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A REVIEW ON DIFFERENT PREVENTION AND TREATMENT TECHNOLOGY USED FOR THE CURING OF VIRAL INFECTION

Sanjeev Kumar[1], Navneet Swami[2], Pawan Singh Rana[3], Prashant Arya[4], Deepak Patel[5], Vijay Jyoti Kumar[6] and Sarvesh Kumar*[6]

[1]MIT institute of Technology, Meerut (UP).
[2]Fresh Water Biology Unit, Department of Zoology and Biotechnology, H.N.B. Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand, India.
[3]Department of Biotechnology, H.N.B. Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand, India.
[4]Department of Microbiology, H.N.B. Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand, India.
[5]Department of Chemistry, A.P.B. Govt. College Aygustumani, Rudharpryag, Uttarakhand, India.
[6]Department of Pharmaceutical Sciences, H.N.B. Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand, India.

***Corresponding Author: Dr. Sarvesh Kumar**
Department of Pharmaceutical Sciences, H.N.B. Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand, India.

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ABSTRACT
Recently, the corona virus continues to cause epidemics worldwide, and it has killed millions of peoples all over the world. The history of epidemics linked viral infection has been very long and has often reached human civilization. Thus by this article, we have tried to explain the basics of the virus as well as how it spreads; how do it disturbs the metabolic processes, and measures to prevent its spread and various methods of treatment. Viruses are microorganism; containing genetic material which remain packed in a protein coat. They are known to cause diseases such as the common cold, flu and allergies, while some of them also cause serious diseases like AIDS, smallpox and Ebola etc. They use host body for their multiplication and thereby increasing their numbers. They attack living, normal cells and inject their own nucleic acid into the host cells. The viral nucleic acid is injected into the host genome within the host cell, where it can replicate the genetic material. It also creates the protein coat After translation and as soon as these two are ready they come together to form the entire virus and comes out by via cell lyses. This is how virus destroys the other cells, such as liver, respiratory system, nervous system and blood. Some therapies only will help to get rid of the symptoms as you wait for the infection to fight off your immune system. Antibiotics are not working for viral infections. Some antiviral drugs were developed to treat viral infections but these are not enough. Vaccine production can also help protect against many viral diseases but it can't help in the scenario where a novel virus attacks the hominids. In these cases, various therapy modes such as RNase-based therapy and ribozyme are used to be investigated. The vaccine method and other biological strategies that can be successful against novel viral attacks will be explored here.

KEYWORDS: Virus, Infection, Therapy, Vaccine, Biochemical.

INTRODUCTION
Viruses are mesobiotic entities made up of nucleic acids (either DNA or RNA) packed inside a protein coat. The nucleic acid part consists of a set of genes required for its survival surrounded by the other body called Capsid (the protein coat)[1,2] as in fig1. Some viruses also have a fat "envelope" which covers.[3] They requirea host cell and its components for growth and metabolic functions, since thevirus has not cytoplasm, mitochondria, or other cell organs.[4]

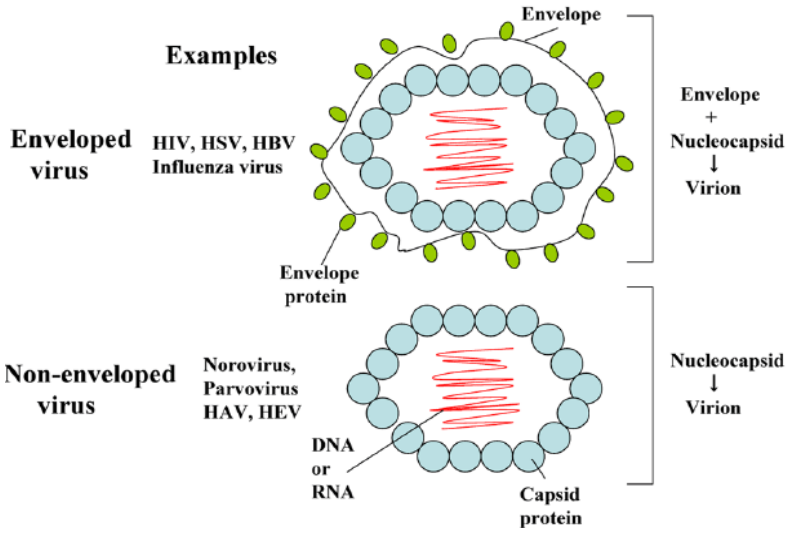

Fig. 01: Enveloped and Non Enveloped Virus.

