KENDRIYA VIDYALAYA, BALLYGUNGE

REPORT

CSIR-CECRI LIVE WEBINAR LECTURE SERIES on ELECTROCHEMICAL SCIENCE AND TECHNOLOGY (26th Aug 2020, 2pm)

TOPIC: DELINEATION OF INFECTIOUS DISEASE PROFILE: ROLE OF ELECTROCHEMICAL IMMUNOSENSORS

TALK BY Dr. V. MURUGAN

NUMBER OF STUDENTS REGISTERED & ATTENDED-25

TEACHER COORDINATOR- SABITABRATA MANDAL,PGT(BIO)

-POOJA DEVI PGT(CHEM)

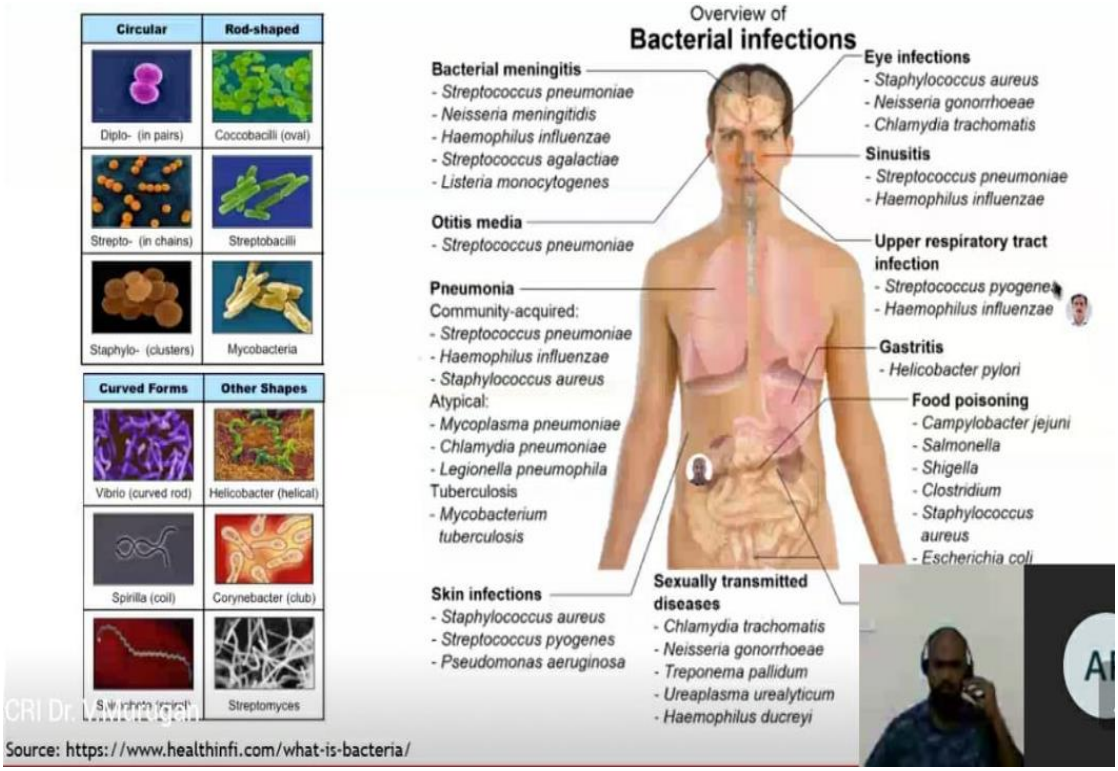
STUDENT COORDINATOR- ANANYA PAUL XIIB

HIGHLIGHTS

1) OVERVIEW ON TYPES OF BACTERIAL AND VIRAL INFECTION.
2) BASIC DIFFERENCE BETWEEN BACTERIA AND VIRUS.
3) CONVENTIONAL ASSAY OF INFECTIOUS DIEASE.
4) ROLE OF ELECTROCHEMICAL IMMUNOSENSORS.

The meeting stared at sharp 2pm. After a brief introduction he startd to explain the real content.

He stared by giving a really interesting content on the bacteria(monera kingdom) and explained the impact of these tiny microbes in our surroundings and on us. The diseases that these living microorganisms can cause to us like pneumonia, typhoid etc.



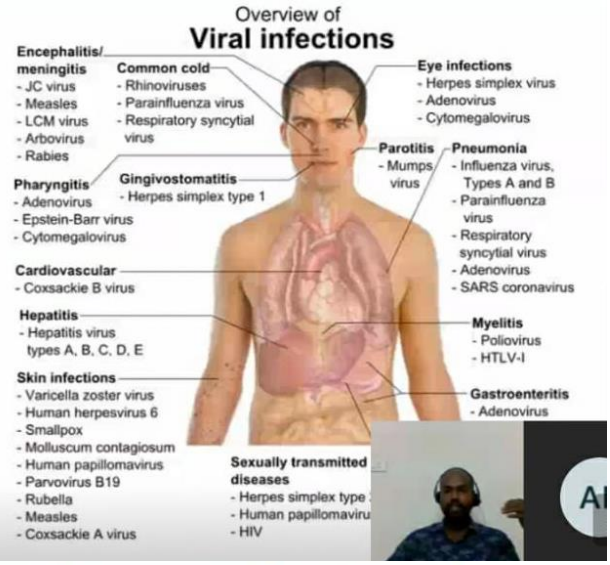
Next he enlighted us with his great knowledge on the viruses and the diseases caused by them like the common flu, the STDs which are caused by virus, hepatitis etc and explined the mechanism how the visus hijack the cellular mechanism of the host cell and basically forces the host cell to function as a factory for the synthesis of new viruses.

Most **viruses have** either **RNA** or **DNA** as their genetic material.

