next infection from from a zoonotic virus into a human. So what's kind of what's going on now, just kind of help people understand a little bit more about why that happens.

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Ilaria Capua 13:15

Well, people belong to the animal kingdom. Agreed?

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Phillip Stokes 13:23

Agreed. Thank you, that is a something we probably should say.

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Ilaria Capua 13:27

Right. And so as you a spillover of a virus from one animal population, to another animal population is reasonable and happens, right? So for example, Parvovirus, which is a disease, which causes gastroenteritis in cats, spilled over to dogs, and it established disease in dogs. So when I said we belong to the animal kingdom, I mean, then we should not forget that we respond to those biological rules. And so what is happening out there? Well, what is happening out there is actually what has always happened. So these viruses are present in the wild, they would actually stay where they are in the middle of a forest and wouldn't bother anyone. But because of encroachment so humans invading certain areas, because of the continuation of certain practices like having live animal markets in the middle of big cities, which have large populations and have large airports. These are the factors that created the perfect storm for COVID-19 to become a pandemic and not remain confined, you know, in a forest or in a small group of people. So this same event has probably happened many times in the past, if it happened 100 years ago, it would have not become a pandemic, because there weren't the conditions for this virus to become widespread. So basically, we have a constant reservoir of these infections, you mentioned influenza, swine flu of 2009, came from pigs, and animals provide most of the

pathogens that are that threaten our, our health, Ebola, for example, comes from animals. Zika has its reservoir monkeys, so many, many of these, of these pathogens can actually infect human beings. The problem is that now we have a series of conditions around those pathogens that are, you know, mobility and that are concentrations of people. And that's what created the storm, the storm that put COVID put SARS-CoV-2 on a plane on a series of planes and spread it all over the world.

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Phillip Stokes 16:35

So I think that's just a really interesting thing. So I mean, as you said, humans are animals were part of the animal kingdom. So these crossover events are not necessarily atypical, it's it's more the current conditions of where we are. So I did want to ask you a little bit. It sounds like to me, a lot of attention, at least from the media and others has been put on human behavior, as far as one of the drivers of the pandemic, people congregating people socializing, whatever, whatever that happens to be you mentioned, air travel and things like that. You know, in our current world, kind of where what our current culture is, and our current climate of mobility, and trade, just kind of this global climate that we have right now. Is it really? Is it really a fair expectation to be able to quell a virus like this? Or are we just kind of, are we in too deep? Does that make sense?

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Ilaria Capua 17:40

Okay, for So for this one, this one is, is not going to go away. It's not, it is here to stay, and it will continue to circulate for years to come, it will most probably continue to circulate in a vaccinated population, which is good, right? Because we will have a vaccine and so the number of severe cases will go down. So now what we can do with our behaviors, which is what we we were, you know, actually was very clear at the start, was we could flatten the curve, you can't zero the curve, right? That means that the virus will continue to circulate. However, you talk about behaviors. And my question for you is, what if everybody knew, and had personal protective equipment like masks at home, that would have allowed them to stop the initial spread? And so this goes back to behavior. And I think that we must, we must learn certain things that the pandemic has shown us to make sure that the next time we do much better than this.

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Phillip Stokes 19:02

So what are what would you say are some of those things that we have learned from from this pandemic for the next one?



Ilaria Capua 19:08

Well, I hope that every time we now have a lunch or a dinner with someone, we go and we wash our hands, right after you shake hands and you meet someone, you're out in a gathering you shake hands, hi, hi, before eating you go wash your hands. Another thing that I am hopeful is that about is that you don't go to work if you're sick. Right? If you're sick, you stay at home. And this, you know, is also something that I believe has touched governments, you know, that have had to question themselves on whether people should have access to sick leave because some workers don't at all, even in developed countries. I am hopeful that people understand, will understand more the importance of vaccination. So yeah, these are some of the things that we've learned, I think that we have also learned that we can work without being caught constantly in traffic jams. Remote working is possible. And sometimes it's even more functional. And so pandemics are transformational events, by definition, and, and this pandemic will transform our lives. So I don't know how old you are. But I am 53. My parents were born before the Second World War, my grandparents were born before the First World War. So they had to, you know, those generations had much harder things that they had to put up with, we are certainly experiencing a very, very severe event. But we're just going to have to put up with it. And, you know, there is a very clear light at the end of the tunnel. And that's the direction we have to go in. And but we have to learn, because we can't take another one of these again. I think I'm not an economist, but I think that numbers aren't really adding up.



