TEACHER'S ACTIVITY REPORT 2017 - 2018

FACULTY: Science

DEPARTMENT/ COMMITTEE : Biochemistry

IQAC ACTIVITY No: SVC/2017-18/BIOCHEM/SOC/7

NAME OF THE ACTIVITY: Interview with Dr. Navin Khanna, ICGEB, New Delhi			
DATE	**FACULTY**	**DEPARTMENT/ COMMITTEE**	**COORDINATORS NAME**
February, 2018	Science	Biochemistry Society "Catalysis"	Dr. Vandana Malhotra Dr. Nandita Narayanasamy
TIME	**VENUE**	**NUMBER OF PARTICIPANTS**	**NATURE: Outdoor/Indoor**
12:30 pm - 1:30 pm	ICGEB, New delhi	3 staff and 4 students	Indoor/Outdoor
SUPPORT/ASSISTANCE:	No funding (Independent)		

BRIEF INFORMATION ABOUT THE ACTIVITY (CRITERION NO. – II, V, VII):

TOPIC/SUBJECT OF THE ACTIVITY	Conduct of an interview with an eminent scientist – Dr. Navin Khanna, ICGEB, New Delhi
OBJECTIVES	• To provide students with the opportunity to interact with a virologist to discuss about the current situation of the world. • Train them in the conduct of an interview and to translate the interview into a published document after proper editing
METHODOLOGY	• Screen for a suitable personality for the given subject. • Obtain their consent for the interview and fix a convenient time and venue • Conduct the interview with prepared and extempore questions • Write, edit, format and publish in the Department Annual magazine 'Expressions'
OUTCOMES	• Students learn the importance of background reading required to conduct an interview. • They appreciate the discipline and decorum necessary when interacting with scientists and administrators in a professional space • Hands on experience in journalistic skills. • Positive encouragement and inspiration towards higher education and research

PROOFS & DOCUMENTS ATTACHED (Tick mark the proofs attached):

Notice & Letters	**Student list of participation** √	**Activity report** √	**Photos** √	Feedback form
Feedback analysis	News clip with details	Certificate	Any other	

IQAC Document No:	Criterion No:	Metric No:
Departmental file no	IQAC file No;	

NAME OF TEACHER & SIGNATURE	NAME OF HEAD/ COMMITTEE INCHARGE & SIGNATURE	IQAC COORDINATOR (SEAL & SIGNATURE)
Dr Nandita Narayanasamy Dr. Vandana Malhotra	Dr. Shalini Sen Teacher-in-Charge Department of Biochemistry	Dr. N.Latha IQAC Coordinator Sri Venkateswara College

For Reference

Criterion I	Curricular Aspects (planning & Implementation)		Criterion V	Student Support & Progression
Criterion II	Teaching Learning & Evaluation		Criterion VI	Governance
Criterion III	Research, Innovations & Extension		Criterion VII	Institutional Values & Best Practices
Criterion IV	Learning Resources and Infrastructure			

Proofs:

- **Photo**

- **Interview report**

In Conversation with Judge Dredd of Dengue

Dr. Navin Khanna

Group Leader at the International Center for Genetic Engineering, New Delhi spoke to Catalysis Team about his revolutionary discovery and his plans for eradication of Dengue, and more. Read excerpts.

Once, in a conference, a student met Albert L. Lehninger, a person whose book, every biochemistry student swears by. This student then proceeded to correct the tryptophan synthesis pathway in the first edition of his book! Highly impressed, Lehninger gifted him the second edition of the book for free!

Dr. Navin Khanna, the student then and now the scientist behind the path-breaking Dengue Day-1 diagnostic kit, sat down for a candid chat with us, describing his product's journey from the laboratory to the market.

SVC Students: *Does Dengue have any vectors other than Aedes aegypti?*

Dr. Navin Khanna: Yes, there are other vectors for Dengue such as *Aedes albopictus* that can grow and multiply in colder environments. It has been seen in Japan and Canada. One of our tests tells whether the mosquito is carrying Dengue or not. You can take the mosquito, crush it with a drop of water and put it on the test. Wait for 5 minutes. A red line means that the mosquito was infected with Dengue virus.

SVC Students: *How is your diagnostic kit sensitive to all the four serotypes?*

Dr. Navin Khanna: We took the (Non-Structural Protein 1) NS1 from all four serotypes; they're very similar but also very different. We have binders, which are very cross-reactive to Dengue 1, 2, 3 and 4's NS1. Naturally, when you use something so cross-reactive, there is a problem of non-specificity. We have figured out a way to enhance specificity, such that it will only cross-react with the Dengue serotypes. It will not cross-react even with closely related *flavi* viruses like Zika or Yellow Fever. No other kit has done this.

