

Bacterial and Viral Pathogens, Molecular Mechanisms and Cellular Toxicity

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Abstract

Viruses as pathogens have ability to replicate in the particular host in order to damage their organs. Some bacterial pathogens cause lethal diseases associated with metabolisms. Bacteria also increase the rate of infection due to antibiotic resistance. There is need to design such drugs that control the specific targets of bacterial strains. Streptococcus type also causes the diseases associated with medical conditions such as pneumonia. *Shigella* as well as *Salmonella* also causing the diseases in food and food products. *Pseudomonas syringae* as one of the bacterial pathogens that attacks on the leaves as well as different parts of plants that finally damaged to whole plant. *S. pneumoniae* is the pathogenic bacterial strain that causes severe inflammation in the lungs by damaging to the lungs. *E. coli* as the type of bacterial pathogen that enter into the intestine of the human. It particularly stays here and multiplies to increase its infection to damage the specific parts of intestine. Chikungunya virus is spread to people by the bite of an infected mosquito. The most common symptoms of infection are fever and joint pain. The DENV genome is about 11000 bases of positive-sense, single stranded RNA (ssRNA) that codes for three structural proteins. At present, CYD-TDV or Dengvaxia[®] is the only approved vaccine, but potent inhibitors are currently under development.

Keywords: Viral Infections, Bacterial infections, dengue, microbes, genetic engineering.

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INTRODUCTION

Rinderpest viruses reported firstly of a rapidly growing list of causative agents of major infectious diseases of domestic animals that at the beginning of the twentieth century led to the establishment of the discipline of animal virology [1, 2]. A few examples of other animal viruses discovered in those early days are those associated with African horse sickness (AHS), rabbit myxomatosis, fowl plague (avian influenza), and avian leucosis [3-5].

As water contains variety of pathogens and other microbes that directly enter into the human body. Through drinking water and polluted water, many

microbes damage the cells of living organism. Water gets polluted day by day due to serious water pollution in environment. Polluted water has large number of toxic heavy metals that rennet kills the living cells. While on the other hand, vegetable also source of microbes that damage the plant as well as large population of human [6]. Vegetable and fruits that directly harvested through farms exhibit large number of bacteria. It is better to clean the vegetables and fruits though healthy environment as compared to the chemical sprays that damage the animals as well as plants. Huge number of plants and animal have been affected through chemical sprays [7-10].

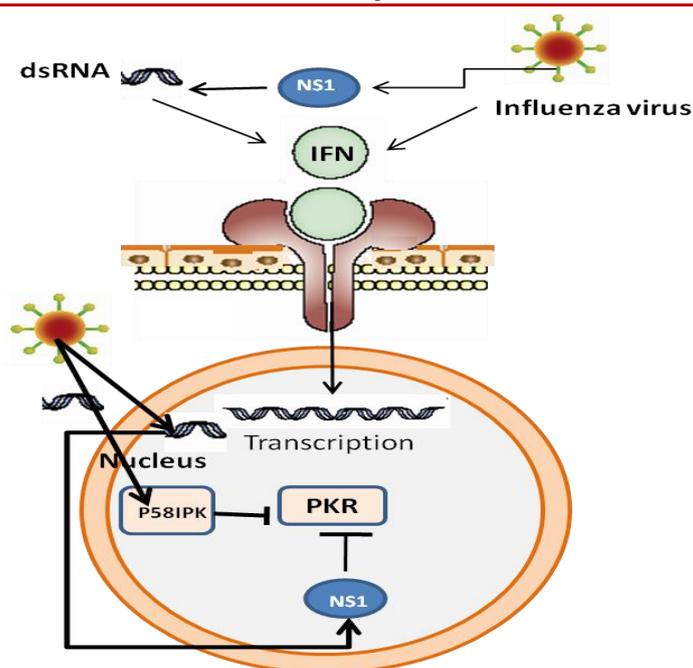


Fig-1: Shows the viral mechanism of interplay of genes at cellular level

Viruses are the group of particles that have ability to replicate in the particular host in order to damage their organs [11]. Some viruses containing the genetic material in the form of DNA while on the other hand, some other containing the genetically material in the form of RNA. There are different types of viruses in which some of them are more lethal and causes the more serious disease in human as well as in plants. One of the viruses the infected the people all around the world is the COVID-19 that is transmitted through infected person already suffering form that disease. It has different strains depends upon the particular strain. This virus rapidly infect the air passage of human and transmitted from person to person due to its rapid replication in the living cells [12-14].

Bacteria also increases the rate of infection due to antibiotic resistance. There is need to design such drugs that control the specific targets of bacterial strains. Molecular biology and genetic engineering employed the approach to target and design specific drugs that kills the large variety of bacterial strains. Each bacterial strain rapidly multiplies due to growth factors that activating their replication faster than normal. Bacteria need specific temperature to grow and survive under different environmental conditions [15].

