

The top of the slide features several overlapping, wavy lines in shades of light blue and teal, creating a modern, abstract header design.

Arboviruses

Introduction

Arbovirus

These viruses are transmitted by arthropods, primarily mosquitoes and ticks.

It is a collective name for a large group of diverse viruses, more than 400 at last count.

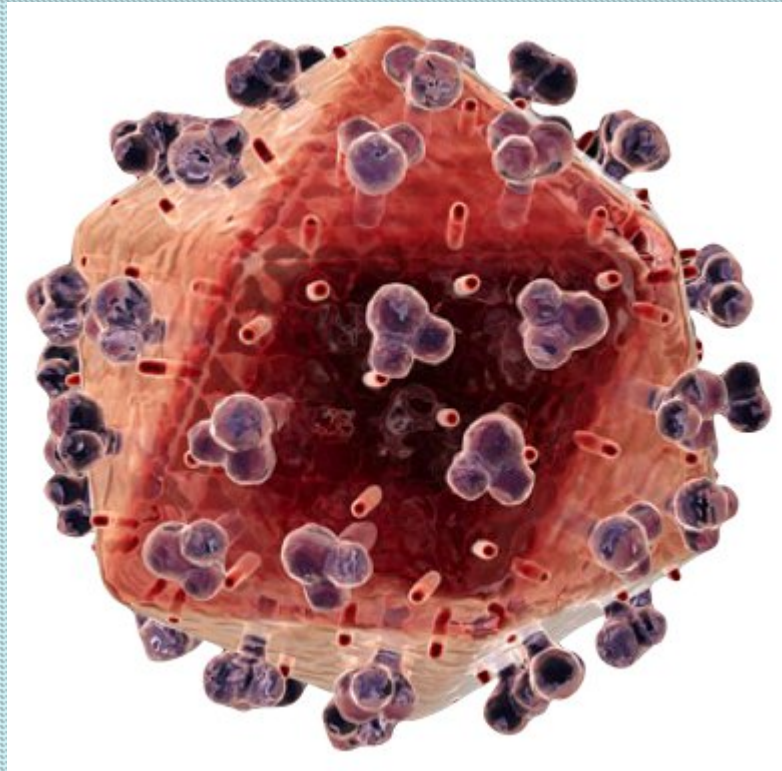
In general, they are named either for

Diseases they cause, e.g., yellow fever virus

Place where they were first isolated, e.g., St. Louis encephalitis virus.

Yellow Fever Virus

YFV is Flavivirus, which contains more than 60 positive-sense, single-stranded RNA viruses



C/P

Yellow fever is characterized by jaundice & fever.

Prodromal symptoms, it is a severe, life-threatening disease that begins with the sudden onset of

fever

headache

myalgias

photophobia

After this prodrome, the symptoms progress to involve the liver,

kidneys, &

heart.

Prostration & shock occur, accompanied by upper gastrointestinal tract hemorrhage with hematemesis ("black vomit").

Diagnosis

Isolating the virus

Detecting a rise in antibody titer.

No antiviral therapy is available

The mortality rate is high.

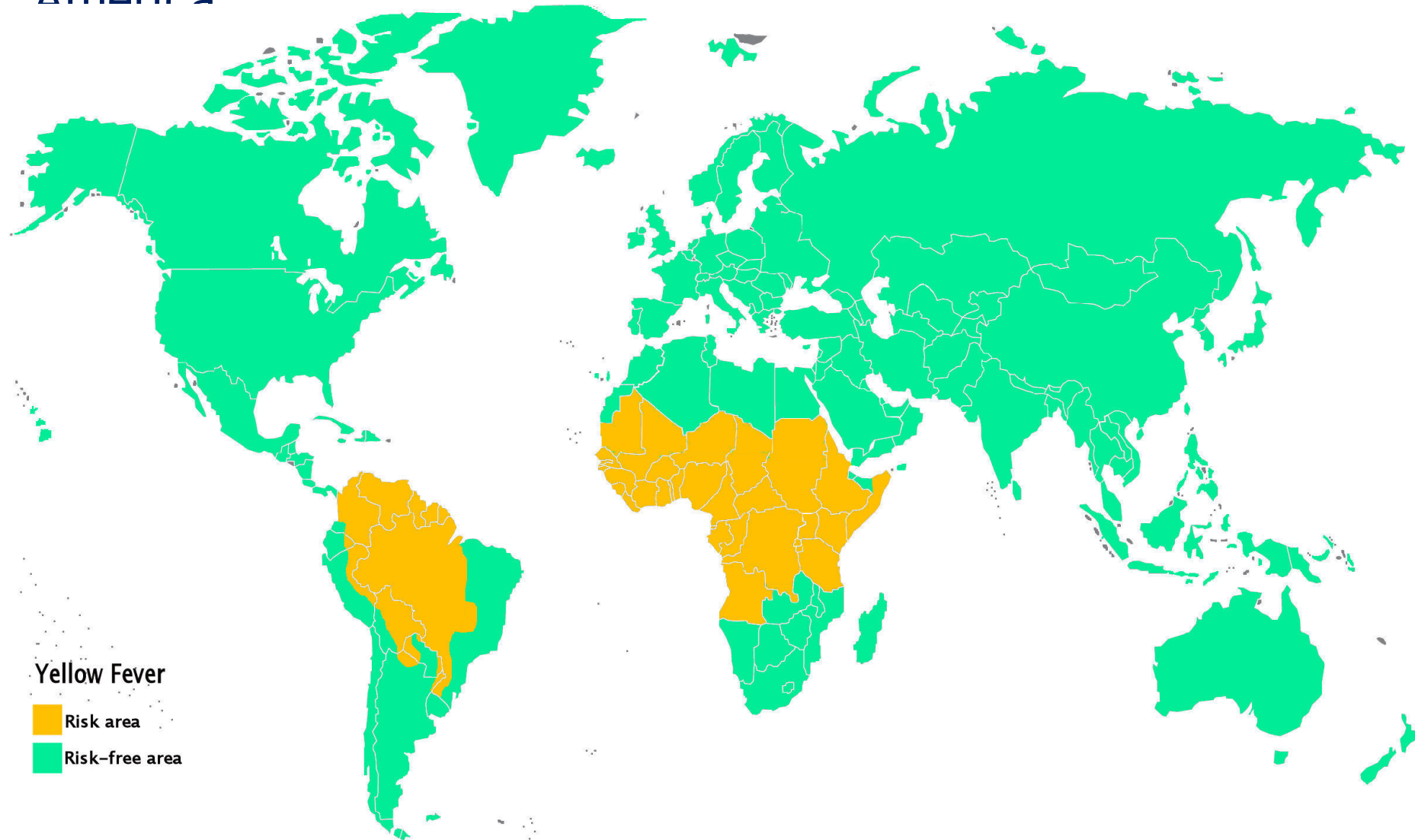
If the patient recovers,

No chronic infection ensues &

Lifelong immunity is conferred.



Yellow fever occurs in the tropical areas of Africa & South America



Epidemiology

Two distinct cycles exist in nature, with different reservoirs & vectors.

Jungle yellow fever

A disease of monkeys in tropical Africa & South America

Transmitted primarily by the treetop mosquitoes of the *Haemagogus* species.

Monkeys are the permanent reservoir, whereas humans are accidental hosts.

Humans (e.g., tree cutters) are infected when they enter the jungle occupationally.

Epidemiology

Urban yellow fever

Is a human disease transmitted by the mosquito *Aedes aegypti*, which breeds in stagnant water.

Humans are the reservoir.

For effective transmission to occur, the virus must replicate in the mosquito during the 12- to 14-day extrinsic IP.

After the infected mosquito bites the person, the intrinsic IP is 3 to 6 days.