Dengue Day 1 test kit consists of two devices: one device for detection of Dengue NS1 antigen and second device for the differential detection of Dengue IgM / IgG antibodies in Human serum / plasma.

Dengue NS1 antigen if present in the sample will bind to the anti-dengue NS1 gold colloidal conjugate present in the kit making antigen antibodies complex. This complex migrates along the membrane to the test region and forms the visible pink line. Also, high levels of IgM indicate primary infection and that of IgG indicate secondary infection.

SVC Students: *What about Chikungunya, Sir?*

Dr. Navin Khanna: Our test doesn't pick up Chikungunya, Zika or Yellow Fever. Despite the similarity in symptoms of these diseases, the test is highly specific that you do not pick up a false positive. If there is a patient with Dengue-like symptoms, you can use this test to confirm if it is indeed Dengue. We have made another test for which you don't even need to go to a doctor. It is a finger-prick test. You prick your finger, get the sample, put it on the

device, put a drop of buffer and wait for five minutes. Two red lines on the device means you have Dengue, one red line means you don't have Dengue. No red lines mean that the test hasn't been done properly. **This is called Dengue FP (Finger Prick)**. There is no test for Chikungunya. It is like flipping a coin. If it's not Dengue, it must be Chikungunya. We are trying to design a test for Chikungunya using a similar strategy.

SVC Students: *What was your approach towards making the vaccine?*

Dr. Navin Khanna: Our mantra is, "less is more". We don't give the full virus as an immunogen to the body. In simple terms, the virus has a "key" to gain entry into the host cell. We call that the "business end" of the virus. We take away this end (FC receptor-binding domain) of each of the four viruses, link them together using molecular biology and turn them into a Virus Like Particle (VLP). This VLP has five epitopes, four from each of the Dengue viruses. The virus doesn't want the body to make antibodies against these binding domains. So, we forcefully sensitize the immune system to make antibodies. These antibodies are highly protective that even traces of the virus are killed and the disease is not enhanced. This VLP is made in yeast, hence it is cheap. The added advantage is that it protects you from Hepatitis B also. So, it's a pentavalent vaccine. Hepatitis B acts as the scaffold where domains of the four serotypes are linked. Thus, in National Immunization Programs, if you replace the existing Hepatitis B vaccine with our vaccine, you get protection against Dengue 1, 2, 3 and 4 in addition to Hepatitis B.

SVC Students: *Sir, you mentioned that the disease will not be enhanced. Could you please elaborate on that?*

Dr. Navin Khanna: The immune system produces antibodies against the first set of proteins that the virus produces and these antibodies cannot completely neutralize the virus, which is okay. But these antibodies help the immature virus gain entry into other host cells, through the FC receptors as immune complexes inside the cells. Responses to dengue are of two kinds: protective, which protect human cells, but this happens only 5% of the time. The response is pathogenic 95% of the times, which helps the virus. Still that 5% response has the ability to protect you. That's why the second infection of Dengue becomes very severe because of antibody-dependent enhancement. This phenomenon is seen only in Dengue and not in other viruses. Contrary to our traditional belief, this is an example where antibodies are not protecting humans but helping the virus.

SVC Students: *Was there any resistance to accepting "phenomenon of antibody enhancement" in the scientific community?*

Dr. Navin Khanna: Yes, there is always resistance. But the evidence is forty years old. The initial research by Scott Halstead was rejected. Scott was born in Lucknow. His parents were British, who stayed back in India. He worked in Thailand and he noticed that if a mother has Dengue, and she delivers a baby then for the first six months, the baby was okay. But post that, the baby got Dengue. Moreover, the severity was high and the baby died. He reasoned that something from the mother is being transferred to the baby, and then he proved that all those mothers were infected with Dengue. They had transferred antibodies to the babies and these antibodies enhanced the infection, when the mosquito bit them again. He did another experiment where he took two sets of monkeys. In one set, a day before, he injected 5 ml anti-dengue virus serum. The next day he injected both of them with the Dengue virus. The set which had pre-circulating antibodies for Dengue had a much severe infection than the other set. The virus load in this was much higher than the other one. This proved that there was antibody enhancement.

