

Effect of Antivirals on Viruses - A Review

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ABSTRACT

Antivirals are the medication that reduce the multiplication and intense of the virus in the host cell and these type of antivirus acts only on a specific type of viruses and which cannot cure all the viruses and the first marked line of defence is by the annual flu vaccine,however these are used at the time of emergency to cure certain viral diseases like HIV, herpes viruses, the hepatitis B and C viruses, and influenza A and B viruses and still Researchers are working to extend the range of antivirals to other families of pathogens and mutated viruses too A literature review was carried out from the scopus pubmed database The aim of the study is to collect the data and analyse the effects of antiviral drugs on viruses. The antivirals helps to prevent and reduce the activity of viruses while it also decreases the immunity of the host so the prime motto is to maintain the surplus immunity to withstand the effects of viruses and to withstand the counter effects of antiviruses

KEYWORDS: Mutated viruses ;countereffects of viruses ;annual flu vaccine,surplus immunity;counter effects of antiviral;specific type of viruses

INTRODUCTION

Antivirals are the class of medication that are used to treat viral infection(Heinz, 2000). Most antivirals target specific viruses while a broad spectrum against a wide range of viruses(Kotwal, 2014). Unlike most antibiotics,antiviral drugs do not destroy their target pathogen,instead they inhibit their development and deactivate or destroy viral particles. Usually viral replication occurs as a six stages which is adsorption,penetration,uncoating,viral genome replication,maturation and release

Background:

The previous study was done to evaluate the prevalence of torque teno virus (TTV),epstein-barr virus (EBV),and cytomegalovirus (cmv) in cardiac patients with atherosclerosis and coexisting chronic periodontitis (Priyanka *et al.*, 2017) and there is also an evoke of drugs designed against the pathogen in fishes and in clinical point of view (Geetha and Veeraraghavan, 2016; Mohanty *et al.*, 2017; Rajeshkumar, Agarwal, *et al.*, 2018; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Anitha and Rajeshkumar, 2019) and further several extracts were proven to inhibit all microbes in recent studies(Karthiga, Rajeshkumar and Annadurai, 2018) and a study done on cytotoxic effect of caralluma fimbriata against some cancer cells which is slightly similar to our study(Ashwini, Ezhilarasan and Anitha, 2017) and study done on *Azadirachta Indica* a herbal panacea which helps in dentistry(Lakshmi *et al.*, 2015) and similar study we done in emergency trends in novel drug delivery approaches for the treatment of lung cancer(Sharma *et al.*, 2019) and Ethanolic bark of *Acacia cathechu* induces apoptosis in human oral squamous carcinoma cells which is similar to our study we have done(Lakshmi, Ezhilarasan, Vijayaragavan, *et al.*, 2017) and In silico and in vitro analysis of coumarin derivative induced anticancer effects is by undergoing intrinsic pathway mediated apoptosis in human stomach cancer is the study we have done previously(Perumalsamy *et al.*, 2018) and *acacia catechu* ethanolic seed extract triggers apoptosis of SCC-25 cells which is the previous study which we have done(Lakshmi, Ezhilarasan, Nagaich, *et al.*, 2017) and the oligonucleotide therapy:An emerging focus area for drug delivery in chronic inflammatory respiratory diseases which is our previous study done on the topic(Mehta *et al.*, 2019) and our previous study like oxidative stress is bane in chronic liver diseases:clinical and experimental perspective which is similar to the study(Ezhilarasan, 2018) and our previous study Hepatic

fibrosis :its time to go with hepatic stellate cell-specific therapeutic targets is similar to our study(Ezhilarasan, Sokal and Najimi, 2018) and our previous studies like Syringic acid triggers reactive oxygen species-mediated cytotoxicity in HepG2 cells which is slightly similar to our study(Gheena and Ezhilarasan, 2019) and our previous study Selenium nanoparticles: A potent chemotherapeutic agent and an elucidation of its mechanism which helps to cure several cancer cells destruction which is similar to our study(Menon, Ks, Santhiya, *et al.*, 2018) and our previous studies like Biosynthesis of zinc oxide nanoparticles using *Mangifera indica* leaves and evaluation of their antioxidant and cytotoxic properties in lung cancer (A549) cells which helps in cancer cells to degrade(Rajeshkumar, Kumar, *et al.*, 2018) and Mechanism of Larvicidal Activity of Antimicrobial Silver Nanoparticles Synthesized Using *Garcinia mangostana* Bark Extract which helps to kill the larva which is our study we done for eradicating larvae in natural means(Karthiga, Rajeshkumar and Annadurai, 2018) and Brassica oleracea mediated synthesis of zinc oxide nanoparticles and its antibacterial activity against pathogenic bacteria which is our previous study which zinc