From minor infections to contagious epidemics viral infections has the ability to alter the history of any country or the whole world.[5] The pathogenesis and epidemiology of viruses is a persistent changing feature and hence there is no permanent therapy available, it can't be either. Different viral infections have different effects on the host body.[6-7] This review articlewill coverthe different methods of detecting preventing and eradicating the virus and the infection caused. There is currently no permanent cure for any form of viral infection and vaccination is therefore the only reliable treatment available to us.[8-10] Scientist have suggested various treatments relating to human history: Immunoprophylaxis, Active Prophylaxis (Vaccines), Passive Prophylaxis, Sanitation and Vector Control, Antiviral Chemotherapy, Interferons and Cytokines.

Immunoprophylaxis and Vaccination[11] It involves the use of a specific recognizable part of pathogen. Which leads to the activation of host's immune system in order to prepare antibodies within so that when the actual pathogen attacks the individual's immune system remains armored against it? It could be either active or passive.

Immunity[12] a condition where the host's defense system can resist a particular infection. It is either the ability of one's immune system to let the pathogen develop in or it to counteracts the toxic molecule secreted by it.

Immune system there is a specific group of organs within an organism that protects them from various infections, called the immune system. This system helps the organism to fight against any foreign molecule that enters the body. It consists of highly specialized to some universal kinds of cells, tissues and organ associated. Some important parts of the immune system are Lymph nodes, lymphatic cell deposits (in the gastrointestinal tract), spleen, bone marrow etc. while among cells the important are B cells, T Cells and macrophages.

Passive acquired immunity[13] Passive immunity includes simply the transfer of antibodies from an individual to another, so that the later one gets immunized against a certain pathogen without having an encounter with it. These further can be divided as:

a) Naturally acquired passive immunity[13]: transferred directly from mother to the fetus (IgG) or through the Colostrum (IgA)
b) Short-term immunization by injection of antibodies- it can be achieved by injecting the antibody containing plasma to the recipient. Such as injection of gamma globulin to hypogammaglobulinemia children

Active acquired immunity[14] active acquired immunity is the development of antibodies against a certain pathogen by an individual's immune system when it encounters the pathogen. This forms the basis of Vaccination. Such kind of immunity though gained at a slower rate but remains for a long time or the whole life span of individual.

Natural active acquired immunity: The person becomes immune as a result of previous exposure to a live pathogen

a) Artificially active acquired immunity [15]: A vaccine induces a primary anti-antigen response without triggering disease symptoms

Herd immunity is a case where, a person remains immune towards a certain infection not due to his immune system but just because other people surrounding him have the immunity against certain infection. So if an individual have less chances of getting infection as he has lees chances of getting in contact with an infected person. The other people of the community may have developed immunity to a particular disease especially through previous exposure or vaccination.

Immunization[15] is the process of making a person or a community, immune toapossible infection, by the administration of a vaccine. These vaccines make an

organism's immune system to develop antibodies against the pathogen which protects the individual against future infections of that pathogen.

This process has proved a guaranteed security against life-threatening infections that are responsible for 2-3millions deaths around the globe annually. It is a cost-effective health investment, with proven records of reaching to the far remote and susceptible populations. The target groups for immunization are clearly defined; and it can be delivered easily and efficiently through outreach programs; most importantly it does not ask for any major lifestyle change.