Phillip Stokes 21:27

Sure.



Ilaria Capua 21:27

Mm hmm.



Phillip Stokes 21:29

Yeah, you know, it's funny, just to kind of side note, I had a dream last night where I shook someone's hand, simple as that I shook someone's hand. And it was a bizarre moment in the dream. And I walked away, you know, in, like I said, in the dream, and I just, I don't know how to go wash my hands or something. Anyway, just kind of a separate



Ilaria Capua 21:48

this is these are the ramifications of the pandemic. A pandemic is, is an event with

complex ramifications. And for the first time, because we have so many tools to measure this pandemic, this is a pandemic, which has been most measured ever in history, we're measuring everything. And so if we're measuring everything, we should have the information to, you know, understand the behavioral ramifications, which are not only you know, what you've just described, but they are people are lonely, people are depressed they are, you know, they get, they have anxiety and lots of other things. So, I think that what this pandemic is telling us is that we need to put health at the center, because if you don't have healthy people, nothing works.

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Phillip Stokes 22:45

Yeah, and I also stuck on the word you said, transformational, you know, this pandemic has been transformational. It's, you know, ever, of course, every pandemic, or every major disease outbreak probably changes society and culture in different ways. I guess one question, I wanted to ask, as we're kind of wrapping up here, what are some of the non health related variables or non scientific, you know, science can be measured? It's, you know, quantifiable, what are some of the more intangible things that you believe are at play, you know, or have been at play during this pandemic, and kind of how have those played out?

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Ilaria Capua 23:27

We have an enormous opportunity, which is because we have a window of attention, people are interested in science because of this pandemic, because they suddenly realized that what they know, is not enough to keep them let's say tranquil to keep them in to make them feel safe. And so we really need to take advantage of this moment of attention, to deliver science in different ways of delivery, because I think that the pandemic is clearly showing us that we haven't done a good job at delivering even the basic science because so many people are just doing the wrong things. And so, I think that centers like the PIE Center have a big challenge and but many, many opportunities here.

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Phillip Stokes 24:35

So moving forward, and more on a grand scale. We've talked about kind of the global culture that we're in. Climate change is maybe going to be even more one of the more severe, you know, things that we're dealing with as people in the years ahead. What are we looking at, as far as infectious diseases go with some of these other factors like climate change, globalization, what what's the future going to look like, from your understanding and your knowledge?





**Ilaria Capua 25:10**

Well, I think that the future is not going to look good if we continue to ignore certain problems. And so I think that now is the time to do exactly what you said. So climate change is, is here, and it's not going to go away. And climate change is influencing has a domino effect on many aspects of our health, including diseases, right, because vector borne diseases are linked to the ecology of mosquitoes. And these are influenced by climate change. But not only that, I just think that now is the time to be ambitious, I mean, now is the time to seek convergence between all these issues that we have, we know we have, and that are clearly interlocking one with the other. And we should try to find solutions that do not only address the issues in silos, but they address the issue and its complexity. And so, I think that there is a whole new dimension that we should look into. And and this is this circular health view. So sorry, this, the circular health vision, which basically brings health outside the domain of health, right, and it brings health towards agriculture, it brings health towards urban development, it brings health towards climate, it brings health towards technological innovations, and so on. And we have the computing infrastructure, we will have more and more computing power and, and we just have to think of creative ways of using the information to be more prepared and more resilient for the future. Because as you say, this is not the first one it's certainly not going to be the last one.



**Phillip Stokes 27:26**

I want to thank Dr. Ilaria Capua for being a guest on our very first episode of Science by the Slice. Be sure to subscribe to our podcast. In our next episode, we're joined by Dr. Glenn Morris, director of the Emerging Pathogens Institute at the University of Florida. Dr. Morris goes into a bit more detail about the vaccine development and discusses life moving forward in a vaccinated population. He also addresses the impacts of COVID-19 on agriculture in Florida. There's a ton of really great information in this episode. I want to thank my co workers at the PIE Center for working on this podcast with me, Ricky Telg, Michaela Kandzer, Sidney Honeycutt, Ashley McLeod-Morin, Alena Poulin, and Valentina Castano. Lastly, I'd like to conclude today's episode with a fitting quote from Dr. Capua's book, Circular Health: Empowering the One Health Revolution. It goes, "we know that science continuously moves forward, the latest breakthrough leapfrogging over the one that came before, showing that what was true yesterday may not be true today, and may be completely contradicted tomorrow. I'm Phillip Stokes. We'll see you next time on Science by the Slice