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Review Article

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Viruses as a Cause of Many New Borne Diseases: An Overview

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Abstract In the present study board range viral diseases have been carried out. The spectrum of food borne pathogens includes a variety of enteric bacteria, aerobes and anaerobes viral pathogens & parasites. Viruses are the most common pathogens transmitted via food, viruses are considered as the most important human food borne pathogens with regard to the number of out breaks. The viruses causes many diseases in that some of them like*West nile virus, Swine flu (H1N1), Bird flu/Avian flu (H5N1),E-Bola virus* and *Zika virus* history, diseases caused and treatment has been reported.

Keywords Virus, Swine flu (H1N1), Bird flu/Avian flu (H5N1), Pathogenic

Introduction

The spectrum of food borne pathogens includes a variety of enteric bacteria, aerobes and anaerobes viral pathogens & parasites. Viruses are the most common pathogens transmitted via food, viruses are considered as the most important human food borne pathogens with regard to the number of out breaks.

Viruses are small a cellular microorganism with diameters of 15-400 nm, each containing only one type of nucleic acid, they cause many diseases of plants, animals & humans. Their replication is strongly dependent on the host organism; they cannot multiply outside the host [1].

Etiology of Food Borne Human Viral Infections

People commonly get infected by eating products that have been contaminated during processing & contamination may occur through

- Contact with human or animal feces or water contaminated during processing
- Contact with hands, objects solid with faces

Transmission of the viruses does not only depend on its interaction with the host, but also on the influence of external environment [2].

a) Genera-Noro Virus & Sapo virus

Noro virus (Norwalk) or small, round structured viruses &sapo viruses previously called Sapporo like viruses. These viruses do not grow in cell or organ culture & there is no animal model for Noro virus infection & GI disease.

Factors that contribute to the significant impact of noro viruses include a large human reservoir, low infection dose (10-100 virons can cause disease). Sapovirus mainly affects babies & children under the age of 5 years, infections are not associated with eating sea food. Norovirus has been recorded in feces of children with acute gastro enteritis.

b) Genus Entero virus

The genus entero virus is a member of broad picornarvidae family of RNA viruses. The human entero viruses are ubiquitous, enterically transmitted viruses that cause a wide spectrum of illness among infants & children's. Though

Entero viruses are particularly transmitted via faecal-oral route, symptoms of infections are often slight, moderate but almost the entero virus infections are Asymptomatic [3].

Methods for Detecting Viruses in Food

Although viral food borne is a significant problem, foods are rarely tested for viral contamination, testing is limited to shell-fish commodities, they must be directly detected in food extracts, which is accomplished with many problems concerning standardization. Infection with gastro enteric is routinely diagnosed by examination of stool sample by electron microscopy. However the sensitivity of these procedures is not high enough to detect the low number of viral particles in the environment. ELISA is also routinely used for the detection of Adeno viruses & Astro viruses. Sapo viruses and Noro viruses can be demonstrated using RT-PCR [1].

Conclusion

Despite the fact that viruses are the common pathogens transmitted via food, for *e.g.* 66.6 % food related illness, accordingly the education of food industry managers, producers, distributors & consumers about hygienic regulations & conditions of food production & processing are essential.

1. West Nile Virus

Importance

Since its introduction in North-America in 1999, West Nile virus has produced the 3 largest a Neuro-Invasive disease out breaks ever recorded in the United States [4].

Findings

West Nile virus is now endemic throughout the contiguous united states, with 16, 196 human Neuro Invasive disease cases & 1,549 deaths reported since 1999, more than 7,80,000 illness have likely occurred.

Ecology

West Nile virus is maintained in a Bird, Mosquito-Bird transmission cycle. Although West Nile virus has been detected in 65 different mosquito species & 326 Bird species in U.S, only a few culex mosquito species drive transmission of the virus in nature & subsequent spread to humans.

Transmission to Humans

Mosquito bites account for nearly all human infections, West Nile virus can also be transmitted via transfused platelets, RBC & fresh frozen plasma as well as through heart, liver, and lung & kidney transplantation.

