Viral Hemorrhagic Fevers

Viral hemorrhagic fevers (VHFs) refer to a group of illnesses. They are caused by several families of viruses. In general, the term "viral hemorrhagic fever" is used to describe a severe syndrome. With it, multiple organ systems in the body are affected. Usually, the overall vascular system is damaged. And the body's ability to regulate itself is working poorly. These symptoms are often accompanied by bleeding (*hemorrhage*). But the bleeding is itself rarely life-threatening. Some types of hemorrhagic fever viruses can cause relatively mild illnesses. But many of these viruses cause severe, life-threatening disease.

Researchers are shown here wearing protective clothing to investigate the 1993 HPS outbreak.

VHFs are caused by viruses of four distinct families. They are arenaviruses, filoviruses, bunyaviruses, and flaviviruses. Each of these families share some features:

- They are all RNA viruses. All are covered, or enveloped, in a fatty (*lipid*) coating.
- Their survival is dependent on an animal or insect host. It is called the natural reservoir.
- The viruses are restricted to the geographic areas where their host species live.
- Humans are not the natural reservoir for any of these viruses. Humans are infected when they come into contact with infected hosts. But, with some viruses, after the accidental transmission from the host, humans can transmit the virus to one another.
- Human cases or outbreaks of hemorrhagic fevers caused by these viruses happen sporadically and irregularly. The occurrence of outbreaks cannot be easily predicted.
- With a few exceptions, there is no cure or established drug treatment for VHFs. In rare cases, other viral and bacterial infections can cause a hemorrhagic fever. Scrub typhus is an example.

CAUSES

Viruses associated with most VHFs are zoonotic. This means that these viruses naturally live in an animal reservoir host or arthropod vector. They totally depend on their hosts for replication and survival. For the most part, rodents and arthropods (ticks and mosquitoes) are the main reservoirs for viruses causing VHFs. The multimammate rat, cotton rat, deer mouse, house mouse, and other field rodents are examples of these hosts. Arthropod ticks and mosquitoes serve as vectors for some of the illnesses. The hosts of some viruses such as Ebola and Marburg viruses are well-known examples.

The viruses that cause VHFs are spread over much of the globe. But since each virus is associated with one or more particular host species, the virus and the disease it causes are usually seen only where the host species live(s). Some hosts range over continents. Examples include:

- Rodents that carry viruses which cause various forms of hantavirus pulmonary syndrome (HPS) in North and South America.
- The different set of rodents that carry viruses which cause hemorrhagic fever with renal syndrome (HFRS) in Europe and Asia.

A few hosts are distributed nearly worldwide, such as the common rat. It can carry Seoul virus. That is a cause of HFRS. So humans can get HFRS anywhere where the common rat is found.

People usually become infected only in areas where the host lives. But sometimes a host that has been exported from its native habitat infects people. The first outbreaks of Marburg hemorrhagic fever, in Marburg and Frankfurt, Germany, and in Yugoslavia are an example. They occurred when laboratory workers handled imported monkeys infected with Marburg virus. Sometimes a person becomes infected in an area where the virus occurs naturally and then travels elsewhere. If the virus is a type that can be transmitted by person-to-person contact, the traveler could infect other people. For instance, in 1996, a medical professional treating

patients with Ebola hemorrhagic fever (Ebola HF) in Gabon became infected without knowing it. He later traveled to South Africa and was treated for Ebola HF in a hospital. Then the virus was transmitted to a nurse. She became ill and died. More and more people travel each year. So outbreaks of these diseases are becoming an increasing threat in places where they rarely, if ever, have been seen before.

TRANSMISSION

Viruses that cause these fevers are spread to humans when the activities of infected reservoir hosts or vectors and humans overlap. The viruses carried in rodent reservoirs are spread when humans have contact with body excretions from infected rodents, such as:

- Urine.
- Fecal matter.
- Saliva.

The viruses from arthropod vectors are spread most often when:

- The vector mosquito or tick bites a human.
- A human crushes a tick.

But some of these vectors may spread virus to animals, such as livestock. Humans then become infected when they care for or slaughter the animals.

SYMPTOMS

Specific signs and symptoms vary by the type of VHF. But initial signs and symptoms often include:

- Fever.
- Fatigue.
- Dizziness.
- Muscle aches.
- Loss of strength.
- Exhaustion.

Patients with severe cases of VHF often show signs of bleeding:

- Under the skin.
- In internal organs.
- From body orifices like the mouth, eyes, or ears.

But, though they may bleed from many sites around the body, patients rarely die due to blood loss. Severely ill patient cases may also show:

- Shock.
- Nervous system malfunction.
- Coma.
- Delirium.
- Seizures.

Some types of VHF are linked to kidney (renal) failure.

TREATMENT

Patients receive supportive therapy. But generally there is no other treatment or established cure for VHFs. Ribavirin, an anti-viral drug, has been effective in treating some individuals with Lassa fever or HFRS. Treatment with convalescent-phase plasma has been used with success in some patients with Argentine hemorrhagic fever.

PREVENTION

- With the exception of yellow fever and Argentine hemorrhagic fever, for which vaccines have been developed, no vaccines exist that can protect against these diseases.
- Prevention efforts must concentrate on avoiding contact with host species.
- If prevention methods fail and a case of VHF does occur, efforts should focus on preventing further transmission from person to person, if the virus can be transmitted in this way.

- Many of the hosts that carry these viruses are rodents. So disease prevention efforts should:
  - Control rodent populations.
  - Discourage rodents from entering or living in homes or workplaces.
  - Encourage safe cleanup of rodent nests and droppings.
- For viruses spread by arthropod vectors, prevention efforts often focus on community-wide insect and arthropod control. Also, to avoid being bitten, people are encouraged to use:
  - Insect repellant.
  - Proper clothing.
  - Bed nets.
  - Window screens.
  - Other insect barriers.
- For those viruses that can be transmitted from one person to another, avoiding close physical contact with infected people and their body fluids is the most important way to control the spread of disease. Barrier nursing or infection control techniques include:
  - Isolating infected individuals.
  - Wearing protective clothing.

Other infection control recommendations include proper use, disinfection, and disposal of instruments and equipment used to treat or care for patients with VHF. Needles and thermometers are examples.

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