Project Report on Viral Diseases

Introduction towards Project Report on Viral Diseases :

A virus, in the words of one eminent scientist, can be thought of as "a piece of bad news wrapped in protein." Unlike bacteria and fungi, viruses are not living organisms; rather, they consist in essence of a length of nucleic acid-their genetic material-that is surrounded and protected by a protein coat. *(Some viruses have, in addition to this coat, a soft outer envelope, which confers some special properties.)* The genetic material of viruses is composed of one type of nucleic acid, which may be either ribonucleic acid (RNA) or deoxyribonucleic acid (DNA).

Viruses carry out no independent metabolism: they do not respirate, they do not process nutrients, they do not generate waste products, and they rely on living cells of the host for their reproduction. A virus outside a cell is an inert bit of particulate matter; once inside, however, the virus seizes command of the cell's biosynthetic machinery, converting the cell into a "high-tech" factory for the production of new virus particles.

Many viruses eventually kill their host cells, resulting in disease and provoking an assault by the immune response of the host. Sometimes, this response goes away, so that the harmful effects of the immune response are actually more serious than those of the viral disease itself Other viruses provoke little, if any, reaction, and some can remain dormant, or latent, in the host for years. The vast majority of all virus infections appear to be asymptomatic in nature that is, the infections are so mild and the host response so effective that clinical signs of disease never develop.

A virus is a small infectious agent that can replicate only inside the living cells of organisms. Viruses infect all types of organisms, from animals and plants tobacteria and archaea.

Virus particles (known as virions) consist of two or three parts: the genetic material made from either DNA or RNA, long molecules that carry genetic information; a protein coat that protects these genes; and in some cases an envelope of lipids that surrounds the protein coat when they are outside a cell. The shapes of viruses range from simple helical and icosahedral forms to more complex structures. The average virus is about one one-hundredth the size of the average bacterium. Most viruses are too small to be seen directly with a light microscope.

Viruses spread in many ways; viruses in plants are often transmitted from plant to plant by insects that feed on the sap of plants, such as aphids; viruses in animals can be carried by blood-sucking insects. These disease-bearing organisms are known as vectors. Influenza viruses are spread by coughing and sneezing. Norovirus and rotavirus, common causes of viral gastroenteritis, are transmitted by the faecal-oral route and are passed from person to person by contact, entering the body in food or water. HIV is one of several viruses transmitted through sexual contact and by exposure to infected blood. The range of host cells that a virus can infect is called its "host range". This can be narrow or, as when a virus is capable of infecting many species, broad.

Viral infections in animals provoke an immune response that usually eliminates the infecting virus. Immune responses can also be produced by vaccines, which confer an artificially acquired immunity to the specific viral infection. However, some viruses including those causing AIDS and viral hepatitis evade these immune responses and result in chronic infections. Antibiotics have no effect on viruses, but several antiviral drugs have been developed.

Viral Infections

Viruses are microscopic pathogens, just a fraction of the size of a bacterium, that consist simply of genetic material (DNA or RNA) and a container. Because they cannot replicate on their own, viruses invade host cells, commandeering the machinery needed for normal cell function. A large number of zoonotic illnesses (diseases that pass from animals to humans) are caused by viruses, including rabies, ebola, and recently emerging diseases such as avian influenza and the H1N1 “swine” flu.

Illness from viral infections can be prevented with vaccines, which prime the immune system to attack and clear invading pathogens; however, many viruses mutate rapidly, resulting in new strains that the immune system no longer recognizes. Viruses also have the ability to remain dormant within a host cell. During these times, the immune system is unable to recognize and destroy the invading pathogen.

Structural characteristics -

Basic structural characteristics, such as genome type, virion shape and replication site, generally share the same features among virus species within the same family. There are currently 21 families of viruses known to cause disease in humans.

There are five double stranded DNA families: three are non enveloped (Adenoviruses, Parvovirus and Polyomavirus) and two are enveloped (Herpesvirus and Poxvirus).

There is one family of single stranded DNA viruses that infect humans: the Parvoviridae.

There are two additional viruses (Hepatitis D and Hepatitis E) which have not yet been assigned to a family but are clearly distinct from the other families infecting humans.