Diagnosis

Detection of IgM antibody in serum or cerebrospinal fluid using IgM antibody-capture enzyme linked Immunosorbent assay (MAC-ELISA) forms the corner stone of West Nile virus diagnosis in most clinical settings. Because IgM antibody does not cross the Blood Brain Barrier (BBB), its presence in cerebro spinal fluid (CSF) indicates CNS Infection. Recent vaccination with yellow fever or Japanese encephalitis vaccines or recent infection with a related flavivirus may produce a positive West-Nile virus-IgM antibody test result [5-9].

Treatment and Prevention

Treatment of West-Nile virus infection remains supportive; several investigated therapeutic approaches include immune Ý- globulin, West-Nile virus- specific neutralizing Monoclonal antibodies, cortico steroids. No vaccine is licensed for humans, despite 4 licensed equine vaccines & promising preliminary results from several phase 1&2 human vaccine candidates, phase 3 trials have not been attempted due to the unknown market potential of WNV vaccine & difficulties in conducting phase3 for this widely dispersed disease [4].

2. Swine Flu (H1N1)

Introduction

Swine flu or pig flu is an infection caused by any of several types of swine influenza virus (SIV) which is common throughout pig population worldwide. Swine flu causes high level of illness, when influenza viruses from different species infects pigs, the viruses can reassert & new viruses that are mix of swine, human & human influenza viruses can emerge [10].

Classification

- **Influenza (A)**: swine influenza is known to be caused by influenza A subtypes. H1N1, H1N2, H2N3, H3N1 & H3N2. In pigs, three influenza A virus subtypes are common strains worldwide.
- **Influenza (B):** Influenza B viruses are only known to infect humans & seals giving them influenza. This limited host range is apparently responsible for the lack of influenza virus B caused by morphologically similar virus influenza A.
- **Influenza (C)**: It infects both humans & pigs, but do not infect birds. Transmissions between pigs & humans have occurred in the past. Influenza (C) caused small out breaks of a mild form of influenza amongst children in Japan & California.

Prevention

- Currently no vaccine is available to protect humans against the H1N1 flu virus, following steps helps to prevent from H1N1,
- Wash your hands often with soap & water, especially before eating & after sneezing
- Also can use alcohol gel product available over the counter, effective in protecting flu [11-13].

Prescribing Pattern for Swine Flu

- For a stuffy or blocked nose, use saline / warm water & Nose drops
- For throat pain, Tylenol or Ibuprofen is very helpful
- Flu can cause body aches that include leg pain, back pain, chest pain, give Ibuprofen to make these sore muscles feel better
- Tami flu is an Anti-viral medicine that may be useful for some children.

Anti-viral Drugs for Influenza

- **Oseltamivir** – The Neurominidase inhibitor oseltamivir formulated as capsules as oral suspension (Tami flu ®) is FDA approved for the treatment of uncomplicated acute influenza in patients 1 year & older not more than 2 days.
- **Zanamivir**- The Neurominidase inhibitor zanamivir formulated for oral inhalation (Relenza ®) is FDA approved for the treatment of influenza in patients 7 years of age & older, who similar to approved used Oseltamivir
- **Peramivir**– A third Neurominidase inhibitor peramivir formulated for IV administration is an investigational product, currently being evaluated in clinical trials [10].

Conclusion

H1N1 influenza/ swine flu disease that caused by influenza virus, infection with H1N1 can result in severe illness & life threatening complications, symptoms of H1N1 flu are similar to those of common flu. For people at high risk of developing flu complications, medication & hospitalization may be needed. The flu can be prevented by avoiding close contact with sick / infected people.

3. Bird Flu/Avian Flu (H5N1)

Introduction

Avian influenza virus is a zoonotic pathogen with a natural reservoir entirely in birds. The influenza virus genome is an 8 segmented single stranded RNA with high potential for in-situ recombination. Two segments code for the hemagglutinin & neurominidase antigens used for host cell entry. At present, 16H & 9N subtypes are known host susceptibility. Reservoirs for all H&N subtypes of avian influenza virus include aquatic birds, in which the vectors multiply in the GIT, producing large amounts of virus usually without producing clinical signs. Infections in poultry cause a wide spectrum of symptoms & viruses can be divided in to two groups according to their pathogenicity [13].

