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Social Influence of Biological Viruses on Communities

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Abstract

Biological viruses are the world smallest microorganism that survives and dependant on other organisms. Biological viruses have impact on different communities like human, plant and animal. Viruses affect along with their hosts and have been recently classified using ontologies. The Biological Viruses Community Ontology (BVCO) contains different viral communities that allow investigating different biological viruses and its impact on those communities. The BVCO based on Core Ontology (Biological Viruses Ontology) which has the viruses definition and Species Ontology which contains the communities of living organism. This all-ontological information will help us to classify and analyze the impact of viruses on different communities. Viruses have badly and beneficial influences, as infectious diseases or a biological weapon, plant virus transmission process, marine nutrient and energy cycles, virus impacts continues to spread all over the world. The current study aims to define the good or bad impacts of virus on society.

Keywords: Animal viruses, biological viruses, biological viruses community ontology, human viruses, marine viruses, plant viruses and viruses impacts.

Introduction

Over the last few decades, interest in biological viruses and its related subject matters has re-emerged, as shown by the increasing number of paper publishing on this topic. Since different communities makes a society. Recent theoretical and empirical studies of biological viruses and ontological classification have helped to improve our understanding of the major factors that influence on society. This involves both positive and negative factors, which are helpful in establishment, persistence and spreading to other social communities.

Virus is very smallest and most abundant biological organism of the world that are dependent on other living organism. The public perception regarding virus is that they cause diseases and infections only, but majority of them are until unknown about its positive aspects. Virus is composed of protein core and nucleic acid and is responsible for all happenings. Viruses can cause cruel damage to crops by substantially reducing vigor, yield and product quality. Losses of several billion $ are reported annually in vegetables and fruit crops that enforce bad impact on society. Human are the basic source of society and health has been considered as a fundamental human right and is a key factor in distribution of resource in a society. All living things are major parts of community and can be infected and died due to many harmful viruses. This paper will enlighten the constructive use of viruses as in diagnostic regent, vaccines, biological weapons, material world, solar system as well as nanotechnology. For its tabulation purpose, engineers developed biological viruses community ontology (BVCO)[1] in which all types of viruses were categorized with respect to their hosts, nucleic acid, and biological classification order to species.

Material and Method

Viruses Impact on Society: Impact of Plant Viruses: Plant viruses are obligate intercellular parasite that doesn't have the molecular machinery to replicate without a host. A plant has a key role in our society and world's economy. Food production is based on cultivation of plants. In economic terms, viruses are spread to crops during their commercial lifetime, which varies between very short extremes in horticultural production and very long extremes in forestry. Virus infects all kind of plants and can cause serious damage of crops. This infection reduces the growth of marketing and financing, which are the major components of our business. Think, if one country's economy and running completely depends upon the crops, vegetables, fruits, flowers and pulses then the virus plays a villainous role in that society.

There are many examples of plant virus as that have made a major impact on social community and have changed human history. The first virus to be discovered was Tobacco Mosaic Virus in 1898 by Martinus Beijerinck[2]. Plant viruses cause an estimate US $ 60 billion loss in crops yield world widely each year. Viruses are common inhabitants of fungi and contain double standard RNA in fungi. So, the loss of crops due to any fungus virus is more than 70% of all major crops. Potato famine that occurred in Ireland in the 19th century, and led to death of million of people from severe epidemics of late blight of potatoes. The international potato center has estimated annual

production loss in potato in developing countries is approximately US $2.75 billion[3].

Plant virus particularly effects on natural vegetation, as seen in Europe in 1960 by Dutch Elm[4] diseases. This disease caused the death of 80% native Americans and its spreading across the continents and estimated 77 million elms have died. A Bipolaris oryzae virus responsible of brown spot of rice; 2 million people died because of starvation. In Sri Lanka and many other country where economy depend on coffee, apple, pine tree crops have been devastated by rust fungi. Furthermore it is estimated that more then 1 million metric tons wheat is lost annually in the world. Watermelon mosaic2 virus and cucumovirus infect watermelon and cucumber plants and responsible for 50 % loss in central Spain[5]. Sugar cane mosaic virus is the dominant virus in Asia especially in Pakistan; infect Sugarcane, maize, Johnson grass and several other grasses. Tomato spotted wilt virus (TSWV) disease cause occasionally loss of 100% tomatoes in Pakistan[6].