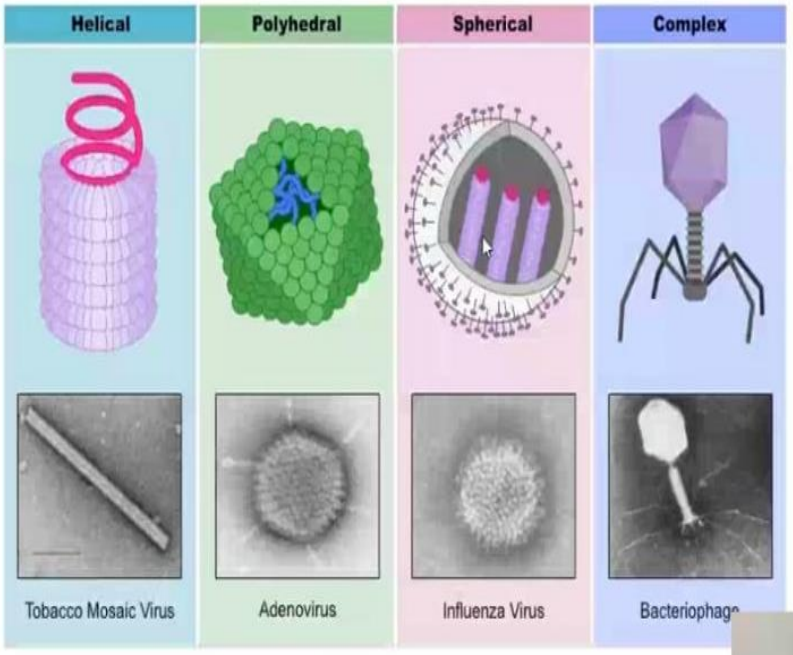
The nucleic acid may be single- or double-stranded.

The entire infectious **virus** particle, called a virion, consists of the nucleic acid and an outer shell of protein.

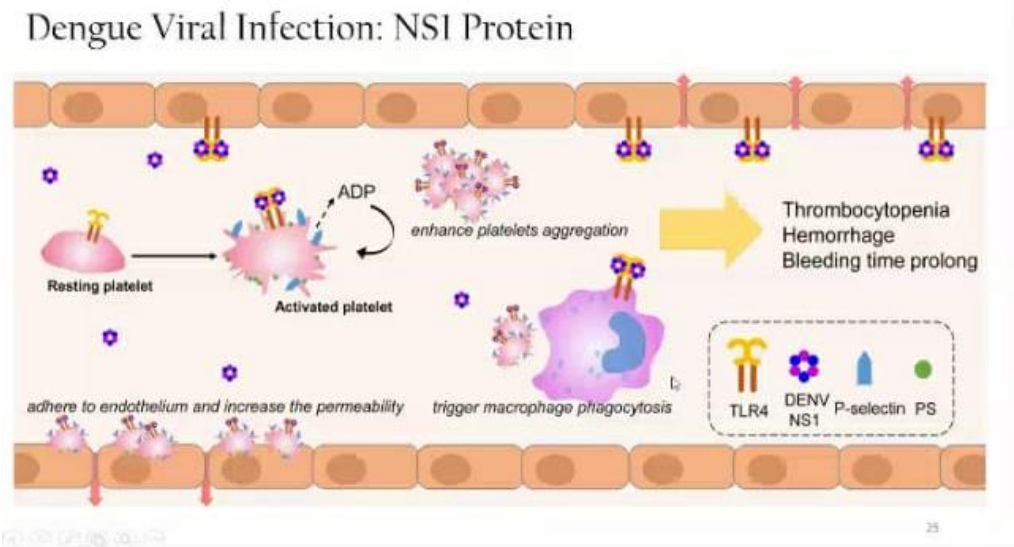
The simplest **viruses** contain only enough **RNA** or **DNA** to encode four proteins.



Credit: Bruce Ruben



Viruses come in many shapes and sizes, and only replicate when inside living cells. An non-enveloped virus, meaning it has no protective coating. A **retrovirus** is an example virus, making it more resilient and causes higher tendency of infection or diseases



He also made us understand the difference between the two major type of niruses i.e. the adino virus and the retro virus.

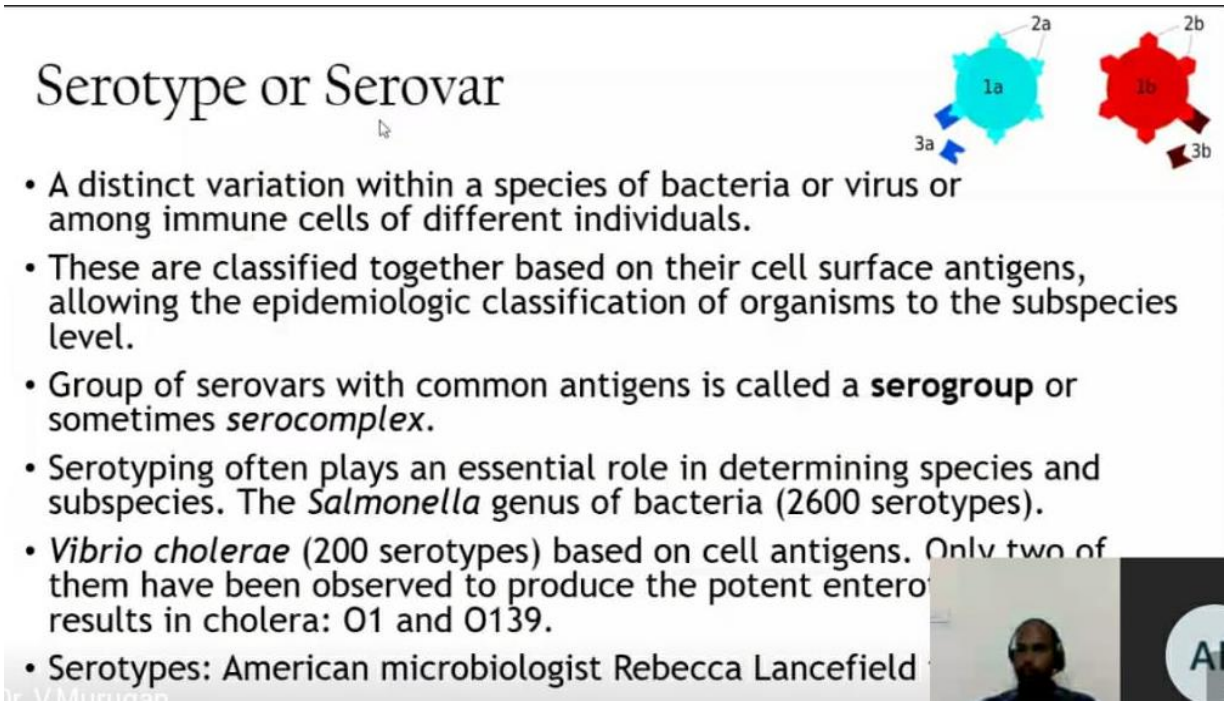
- Adino virus: The non capsulated virus. These virus are more prone to destruction hence are easily destroyed.
- Retro virus: These are the viruses with capsules/ envelope around them. As they are protected by the covering they are more virulent in nature and are hard to cure eg. SARS

Next he clarifed the basic diffence between the bacterial and the viral infections that will help us to identify and distinguish the type of disorders caused by these two main pathogenic microorganisms.

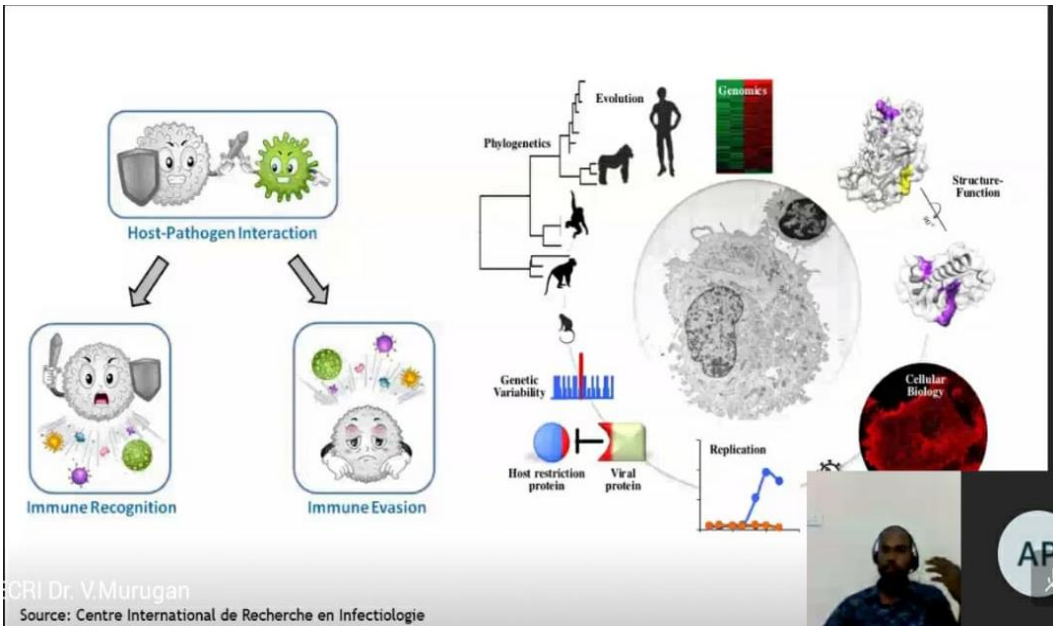
Viruses	Bacteria
I. They are very small.	They are larger in size as compared to viruses.
II. Non-cellular.	Single-celled.
III. Have no metabolism of their own.	Have metabolism of their own.
IV. Taken no food by any method.	Take food by absorption.
V. Do not grow and do not divide.	Grow in size and divide to produce more bacteria.
VI. Command the host cell to produce virus.	They can reproduce by their own.
VII. Can be crystallised.	Cannot be crystallised.
VIII. All produce diseases in man, animals or plants.	Some are harmless, so useful and some are dise causing.

Now one of the new and interesting yet useful information that we got today was about the “serotypes” or “serovars”

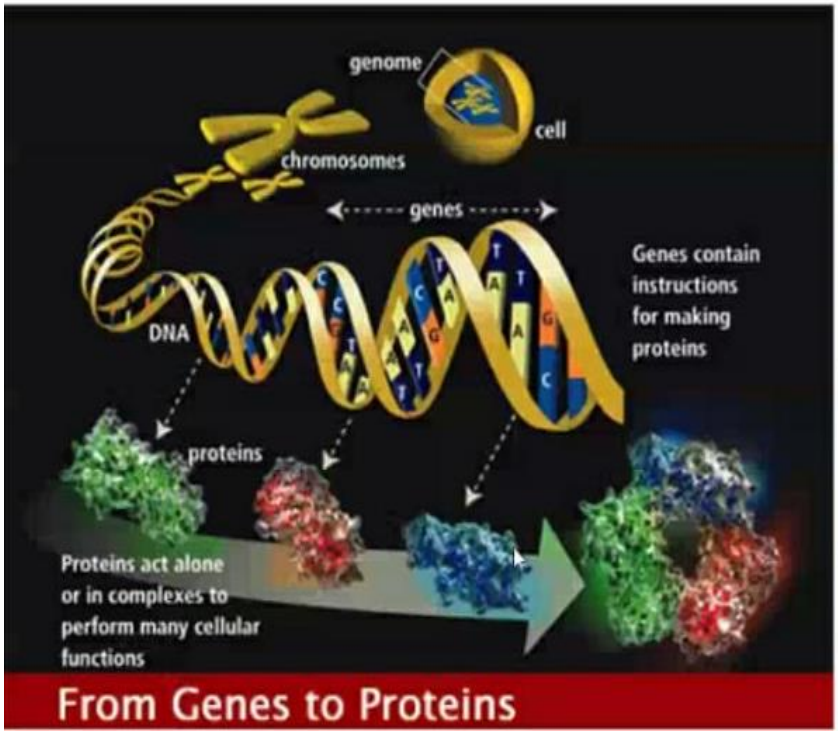
Serotypes are basically two subspecies undera single strain, **and was first identified by Rebecca Lancefield in 1933. Serotypes** are groups within a single species of microorganisms, such as bacteria or viruses, which share distinctive surface structures.

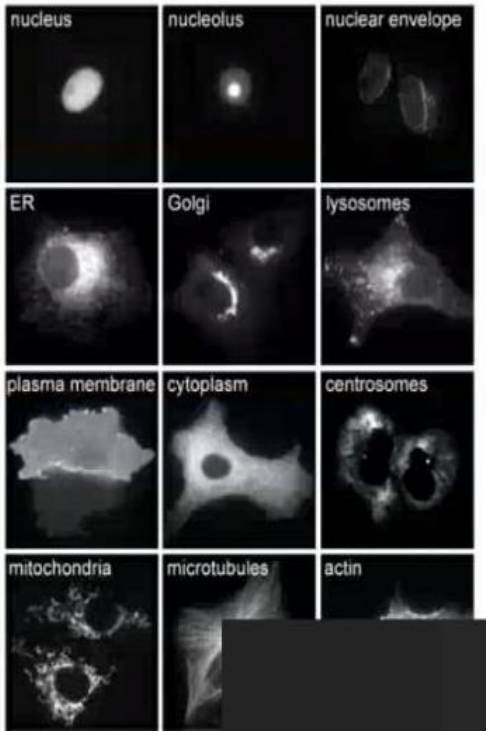


He also elucidated the means of dispersal of these harmful microorganisms and how they are effecting our immediate surroungs including us and how it is changing our immune system to fight against them!

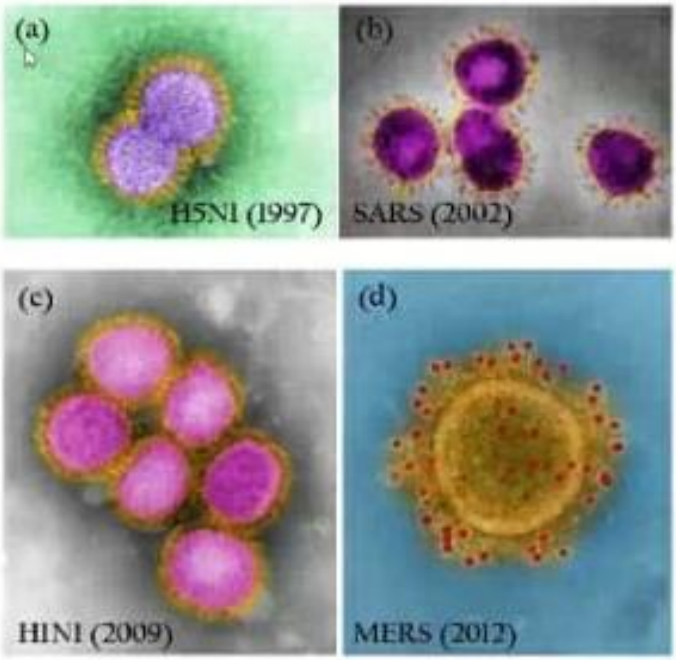


With some original pictures the lecture was made very attractive, informative and engaing.



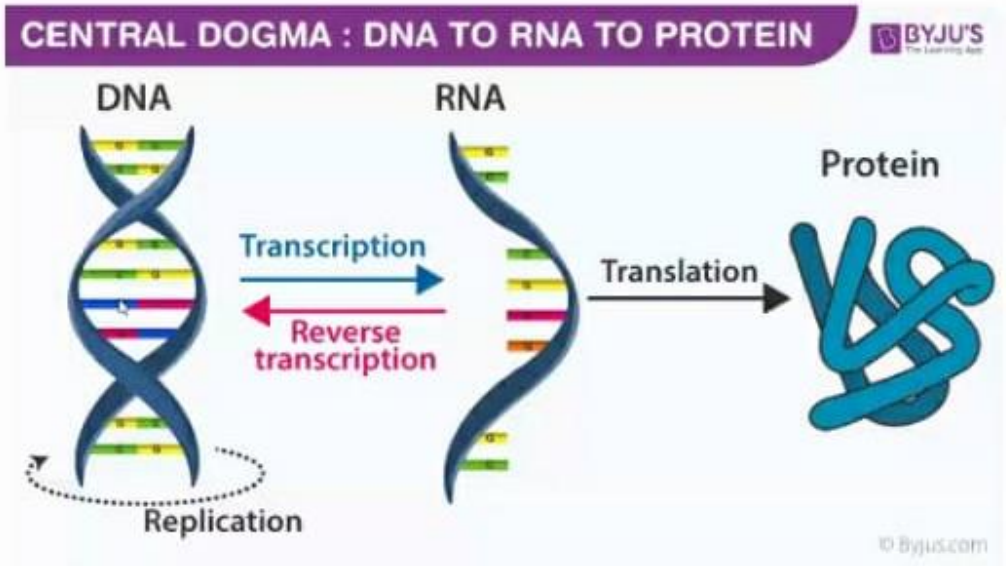


Electron Micrographs of Virus Structures



Credit: Science Source (a); Getty/Callista Images (b,c); NIAID (d); NIAID-RML (e)