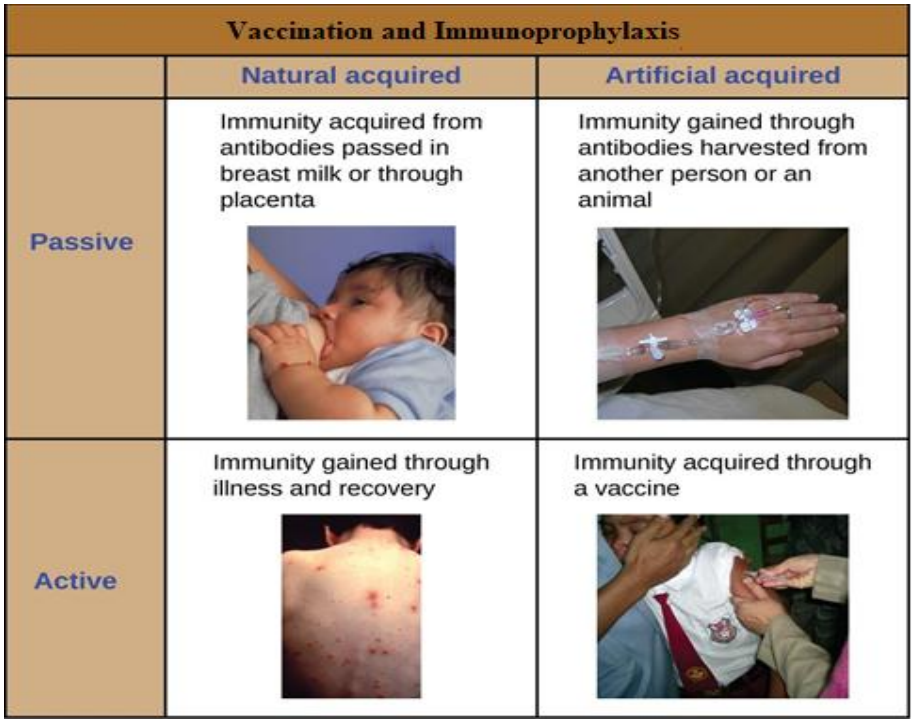

Fig. 02: Vaccination and Immunoprophylaxis.

Active Prophylaxis (Vaccines)

Vaccines include either the whole inactivated (or killed) pathogen or any part of the pathogen that is easily detectable to the immune system. As soon as the immune system recognizes a foreign molecule it gets activated and starts to produce antibodies as well as memorize it for subsequent similar infections. Recognizable types of vaccines are:

1. Live attenuated
2. Killed (inactivated)
3. Toxoid

Live attenuated[16-17]

These vaccines are developed by in-vitro manipulation, so that they lose their pathogenic aspect but remain detectable to the immune cells. These attenuated viruses can be inserted into the body of host where they can stimulate the immune system that begins developing antibodies against them. This way, the immune system uses antibodies to protect the host from any future infection. Live attenuated virus vaccines can also confer lifetime immunity following a single sequence of immunization. Nevertheless, these attenuated vaccines are not necessarily safe, as the virus alive and at any point in time it can return to a pathogenic form. Advance in biological research techniques have contributed to recombinant vaccines development. These vaccines are developed by eliminating or altering the genetic area that has the potential for reversal to a more pathogenic form. Such direct modifications in the viral genome provide the scientist with the technology for creating live attenuated vaccines which can be used without worrying about any adverse impact.

- ✓ Measles, mumps, rubella (MMR combined vaccine)
- ✓ Rotavirus
- ✓ Smallpox
- ✓ Chickenpox
- ✓ Yellow fever

Vaccines for Prevention

Although we have small numbers of antiviral medications, such as those used to treat HIV and influenza, vaccination is the main method of preventing infectious diseases, and is intended to avoid outbreaks by developing immunity to developing a family of viruses. The primary method of controlof viral disease is vaccination design to prevent outbreaks by virus or family of virus. Vaccines may be produced using live viruses, killed viruses, or molecular virus subunits. The killed viral vaccines and viruses in the subunit are both unable to cause disease.

Inactivated vaccines[18]

It is an alternate attenuated vaccine because it inactivates the virus that causes the disease, so it is called inactivated vaccine that kills the virus with heat increase, so it is also called killed vaccine. Inactivated vaccine does not provide the virus with immunity. Inactivated vaccine is a virus particulate bacteria or other pathogen that have evolved in culture media vaccines. So, you can need a number of doses over time (booster shots) to get consistent immunity. To guard against: diseases. Inactivated vaccines

- Hepatitis A
- Flu (shot only)
- Polio (shot only)
- Rabies

Toxide vaccines[19-20]

Some diseases are caused by a toxin of bacteria like tetanus which is spreads by clostridium tetani bacterium. Toxide vaccines contain toxin or chemicals produced by a type of bacteria or virus that make the virus's toxicity immune to the harmful effects of virus infections rather than immunity to chemical rays. Examples are diphtheria and tetanus vaccines.

Vaccines and Anti-Viral Drugs for Treatment[21]

Vaccines can be usedin some cases, to treat an infectious viral infection. The concept behind this is that by giving the vaccine, immunity is boosted by giving the vaccine without adding more disease-causing viruses. In the case of rabies, a deadly neurological disease transmitted via the saliva of animal infected with the rabies virus, it may take two weeks or longer to progress the disease from the time of the animal bite to the time it enters the central nervous system. This is ample time to vaccinate an adult who things a rabid animal has bitten them; their enhanced immune response is sufficient to prevent the virus from entering nervous tissue. Thus, the diseases potentially-fatal neurological effects are averted; the patient need only recover from the infected bite. This method is also used to diagnose Ebola virus, which is one of the strongest and most lethal virus on earth.The diseases, transmitted by bats and great apes, will causes death within two weeks in 70-90 percent of infected humans. Using newly-developed vaccines that improve the immune system in this way, there is hope that the individuals affected will be better able to contain the virus, possibly saving a higher percentage of infected people from a rapid and very painful death.

