**PRESS RELEASE**

**FNU’s** **medical lab scientists shed light during discussions on COVID-19**

**Suva, Fiji.** Four medical lab scientists at the Fiji National University’s (FNU), College of Medicine, Nursing and Health Sciences (CMNHS) were part of the University’s recent “Explain the Science” panel discussions on COVID-19.

Organised and moderated by CMNHS Associate Dean Research and Director of the Fiji Institute of Pacific Health Research (FIPHR), Dr Donald Wilson, the recent panelists consisted of Assistant Professor Aruna Devi, Transfusion Medicine lecturer Adriu Sepeti, Molecular Biology and Genetics lecturer Atlesh Nand and Microbiology and Immunology lecturer Taina Naivalu, who is also Head of the Department of Pathology and Medical Laboratory Sciences.

The panel discussion was conducted via Zoom and live streamed on the FNU and CMNHS Facebook pages. Discussions highlighted the differences between bacteria and viruses, the coronavirus and influenza virus, transmission of the virus from wildlife to humans, the incubation period, the immune systems and how it responds, and the COVID-19 vaccines.

Below are highlights of key issues discussed;

**Difference between bacteria and viruses**

Devi highlighted the differences between bacteria and viruses and said this was important to to distinguish this in a patient’s assessment so that the proper treatment would be given.

“To differentiate between the two I will first talk about how they are similar. Looking at the similarities in bacteria and viruses they both are germs, both spread by coughing, sneezing, contact with infected people, contact with contaminated surfaces, food, water and they can both cause mild, moderate or severe diseases and both can cause similar symptoms like cough, sneezing, fever, inflammation, vomiting, diarrhea,” she said.

“Both bacteria and viruses are capable of causing diseases in human beings, animals and plants as well and both cannot be seen with our naked eye but they are around us in truly staggering numbers. Both carry genetic materials. Those are some of the similarities of viruses and bacteria.”

“Now, there are several differences that distinguish the two and at the biological level, the main difference is that bacteria is a preliving cell that can live inside or outside a body, and it can exist on its own in the environment. For example, in the soil or oceans, there are so many bacteria in the ocean, more than the stars in the entire universe.”

She said bacteria and viruses were structurally different and this could be attributed to how they reproduce.

“Bacteria are relatively complex single cell creatures and many rigid cell work, just like we are made up outside skin and layers so are these tiny minute creatures that we cannot see with our naked eye, they have their own protection as well so bacteria can have a rigid cell wall with a thin rubbery membrane.”

“Bacteria can reproduce on their own and records have shown that bacteria have existed about 1.5 billion years so bacteria can also survive in different environments extreme heat and in extreme cold and can also survive in human body. Most of the bacteria are harmless and are also useful. Some live in our guts, digesting and helping in absorption of our food.”

“Whilst I said bacteria was a living thing, viruses are not. Or at least we could put it somewhere between living and non-living cells. Viruses are tinier. The largest virus is still smaller than the smallest bacteria. All they have is a protein coat and core genetic material, either RNA or DNA.”

“Unlike bacteria, viruses cannot survive without a host. They can only reproduce by attaching themselves to a cell. When they attach to a cell, they reprogram a cell to make new viruses and they are attached to a cell until this host cell bursts and die. In other cases, they can turn normal host cells into malignant or cancerous cells.”

Devi said viruses were also specific about the cells they attacked in the body.

“Certain viruses attack cells in the liver, some the respiratory systems, such as the coronavirus, or blood and some viruses target bacteria even. So, all viruses consist of the genome, the nucleic acid and DNA or RNA. They can have either of this but not both.”

“So, what DNA does is it stores genetic material that we are made up of. Similarly, in the DNA of the virus, the genetic information is stored. RNA what they do is codes for amino acids and acts as a messenger between the DNA molecules and the ribosome so what RNA does is it passes the message for the survival of the cell.”

“The second part of the virus is the protein coat. This is a membrane that protects the nucleic acid inside the cell. So some viruses also have a flat layer outside it and this is called the envelope. This surrounds the capsid. This envelope has been said to be derived from the host cell that these viruses infect so they develop this envelope and some of the proteins can be coated from the virus’ genes as well.”

She said another feature is they can have a tail which protects from these androbes and is an additional protein attachment, for example coronavirus spikes.

“When we talk about the two, the importance in knowing the difference is for the treatment,” Devi said.

“When you visit a physician, they may have said to get a sample tested, your blood, sputum, urine or a swab from your nasal, as is the case for coronavirus, or from the throat.”