oxide nanoparticles extracted from brassica oleracea which shows antibacterial activity(Rajeshkumar, Agarwal, *et al.*, 2018) and Antihyperglycemic activity of Caralluma fimbriata: An in vitro approach which is our previous similar type of study(Ashwini and Anitha, 2017)Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Ariga *et al.*, 2018; Basha, Ganapathy and Venugopalan, 2018; Hannah *et al.*, 2018; Hussainy *et al.*, 2018; Jeevanandan and Govindaraju, 2018; Kannan and Venugopalan, 2018; Kumar and Antony, 2018; Manohar and Sharma, 2018; Menon, Ks, R, *et al.*, 2018; Nandakumar and Nasim, 2018; Nandhini, Babu and Mohanraj, 2018; Ravinthar and Jayalakshmi, 2018; Seppan *et al.*, 2018; Teja, Ramesh and Priya, 2018; Duraisamy *et al.*, 2019; Gheena and Ezhilarasan, 2019; Hema Shree *et al.*, 2019; Rajakeerthi and Ms, 2019; Rajendran *et al.*, 2019; Sekar *et al.*, 2019; Sharma *et al.*, 2019; Siddique *et al.*, 2019; Janani, Palanivelu and Sandhya, 2020; Johnson *et al.*, 2020; Jose, Ajitha and Subbaiyan, 2020).

Stages of viral replication:

Usually in adsorption the virus become attached to the cell and usually gets attached to specific receptors and commonly receptors are glycoprotein type while some are phospholipids or glycolipids type and the special type of animal viruses like orthomyxovirus, paramyxoviruses have specific and specialized attachment sites distributed on the surface of the virion even they have glycoprotein spikes through which they attack. Next is the penetration which is followed after adsorption and the virus can no longer be recovered from the intact cells and the most common mechanism is receptor mediated endocytosis,the process by which many hormones and toxins enter cells and virions are endocytosed and contained in cytoplasmic vacuoles Third step which is a uncoating a key step in uncoating.A key step in uncoating is the acidification of the content of endosome to a ph of about 5,owing to the activity of proton pump present in the membrane The low pH causes rearrangement of coat components,which then expose normally hidden hydrophobic sites and they bind to the lipid bilayer of the membrane causing the extrusion of the viral core into cytosol.for the influenza viruses sensitive component is the core HA₂ unit of hemagglutinin for adenovirus , it is the penton base(*Replication of Viruses*, no date a)

Viral genome replication:

The fourth step is viral genome replication in which virulent viruses,either DNA and RNA shut off cellular protein.synthesis and disaggregate cellular polyribosomes, favouring a shift to viral synthesis. The mechanism of protein synthesis shut off varies even within the same viral family.polio virus using a viral protease causes cleavage of a 200kd cap binding protein which is required for the initiation of translation of capped cellular messengers.in contrast to virulent virulent viruses,moderate viruses eg: polyomaviruses may stimulate the synthesis of host DNA,MRNA and protein.this phenomenon is of considerable interest for viral carcinogenesis (*Replication of Viruses*, no date b)

Maturation and release:

The last step fifth and sixth stage occurs consecutively as the maturation and release. The elaborate description about the virus replication is needed to know the action of antiviral drug on specific site on viral replication cycle.The viral particles inhibited at a particular site where enfuvirtide drug inhibits fusion used for HIV.Amantadine(Baden *et al.*, 2016) ,Rimantadine(Myburg *et al.*, 1998; Hayden *et al.*, 1999) inhibits influenza(Betakova, Nermut and Hay, 1996) (Reiss and de Jong, 1994) by blocking the coating of viruses(*Replication of Viruses*, no date c)

Reverse transcriptase inhibitor:

Reverse transcriptase inhibitor like zidovudine,didanosine block reverse transcriptase activity

Raltegravir, dolutegravir integrates and disrupts by insertion of viral DNA into target DNA (*Replication of Viruses*, no date d)

Initiation and neuraminidase inhibitor:

Ritonavir, Indinavir, Nelfinavir are protease inhibitors which blocks initiation of translation. Zanamivir (Townsend, Perri and Mento, 1999) and oseltamivir (Dukes, 2001) are neuraminidase inhibitors and several natural extracts of green tea which contain catechins and the green tea extracted from the leaves of the green plant like *Camellia sinensis*.