Another way to treat viral diseases is by taking antiviral medicine. Although these medications also have limited effectiveness in curing viral disease, they have been used in other case to manage and reduce symptoms for a wide range of viral diseases. These drugs can kill the virus in most viruses by blocking the activities of one or more of its proteins. It is essential that the viral genes encode the targeted proteins, and that these molecules are not present in a healthy host cell. Viral growth is thus blocked, without affecting the host. There are several antiviral medicine available for treating infections, some unique to a single virus and others that may affect several viruses.

Antiviral for treating genital herpes (herpes simplex II) and influenza have been developed. drugs such as acyclovir can minimize the number and length of active viral disease episode during which patients grow viral lesions in their skin cells for genital herpes.Since the virus stay dormant in the body's nervous tissue for life, this medication is not curative, but may make the disease's symptoms more manageable. Drugs such as Tamiflu (oseltamivir) can shorten the length of the "flu" symptoms by one or two days for influenza, but the drug does not eliminate symptoms altogether. Tamiflu works by inhibiting an enzyme (viral neuraminidase) that protects infected cells from new virions. Tamiflu thus prevent the transmission ofvirus from infected cells to uninfected ones. Many antiviral medications, such as Ribavirin, have been used to treat a number of viral infections, but their mode of action against certain viruses remains uncertain.

Treatments other than Vaccines

Though, vaccines have played important role in prevention of various viral infections. They have their own limitations like,

1. It is not always possible to make them
2. They are ineffective in many viral infections
3. In some cases, vaccines also have some risks are associated with them for a small ye significant part of population.

Therefore, scientists have turned to the biochemical aspect of the prevention and treatment of the viral infection. It includes.

1. Use of host cell receptor blockers to prevent the viral entry into host cell.
2. Inhibiting the viral mRNA by ribozymes, anti-sense DNA or the RNAi (RNA interference) (Fig.-03).

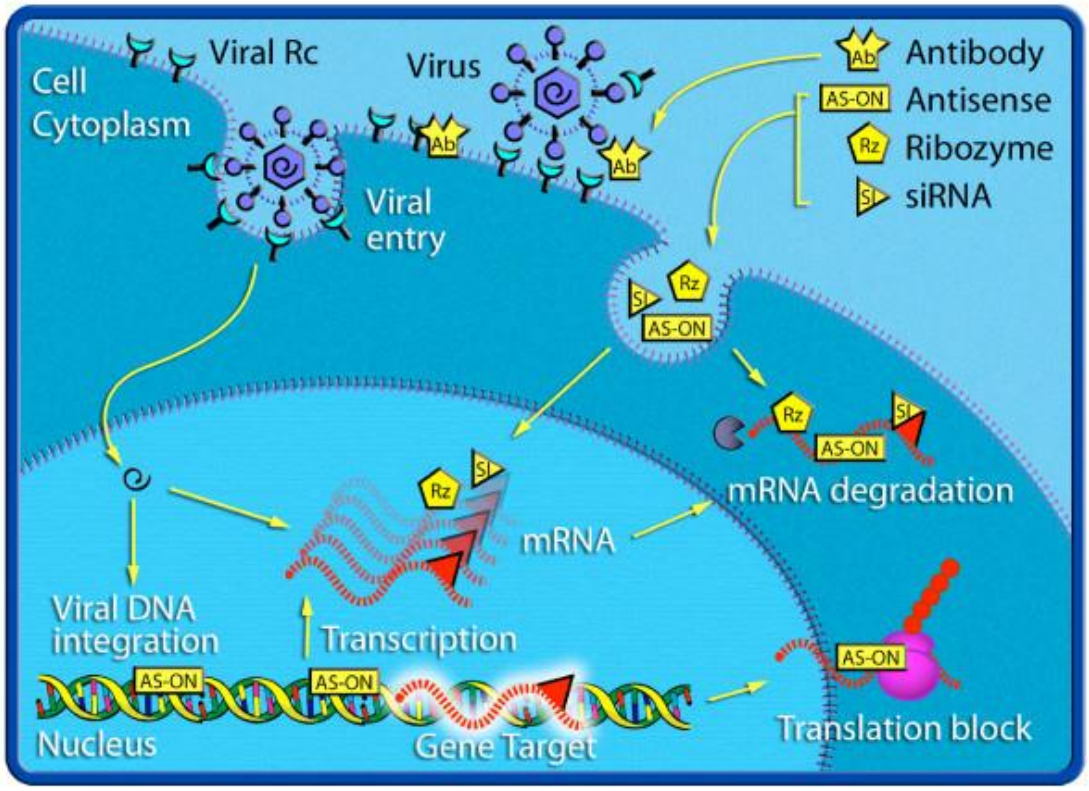

Fig. 03: Prevention and Treatment of viral infection by Biochemical strategies.

