Rabies

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**Disease Etiology:**

According to the International Committee on Taxonomy of Viruses (ICTV), the etiologic agent that causes classical Rabies belongs to the genus Lyssavirus, species Rabies virus (RABV). [1],[2].

**Disease Transmission:**

The most common way of transmission is through the bite of an infected host having virus containing saliva to an uninfected animal. Although rare, transmission can also take place by means of contaminated mucous membranes (i.e., eyes, nose, and mouth) and corneal and organ transplantations. [2].

**Reservoirs:**

All species of mammals are susceptible to infection, but only a few species are important as reservoirs. These are skunks, Raccoons, foxes, coyotes, several species of insectivorous bats, and in Puerto Rico, the Mongoose. [3].

**Specific Microbial Characteristics:**

Lyssavirus (rabies virus), which belongs to the family Rhabdoviridae have a distinctive rod or bullet-shaped morphology. It’s a single-stranded RNA virus measuring approximately 60 nm × 180 nm. It is composed of an internal protein core or nucleocapsid, containing the nucleic acid, and an outer envelope, a lipid-containing bilayer covered with transmembrane glycoprotein spikes. [5].

**Specific Tests for Identification:**

Rabies in animals is diagnosed using the direct fluorescent antibody (DFA) test, which looks for the presence of rabies virus antigens in brain tissue. Results using these tests can be acquired within a few hours, which are very important to avoid unnecessary physical and psychological trauma to the exposed person. [6][7]
**Diagnosis in humans:**

Ante-mortem (before death) diagnosis in humans require more than one test. Samples are needed of saliva, skin, serum, and spinal fluid. Skin biopsies are taken from the nape of the neck and are tested for rabies antigen in the cutaneous nerves at the base of hair follicles. Saliva is tested by virus isolation or reverse transcription which is followed by polymerase chain reaction (RT-PCR). Serum and spinal fluids are tested for antibodies to rabies virus.[7].

**Signs and symptoms of disease in humans:**

First symptoms are flu-like including general weakness or discomfort, fever, and headache. This may last for days. Within days the symptoms progress to cerebral dysfunction, anxiety, confusion and agitation. As the disease progresses, the person may experience delirium, abnormal behavior, hallucinations, and insomnia.

The acute period of the disease will last 2 to 10 days. Once clinical signs of rabies appear, however, it is nearly always fatal, and treatment is usually supportive. There have only been 10 documented cases of human survival from rabies have been reported. [7].

**Historical information:**

Rabies was first recognized in Egypt before 2300 B and described by Aristotle in ancient Greece. It is one the most lethal of all infectious diseases and also has the widest known host range of any virus. Louis Pasteur in 1886 developed the rabies vaccine. It was the success of this vaccine that encouraged scientists to develop other vaccines to prevent other infectious diseases [13]

*Rabies* is derived from the Latin word *rabere*. *Rabere* means to rage or rave, however, *rabere* may have roots in a Sanskrit word *rabhas*. *Rabhas* means to do violence. The Greeks called rabies *lyssa* or *lytta*, which means frenzy or madness, thus the genus *Lyssavirus*. They named human rabies *hydrophobia*, which means fear of water, a symptom shown by rabies victims.[8].

**Virulence factors:**

Following inoculation, the virus replicates in the striated or connective tissue at the site of the bite and enters the peripheral nerves through the neuromuscular junction. It then spreads to the CNS in the endoneurium of the Schwann cells. Terminally, there is widespread CNS involvement but few neurons infected with the virus show structural abnormalities.[9].

Infection requires the rabies virus glycoprotein. Nicotinic acetylcholine receptor (nAchR) was the first identified potential receptor for rabies virus. Other potential receptors include neuronal cell adhesion molecule (NCAM; also known as NCAM1) and low-affinity nerve growth factor receptor (p75NTR; also known as BeX3 and NGFR).[14].

Symptoms may be very similar to those of the flu and include weakness or discomfort, fever, or headache. These symptoms may last for day and progress within days to symptoms of cerebral dysfunction, anxiety, confusion, agitation. As the disease progresses, the person may experience delirium, abnormal behavior, hallucinations, and insomnia.

The acute period of disease typically ends after 2 to 10 days. Once clinical signs of rabies appear, the disease is nearly always fatal, and treatment is typically supportive [5].
Control/Treatment:

The combination of human rabies immune globulin (HRIG) and vaccine is recommended for both bite and non-bite exposures, regardless of the interval between exposure and initiation of treatment.[10]. In rare cases treatment may involves putting the patient into a chemically induced coma and administering antiviral drugs, this is known as the Milwaukee protocol, and was developed and named by Rodney Willoughby, Jr., M.D., following the successful treatment of Jeanna Giese [15]. Mass canine vaccinations is the best way to prevent exposure to rabies worldwide.[16].

Prevention/ Vaccine info:

“A regimen of four 1-mL doses of HDCV or PCEC is administered intramuscularly to previously unvaccinated persons. The first dose of the four-dose course should be administered as soon as possible after exposure. Additional doses should be administered on days 3, 7, and 14 after the first vaccination.”[11].

Current outbreaks / cases locally (with prevalence/incidence):

The number of rabies-related human deaths in the United States has declined from more than 100 annually at the turn of the century to one or two per year in the 1990's. Modern day prophylaxis has proven nearly 100% successful. [12]. In 2010, 48 states and Puerto Rico reported 6,153 cases of rabies in animals and 2 human cases to CDC (Hawaii is the only state that is rabies free). The total number of reported cases decreased by approximately 8.0% from those reported in 2009 (6,690 rabid animals and 4 human cases).[12]

Current outbreaks/cases globally (with prevalence/incidence):

Exposure to rabid dogs is still the cause of over 90% of human exposures to rabies and of over 99% of human deaths worldwide. Most deaths from rabies occur in countries with inadequate public health resources and limited access to preventive treatment. These countries also have few diagnostic facilities and almost no rabies surveillance. [12] [16].
References:


