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Review Article

HOW CAN YOU KILL A VIRUS THAT HAS NO LIFE?

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Abstract: All living beings have tendency to get rid of those who harms them. Presence of viruses in the host went unnoticed until they remain as either commencel or symbiont but not as a pathogen. Viruses are resistant to drugs because neither they have their own metabolic activity nor ability to reproduce. Soap – water disfigure their structural organization and make them incapable to penetrate the human cell; normally where they are capable to divide by utilising host cells machinery. Immunologically, they also become incapable of dividing even after they invade the host cells because they are covered with specific antibodies. Newly identified SARS-CoV2 virus has become pandemic and couldn't be "killed". To protect ourselves from this virus we have adopted three strategies namely, do not come in contact with the virus; disintegrate its structure if it is sitting on the surface of your body by washing the surface with soap water or by alcohol; and even if it enters the body coat with specific antibodies by plasma therapy or vaccination .

Keywords: Virus. Inativation

Dr. P. D. Gupta, Former Director Grade Scientist, Centre for Cellular and Molecular Biology, Hyderabad, India. Dr. Gupta has published about 250 research articles in international Journals. According to Research Gate his recent publication in **J. Cell and Tissue Research 16(2): 5705-5711(2016)** reveals research interest, 971; Citations 21; Reads 41,569 and 857 Recommendations. Likewise his another paper in J**. Cell Tissue Research Vol. 21(1): 7025-7028, June 2021** issue reveals 2.8 Research Interest, 3 Recommendations and 76, Read as per Research Gate.

Dr. (Mrs.) K. Pushkala, Retired Prof. of Zoology, Women College Chennai. Along with Dr. P. D. Gupta, she developed a "blind women model" to described light as an epigenetic model for breast cancer. Her recent article **"Corona (SARS-COV2) and dogs: Foes and friends"** published in **J. Cell and Tissue Research Vol. 21(1): 7025-7028 (2021)** showed 75 reads, 3 recommendation &2.8 research interest.

Dr. P. P. Sood, (a) Professor and Head, (b) Emeritus Medical Scientist, ICMR, New Delhi (c) Emeritus UGC Scientist, New Delhi (retired from Department of Biosciences, Saurshtra University, Rajkot Gujarat, 360005). He has about 200 publiations in international journals. His recnt paper "**Origim of COVID-19** published in **J. Cell Tissue Research Vol. 21(1): PV 1 (2021) has shown** 4 Research Interest, 6 Recommendations and 76 Read as per Research Gate within one month.

The oldest ancestors: A pre-virus era was only chemistry era, viruses remain dormant like seeds and the other line of evolution started. Actually biological evolution begin with the evolution of bacteria followed by plants and animals either unicellular or multicellular. "Earlier life" was less energy consuming and thus relationships such as commensalism, symbiosis and parasitism evolved.

Then interactions between them were established. Probability is that these dormant seed like viruses lost their independency for an obligatory intracellular life due to a simple reason to get energy and other chemicals to sustain metabolic and reproductive activities [1,2]. The mitochondria and chloroplast also invaded the plant and animal cells but they prefer to become integral part of the cell. As complexity arose with high genetic variability, energy consumption increased many folds and the organisms started leading independent life [1,2]. To begin with viruses would have remained parasites or symbionts; circumstances may have converted them pathogens as discussed in a book entitled "Viruses: More the Friends Than Foes" [3]. Mitochondria and chloroplasts are successfully acclimatised in their host cells that they now cannot grow independently. On the other hand, an intracellular parasite, Rickettsia in addition to growing inside the host cell, can grow outside also.

Viruses are needed: Tony Goldberg, an epidemiologist said "All the essential things they do in the world far outweigh the bad things" [4]. Again, according to virologists some viruses can elevate the ability to tolerance level to drought, cold and hot soil temperatures by the plants; however, they are not considered as the beneficial microbes. In addition, virus increases value or growth potential as well as decreases the use of chemical fertilizers or pesticides in agriculture [5-8].

Protective to humans: Scientific data prove that infection with certain benign viruses in humans can prevent the entry of other dangerous pathogens [9]. Scientists are focussing their attention to study the special capabilities of viruses to utilize them for its benefits and defence mechanism against others and not as a pathogen alone. Wealth of knowledge about the viral diversity also gives an insight into the questions, that how our planet and each ecosystems works [10,11].

Role in therapeutics: Phage Therapy: Now, phage therapy a fast growing field replacing the use of antibiotics to control bacterial diseases. This therapy is more beneficial because it will kill only the specific bacterial population rather than killing entire bacterial population as antibiotics generally does [12].

Virus as microscopic guided missiles in oncology: Technological advancement paves way to destroy cancer cells using specific dose of selective virus. This procedure is also gaining popularity due to its less toxic and more effective in cancer treatment [12,13].

Genetic innovation: The replication mechanism operated by viruses is remarkable because they use the host replicating machinery for their benefit. In a similar way in germ line cell (eggs and sperm), the viral code can be passed on to the next generation and become permanently integrated. As a result "All organisms that can be infected with viruses have an opportunity to suck up viral genes and use them to their advantage [14]. Evidence indicates that the genetic code inherited from ancient retroviruses that infected our ancestors more than 130 million years ago is responsible for live births [15]. Such signatures could be anticipated in many multi-cellular forms and many similar functions that remain unknown," Suttle says [10].

Viruses are hard to "kill" (Immortality of the virus): Pandemic spreading of viruses pose a biggest threats to humanity since, they cause untold havoc

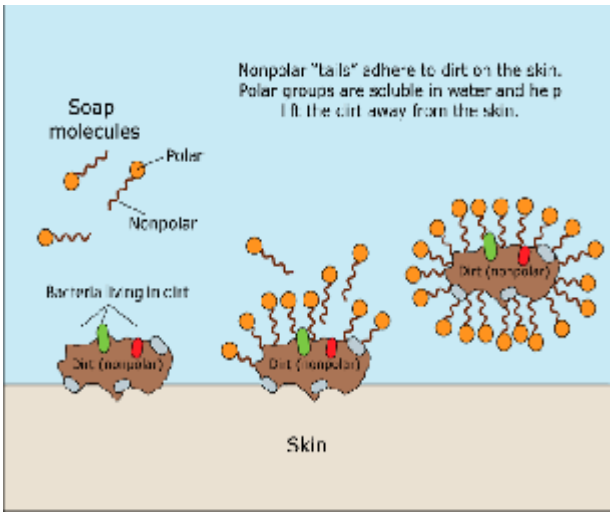

Fig. 1: shows how the weakest link (lipid bilayer having no strong covalent bonds) protein units could be split apart using soap and soap water and avoid harsh chemical treatment

and responsible for uncontrolled human sufferings. They are neither alive nor dead like a seed and do not follow the characteristics of living beings. The fact is that they are not alive implying not to follow the same rules as other living beings. Their "life wire is on" only when they come in contact with a host cell [16] .

The odd makeup of these minuscule is resistant to drugs as well as disintegration is impossible, unlike other pathogens [17]. Protein receptor interaction of the virus (one of its proteins will bind to another protein) gives the power to hijack certain cells [18]. Some times their interlocking of coat proteins can be open up by simple soap and water [19] which renders virus inactive [Fig.1].

Once the virus enters the human cell it directs the host cellular machinery to produce more of its kind [16]. In response to the new invader, our defence mechanisms tries to kill such infections though they fail at times [20]. Our immune system is finally triggered resulting in "cytokine storm" [21,22], which is anticipated to be the cause of severity among corona virus cases. Recent in depth study gives enough evidence that very strong and brisk immune response, where the body is fighting back and sort of throwing everything it has at the virus. Unfortunately, by this time virus gained enough time to amplify in large numbers and spread to a wide range of human host. Detection and therapeutic treatment also are difficult. Developing specific antiviral drug to combat certain viruses is also not that easy and fast, unlike antibiotics which works with a wide variety of bacterial infections. Viruses also differ in their structure and function implying that their pathogenicity as well as response to treatment differ; since they are structurally and genetically dissimilar to their close relatives. The best example is the corona virus prevailing in the world now and corona virus causes influenza (SARS-CoV1) that causes Covid-19 (SARS-CoV2). Recently, scientists have doubts that vaccines deve-loped against SARS-CoV2 would work against variants of SARS-CoV2. Similarly, herpes simplex virus do not respond to same drug which are effective against other herpes viruses.

Similarly the antiviral drugs available for some viruses hardly cure the infection [23,24]. Drugs used to treat HIV, for instance, has the potency to suppress virus replication but could not kill the virus like genetic operation (CRISPR) [25]. Another in the list is Tamiflu can shorten the duration of seasonal influenza even though virus can be detected even after a patient recovers [26]. The resilience of viruses is the reason for creating such a menace throughout from flu pandemics to outbreaks of Ebola. Their capability to evolve rapidly cannot match with the speed of developing treatments and cures resulting to remain as a constant threat to human kind. Neigher many drugs are available to "kill" viruses, nor prevent their host range. Hepatitis C is the only virus successfully eradicated by drugs. The host cell is fully packed with multiple copies of SARS-CoV-2, the cell bursts ultimately to find adjacent new host cell. An antiviral treatment at this junction to break the life cycle of the virus is successful as long as it does not tamper with the replication process that is also important to the host cell. In such conditions it is likely to be toxic to the human host as well. Influenza A or B are successfully treated with newer drugs such as Zanamivir (Relenza) and Oseltamivir (Tamiflu) by blocking a key viral enzyme, obstructing virus release from the cell, slowing the spread of infection within the body, and minimising the damage the infection causes. The scientific community and drug companies are focussing their attention to develop antiviral drug to treat SARS-CoV-2, the virus that causes COVID-19 after this pandemic.

To kill or to be killed: Virus is an invisible small infectious agent sitting anywhere without showing any activity and looking for suitable environment failing which often remain dormant for many months or even years. Since Virus have life only in a living host cell, the probability is that their existent is since living cells first evolved [27]. The viral replicating mechanism works only inside the cells of another organism. The cytopathic effects (structural and biochemical) of these organisms on the host cell is extensive. For their own safety host cell is destroyed in most of the cases as an expression of their own defence mechanism through cell lysis, alterations to the cell's surface membrane and various modes of programmed cell death. The presence of some virus such as Cytomegalovirus (CMV) go unnoticed because of no apparent symptoms, but can cause complications during pregnancy or when the immune system is weak. Persistent infection is a pain around the neck because these latent and inactive virus exhibits few signs of infection occasionally but the host cell functions normally [28]. For example not always the oncogenic virus develop cancer in the host. On the other hand oncogenic viruses such as

Epstein-Barr virus, human papilloma virus, hepatitis B virus, and human herpes virus-8 (DNA virus) and human T lymphotrophic virus type 1 and hepatitis C virus (RNA virus) are associated with progression of human cancers [29,30].

Self defense: Genetically controlled cell death programme called apoptosis kills the virus preventing the spread to a wide range of the virus. On the other hand, the virus also refined a wide variety of strategies to nullify the host defence mechanisms for their own survival during pathogen-host co-evolution. Mitochondrial antiviral signalling protein (MAVS) serve as a crucial platform for innate immune signalling process. So it is not surprising that mitochondria prove to be a recurrent target for viruses, aiming to manipulate the fate of the infected host cell or to inhibit innate immune response [31]. As a result virus tries to prevent the host cell apoptosis, control inflammatory responses, and evade immune reactions. These miniscule pathogens can trigger the death of infected cells and uninfected cells from the immune system thereby it is paving way for them to spread as well as prevents/limits an active antiviral response. Many viruses are known to prevent the translocation of calreticulin to the surface of dying cells to block the exposure of an engulfment signal required for the efficient uptake of dying cells by dendritic cells and for the induction of the immune response [32].

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