History

Swine influenza was first proposed to be a disease related to human flu during the 1918 flu pandemic, when pigs became sick at the same time as humans. The first identification of an influenza virus as a cause of disease in pigs occurred. About ten years later, in 1930. For the following 60 years, swine influenza strains were almost

exclusively H1N1. Then, between 1997 and 2002, new strains of three different subtypes and five different genotypes emerged as causes of influenza among pigs in North America. In 1997–1998, H3N2 strains emerged. These strains, which include genes derived by re-assortment from human, swine and avian viruses, have become a major cause of swine influenza in North America. Re-assortment between H1N1and H3N2 produced H1N2. In 1999 in Canada, a strain of H4N6crossed the species barrier from birds to pigs, but was contained on a single farm.

Who are prone to infection with swine flu?

- Older age group 65 yr.
- Pregnant woman.
- Individuals with chronic lung disease.
- Individuals with congestive heart failure.
- Individuals with renal failure.
- Immunosuppressant.
- Hematological abnormalities.
- Individuals with Diabetes mellitus.

Diagnosis

For diagnosis of swine influenza A infection, respiratory specimen (nasopharyngeal swab, throat swab nasal aspirate, nasal washing) would generally need to be collected within the first 4 to 5 days of illness (when an infected person is most likely to be shedding virus). Most of the tests can distinguish between A and B types. The test can be negative (no H1N1infection) or positive for type A and B. If the test is positive for type B, the flu is not likely to be swine influenza (H1N1). If it is positive for type A, the person could have conventional influenza strain or swine influenza (H1N1).

Available Laboratory Tests

- Rapid Antigen Tests: not as sensitive as other Available tests.
- RT–PCR: In this detection and quantification of mRNA is done. This test detects the viral load in an individual.
- Virus isolation: The throat swab is generally taken to culture virus from the suspected cases. Though if it is not detected doesn't rule out the disease.
- Virus Genome Sequencing.

Precautions

According to World Health Organization, swine flu has been declared as a pandemic disease. Following are the WHO safety precautions to be taken against swine flu.

- The nose and mouth must be covered with disposable tissues while coughing or sneezing.
- The used tissues must be disposed of immediately after using them.
- Hygiene and cleanliness must be maintained by washing hands frequently with soap and water.
- Touching the eyes, nose or mouth without washing hands must be totally avoided.
- One should stay at home from work, school and crowed places in case flu-like symptoms are observed.
- Face masks and gloves must be used when moving out in crowded places or nursing any ill patient. If a person is ill, then he or she should avoid contact with other people and stay isolated. Visit an authorized swine flu treatment hospital or doctor for further treatment. One should keep their surroundings clean and maintain hygiene.

Treatment

Treatment of swine flu can be done by,

a) Vaccination

Vaccines have been developed to protect against the virus that causes swine flu. There are two different brands of vaccine Pandemrix and Celvapan. Many people given the Pandemrix vaccine will only need one dose. People who have the Celvapan vaccine will need two doses three weeks apart. The swine flu vaccine is different from the seasonal flu vaccination that's offered every year. The seasonal flu vaccine does not protect against swine flu. The

vaccine is being offered first to pregnant women at any stage of pregnancy, child and people who are most likely to become seriously ill if they catch swine flu. There are only a few people who cannot have the swine flu vaccine. The vaccines should not be given to anyone who has had a severe allergic reaction to a previous dose of the vaccine or any component of the Vaccine.

b) Antiviral Therapy

Two classes of antiviral drugs are available for the prevention and treatment of influenza: neuraminidase inhibitors, which inhibit a viral protein called M2. Influenza A H1N1, formerly known as swine flu, has been found to be resistant to adamantanes (Amantadine and Rimantadine). Oseltamivir (Tamiflu) and Zanamivir (Relenza) are the two neuraminidase inhibitors currently available by prescription. These drugs reduce the median duration of symptoms by approximately one day and reduce the chance of contracting influenza by 70 to 90 % when used for known influenza exposure. Zanamivir and Oseltamivir are structurally related drugs that have been approved by the United States Food and Drug Administration (FDA) for the prophylaxis and treatment of influenza. In addition to their activity against current influenza A and influenza B strains, they are also active against the strain that caused the 1918 pandemic and against avian influenza strains [13-18].

