

## What is Potomac Horse Fever?

Potomac Horse Fever is a serious illness of horses that was first described in the area around the Potomac River in Maryland in 1979. The disease is now recognized throughout the United States as well as in other countries. It is caused by a type of tiny bacteria, *Neorickettsia risticii*, which is related to the organism that causes salmon poisoning in dogs. Previously, the horse's organism was called *Ehrlichia risticii*, so the disease in horses is also known as Equine Monocytic Ehrlichiosis. After the organism is ingested, it multiplies in the intestinal tract, where it can cause marked inflammation (colitis). This leads to the clinical signs of fever, depression, poor appetite, and in most cases, diarrhea. A subset of horses will founder and pregnant mares can abort. Some will also develop swelling of their lower limbs or body wall. In the early stages of the disease, the bacteria may rarely be seen in a type of white blood cell, called monocytes, which may be more numerous than normal on a complete blood count. This abnormality is transient, so the diagnosis most often relies on molecular diagnostics, such as PCR testing of the blood or feces, which detects the DNA of the organism. These samples need to be taken before antibiotics are given. If that is not possible, then paired blood samples can be evaluated to measure the antibody levels produced in response to active infection. Much higher antibody levels are produced by the disease than from vaccination alone.

Not all horses exposed to the PHF organism become ill. This disease can kill affected horses, but most respond well, if treated early, to oxytetracycline, an antibiotic given intravenously. As the diarrhea can be severe, fluid therapy is often needed to address dehydration and electrolyte imbalances. Anti-inflammatory drugs, such as Banamine, help reduce the effects of toxins that get into the bloodstream from the inflamed intestinal tract. Very severe cases may require intensive care, including plasma transfusions. Additional therapy may be needed if the toxins induce founder or laminitis in the horse.

In the last 7 years, excellent research at a number of veterinary colleges (particularly University of California at Davis and The Ohio State University), has helped elucidate most of the natural life cycle of *Neorickettsia risticii*. This knowledge helps explain the frequent association of clinical cases with premises that are near rivers, streams, canals or ponds. The PHF organism is harbored inside flukes (trematodes) that parasitize water snails. When the water becomes warm, the flukes "hatch" immature forms, called cercaria, which carry the PHF organism, and pass out of the snail into the water. Experimentally, this water can infect horses. Currently, the most important transmission route is believed to be these immature flukes which are ingested by a variety of aquatic insects. The larval stages of the insects then molt into flying insects, carrying the immature fluke and PHF organisms into the horse's environment. The horse then becomes infected when it eats or drinks anything contaminated with these insects. Most of the research has focused on 2 types of insects: caddis flies and mayflies, which carry the organism (see photos below). Most recently, the fluke with the *Neorickettsia* has been identified in 2 species of bats and in barn swallows, but we do not yet know if these animals can serve as an infection source for horses. Direct transmission of the disease from one horse to another is remotely possible, but requires consumption of a very large amount of manure from a sick horse. As diarrhea can be caused by a number of other organisms as well, such as Salmonella, and Clostridia, it is always wise to isolate any horse with diarrhea to minimize transmission of possible contagious microbes to other horses, animals or humans.

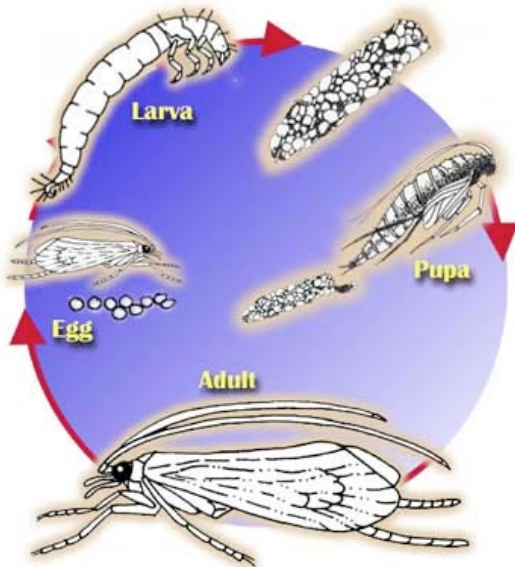
In July and early August, more cases of PHF were seen in Minnesota horses than usual, based on observations of many equine veterinarians. This number of cases is perplexing but may have an explanation, as more cases are seen during hot summer days. Weather conditions determine the hatch rates and timing of aquatic insects. High hatch rates may result in swarms near rivers or lowlands. For most of these insects, the swarm is adult insects that live briefly, mating, depositing eggs back in the

water, then dying in 1-2 days. Aquatic insects are attracted to lights at night. Anecdotal reports suggest that horses in stalls near night lights may be at greater risk of developing clinical signs. The insects fly towards the lights, and may die there in large numbers, getting into the horse's feed, bedding or water. In one confirmed cluster of 4 cases in Minnesota this summer, thousands of dead mayflies were observed outside the barn, and some got into the affected horses' hay and stalls.

Research using molecular techniques has shown that there are many different strains of the PHF organism that can be isolated from sick horses from different areas. The current vaccines contain a single strain of PHF and therefore do not provide very strong protection against other strains. Instead, the vaccine-induced immunity diminishes the severity of disease if the horse is exposed to the organisms. If infected, the vaccinated horse can still become ill, and may die. The vaccine does NOT produce very high blood antibody levels, whereas natural infection produces very high titers which protect the horse for several years. An economic study in New York showed that it was more cost effective to recognize clinical cases and treat them promptly with oxytetracycline, than to keep all the horses on the farm annually vaccinated against the disease. For these reasons, many veterinarians do not routinely recommend this vaccine unless PHF has been previously diagnosed on the farm or neighborhood. When a PHF vaccine is used for the first time, the horse must receive a booster in 2-4 weeks. After that, annual vaccination is recommended if the horse lives in a high risk environment. In years where a high number of cases are observed, veterinarians may suggest a late summer booster as well.

Clusters of horses affected with Potomac Horse Fever are rare, but when observed, are most often in stables near waterways. More often, a veterinary practice will just see an occasional case. The pattern of cases this summer in Minnesota suggests that key new information may be gained to further advance the knowledge of the life cycle of the organism and the flukes that harbor it. This can lead to better recommendations for disease prevention. The University of Minnesota is collaborating with the University of California at Davis to investigate recent cases here. Please contact Dr. Julia Wilson at the College of Veterinary Medicine if you would like more information: 612 625-6700.

**Caddis Fly**



**Mayfly**