Viral Diseases :–

Viral diseases are extremely widespread infections caused by viruses, a type of microorganism. There are many types of viruses that cause a wide variety of viral diseases. The most common type of viral disease is the common cold, which is caused by a viral infection of the upper respiratory tract (nose and throat). Other common viral diseases include:

- Chickenpox
- Flu (influenza)
- Herpes
- Human immunodeficiency virus (HIV/AIDS)
- Human papillomavirus (HPV)
- Infectious mononucleosis
- Mumps, measles and rubella
- Shingles
- Viral gastroenteritis (stomach flu)
- Viral hepatitis
- Viral meningitis
- Viral pneumonia

ABOUT THESE DISEASES : -

Viral diseases are contagious and spread from person to person when a virus enters the body and begins to multiply. Common ways that viruses spread from person to person include:

- Breathing in air-borne droplets contaminated with a virus.
- Eating food or drinking water contaminated with a virus.
- Having sexual contact with a person who is infected with a sexually transmitted virus.
- Indirect transmission from person to person by a virus host, such as a mosquito, tick, or field mouse.
- Touching surfaces or body fluids contaminated with a virus.

In some cases, viral diseases can lead to serious, possibly life-threatening complications, such as dehydration, bacterial pneumonia, and other secondary bacterial infections. People at risk for complications include those who have a chronic disease or a suppressed or compromised immune system, and the very young and very old. In addition, certain types of sexually transmitted viral infections, such as HIV/AIDS and

HPV, can lead to serious complications and death. Seek prompt medical care if you think you have a viral disease, especially if you are at risk for complications, or if you believe you have been exposed to a sexually transmitted disease.

TREATMENT –

1. Prevention of Human Rhinovirus infections

Human rhinovirus (HRV) causes over 80% of the common cold in the fall. Developing vaccines against HRV is unfeasible because HRVs have at least 115 anti-genically distinct serotypes. One of the proven methods to prevent and inhibit viral infections is to block host cell receptors that are used by viruses to gain cell entry. Receptor blockage is commonly achieved via application of MAbs that bind to specific epitopes on the receptor molecules. A plethora of in vitro studies have reported effective viral inhibition by receptor-blocking MAbs. However, these works have not yielded yet any approved drug on the markers.

High avidity is achieved by multivalency. To improve avidity of HRV receptor blocking antibody, a novel tetravalent recombinant antibody, CFY196, has been generated against ICAM-1. CFY196 is composed of Fab fragment of a humanized version of MAb 1A6 fused with a linker derived from human immunoglobulin D (IgD) hinge and a tetramerization domain derived from the coiled-coil sequence of human transcription factor ATFα. CFY196 is expressed in bacteria and purified as a homogenous tetrameric molecular complex. CFY196 exhibited almost two-orders-of-magnitude improvement in functional affinity compared with its bivalent counterpart based on the kinetic parameters measured by BIAcore analysis. Such kinetic improvement also directly leads to functional superiorities of CFY196. In in vitroassays, CFY196 consistently and significantly outpaced the best commercial anti-ICAM-1 MAbs in preventing HRV infection as measured by reduction of cytopathic effects and HRV viral titers. The preclinical findings of CFY196 bode well its efficacy in human since MAb 1A6, from

which CFY196 is derived, has already exhibited positive effects in a human trial. Moreover, to prevent possible immunogenicity, CFY196 is humanized.

2. Biochemical Prevention and Treatment via targeting on viral mRNA

Targeting viral mRNA is one of the most active areas of research and development. Several strategies have emerged over the years and are being tested pre-clinically and clinically. They include: antisense-oligonucleotides (AS-ONs), ribozymes, and recently, RNA interference (RNAi). All these strategies share the features of conceptual simplicity, straightforward drug design and quick route to identify drug leads. However, the challenges have been to improve potency, pharmacokinetics and, most importantly, intracellular delivery of the drug candidates. As the oldest strategy, AS-ON technology has produced to date one drug in the market place, Vitravene®. A number of clinical trials of drug candidates from these technologies are currently ongoing.

Antisense-oligonucleotides

Antisense-oligonucleotides (AS-ONs) are short synthetic oligonucleotides that form complementary pair with specific viral mRNA targets. AS-ONs inhibit viral protein production by both blocking viral mRNA translation and triggering its degradation. Since the discovery of viral inhibition effect of AS-ONs by Zamecnik and Stephenson in 1978 , antisense technology has been developed as a powerful tool for target validation and therapeutic purposes.

Vitravene is the first AS-ON based drug approved by FDA. Vitravene, or fomivirsen sodium, is a 21-base phosphorothioate oligodeoxynucleotide complementary to the messenger RNA of the major immediate-early region proteins of human cytomegalovirus, and is a potent and selective antiviral agent for cytomegalovirus retinitis, a herpes-like eye disease that afflicts the immune-suppressed.

Bibliography

- Internet Source : www.google.com www.yahoo.com