Cotton plays a pivotal role in the agrarian economy of Pakistan. It accounts for 8.6 percent of value added in agriculture. Cotton leaf curl virus (CLCuV) was reported for the first time in Pakistan in 1967 near Multan, damaged the crop on about sixty thousand hectares with a loss of 0.3 billion bales in production[7]. Major economic disruption in Philippine by Cadang-cadang viroid in coconut palms causes financial hardship in local populations.

Plant viruses not only destroy or damage crops but also infect human as well. Researchers from university of the Mediterranean in Marseille, France have found evidence that suggest a virus common to pepper may have moved to infect humans. Virus may not infect human cells directly, but may effect through food that they, eat. Virus can be readily detected in fruits, peppers, vegetables and many food products. After having abdominal-pain, fever, liver dialysis and other diseases were significantly associated with the presence of RNA in virus can occur.

Furthermore plant virus may infect human by inclusion in air. Infected plants start to become rotten, which cause to pollute air to ailing social objects like allergy, itching, sinus syndromes produce big loss affected on society. Preferably these plants should be burned, as soon as possible, so the virus destroyed by itself and not to rise for replication and penetration. Although plant virus plays a horrible role in our society, but its positive impact cannot be rectified or neglected and it could be beyond the technology in future. The world's powerful capital of USA, Washington discovered the chemotherapy technique called *'Smart Bombing'* [8] by modifying a common plant virus, which can deliver drugs only to specific cancer cells inside human body with out affecting surrounding tissues.

Plant virus is also used as best antigen to kill the infectious part of body. The coat protein of alfalafa mosaic virus was as a carrier's molecule to express antigenic peptides protein (virus particle) was purified and used for immunization of mice[9]. Virus's antigen property can be exploited to produce particular antibodies that can be used for virus detection and examining diseases. ELISA (Enzyme like Immunosorbent Assay) is best procedure for creating virus as good antigen.

Virus can be used as diagnostic regent, drugs and vaccines. Tobacco mosaic virus[2] is a destructive beast infecting over 100 different species of plants. But it may have weird eco benefit; incorporated into lithium batteries that can increase storage capacity 10 times. Scientist in US had already worked out on it. Virus is benign as killer yeast; its strains that are infected with one of a group of viruses produce toxic protein that kills infected yeast. Yeast that is used in making of bread, alcohol, and different maize are actually virus innovations.

Impact of Marine Viruses: Marine viruses are most common and bounteous entities in the sea. They are major players of global ecosystem. Millions of viruses are present in every milliliter of ocean world, typically numbering 10 billion per liter. Viruses are infecting specifically sea organisms[10] have been studied for several decades. Viral infections are responsible for abatement of 80% of sea organisms. Viruses move between marine and fresh water, posing threats to fishing industries. Most of the marine virus are bacteriophages, but there are also significant number that infect eukaryotic phyto plankton invertebrates and invertebrates. Many poxviruses can cause diseases in marine mammals phocid distemper virus is a morbilli virus of arctic phocid seals that has killed thousands of harbor seals in Europe. Similar viruses kill dolphins[11] and other cetaceans[12]. They probably infect all kind of objects in the sea either they are on the surface or in depth and influence may ecological cycles like nutrient cycle, system respiration bacterial and algal biodiversity and many more.

Geographically, those countries that completely comprised on sea are called *'golden lands'* because of seafood and sea resources that provides millions of dollars. The commercially marine fisheries are important resources of Asia are composed of 350 species. Growth of productivity, success and economy[13] dependent on living species with out infections. This all happen when normality of sea should maintain constant and marine giants not to effect in bad manner. Positively increasing of biochemical cycles and metabolism functions of the ecosystem that cause climate changes. Changing climate has direct and indirect consequences on marine viruses, including cascading effects on biogeochemical cycles, food webs, and the metabolic balance of the ocean.