“Why is this important? Because the treatment for these infections are different. The doctor needs to know whether it is a bacterial or viral infection. For bacterial infection it can be treated with antibiotics but for virus, you need anti-virals to treat the symptoms.”

“Most importantly, preventing infection in the first place is by getting vaccinations, this is for viruses. Antiobiotics do not work for viral infections.”

**Difference between the influenza virus and coronavirus**

TainaNaivalu discussed the similarities and difference between the two, emphasizing that despite the similarities they were very different viruses altogether.

“How did scientists know this? They got samples and put it in some fluids and they focus it using an electron microscope. We don’t have an electron microscope here in Fiji, its huge and needs specialised rooms? And they are able to view the structure of this,” she said.

“The influenza virus and the coronavirus have the same shape (round like soccer balls) and they also have flattened nail heads (spikes), these are present in both viruses’ however the shapes of the heads of the nails (spikes) are different.”

“There are two different types of spikes on the influenza virus, while there is only 1 type of spike on the coronavirus. When we look at the genetic material, they are both RNA viruses. The influenza virus has 8 segments of RNA inside the capsid. For coronavirus, there is only 1 strand of RNA.”

“We also have to note that information about the coronavirus is new as it’s a pretty new disease and we are still collecting data to ensure that we have enough information to diagnose people who may have symptoms of COVID19. However, we have to note that influenza is an old disease so all information on it is readily available.”

“Furthermore, both of them are enveloped viruses. There is an envelope that covers the capsid that keeps the genetic material safe. Understanding the structure of the viruses allows us to implement preventative measures.”

“We know the properties of the virus and the properties that make up the virus (lipid, fat, oil) can be destroyed using detergent and that is why the Ministry of Health has emphasized that we wash our hands with soap and water because the soap will destroy the envelope.”

“When the envelope is destroyed the spikes won’t be stable enough to stick onto our cells. That’s the reason why its important to wash ourselves with soap and water because we understand the structure of the virus. And for the alcohol handwash or hand sanitizer that we are promoting , the alcohol helps destroy the envelope that covers the protein.”

“It’s very important that we know the concentration of the alcohol and the amount or volume of the hand sanitizer we put and the time we take to rub in the hand sanitizer on our hands because we understand the virus enough to implement strategies to prevent the transmission of these viruses. Basically, these are two different viruses and even though they show similar symptoms, they are very different genetically.”

**Transmission of virus from wildlife to human**

Panelist Atlesh Nand also gave a brief background on the origins of COVID-19 and encouraged people to disregard conspiracy theories that were not based on scientific evidence.

“Despite all these noise about the conspiracy theories, there is no credible evidence that SARS-CoV-2 was ever known to virologists before it emerged in December 2019. The reality is that this particular lab (in China) is engaged in long term studies of natural reservoirs of SARS and coronavirus,” Nand said.

“One thing you should note here is that this particular lab is the first institution that identified the SARS coronavirus after the 2019 coronavirus outbreak and it discovered the virus sequence, which is 96.2% similar to the current coronavirus.”

“This was done in 2013 and this sequence is very important for us in terms of laying the foundation to understanding the origin of the virus and development of diagnostics methods, anti-viral drug screenings and for vaccine development.”

He also discussed the WHO request for the identification of the zoonotic source of the virus and its introduction to the human population.

“The aim of this request was to prevent both the reinfection with the virus and the animals and humans and also to establish new zoonotic reservoirs so that there can be reduced risk of further emergence and transmission of zoonotic diseases.”

“The results of this operation was that the virus may have evolved in a bat until an unknown spillover event into humans occurred. The possibility of an intermediary host was another recommendation of this joint operation.”

“For instance, the virus may have been present in zoonotic animals and then these animals were infected by parasites, which may have been consumed by the population and then the population got infected with the virus.”

“It’s important to highlight that most viral pathogens that have caused epidemics or pandemics in human population have emerged naturally from wildlife reservoirs, such as Ebola, SARS, chicken flu and HIV.”

“So, it is pointless to believe in all these conspiracy theories,” he stated.

Fellow colleague Adriu Sepeti spoke further on this, saying the virus needs a host in order to survive and multiply.

“The virus will have to have an animal host, which is characterized as an animal that the virus is adapted to, which means its present in the animal but does not cause any disease or infection to the animal,” Sepeti explained.

“The virus has the ability to jump from its animal host to a new host, which is called an intermediate host. With an intermediate host, there is no understanding between the host and the virus, so what the virus does is it multiplies rapidly and during the course of rapid multiplication it causes an infection on the intermediate animal and the important aspect here is how does it jump from the intermediate animal to infecting humans.”