Prevention

Prevention of yellow fever involves

1. Mosquito control
2. Immunization with the vaccine containing live attenuated yellow fever virus.

Prevention

Indications of vaccinations

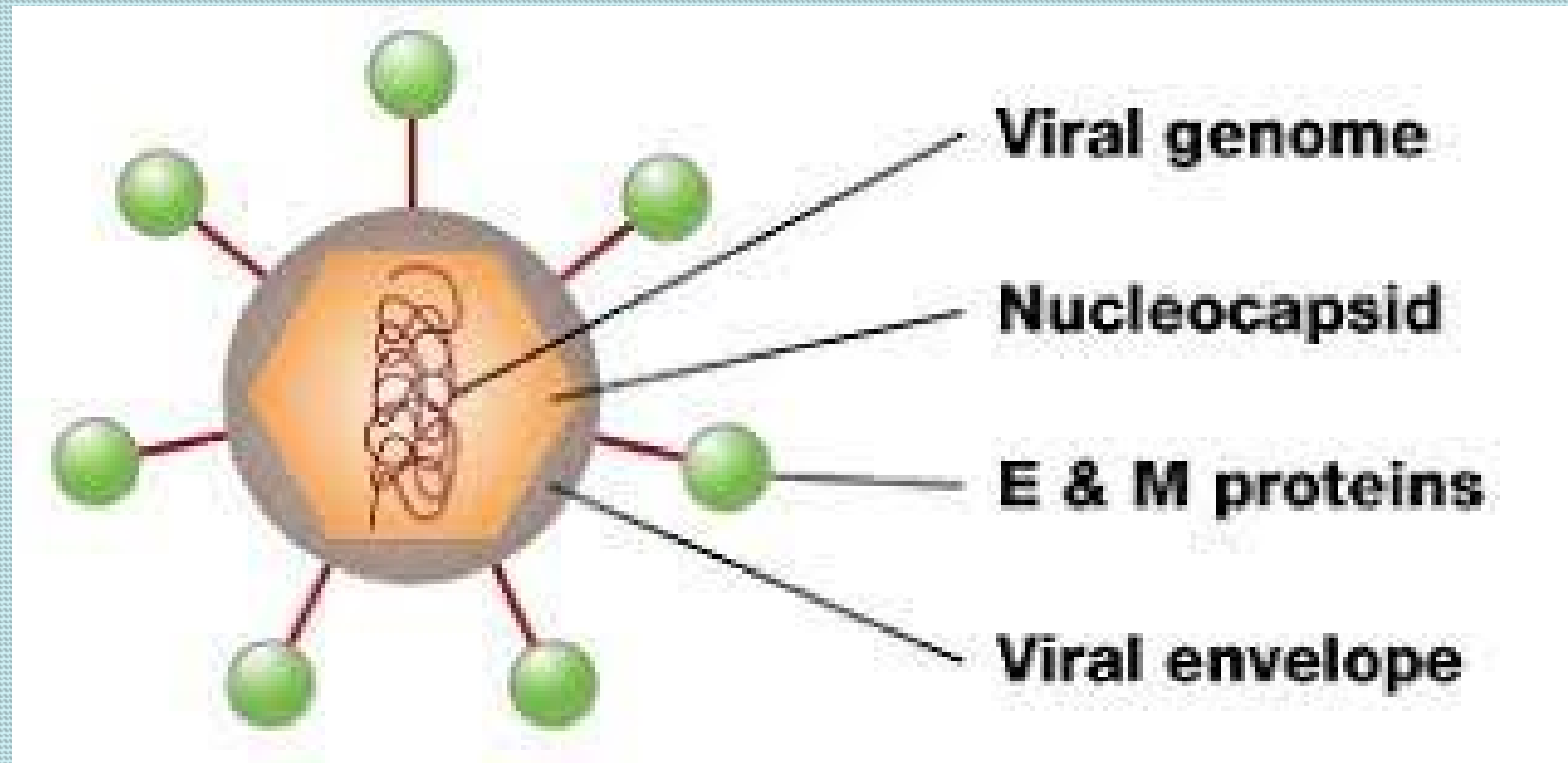
1. Travelers to endemic areas
2. Residents of endemic areas

Protection lasts up to 10 years, & boosters are required every 10 years for travelers entering certain countries.

Epidemics still occur in parts of tropical Africa & South America.

Because it is a live vaccine, it should not be given to immunocompromised people or to pregnant women.

Dengue Virus



Dengue Virus

DENV is a member of the Flaviviridae family The viral genome consists of a positive-sense RNA

Dengue Virus

It is estimated that about 20 million people are infected with dengue virus each year worldwide.

Dengue is the most common insect-borne viral disease in the world.