Sea-surface warming, sea-ice melting and ocean acidification induced by the present climate changes[14] are modifying marine ecosystem structure and function with the help of viruses. The basic interruption of virus is clear that a large proportion of the total energy in marine food web passes through such organism by means of dissolved organic matter (archea, bacteria, eukaryotes etc)[12]. In viral replication process (lytic cycle) virus

infect phyto plankton, burst their cells and release content and fatty acid into the water and form energy in form of carbon that helpful in egg growth, development of sea animal as well as human diet perfection. Marine viruses affect weather through production of gases to built clouds responsible for rain.

Impact of Animal Viruses: Animal pathogens are potential sources of disruptive viral infections. Sporadic outbreaks of viral disease in domestic animal for example, vesicular stoma tic virus in cattle and avian influenza in chicken, Blue tongue virus attack on sheep, cattle and goat, African swine flue in pigs, Herpes virus are successful pathogens infect in pig, farming animals and man, Paramyxovirus in animal, birds and in human also results in significant economies and personal losses. Rabies in wild animal population in the Eastern United States has spread continually during the past half century. Viruses those are pathogenic to insects (honey bee and silkworms) cause millions of dollars worth of damage to industries. Disease by animal viruses in domesticated birds and livestock can be complex and enforce on numerous impacts. Productivity loss of live stock sector, loss of income from activities using animal resources and loss of human beings.

Well known wild aquatic birds are natural host for Avian Influenza virus, occasionally viruses have transmitted to other species like chicken and birds. This disease creates many devastating outbreaks in domestic poultry and give rise to human influenza pandemics. 10 million people every year are affected by zoonotic threat spread by non-human hosts[15]. An estimated 50 million people acquired disease between 2000 and 2005 and up to 78000 have died[15]. These viruses responsible for zoonotic illness, this is worrying scenario because there are no affective vaccines for most common zoonotic virus. Many animal viruses are very important from human medical perspective.

Certain parasites wasps lay their egg in the caterpillar of insects. Polydna virus inserted into caterpillar along with wasp egg induces systematic, immunosuppressive infection so caterpileer cannot eliminate embryo tissue[16]. Chlorella viruses are found in fresh water through out United State and China or even world wide, which cause infection in algae. Myxoma virus is a pathogen of Soput American lagomorphs (rabbits and their relative) had a positive role in limiting the predation of European rabbits in Australia[17].

Modification of viral encoded protein and genetic exploitation of viral genomes are providing new and highly specific vaccines for animal. One very famous virus called herpes simplex virus is useful in the treatment of experimental brain tumors[18]. Genetically engineered herpes simplex viruses are currently being evaluated as an experimental approach to eradicate malignant human gliomas.

Impact of Human Viruses: Scientist have always recognized the importance of virus, but recently it has become clearer that viruses are an integral part of every ecosystem and can not be ignored when we try to understand how life on earth works. Human viruses have the priority above all viruses, because human are basic source of society on which everything is dependent.

Virus lives in human body happily but in its dormant state, but when it wakes up cause problems. Human viruses are usually attack human body through nose or mouth and make them sick! It can spread very easily from one person to another by touching, sneezing and coughing. Some viruses spread when people are lazy about personal hygiene; they don't wash their hand very often.

Viruses are causing many disease of international importance. Amongst the human viruses, small pox, polio, hepatitis, human immunodeficiency (HIV), measles and SARS are particularly well known. *Smallpox* is a deadly disease that affect human. It killed about 35% people and left many people survived with terrible scars on their skin. Dr. Jenner invented vaccination against smallpox[19], which saved massive amount of lives. In 1980, to the World Health Organization (WHO) declare 'the world land its people'. *Cowpox* in 1796, Dr. Jenner found that milkmaid infected with cowpox.