Role of Bacterial Pathogens

Some bacterial pathogens caused lethal diseases associated with metabolisms, One of the important diseases is the tuberculosis that affected the cells of lungs by increasing infection rate at high level. This diseases is due to the mycobacterium tuberculosis that affected the population all around the world. Streptococcus type also causes the diseases associated with medical conditions such as pneumonia. Shigella as well as Salmonella also causing the diseases in food and food products. These bacteria also affected the large quantity of foods all around the world due to increase resistance [16-19].

Pseudomonas syringae as one of the bacterial pathogens that attacks on the leaves as well as different parts of plants that finally damaged to whole plant. It depends upon on the severity of attacked and type of particular strain of *P. syringae*. The more pathogenic strain of the *P. syringae*, the more attacked to the plant leaves that cause more wilting. The less pathogenic strain of the *P. syringae*, the less attacked to the plant leaves that causes less wilting. The genome of *P. syringae* has been studied to get information about their interaction to plant [20].

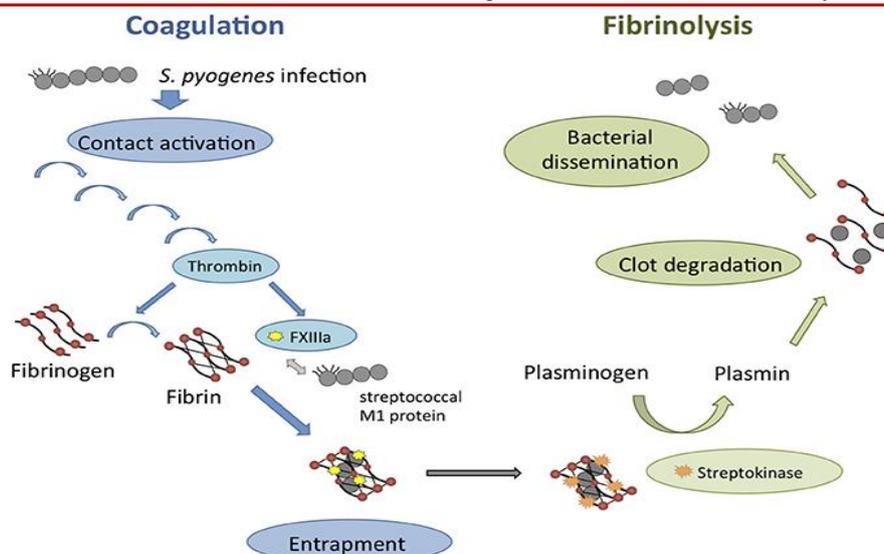


Fig-2: Shows the general mechanism of action of bacterial infection (S.pyogenes)

Role of Streptococcus

Streptococcus as most popular bacterial pathogen that have ability to grow rapidly as compared to other bacterial strain by forming the pairs of chains. They are aerobic as well as anaerobic depend upon the particular conditions. They are divided into different groups on the basis of causing the particular infections. Streptococcus pyogenes is a bacterial pathogen that affected the large populations of human including the children as well as adults. This bacterial pathogen causes the infection such as pharyngitis that takes serious form into chronic conditions if not treated properly [21-23].

Damaging to the lungs It blockage the cells of air passage ways and inhibit the air flow that resulted to severe inflammation. It is important to noted that this infection should be treated at early stage and it takes to chronic inflammation, it becomes difficult to relate for specific antibodies. There are two types of hemolysis tested for checking the bacterial infection. Alpha hemolysis resulted due to incomplete breakdown of membrane of blood cells. Beta hemolysis also occurs in infants due to more chances of infection at early age. It also skin infections as well as lungs [23-26].

Role of Escherichia coli

E. coli as the type of bacterial pathogen that enter into the intestine of the human. It particularly stays here and multiplies to increase its infection to damage the specific parts of intestine. It resulted the swollen and nonfunctional intestinal tract that leads to poor role in digestion. It leads to accumulation of fluids as well as food parts. This type of bacteria also gavage the give tract of animals by inhibiting the flow of food material from digestive tract to the various parts of digestive system. Some antibiotics are available to control their growth but due to bacterial resulted action of antibiotics have been reduced [27].

E.coli also transmitted into the human body through polluted foods. The animal's husbandry exhibits a variety of cattle that eat different types of grasses. These are directly entered into the body of cattle and other animals. When meat from these animals proceeded by human, most of bacteria enters into the cells of body and kills them. Milk also forms dairy and milk based products exhibits loss of bacteria. It is diffusely to kills the pathogens and microbes directly from cattle. The first and easy way to protect living cells is the boiling of milk or provides heat at spiffiest temperature in order to kills the growth of bacterial cells. Usually, at high temperature, most of the bacteria die due and not survive for longer periods of time [28-32].

Symptoms appear after the attacking of E. coli into the particular host depending upon on the immune system. The person with weak immune system has more chances of attack of this attack as compared to their viruses while on the other hand, symptoms such as muscle cramp due to deficiency of calcium supply leads to tetany. It also causes the diarrhea with extensive mitting and high temperature. These symptoms appear after the attack of bacteria and specking of patenting into the body. Then, it can be treated through antibiotics that either kills as well as dingbat the growth of microorganism at the carinas level. But, some medicines are needed to take more than normal due to bacterial resistance [33-37].