Dengue hemorrhagic fever occurs particularly in southern Asia, whereas the

Classic form is found in tropical areas worldwide.

Classic dengue (breakbone fever)

Begins suddenly with an influenza-like syndrome consisting of:
Fever, malaise, cough, & headache.

Severe pains in muscles & joints (breakbone)

Enlarged lymph nodes, a maculopapular rash, & leukopenia are common.

After a week or so, the symptoms regress but weakness may persist.

Although unpleasant, this typical dengue is rarely fatal & has few sequelae.

Dengue hemorrhagic fever

A fatality rate 10%.

The initial picture is the same as classic dengue, but then shock & hemorrhage, especially into the gastrointestinal tract & skin, develop.

Hemorrhagic shock syndrome

Is due to the production of large amounts of cross-reacting antibodies at the time of a second dengue infection.

Pathogenesis of Dengue hemorrhagic fever

The patient recovers from classic dengue caused by one of the four serotypes, & antibody against that serotype is produced.

When the patient is infected with another serotype of the dengue virus, an anamnestic, heterotypic response occurs, & large amounts of **cross-reacting antibodies** to the first serotype are produced.

Pathogenesis of Dengue hemorrhagic fever

There are two hypotheses about what happens next.

1. One is that immune complexes composed of virus & antibodies are formed that activate complement, causing increased vascular permeability & thrombocytopenia.
2. The other is that the antibodies increase the entry of the virus into monocytes & macrophages with the consequent liberation of a large number of cytokines.

In either scenario, shock & hemorrhage result.

Dengue

Dengue virus is transmitted by the *A. aegypti* mosquito, which is also the vector of yellow fever virus.

Humans are the reservoir for dengue virus, but a jungle cycle involving monkeys as the reservoir & other *Aedes* species as vectors is suspected.

Diagnosis

Isolation of the virus in cell culture

Serologic tests that demonstrate the presence of
IgM antibody or

A fourfold or greater rise in antibody titer in acute &
convalescent sera.

Treatment

No antiviral therapy

No vaccine for dengue is available.

Outbreaks are controlled by using insecticides & draining stagnant water that serves as the breeding place for the mosquitoes.

Personal protection includes using mosquito repellent & wearing clothing that covers the entire body.

Ebola Virus

Ebola Virus has a negative-sense, non-segmented single-stranded linear RNA genome.

Ebola Virus

Ebola virus is named for the river in Zaire that was the site of an outbreak of hemorrhagic fever in 1976.

The disease begins with fever, headache, vomiting, & diarrhea.

Later, bleeding into the GIT occurs, followed by shock & disseminated intravascular coagulation.

The hemorrhages are caused by severe thrombocytopenia.

The mortality rate associated with this virus approaches 100%.

Ebola Virus

Most cases arise by secondary transmission from contact with the patient's blood or secretions, e.g., in hospital staff.

Reuse of needles & syringes is also implicated in the spread within hospitals.

Although greatly feared, Ebola hemorrhagic fever is quite rare. Approximately 1000 cases have occurred since its appearance in 1976.

Ebola Virus

Ebola virus is a member of the Filovirus family.

The appearance of Filoviruses (filo-thread) is unique.

They are the longest viruses, often measuring thousands of nanometers.

The natural reservoir of the Ebola virus is unknown.

Monkeys can be infected but, because they become sick, are unlikely to be the reservoir.

Ebola Virus

Bats are suspected of being the reservoir, but this has not been established.

The high mortality rate of the Ebola virus is attributed to several viral virulence factors:

Its glycoprotein kills endothelial cells, resulting in hemorrhage, &
Two other proteins inhibit the induction & action of interferon.

Lymphocytes are killed & the antibody response is ineffective.



Ebola virus—Electron micrograph.

Long arrow points to a typical virion of Ebola virus.

Short arrow points to the "shepherd's crook" appearance of some Ebola virions.

Diagnosis

Isolating the virus or by
Detecting a rise in antibody titer.

No antiviral therapy is available.

Treatment

Immune serum globulins containing antibody to Ebola virus has had variable results.

Prevention

Extreme care must be taken when handling specimens in the laboratory.
Limiting secondary spread by proper handling of patient's secretions

There is no vaccine.