Hepatitis B and C is the main cause of severe liver disease. WHO estimated that there are 350 million hepatitis B virus and 170 million hepatitis C virus infected patient worldwide[20]. In Pakistan, prevalence of HBV and HCV is 3-5% respectively. It transmits through blood transfusion, reuse of needles, injecting drug users, shaving from barber, etc.

Herpes Simplex V type2 (hsv-2) is amongst the most common sexually transmitted infections[21] the highest level of virus have been found in Africa and America. While HSV-2 prevalence in Pakistan is low. Transmitted infection should be amongst the priorities for curtailing the future spread of HIV epidemic in Pakistan[22].

HIV (Human Immunedefiance Virus) recently spread world widely very fast. AIDS in an example of role played by economic factor and other aspect of human behavior. HIV is spread through blood transfusion, omissible syringe and sexual transmission etc.

Dengue is most widely distributed of the mosquito born virus that affect human. The first recorded epidemic of clinically dengue in Madras in 1780 and first isolated in Calcutta and Japan in 1943-1944. Hundreds of thousands of cases of dengue fever reported each year in America, Africa and Asia. it's now endemic in Pakistan[23]. But it can affect all the system of society due to sudden death by this fever.

Results and Discussion

Tools and Technologies used for Viruses: Virus in the context for human disease. But most viruses are not harmful, and

scientists are making them benign and beneficial. Thus they played significant part in evolution and maintaining healthy ecosystem. Viruses are actively used in many technologies and therapies.

Technology is the making, usage and knowledge of tools, techniques, crafts, systems or methods of organization in order to solve a problem and serve some beneficial purpose.

Genetic Engineering is a vast branch of science in which geneticist regularly used viruses as vectors to introduce genes into cells that they are studying. This study is helpful in recognizing of sudden deaths because virus is useful for making cell produce a foreign substance that become supportive in investigation.

Virotherapy uses viruses as treatment against various diseases, commonly specifying target cells, like smart bombing.

Vaccination is one major positive aspect of human virus. Cowpox virus that gives destructive effect on society by infecting people is used in the vaccination against nasty diseases. Scientist nowadays are trying to use bacteria and viruses in vaccination instead of antibiotic.

Nanotechnology Scientist has been able to use virus to create metallic wires and they have potential to be used for binding, self-assembly, solar cells, batteries, fuel cells, liquid crystal and other electrons. The basic idea is to use a virus with known protein on its surface to bind specific materials. Scientist of MIT had developed nanotubes[24], which could funnel and concentrate electrons in cells. These solar cells were fabricated to electricity more. However these nanotubes required clumping via protein process using virus. Virus has a strong protein coat that is used in many ways. It could also have gold nanoparticles grown around material, which produce a gold wire of precise length diameter, and shape. Silver nanoparticles[25] also have significant properties of biological, optical and electrical which can be used in various fields.

A biological weapon is one of the biggest and advance uses of virus as weapon. The concept of employing disease (in which virus) involve, as biological weapon exists for centuries. Potential impact of virus have influenced a number of centuries pursue biological warfare throughout 20th century[26]. This ability of virus to cause devastating epidemic in human societies. Living organism makes biological weapons, which are harmful for human, animal and crops. Smallpox is one of them which is removed from the world, it exist only in secure laboratories in United State etc. so it could be stolen and used as a warfare agent. The Geneva Protocol bent it in 1925. Viruses prominently used to disperse, extremely robust as weapon.

Biological Viruses Community Ontology (BVCO)[1] contains biological viruses hosted by different communities like human, plants and animals. The BVCO will help to monitoring and investigating above discussed viruses and their impact on these communities. The Human Biological Viruses Ontology (HBVO)[27] has already been developed, which is one of the component of BVCO and contained the viruses hosted by human. Ontological classification[28] of viruses will play a vital role in future; it may serve any digital health-care network[29] and has a significant impact in society.

Conclusion

This paper discusses virus-based social influences, in which how viruses can cause diseases in animal, human, marine and plants ecosystem and its related examples. As well as massive uses of viruses in vaccination, technologies and engineering environment which impact on societies. All in all, viruses are not only harmful but have many positive effects.

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