Conclusion

From the above survey of information it can be well known that the Swine flu is a dangerous disorder which is spreading worldwide and this is a casual thing to be considered that more and more people in India are affected by it and the cases may increase. So, it is important to take into consideration about this disease as it may prove deadly one. And thus the intensity of this disorder can be lowered by diagnosing and taking proper treatments.

4. E-Bola Virus

Introduction

The complex & unprecedented E-Bola epidemic ongoing in West Africa has highlighted the need to review the epidemiological characteristics of E-Bola virus disease (EVD) as well as our current understanding of the transmission dynamics & effect of control interventions against E-Bola transmission [19].

Background

A complex epidemic Zaire E-Bola virus (EBOV) has been affecting West Africa since approximately December 2013, with the first cases likely occurring in southern Guinea. The causative Ebola strain is closely related to a strain associated with past EBOV outbreaks in Central Africa and could have been circulating in West Africa for about a decade. However, the current epidemic was not identified until March 2014, which facilitated several transmission chains to progress essentially unchecked in the region and to cross porous borders with neighboring Sierra Leone and Liberia and seed a limited outbreak in Nigeria via commercial airplane on 20 July 2014 .The World Health Organization declared the Ebola epidemic in West Africa a Public Health Emergency of International Concern on 8 August 2014 , with exponential dynamics characterizing the growth in the number of new cases in some areas . Economic and socio cultural factors together with the delay in identifying the outbreak in urban settings have hindered a timely and effective implementation of control efforts in the region. Remarkably, the current size of the ongoing EBOV epidemic far surpasses the total number of cases reported for all previous Ebola outbreaks combined. A total of 6,553 cases, with 3,083 deaths, have been reported to the World Health Organization as of 23 September 2014.

Transmission

The virus is transmitted to people as a result of direct contact with body fluids containing virus (vomitus, sweat, stool, urine, tears, breast milk, saliva and respiratory secretions) of an infected patient during the acute stage of disease. Epidemiological studies have revealed that family members are at high risk of infection because they may come in contact with infected body fluids or may help to prepare the corpse of an infected person for burial. Direct contact with virus containing material from contaminated hands of caregivers to their own mouth or eyes is the most common cause. Caregivers who work both at home and in hospitals are at greatest risk for exposure. While studies have proved the spread of EBOV and MARV via aerosol particles under controlled laboratory conditions such transmission rarely appeared in humans in a hospital or household setting during epidemics.[20]

Further, infection can occur through sexual contact and the virus has been traced in semen for up to seven weeks after recovery. It is recommended to control and use condoms during intercourse, and to avoid breast feeding for at least three months after recovery as to prevent secondary cases [21].

Treatment & Prevention

A wide range of studies *in vitro* and several animal models have been developed for EBOV and MARV; however, currently neither a licensed vaccine nor an approved treatment is available. Scientists working in high containment facilities, health care workers in Africa and people residing in the affected areas in Africa run a risk of potential exposures.

Recently, a great attention has been paid to unlicensed treatments and vaccines. A "cocktail" of humanized-mouse antibodies (ZMapp) is among the therapies in development, showing promise in nonhuman primates. Two US citizens who recently evacuated from Liberia to Atlanta were given ZMapp and both patients demonstrated clinical improvements. Other candidate therapeutics covers RNA-polymerase inhibitors and small interfering RNA nano particles that are inhibitors of protein production. The results obtained from gene-silencing treatment using small interfering RNAs have been good both in guinea pigs and non-human primate models of Ebola infections. This data suggests that RNA interference may be an effective post-exposure treatment strategy for people infected with Ebola virus and perhaps other VHF agents.