Source: K. Kostarelos, Nat. Nanotechnol. May 2020



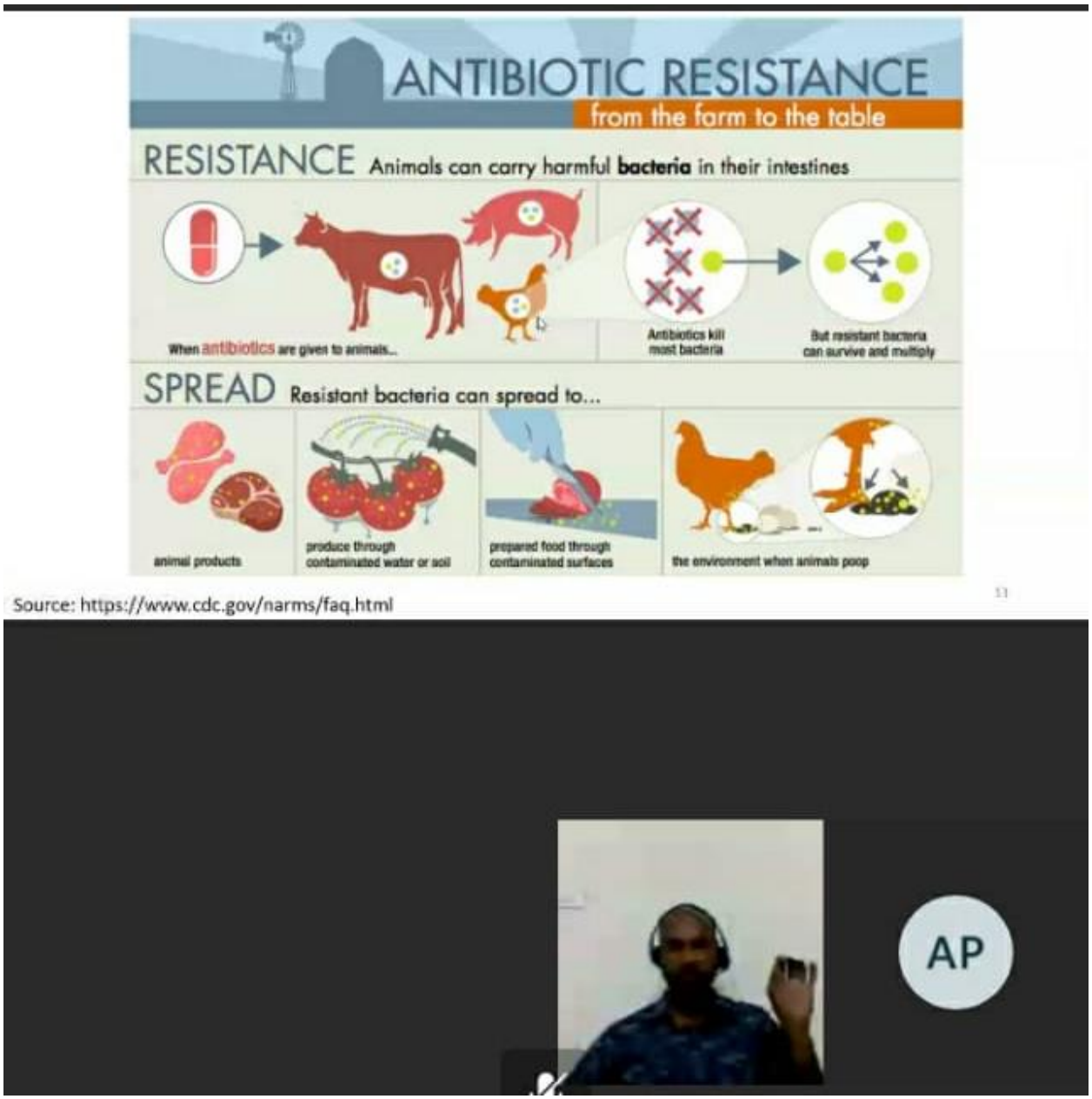
For a better health wr always try to eat healthy. Keeping that in mind he also explained us the importance of agriculture and food management and beautifully represented the data using graphs and charts.

Livestock population (2019 Livestock census)

Sl. No	Species	Number (in millions)	Ranking in the world population
01	Cattle	192.49	Second
02	Buffaloes	109.85	First
	Total (including Mithun and Yak)	302.79	First
03	Sheep	74.26	Third
04	Goats	148.88	Second
05	Pigs	9.06	-
06	Others	0.91	-
	Total livestock	535.78	
	Total poultry	851.81	Seventh
07	Duck	-	Fifth
08	Chicken	-	
09	Camel	0.25	Tenth

Source: https://vikaspedia.in/agriculture/livestock/role-of-livestock-in-indian-economy

One of the interesting question that was mention and explained by him was " why the bat which carried the virus of SARS(COVID19) was not effected by the virus?"

