

Dengue fever and the immune system



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Dengue virus cause variable range of dengue shock syndrome with fatal dengue varies from undifferentiated. Because of the increasing incidence and geographical distribution of dengue in the past 50 years, dengue has become increasingly recognized as one of the main infectious diseases in the world. This research will study the aspects of immune system and dengue. Also offers the importance of dengue virus infection and discusses the current knowledge of dengue fever.

Dengue is a disease caused by a mosquito of dengue virus. In the last century, the dengue goes up in severity of illness and the geographical distribution is now the most common infections of human Arthropod-borne viruses in the subtropical and subtropical regions of the world. Dengue is endemic in more than 100 countries around the world. It causes nearly 50 to 100 million cases per year, including 250, 000 to 500, 000 dengue hemorrhagic fever or dengue shock syndrome. World Health Organization reveal that the two fifth of world population is at a threat of dengue virus infection. It was stressed that globalization and climate change has a major impact on the emergence of dengue virus in new areas.

Dengue is also a major economic burden on affected areas, with annual cost estimated at several billion dollars. Since there is no vaccine against dengue virus, is the primary means of preventing diseases targeting mosquito vectors and to break the cycle of transmission. This requires a large and well-organized, as well as financing of intervention programmes. Although there are programmes in countries affected, in Sri Lanka, which is currently in service in disease vector control strategies were not sufficient to combat dengue. New tools and novel approach are therefore urgently needed.

The incubation period of dengue is around four days. A person about to reduce fever and to provide occasional macular or maculopapular rash. It was difficult to distinguish dengue viral diseases, person usually recovers 5 days. In the most serious cases, fever and rash are accompanied by headache, retroorbital pain, myalgia, back pain, sore throat and abdominal pain. Becoming lethargic patients suffering from anorexia and nausea.

The DHF as dengue hemorrhagic fever has similar incubation period and number same symptoms. However, the fever is more severe and the tiredness and lethargy more extreme. The patient may increase vascular permeability and abnormal balance. This can cause the individual to reduce the volume of blood, leading to low blood pressure and go in dengue shock syndrome (DSS) and die.

Dengue virus infection continues to present a major and escalating global public health problem. Fight against vectors of the programs have been largely unsuccessful or local benefits in the short term only and therefore will continue to develop the vaccine is likely to be the most effective control strategy. Diseases of infection by the dengue and participation apparent protective immune response and disease has proven to be complex and difficult to understand and therefore required more research on these subjects.

It is recognized that important steps to accelerate the dengue fever vaccine established an international network of centers for the clinical trial.

Evaluation of vaccine experimentation is time-consuming and therefore you should not stop this process by theoretical considerations. Then only will be

an initiative of the dengue vaccine in children in a position to assess the effectiveness of a variety of weapons to use in the fight against dengue.

1. 0 Introduction

Dengue fever is a disease caused by virus which is carried by mosquitoes.

Then, these mosquitoes transmit the virus to humans. The virus that causes dengue fever has called an arbovirus, which is the short form for viruses transmitted by arthropods. Mosquitoes are arthropod type insects.

Mosquitoes transmit this virus and responsible for passing it along to humans in a several areas. These countries include the Far East, Middle East, Africa, the Islands Caribbean and countries of Asia such as the India, Sri Lanka and the Thailand. In these areas, Arboviruses of dengue fever is widespread, which means that the virus naturally and repeatedly and repeatedly lives at those countries (1).

To understand how the dengue fever is transmitted, several conditions must be defined. The meaning of the word “ host” is an animal or human that can be affected with a particular disease. The meaning of the word “ vector” is a body that can carry a particular virus causing agent such as a virus or bacteria with no actually develop the disease. The vector can then go by the virus or bacteria to a new host (2), (3).

Most common diseases include the cold, many viral causes of diarrhea and flu or the influenza spread because the viruses that cause these diseases can be transmitted directly from one person to another. However, dengue fever cannot be transmitted directly from one person infected with another. The dengue virus must need an intermediate vector, a mosquito which takes

the virus from one host to one more. The mosquito that takes the Arboviruses, reliable for dengue fever is the similar kind of mosquitoes that can transmit other diseases such as yellow fever. This mosquito is named as *Aedes aegypti*. The more often victims are children less than 10 years (4).

2.0 Dengue Viral Infection

When a person feeds by an infected mosquito, it injected dengue virus in the bloodstream. The virus infects close to skin cells called keratinocytes the most common type in skin cells. The dengue virus has also infected and reproduced within a specialized immune cell in the skin, a dendritic cell type called a Langerhans cell (5).