“An important note of the coronavirus family is that it has broken that barrier before from infected animals to humans, for example, there is the SARS-CoV1 and Middle East Respiratory Syndrome (MERS).”

“Those are examples of this strain of virus breaking the human / animal barrier to infect humans. This can occur if there is an overspillage of infection from the intermediate host and coming into contact with humans. As that happens, the human can get infected from the virus and with SARS COVID 2, the infection has spread which means the virus has adapted and changed the way it lives so that it can rapidly spread from human to human.”

“The important point here is the need to stay put, we’ve heard this from the Ministry over and over again. There’s a need for us to stay within our bubbles and the reason is because the virus has the ability to jump from a person to person thus spreading the infection. If it is contained within a certain area, then sooner or later it will die out.”

**Variants**

Devi elaborated that viruses become variants through a process that took place at a molecular level.

“To know if there are variants and if the bacteria is becoming more stronger or weaker, we need to sequence this in the lab to detect these variants,” she said.

“Coronaviruses are known to have extremely high mutation rates. When they mutate, they still replicate and the mutations become the building blocks of evolution, as what the virus does is it selects the traits beneficial to the virus and enhances virulents to make it stronger and enhances its ability and adaptability to survive in the host cells.”

“RNA genome viruses are very prone to mutations and they replicate at a much higher rate compared to DNA viruses. The variants of the lineages receive a name, for instance the year they are detected and the successive letter.”

“The variants are the change in the genetic material so just like for instance, B117, unusually large number of mutations have taken place, there is a lot of nucleic-acid type changes in that mutation, which makes it more transmissible and has increased severity of the disease.”

“Variants are the change in the genetic makeup so overall, it has been reported that selective beneficial traits shape the evolution of spike proteins and the ongoing evolution of SARS-CoV-2 in humans or at least contributing to the high divergent lineage. More variants are being produced due to its positive selection taking in the beneficial traits and efficiency binding to the host cell.

Devi added that viruses rarely mutate to give rise to variants as it is a rare thing.

“It depends on the mutation, so what vaccination is targeting is the mutation points that this variant has and it has been developed to target that particular variant so for instance, SARS-Cov-2 the AstraZeneca and other vaccines are developed to protect you from getting that infection.”

Naivalu added that it was too soon to say whether the available vaccinations would be able to protect people from emerging or future variants, adding that people will need to wait and conduct further tests and research once the situation arises.

**Human immune system**

Naivalu added that in addition to the vaccine, our immune system is well organised and helps us fight against infections such as COVID19.

“There are two main types of immune response, which is the innate response and adaptive immune response,” she explained.

“Innate is something that we were born with and it involves the skin, chemicals, saliva, tears etc and then we have cells that will engulf these pathogens or viruses when they enter.”

“Our immune system is like a surveillance system, so our immune cells actually surveil and look for foreign matter that enter our body. As soon as foreign matter enters our body or penetrates our skin or enters through our nose, our cells start reacting to it and they start talking to each other using chemical signals.”

“If the cells are not healthy because of our lifestyles, then these cells won’t be able to communicate properly. That is why it is important for us to live a healthy lifestyle, so the innate immune response cells will start signaling and will start destroying the virus.”

“If they are unable to fend off this virus, they will ask for help from the second level, which is the adaptive immune response. The adaptive immune response has very specialised cells that produce antibodies that will neutralize or remove the invading pathogens.”

“This is how vaccination is developed. The vaccination is developed to initiate the adaptive immune response. Once you’re infected with a virus infection, the adaptive immune response will remember that you have been infected with this virus before therefore the immune response will be stronger and faster. “That’s why when we’re infected by the virus the second time around, our immune response is stronger and most of the time, we are asymptomatic.”

“This simply means that there is a balance between the strength of the invading virus and your immune response, which is suppressing the information that produces symptoms such as the fever that we feel when we get viral infections.”

Naivalu said it was important for people to understand that their immune systems needs to be healthy by following a balanced diet, exercising and ensuring a healthy mental and physical wellbeing.

“It is important that we know the enemy and we guard ourselves and our immune systems. We need to heed all the protective measures that we can take to allow us to fight against this very virulent enemy, which is the COVID19 virus.”

**Vaccine**

Sepeti added that the vaccine bridges the gap from the body’s response by the innate immune system to the adaptive immune system.