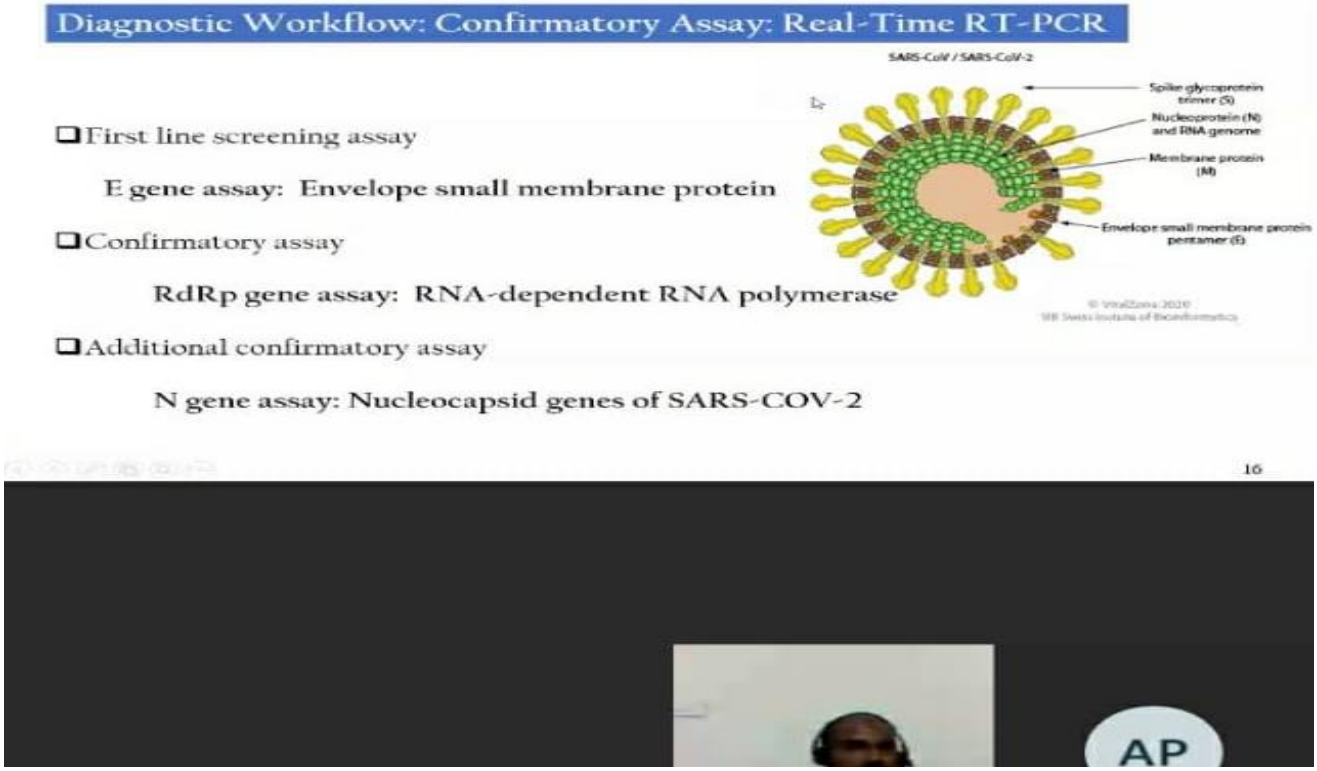


on answer to this he made us understand the importace recptor specificity of the binding protiens present on the surfaces of the virus, and how these spike protiens bind to the specific host cell to cause replication leading to infection and disease.

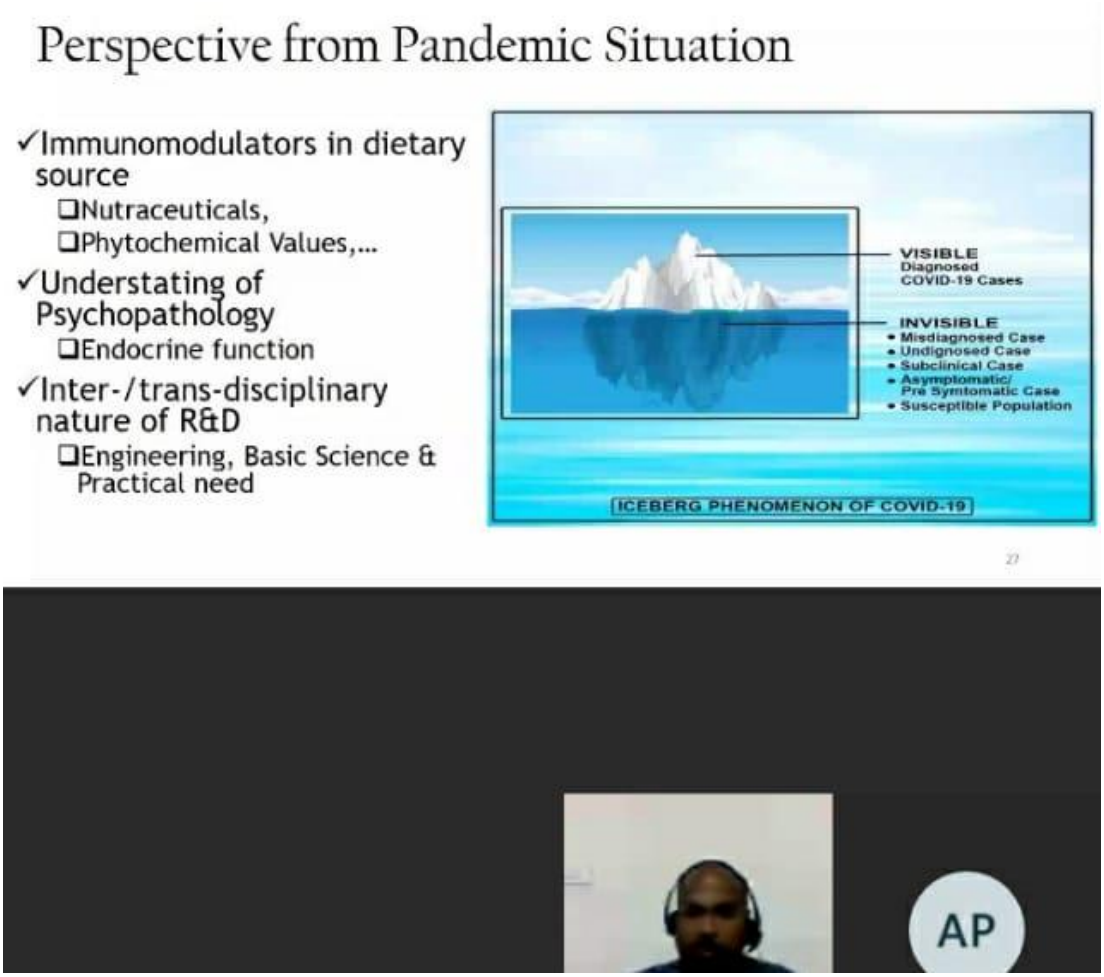
He also focused on how these organisms show high dergree og mutation to change their shape/structure to combat with the environmental changes. He also explained how diffents animals,birds,insects etc acts as a carrier /vector for these harmful pathogens(zoonotic diseases).