There are three main prevention interventions, and the first is to practice strict infection control measures in health care settings; the highest risk of transmission occurs among patients with delayed detection and isolation, not those with diagnosed infection. The second is to provide education and support for the community regarding modification of long-standing burial traditions aimed for preventing direct contact with the blood and body fluids of infectious people, at least temporarily, until the outbreak is controlled; and it will stop the second key medium of the virus widespread. This issue is culturally sensitive that requires culturally relevant and appropriate outreach and educational materials. The third is to avoid direct contacts with bush meat (wild animals hunted for sustenance) and bats (that may be the primary natural hosts of Ebola virus) can eliminate the risk of early importation of Ebola virus into humans [21].

Conclusion

EVD is a painful reminder that an outbreak anywhere can be a risk everywhere. The Global Health Security Agenda seeks to enforce public health systems in most affected countries in order to eliminate the spreads before they become emergencies. Although great improvements have been achieved over the past decade, better surveillance, real-time sharing of data and taking rapid action based on the available information remain necessary. Because Ebola virus is primarily transmitted through contact with the body fluids of symptomatic patients, the infection spread can be stopped by an early diagnosis, contact tracing, patient isolation and care, infection control and safe burial.

5. ZIKA VIRUS

Introduction

Zika, a flavivirus transmitted mainly by mosquitoes in the Genus Aedesaegyptia infected mosquito which outbreaks typically occur in tropical Africa and Southeast Asia and presently it outbreaks in many tropical areas.[27]

History

Zika virus was discovered in 1947 in Uganda from the 1960s to 1980s, human infections were found across Africa and Asia, typically causing mild illness. The first large outbreak of disease was found reported from Island of Yap in 2007, and then the virus moved from south-east Asia across pacific. During a 2013-14 outbreak in French Polynesia, the neurological disorder Guillian-Barre syndrome was linked to zika virus then the first report of locally transmitted came from Brazil in may 2015 the South American country.

Therefore infection moved rapidly through the range occupied by Aedes mosquito in Americas, WHO declared that zika infection associated with microcephaly and other neurological disorders constitutes a Public Health Emergency

of International Concern (PHEIC). By the start of feb-2016, local transmission of zika infection had been reported from more than 20 countries and territories in the Americas [27].

Transmission

Transmission is through the bite of an infected mosquito Aedesaegypti. Initially two instances of likely sexual transmission were reported internationally, one in 2008 and the other in 2016 up to date , all reports of suspected/confirmed sexual transmission of virus involves a symptomatic man transmitting the virus to a woman and virus is also found in the semen of men in some cases and there are some concerns that pregnant women who became infected with zika virus could transmit the disease to their unborn babies, with potentially serious consequences, although no casual link has yet been established. Therefore, until more is known about zika virus, we advice woman who are pregnant or who plan to become pregnant to consider postponing travel to infected area.[29]

Symptoms of Zika Virus

Low fever, arthragia, notably of small joints of hands and feet, with possible swollen joints, myalgia, headache, conjunctivitis, rashes, post-infection fatigue, rarely observed symptoms include digestive problems, mucous membrane ulcerations and purities infection may cause rash such as measles or dengue.

Treatment & Prevention

No specific antiviral treatment is available for zika virus infection. Treatment is generally supportive and can include rest, fluids and use of analgesics and antipyretics. Because the symptoms are as like a dengue or chickungunya virus infection so it is evaluated before prescribing the dose. And aspirin and other non steroidal anti-inflammatory drugs (NSAID's) should be avoided until dengue can be ruled out to reduce the risk of hemorrhage.

It can be prevented by many measures such as:

1. Use an EPA-registered insect repellent. Many insect repellents are safe for pregnant women and children to use, but be sure to check the product label for any warnings and follow the instructions closely.
2. When indoors, use air conditioning, window screens or insecticide-treated mosquito netting to keep mosquitoes out of the home.
3. Reduce the number of mosquitoes outside the home or hotel room by emptying or routinely changing standing water from containers such as flowerpots, pet dishes and bird baths.
4. Weather permitting, wear long sleeves and pants when outdoors [26, 29].

Conclusion

Human Zika virus infection appears to have changed in character while expanding its geographical range. The change is from an endemic, mosquito-borne infection causing mild illness across equatorial Africa and Asia, to an infection causing, from 2007 onwards, large outbreaks and from 2013 onwards, outbreaks linked with neurological disorders including Guillain-Barré syndrome and microcephaly across the Pacific region and the Americas.

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