Langerhans cells detect the pathogenic invaders and display molecules from the pathogens known as Antigen, on their surface. Langerhans cells then pass through to the lymph nodes and warn the immune system to prompt immune response as a pathogen inside the body. Lymph nodes are small organs that placed all the way through body, linked by vessels that form a set of connections named as lymphatic system (6). Lymph nodes are located in the body to help the fight against infection of immune cells.

3.0 The immune response

When a pathogen as dengue virus invades the human body, the body to defend itself by defense of the body against pathogenic invaders is the immune system, which consists of two parts. First part is called as the innate immune system and it provides the body with urgent and regular defense to any pathogen that invading. The innate immune responses quickly identify

and react against to pathogens. However it doesn't afford a person with immunity in the long term against an invasion of pathogens.

Second part of the immune system called as the adaptive immune system generates cells that target more precisely and effectively towards pathogens and affected cells. The cells created by the Adaptive immune system consist of some B cells secreting antibodies and cytotoxic t cells. Immunoglobulin or Ig antibodies concealed by the cells B specially recognize and attach to foreign molecules. Cytotoxic T cells kill cells that are affected with pathogens. Adaptive immune system spends much time to react pathogens that invades the innate immune response (7), (8), but it is a person with immunity against a pathogen in long term.

4. 0 Dengue Virus Tricks the immune system

When the dengue virus infected mosquito bites the skin of the person, then the person also becomes a dengue infected. The dengue virus infects Langerhans cells, a type of dendritic cells in the skin. Infected cells of Langerhans produce interferons can help to limit the continued spread of the infection. Other infected cells to travel to the lymph nodes carrying viruses that infect more cells of Langerhans. Viremia is resulted by the spread of dengue virus when the high level of bloodstream affected. In order to fight against infection, the immune system construct antibodies to defuse the virus particles of dengue and the complement system is enabled for antibodies and white blood cells to get rid of virus. The immune response also consists of cytotoxic T cells also called as lymphocytes that identify and destroy infected cells.

Langerhans cells once infected by dengue virus, they travel on the site of the infection of the skin to lymph nodes. The immune system responds to Infected Langerhans cells are viral antigens of dengue fever on their surface, which enables the innate immune response in alerting the two types of white blood cells called macrophages and monocytes that fight against the virus. In general, monocytes and macrophages consume and wipe out pathogens. But as an alternative of destroying the dengue virus, both of white blood cell types are pointed and infected from the virus. Dengue virus tricks the immune system to circumvent the protection and affect more cells (9). As the affected monocytes and macrophages to go through the lymphatic system, the dengue virus spreads all the way through the body. Throughout his trip, the dengue virus infects lots of cells, including lymph nodes and bone marrow macrophages of the spleen, liver and blood monocytes. Widening and the spread in the outcome of virus Viremia is a situation in which there the bloodstream contains a high level of dengue virus.

Mainly there are four different tensions of dengue virus. These strains are very similar, therefore the immune system recognizes all after seeing one. But the recognition is not protection. Each T cells of humans are automatically identified a specific model or an Antigen. In the first viral infection will be captured and processed by the above mentioned antigen presenting cells. These viruses will be open to T cells forcing them to become activated. And even the B cells will meet their floating free Antigen and make active. B cells create antibodies. They are used to tag the virus to encourage their uptake by macrophages called as opsonisation and inactivate them (10).

The first infection is identified as dengue fever and lasted 6 or 7 days (11). Its symptoms closely look like as a severe flu. Most people get over it with no incident. If one person become affected from fever again things could leave in the wrong. Four types of dengue strains that all are extremely similar. If you are infected with a dissimilar strain that you met the first time, you contract dengue hemorrhagic fever.

The reason for happening this is it turns out that the first infection antibodies attach to virus particles but not inactivate them. The strains are dissimilar enough to stay active in the existence of antibodies against another strain. These are called non neutralizing antibodies. These antibodies will always result in the opsonization if the Macrophages are readily transmittable virus. These speeds up the course on a point infection such as hemorrhagic symptoms are observed. It is one of those interesting times where our immune system not succeeds us. If people were vaccinated for dengue and if someone missed one out of those four vaccines has been inactivated by the improper storage, they would be very susceptible to dengue hemorrhagic fever.

5. 0 Immune system Defeats the Dengue Virus

Although the dengue virus has trapped immune system to infect cells and widen all the way through the body, the immune system contain further protection against the virus. Infected cells produce and release the tiny proteins named as interferons that are part of a huge collection of proteins named as cytokines. Interferons have the capability to interfere with viral replication and they activate the innate and adaptive immune defenses. They help the immune system recognizes cells infected by dengue and help

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protect cells not infected infection. The immune system, fight against dengue infection so the person will experience a fever (12).