Apart from these there can be environmental transmission of bacteria, hospital transmission of pathogens which can be seen on a large scale in cases such as COVID19.

Then he explained a very important concept which is really useful in this time that how the assay is done for the conformatory test of COVID 19 along with the structure of corona virus.

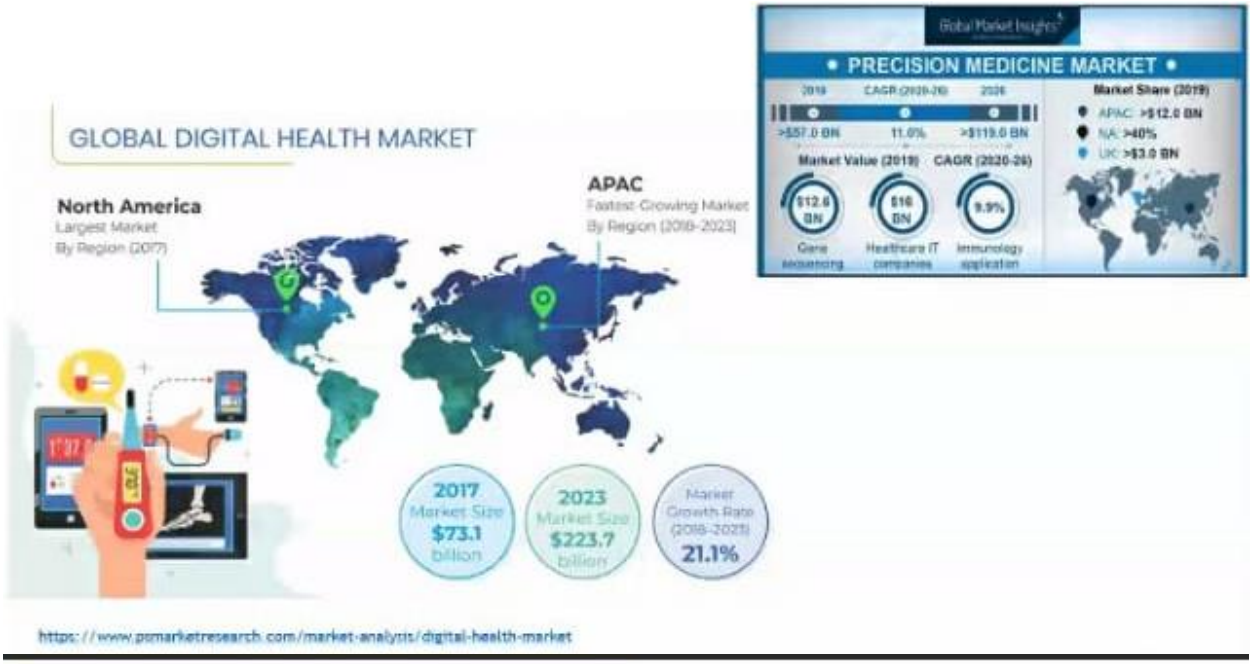


He also exlained the iceberg phenomena for the case of COVID19



Moving on he gave us a broad view about the growing health care market globally and how we can make the future of the medical sctor better for our own country as well as for the humanity as a whole with the use of new technologically advanced devices and processes.

He gave us a brief idea about electrochemical sensors and how they work, about how immunomodulators can be beneficially used, the effect of phytochemicals in our diet and the impotance of psycopathological balance in our life.



https://www.psmarketresearch.com/market-analysis/digital-health-market

ELECTRODES & BIOSENSOR RESEARCH

- ❑ Fabrication cost
- ❑ Limited field use

Point-of-Care Diagnostics

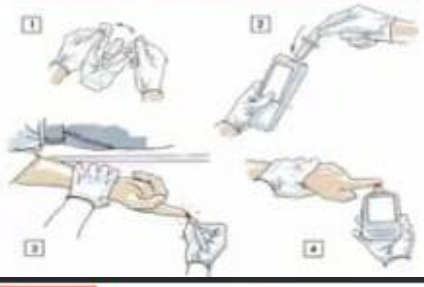
- ❑ Response time: < 1 min
- ❑ Flexible matrix
- ❑ Multiplexed detection
- ❑ Reduced assay cost

RSC Adv., 2018, 8, 34012

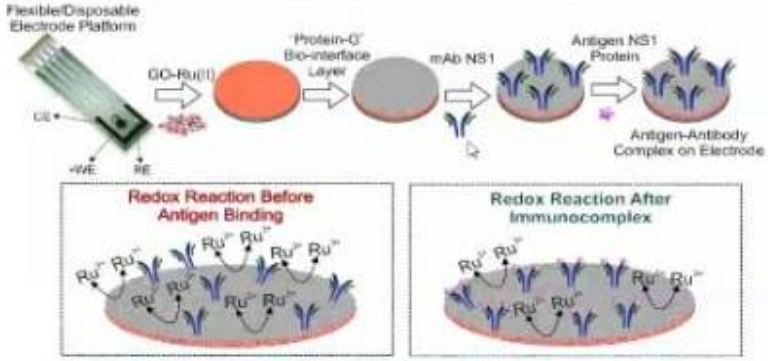
Wang et al. Chem. Rev. 108 (2008) 814

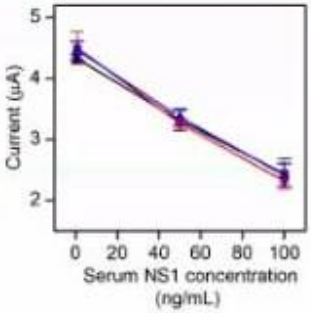
Patient-Side Clinical Diagnostics: A Potential need?