Catechins extract from green tea:

Catechins extracted from the green tea account for 10% dry weight and have (--) epigallocatechin (EGC) and (-) epicatechin gallate (ECG) and epicatechin (EC) (Pearson *et al.*, 2010) and EGCG which accounts approximately 50% of total amount of catechins in green tea (Bhar and Jones, 2019) and the study was formulated that various biological and pharmacological activities reported in EGCG include Antioxidative (Scholtissek, 1996), antibacterial (Becker, 1996), antitumor and antiviral activity.

Activity of extracted compounds like egcg and ecg on viruses:

EGCG and ECG are more effective than EGC or EC and inhibition of HIV-1 reverse transcriptase in vitro (Nakane and Ono, 1990). ECG inhibition of virus mechanism, ECG binds to CD4 molecule and consequent inhibition of gp120 binding (Imanishi *et al.*, 2002). ECG induced inactivation of virus in vitro and deformation of phospholipid (Cianci and Krystal, 1998). The salient features of ECG include distinct antiviral activities where ECG reported the inhibition of Epstein-Barr virus and inhibition of viral protein (Chang, 2011). Antiviral effect of ECG also reported against influenza virus, ECG affects the infectivity of influenza virus and in cell culture and agglutination occurs and thereby preventing virus absorbing MDCK cells (Kimura *et al.*, 1994).

Catechins inhibition of influenza virus:

Mechanism of influenza of catechins is by acidification of intracellular compartments and endosomes, lysosome and resulting in inhibitory growth of influenza virus and cell culture (Scott, Spruance and Aoki, 2000; Lim *et al.*, 2006) thereby acting as antiviral drug with no side effects according to studies conducted but still more natural products have to be discovered which contain antiviral properties and should implement to yield the less side effects.

Vaccination uses and development:

The greatest success against virus infections has been by increasing immunity through vaccination (in the prevention of influenza, polio, measles, mumps, and smallpox) with live attenuated (weakened) or killed viruses is the major preventive measure against this deadly viruses and vaccination led to the eradication of smallpox. In the case of influenza, the causative viruses are constantly changing their antigenic proteins; thus, revaccination is required as the antigenic makeup of the viruses changes annually and some virus groups contain 50 or more different viruses, making effective vaccination difficult where there is a requirement of the newly designed vaccine for the genetic makeup of the virus to solve the future catastrophe like coronavirus and further there is Interferons represent a group of nonspecific antiviral proteins produced by host cells in response to viral infections as well as in response to the injection of double-stranded RNA, some protozoal and bacterial components, and other chemical substances. Interferon results in the production of a protein that prevents the synthesis of viral components from the viral nucleic acid template and The

interferons are of interest because they have broad-spectrum antiviral activity and because they inhibit the growth of cancer tissue. However, the use of interferon is limited by adverse effects, a relative lack of efficacy, and the requirement for local or intravenous administration and extraction of interferons is sophisticated and only ways is to take vaccines and keep us healthy to improve our immunity to fight against the several mutated genes of viruses. Our institution is passionate about high quality evidence based research and has excelled in various fields ((Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Chandrasekar *et al.*, 2020; Mathew *et al.*, 2020; R *et al.*, 2020; Samuel, 2021)

Merits/advantages:

It helps to cure several type of viral infection like HepatitisC and control the course of infection like influenza and Antiviral drug can also be used to prevent the outbreak of some viral illness like herpes and it also helps to prevent infection by 70-90% effectively

Demerits / disadvantages:

It serves only has short spectrum action and It cannot cure all type of viruses and It inhibit the immune cells and cause immune deterioration and it has Narrow antiviral spectrum And it causes Ineffectiveness against the latent virus and Continuous intake of antivirus causes the virus to mutate and become resistant to that type of drug and even Produces toxic side effects

CONCLUSION:

Antivirals used as per the dosage is good and unease to human beings and antivirals can be used only at the primary infective stage of virus and by taking administered dosage as prescribed is quite good for individual and by taking good diet and maintain health may prevent from the drop in immunity while taking antiviral medications and need of a knowledge awareness about the immunology to maintain the constant life and to prevent us from the dreadful viruses

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