As the Adaptive immune response begins to fight against dengue infection, B cells produce antibodies IgM and IgG which are released into the blood and lymphatic fluid, where they specifically identify and deactivate dengue virus particles. In another immune response adaptation, killer T cells or cytotoxic T cells, recognize and kill cells infected with the dengue virus. Active innate immune response of the complement system, response that helps antibodies and white blood cells get rid of the virus. Together with the innate and adaptive immune responses defuse infection of dengue and the patient will recover from dengue (13).

If there is a huge degree of virus in the bloodstream an infected person is experiencing acute dengue symptoms. As the immune response against infection by the dengue, person's B cells begin to create antibodies called IgM and IgG which are released into blood and the lymph fluid and then they identify and defuse the dengue virus and the viral such as dengue NS1 protein molecules (14). The immune response get rid of the virus and leading to recovery.

6. 0 Secondary infections of Dengue

After a dengue infection for the first time person is protected against infection with the three serotypes of dengue rest for several (2-3) months. Unfortunately, it's not a long-term protection, and after this short time period, person can be affected with any of the three serotypes of dengue that are outstanding.

Around 1960s, Dr Scott Halstead and some of his colleagues are studying in Thailand dengue virus (15), (16). They noticed that the people who had been infected to dengue virus second time had a bigger risk of severe dengue compared with who had not been infected previously. They were asking what makes a second infection of dengue, not as well as the first.

In general after an infection from a pathogen, the body keeps in mind the infection for long because the cells named as memory B cells and memory T cells remain inside the body. Since they remember the first disease, memory cells can respond quickly to provide an adaptive response, when infection occurs for the second time. Memory cells can stay behind in the body for many years or even a lifetime. These memory cells help fight a second dengue infection. More often worse than the first infection second dengue infection.

Halstead proposes a phenomenon called “ dependent improvement of antibodies to the infection” to explain these observations. There are four types of dengue (serotypes), but the cells of memory do the immunity against reinfection by serotype of dengue fever that caused the first infection. When a person is infected with a second dengue serotype, Halstead suggested that antibodies to the first infection actually help spread of dengue virus infection and increase the amount of virus in the blood, Viremia. This phenomenon can also occur in children who received antibodies against dengue of their mother while in the uterus. Curiously, rather than destroy the virus, existing antibody and the antibody newly produced by the memory can of b cells actually help the virus infected host cells more effectively. Ironically, the consequence of dependent

development of antibodies is the response of the immune system in fact makes the clinical symptoms of the dengue fever situation and raises the risk of serious diseases of dengue.

In a second dengue infection cytotoxic T produced by the immune system cells provide only partial immunity against the new serotype of dengue (17). Cytotoxic T cells are not responsible for effectively remove the virus from the body and they issue some excess amounts of molecules named as cytokines. In general quantities and cytokines help out the immune response. Though in large quantities, cytokines may produce severe inflammation and tissue such as capillary leak; eventually contribute to the development of serious diseases of dengue.

7.0 Factors That Contribute to Severe Dengue Infections

Prevention of dengue fever means reducing the mosquito population. Any resources of standing water such as buckets, vases, etc. where the mosquitoes can breed must be eradicated. Mosquito repellent is suggested for those areas where dengue fever is widespread. To help break the cycle of spread, sick patients those who are suffered from the dengue fever must be placed in bed net, then the mosquitoes cannot bite them so that they won't become arboviral vectors (18).

Became the prevention and the fight against dengue, dengue hemorrhagic fever and urgent distribution of geographic expansion and increase the spread of the disease over the last 20 years. Unfortunately, the tools available to prevent dengue are very less. There is a no any vaccine invented yet, and the limited option available to fight against mosquitoes.

Clearly, the emphasis should be on prevention of the disease, and if the trend emerging diseases must be reversed (19).

If the effective prevention of the disease and several integrated components, including active laboratory surveillance and emergency response and medical community education to guarantee successful management of the situation, mosquitoes community integrated pest and use of effective vaccines when available Disease Control active is an important part of prevention program against dengue. In addition to monitoring secular trends, the purpose of monitoring should be to give warning or predictive capability for the transfer of the epidemic, and the reason is that if you cannot predict epidemics can be avoided by starting by fighting against mosquitoes emergency. For the prediction of epidemics, health authorities and should be able to precisely control the transfer of dengue virus in the community and be able to say at any time that the virus is transmitted virus serotypes rotation and related this kind of disease with dengue infection. To do this, the system must be on site.

8. 0 Causes and symptoms

Dengue fever can be caused when a mosquito bites a human carrying the Arboviruses and transmit the virus to a new host. When the live virus inside body, it moves to various parts where it crashed. The virus is able to then go through the bloodstream. The existence of the virus within the blood vessels causes modifications to these blood vessels. The vessels enlarge and blood leak through the vessels. The spleen and lymph nodes become swollen. A procedure called disseminated intravascular coagulation (DIC) happens,

where chemicals relevant for clotting are used up and it will be guided to severe bleeding which is called as hemorrhage.