“There is a time gap that is there and once somebody is injected with the vaccine, for eg AstraZeneca, in the vaccine is an inactivated DNA component that codes for the spike. The spike is the mechanism in which the virus attaches to the cell, so the vaccine actually targets the spikes. It stimulates the body cells to produce spikes so as it produces spikes, the immune system recognizes it as foreign, so it produces specific antibodies, specific only to coronavirus, to the spikes.”

“The body does not produce antibodies anyhow, it has to be specific, which means the antibodies for the influenza cannot be used by the body to fight against COVID. It produces specific antibodies and as it produces specific antibodies the body has taken the information and stored it in its memory cells, so the next time the person gets infected the body has already the defensive mechanism in place to fight against the actual coronavirus that is coming in.”

“Some of the questions arising are asking if I am injected with the vaccine does it alter my DNA? The answer is no. it does not alter your DNA.”

“AstraZeneca does not alter or change anything according to our DNA but it helps our body in preparing itself to fight against the virus that will enter our body once we are exposed.”

**Incubation period**

Atlesh Nand laso highlighted that once people contracted COVID-19, they would display varying degrees of the signs of having the virus, depending on how symptomatic or asymptomatic they were.

“Incubation period is the time between when you contact the virus and when your symptoms start. According to WHO information, and from CDC, the SARS-CoV-2 virus takes anywhere between two to 14 days to incubate and some studies have indicated that the most common incubation period is five days until the symptoms show,” he said.

**Ends.**

**ABOUT THE PANELISTS**

**Aruna Devi**

Aruna is Assistant Professor and former HOD of the Department of Pathology & Medical Laboratory Science at College of Medicine, Nursing & Health Sciences. She is also the coordinator of BMLS programme accreditation. She convenes and coordinates BMLS Year 4 courses, Research Projects and Professional Practice. After attaining her Bachelor of Medical Science (Pathology) from Charles Sturt University, NSW, Australia, she was awarded an Australian Leadership scholarship to pursue her Master of Laboratory Medicine at RMIT University in Melbourne, Majoring in Clinical Haematology. Dr Devi was awarded Charles Sturt University COMPACT scholarship to pursue her PhD at the Charles Sturt University, NSW, Australia. Her research thesis was on Epidemiology and Characterisation of antibiotic-resistant Campylobacter spp in Fiji and NSW, Australia. She has published papers on her work and has been awarded FNU SEED grant to conduct research on Biofertilizer. She worked in MOHMS pathology laboratories for 9 years before pursuing her career in academia

**Taina Naivalu**

Taina is a Lecturer in Microbiology and Immunology at the College of Medicine, Nursing and Medical Sciences where she is the Head of Department of Pathology and Medical Science. After attaining her Bachelor in Medical Laboratory Science from the Fiji School of Medicine, she pursued a Master of Science in Medicine (Infection & Immunity) at the University of Sydney. She also has a Master of Science Biology (thesis) from the University of the South Pacific where her research focus was on Arboviruses. Last month, with 2 other collaborators won an OGHI funding to pursue a research in Fiji on surveillance of SARS-CoV-2 in wastewater. She has 20 years of experience working in Medical Laboratories in Fiji including the Fiji CDC.

**Atlesh Nand**

Atlesh is presently lecturing in Molecular Biology and Genetics at CMNHS. He is a lead researcher in Molecular and Genetic sequencing research on HIV 1 strain in collaboration with University of Otago as

part of his qualification upgrade. Mr Nand in partnership with two other collaborators, pursuing mutually interesting and beneficial research on SARS-CoV-2 surveillance study in Fiji. This study is again in collaboration with University of Otago. He was a key member and played an integral part in the roll-out of the confirmatory HIV testing algorithm which was a UNICEF funded project in Fiji. Mr Nand demonstrates enthusiasm and depth of interest in research studies on human health.

**Adriu Sepeti**

Adriu is currently lecturing in Transfusion Medicine at the College of Medicine, Nursing and Medical Sciences. He attained his Bachelor in Medical Laboratory Science from the Fiji School of Medicine, and is currently pursuing his Masters of Management of Transfusion Medicine from the University of Groningen, Netherlands. His research interest is on the Impact of vaccination on the safety of blood supply. Currently he is the president of the Fiji Institute of Medical Laboratory Scientist, and Interim Chairman of the Fiji Allied Health Management Board.

**About the Moderator**

**Dr Donald Wilson**

Dr Wilson is an epidemiologist and a public health physician by background. He is currently the Associate Dean Research and Director of the Fiji Institute of Pacific Health Research (FIPHR) for the College of Medicine, Nursing and Health Sciences (CMNHS) at FNU.