Viral entry can be inhibited by Antibodies (Ab) or soluble receptors (Rc). Antisense oligonucleotides (AS-ONs), ribozymes (Rz) or siRNA (SI) pair combine with their complementary DNA, RNA or mRNA genomic target. AS-ONs can block recombination, transcription, mRNA translation or induce its RNaseH degradation. Rz has catalytic activity, and their targets are identified. SiRNAs (SI) induce target mRNA degradation by RNA-induced silencing complex (RISC).[22]

1. **Prevention by protein inhibition:** It includes the prevention of viral infection by using monoclonal antibodies (MABs). Monoclonal antibodies have been developed by various biotechnological firms some of these are PRO367, TNX-355 and Cytolin etc. most of these were used in the treatment of HIV. Such therapies have been used are under trial in treatment of the lower respiratory tract diseases caused by Respiratory Syncytial Virus (RSV). Therapy using anti-viral proteins has been a successful approach in this context. RespiGam andPalvizumab were the two such proteins that were found to reduce the RSV infection initially. Blocking the receptor cells to prevent the viral infections is done byusing MAbs. Use of MAbs in prevention of Human Rhinovirus infections have been achieved.[23-25]
2. **Prevention by mRNA inhibition:** As the molecular biology has gained pace, scientists have been looking for cure of various diseases by molecular approaches. Over the year's scientists have tried and tested different techniques as 1. RNA interference (RNAi), 2. Ribozymes, and 3. Antisense Oligonucleotide (AS-ONs). Vitravene is one such drug that has been launched and it is based on Antisense Oligonucleotides (AS-ONs).
3. **RNA interference:** RNA interference is a next level biotechnology-based approach that have shown high efficiency in targeting and knocking down the genes. It had been reported that an in-vitro synthesized 21-23 nucleotide long effectively silence the target gene inside the mammalian cells without triggering the interferon production.[26-28] Use of such in-vitro synthesized small interfering RNAs (siRNAs) has attained and efficacy up to 90% and used to develop drugs against several viral diseases.
4. **Ribozymes:** These are catalytically active nucleotides which can bind to a target RNA and can degrade it. This property of ribozymes let them to be useful tool against the retroviruses. Tests of these ribozymes against various viral diseases such as hepatitis, HIV and influenza etc. have shown that ribozymes can be potential inhibitors to viral infections.[29-32] One such ribozyme that have been developed in-vitro to inhibit the infection of Hepatitis C virus is HEPTAZYME.
5. **Antisense oligonucleotide:** AS-ONs involves the use of artificially synthesized nucleotide threads that form complementary pair with the target mRNA inducing its degradation. Some of these drugs are Vitravene, Genasense, ISIS14803 etc. on-route to development AS-ONs based drugs have been to

different stages as "First generation" DNA analogs which are Phosphorothioates Oligonucleotides, "Second Generation "includes oligonucleotides having an alkyl modification at 2' ribose triggering enhanced affinity and less toxicity. The "third generation" ONs have modified phosphate linkage or a different sugar residue instead of furanose ring.[33-34]

Therefore, considering the current pandemic of COVID-19 lead by Novel CORONA virus, we have to look forward to a single effective or a combination of the therapies that we discussed above. No doubt, vaccines are of utmost priority and most of the scientist, institutes and laboratories are working in this direction, but considering the fast mutation rate of this Novel CORONA virus[35] we can't rely solely on vaccines. Therefore, we have to look for Nucleotide based therapies like, RNAi and ribozymes-based therapies.

CONCLUSIONS

The novelty, fast mutation rate and high lethality of Novel CORONA Virus has taken the whole world by shock. The health infrastructure all along the world was not able to hold the disease outbreak. Though, we have been working on nucleotide based therapies against viral infection for past years and many of such therapies are under use or in clinical trials still we have a lot to gather before a complete launch of such therapies available for common public. Therefore, researches towards promoting the RNAi therapy needs to be pushed further as, relying on the vaccines only will not help in the cases where the virus mutates at a faster and high rate.

CONFLICT OF INTEREST: The authors declare that they have no conflict of interest.

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