SVC Students: *How do both enhancing and non-enhancing antibodies exist in the same system? How does that mechanism work?*

Dr. Navin Khanna: Initially, people used to believe that every antibody is enhancing. They thought that at high concentrations the antibody is neutralizing, and if you reduce the concentration the antibody is enhancing. Now there are experiments that show that there are two kinds of antibodies. One would never enhance, no matter how low the concentration is; the other would always enhance, no matter how high the amount. Why? We can attribute this to changes in the assay systems. Initially, the idea that every antibody is enhancing was based on *in vitro* assays. Now we have *in vivo* assays. You can inject a neutralized immune complex in the mouse. Neutralized immune complex shouldn't cause the disease, because it's neutralized, but the mouse is found dead. Whereas iif you inject a partially neutralized complex with another antibody, the mouse is alive. These observations prove that there are different kinds of antibodies. The problem is that these experiments cannot be done in humans. The only experiments done in humans are the ones done by Nature. If you get Dengue 1, you don't even feel it. But if you get Dengue 2 followed by Dengue 1, you are in the hospital. This means that those antibodies enhanced it. Our vaccine design is such that it will never make enhancing antibodies. It will only make neutralizing antibodies.

SVC Students: *Was there any issue with the stability of this molecule?*

Dr. Navin Khanna: No, it is very stable. Hepatitis B surface antigen self-assembles into a VLP. If you add a baggage to this, it may not self-assemble and that was a problem. We figured out a way such that even if you put a baggage of around 200 to 400 amino acids, the VLP could stably assemble. We have sent the technology to Sun Pharma to make the vaccines in large batches.

SVC Students: *Coming to Dengue therapy, you have also developed a drug. Could you tell us more about it?*

Dr. Navin Khanna: Yes, we have developed a botanical drug against Dengue, which I believe will be a game-changer in the fight against the disease. The medicine is very effective; we've checked it *in vitro* and in mice. The drug is non-toxic. It's an Ayurveda-based drug. We have worked on it in association with Ranbaxy for 5-6 years. Now Sun Pharma is taking permissions to produce the drug in high numbers so that it can be brought to the market. We are giving it to dengue patients in AIIMS, etc. to see how it works, instead of waiting for the classical drug trials. It has to undergo toxicity studies also, even though we know that it isn't toxic.

SVC Students: *Since you have successfully translated your research, how should someone go about translating an idea, something that's been researched about in a laboratory, into a product?*

Dr. Navin Khanna: One thing that should be very clear is that Translation is a massive collaboration. If you think that you will do it all alone, don't even start it. You need to have an open mind, and trust. Don't hide things. If you wish to work for a company, be open with them. If the company says that it doesn't work, then it doesn't work. Everyone should be able to do the test, or use the product. Share every information with the company, both positive and negative. Stay with the company. It is a continuous process, it never stops. Now-a-days there are lots of Indian companies who are willing to invest.

SVC Students: *Is it harder to be in translational research particularly in our country?*

Dr. Navin Khanna: Yes, it is. When it comes to promotions, we're afflicted with the Impact Factor Syndrome. Impact Factor (IF) is the impact that any published paper has. In Finland, researchers

don't care about the IF. They tell their students that if your work has an impact, you don't need to factor it. But in India, once the paper is published, we stop. Translation begins when you start asking the questions, "what next?"

SVC Students: *Science is becoming more and more competitive. People are not very open-minded. In such a scenario, what do you think is the future of translational science?*

Dr Navin Khanna: A big issue in India is that there's less amount of money being put in Science, Health and Education Departments. As a result, people walk away from science. Why is it that an MBA gets paid four times more than a science student? We need to bridge this gap. Currently, for the amount of money that the government invests, Indian scientists are doing very well. In any case, you should always believe in your idea, and stick to it, no matter what. Always try to do something different.

SVC Students: Thank you so much Sir, for taking time out of your busy schedule to join us for this interview. The passion that you have towards innovation motivates us to create something new too!

A candid chat with Dr. Navin Khanna

Interview Team
Dr. Nandita Narayansamy
Dr. Vandana Malhotra
Eeshita Das
Aishwarya V.
Mohd. Areeb
Mehar Monga

Attendance:

ACTIVITY: Interview with an eminent scientist

Date: February 2018

Time:12:30- 1:30 pm

Venue: IGGEB, New Delhi

Criterion No: II/V/VII

Sr. No.	Name of the student	Group	Signature
1.	Eeshita Das	BSc (H) Biochemistry	
2.	Aishwarya V.	BSc (H) Biochemistry	
3.	Mohd. Areeb	BSc (H) Biochemistry	
4.	Mehar Monga	BSc (H) Biochemistry	

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Internal Quality Assurance Cell

This is to certify that the Activity report (Teacher/Department /Society/Association) has been submitted for documentation to IQAC, Sri Venkateswara College, University of Delhi.

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