- Rapid detection of clinical abnormalities
- Improve health care treatments
- Point-of-care-testing (POCT)
- Low cost, easy integration, high sensitivity & good selectivity

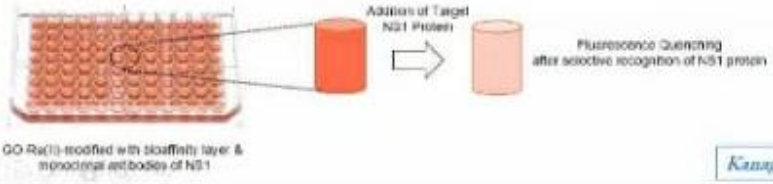


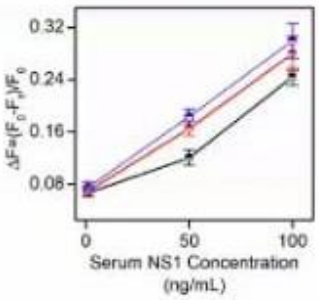
Electrochemical Method of Immunosensing of NS1 Protein





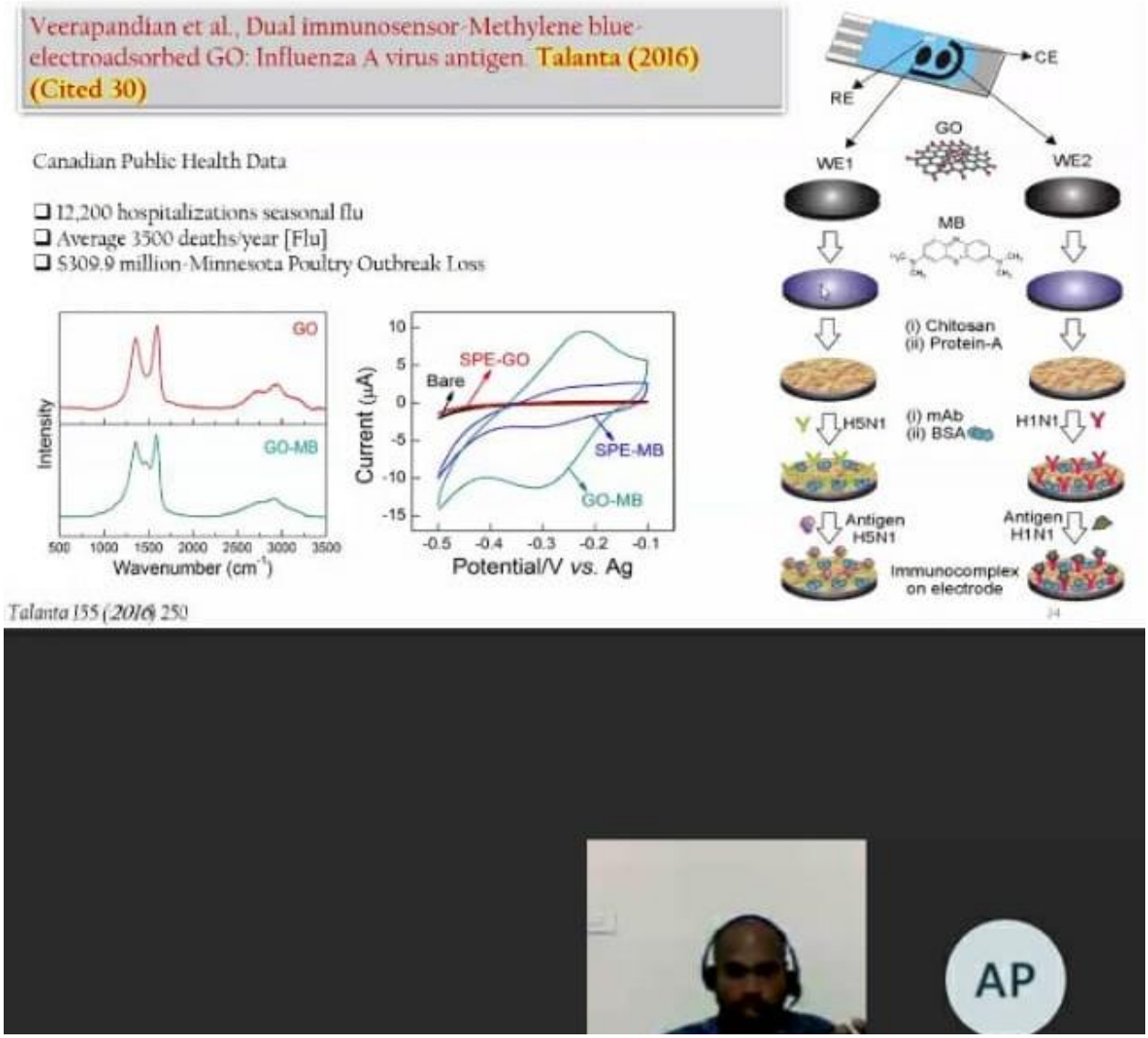
Optical Method of Immunosensing of NS1 Protein





Kanagavalli & Veeraparadina, Biosens. Bioelectron. 2020

He also shared his own work with us which was really inspiring!



Last but not the least he ended the meeting by showing the acknowledgement and answering our questions informative answers. It was a very helpful session.