Biological Role of Chikungunya virus

Chikungunya virus is spread to people by the bite of an infected mosquito. The most common symptoms of infection are fever and joint pain. Other symptoms may include headache, muscle pain, joint swelling, or rash. Outbreaks have occurred in countries in Africa, Asia, Europe, and the Indian and Pacific Oceans. In late 2013, chikungunya virus was

found for the first time in the Americas on islands in the Caribbean. There is a risk that the virus will be imported to new areas by infected travelers. There is no vaccine to prevent or medicine to treat chikungunya virus infection. Travelers can protect themselves by preventing mosquito bites. When traveling to countries with chikungunya virus, use insect repellent, wear long sleeves and pants, and stay in places with air conditioning or that use window and door screens [38].

The symptoms of chikungunya are similar to those of dengue and Zika, diseases spread by the same mosquitoes that transmit chikungunya [39].

Dengue Virus and its influence on human population

Until a few hundred years ago, dengue virus was transmitted in sylvatic cycles in Africa, Southeast Asia and South Asia between mosquitoes of

the genus *Aedes* and nonhuman primates, with rare emergences into human populations. The global spread of dengue virus, however, has followed its emergence from sylvatic cycles and the primary lifecycle now exclusively involves transmission between humans and *Aedes* mosquitoes. Vertical transmission from mosquito to mosquito has also been observed in some vector species. Dogs have been found to be infected by the virus, but more research is needed to determine if dogs or other animals can serve as reservoirs or are just incidental hosts [40].

The DENV genome is about 11000 bases of positive-sense, single stranded RNA (ssRNA) that codes for three structural proteins (capsid protein C, membrane protein M, envelope protein E) and seven nonstructural proteins (NS1, NS2a, NS2b, NS3, NS4a, NS4b, NS5) [4]. It also includes short noncoding regions on both the 5' and 3' ends [41].

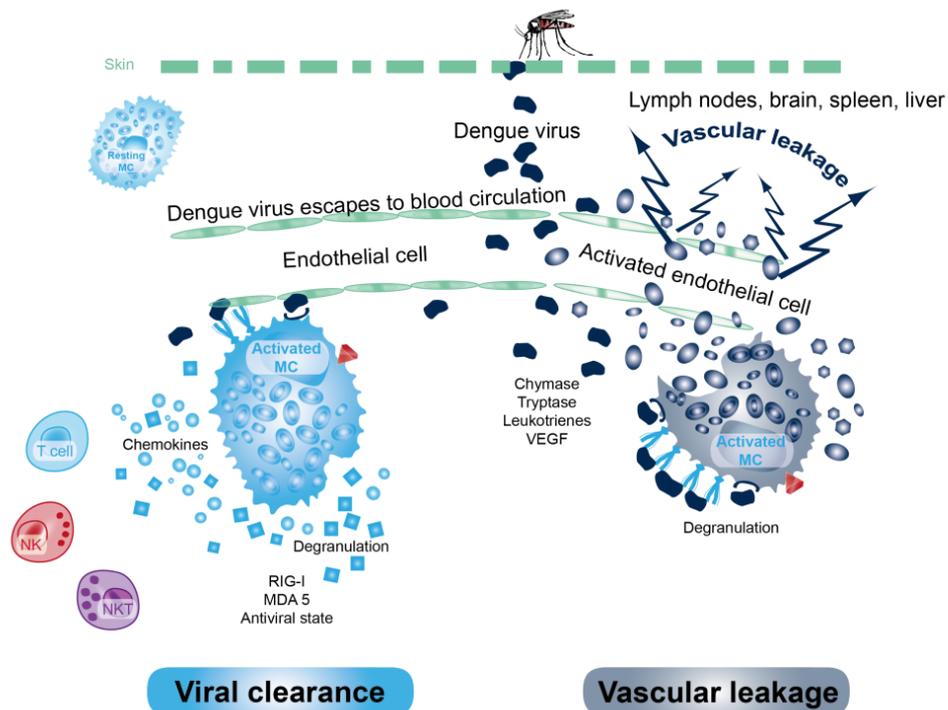


Fig-3: Shows the attacking mechanism and replication of dengue virus

The global occurrence of viral infectious diseases poses a significant threat to human health. Dengue virus (DENV) infection is one of the most noteworthy of these infections. Numerous foundational and clinical investigations on viral epidemiology, structure and function analysis, infection source and route, therapeutic targets, vaccines, and therapeutic drugs have been conducted by both academic and industrial researchers. At present, CYD-TDV or Dengvaxia® is the only approved vaccine, but potent inhibitors are currently under development. These successes and failures have enabled progress in anti-

DENV drug discovery and hope that our review will stimulate further innovation in this area [42].

CONCLUSION

Different diseases caused by viruses and bacteria from animals and plants have different sources of infections. Infectious diseases rate increasing day by day due to resistance of pathogens. Antibiotics effective for treating the microbes but there is need for genetic engineering top control the diseases rate at cellular and molecular level. Cellular study at gene level helpful to

control the pathogenicity of different microbes responsible for infections in specific host.

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