When the virus has been spread to the human host, happens a period of incubation. During this time it lasts approximately five to eight days, the virus multiplies. The signs of the disease come out at once and consist of headache, high fever, chills, eye pain, lymph nodes swollen, red eyes, back pain, red hunting in the face, extreme weakness and severe pain in the limbs and joints (20).

This early duration of the disease is about 2-3 days and after this duration, fever decreases rapidly, and the patient sweats strongly. After about a day to feel relatively well, the patient temperature increases again, but not as much as the first time. Begins a rash of small red bumps on arms and legs, spread to the chest and abdomen. It hardly ever affects the face. The palms and the soles of hands and feet swollen and turn bright red. The combination of characteristic of fever, rash and headaches are named as the “ dengue triad.” Many people get well completely from dengue fever, even if the weakness and fatigue may last numerous weeks. When a person has been suffered by dengue fever, his immune system guards produce for about a year cells that prevent reinfection from dengue virus (21).

More serious diseases can occur in some people. These persons may meet with dengue fever for the first time. Anyway, in some situations, that a person may have already had dengue recovered at a time and then is re-infected with the virus. In these cases, the infection first guides the immune system to identify the attendance of the Arboviruses. When the immune cells

the virus infections later, the immune system reacts. These types of disease called dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) (22), engage more strict symptoms. Fever and headache are the opening symptoms, but signs of dengue fever are not present. The patient improves a cough go after by the appearance of small purple patches named as petechiae on the skin. The petechiae are areas where the blood is leaking from the ships. Large areas bruises appear as the getting worse bleeding and abdominal pain can be strict. The patient may starts to vomit a material that is similar to coffee. It is actually a sign of hemorrhage in the stomach (23). As the blood vessels turn into more injured, they escape more and carry on increasing in diameter called as dilation, causing a decrease in blood flow to the body tissues. This condition of reducing the blood flow is called as shock. Shock can cause damage to the organs of the body especially the heart and kidneys, because the low blood flow deprived oxygen (24).

9. 0 Diagnosis

Diagnosis should be detected in native areas each time that a high fever continues for 2-7 days, especially if go together with by a ability to hemorrhage. The signs of shock should suggest the development of the disease to the dengue.

There are several types of Arboviruses but one of them causing dengue fever that can be isolated from the blood serum (25), (26). The serum is the fluid that the blood cells are floating. Serum can be verified because the phase in which the virus moves into the bloodstream is longer in DF than in other arbovirus diseases. Numerous tests are used to find reactions between the

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serum of the patient and antibodies produced in the laboratory. Antibodies are particular cells that identify the markers or antigens present on the attack of the body. During these tests, the antibodies are mixed with a sample of the patient serum. Health care workers and then looks for reactions that would occur only if the virus antigens are present in the serum (27).

10. 0 New diagnostic technology

In recent years, he has developed several new methods of diagnosis and has proved very useful in the diagnosis of dengue. After reviewing this issue in depth over the past. Here follows a brief description of the various methods below.

10. 1 PCR

Reverse transcriptase PCR (RT-PCR) was build up for numeral RNA viruses in recent years and possible to modernize laboratory diagnosis of dengue (28). RT-PCR provides a rapid diagnosis specific serum. This method is fast, simple, sensitive and reproducible if handled properly it can be used to discover viral RNA in human clinical specimens and autopsy tissues, or mosquitoes. There were number of methods developed involving primers genome in different places and different methods to detect RT-PCR products in recent years (29).

10. 2 Immunohistochemistry

A major problem in the laboratory diagnosis of dengue confirmation of fatal cases. Only one sample is obtained serum and serological tests of limited value. In addition, most patients die at the same time or shortly after defervescence as the virus isolation is difficult (30). With novel techniques of <https://assignbuster.com/dengue-fever-and-the-immune-system/>

building, it is now possible to detect antigens of dengue viruses in a variety of tissues.

11. 0 Treatment

No treatments are available to reduce the course of dengue hemorrhagic fever or dengue shock syndrome. Drugs to reduce fever and decrease muscle pain and headache pain (31). Fluids are given through a needle into a vein to prevent dehydrating. Blood transfusion may be necessary if serious bleeding happens. Oxygen should be given to shocked patients (29).

12. 0 Conclusion

The immune system is the body's defense against viruses dengue Home. When a person is infected with the dengue, response to innate and adaptive immune system to join forces to fight against the virus. B cells create antibodies which specifically identify and defuse foreign particles and viral cytotoxic T cells to recognize and destroy cells that are infected by the dengue virus. For people who can develop later with another type of dengue virus experience called " antibody based on the promotion." This situation occurs when the immune response leads one clinical symptoms of dengue worse, which increases the risk of severe dengue.