

THE CANINE HERPESVIRUS

A virologist addresses the GAZETTE's questions.

"About a year ago, I bred my dog to a bitch who subsequently lost four puppies from a litter of ten," began the letter from Connie Blair, a *GAZETTE* subscriber. "Being a conscientious breeder, I was not willing to accept the puppies' death without a reason. A local veterinarian told me the cause was the canine herpesvirus.

"But little information about the canine herpesvirus was accessible in terminology that I could easily understand. Local veterinarians were cooperative in discussing the virus with me, but still did not give me a clear picture of the problem. I asked my veterinarian for copies of any articles he might have regarding the virus, and he gave me one from the *Merck Manual*."

Thus began Blair's search for information about the virus that raided her dog's litter. Along the way, the Rhodesian Ridgeback breeder contacted Dr. James F. Evermann--the author of the *Merck* article--at Washington State University for more information, and obtained his consent to be interviewed for an article about the disease for the *GAZETTE*.

"Dr. Evermann agreed that the need to educate the public about this common virus is long overdue," Blair told the *GAZETTE*. "He explained that the reason I found the material I collected to be so negative is that most articles discuss only cases of the disease and do not address either the presence of herpesvirus in nature as a subclinical infection or practical control measures to prevent the disease. I hope Dr. Evermann's hard work and dedication to animals can be rewarded by the printing of this article."

Blair deserves her own share of the credit for bringing you the following examination of the canine herpesvires.
- The Editors

Question: What is the canine herpesvirus?

Dr. Evermann: Viruses are minute infectious agents that contain genetic material surrounded by a coat made of protein. The canine herpesvirus, first reported in 1965 by two independent research groups (one at Cornell University and the other at the National Institute of Health), is a virus that reproduces inside dogs and causes occasional mild sign of illness in adults. However, infection is frequently fatal in prenatal or neonatal puppies. The herpesvirus is capable of surviving outside the dog's body, in the environment, for six to twelve days. It is, however, readily inactivated by heat, drying and bleach solutions.

Q: Is herpesvirus infection common?

Yes, especially in dogs maintained in high density environments, such as kennels, where infection may approach 80 percent of the population. The infection rate is much lower in dogs that live singly in households, or dogs that do not commingle with other dogs; in these situations, the rate of infection is approximately 10-15 percent.

Q: Does that mean these dogs are sick?

No it doesn't. Most of these dogs appear perfectly normal, for reasons I will explain, but they may be shedding small quantities of virus into their environments because they function as "carrier" animals. In fact, that's how the virus typically spreads to susceptible dogs.

Q: How is the virus spread?

The virus itself is carried predominantly in salivary and nasal secretions. Therefore, direct dog-to-dog contact via licking or shared feeding bowls, as well as shared bedding, may facilitate the spread of infection. The virus can also potentially be spread by humans who inadvertently carry it from one dog to another. Venereal spread from male to female or female to male is regarded as extremely rare.

When susceptible dogs (those without previous exposure to the herpesvirus) encounter the virus, they usually develop a *silent infection*. That means the virus replicates actively in the body for a given period of

time, but the dogs are clinically normal. These dogs then develop an immune response to prevent further virus replication and provide a quicker response the next time the animal is exposed.

Furthermore, the state of immunity regulates the extent of and duration of *latency* in the case of herpesvirus infections. Latency is defined as the sequestered (or hidden) phase of the herpesvirus, when the virus is not replicating or causing illness at that time.

Q: So infection isn't a problem for most dogs?

Right. The majority of infected dogs become immune following exposure and, hence, develop a level of resistance to disease (known as "acquired natural immunity"). In other words, they encounter and become infected with the virus, but it doesn't make them sick. There are, however, some important exceptions.

Q: What are those exceptions?

The canine herpesvirus poses a threat in two types of dogs: pregnant bitches who have never before been exposed to the virus ("naive" bitches) and their puppies, from three weeks prior to three weeks after their birth. As newborns, these puppies are usually susceptible because they lack the protection of maternal antibodies (normally, this shields them until they are three to four weeks old, when their own immune systems mature). Furthermore, young puppies cannot regulate their body temperature, which normally is an important body defense mechanism against the herpesvirus as well as other infections.

Q: When are the pregnant bitch and her puppies most susceptible to infection? What can breeders do to protect them?

Remember that any dog, regardless of sex, is susceptible to infection at any age. However, the virus is only a disease problem in the pregnant naive bitch during a six-week "danger period" from three weeks prior to three weeks after whelping. Breeders should keep susceptible bitches sequestered from other dogs as much as possible during this period and, of course, enforce good sanitation around pregnant bitches and their litters at all times. It may be wise to keep dog toys and other items that have previously been used by older dogs away from susceptible bitches.

Q: How does the virus affect the litter of a naive bitch who contracted the virus before whelping?

If the naive pregnant bitch becomes infected with the canine herpesvirus, one of several situations may occur. The first is that she may develop a subclinical infection limited to the upper respiratory tract, but the litter is unaffected.

The second is a clinical infection in which the virus spreads through the bitch's bloodstream and infects the puppies *in utero*. Abortion may result from this type of infection. Usually, 100 percent of the litter is affected; the puppies are either born dead or they die shortly after whelping.

A third type of infection is a localized infection of the bitch's urogenital tract, causing the puppies to become infected as they pass through the birth canal. The entire litter may be infected during this process, but only a percentage (usually about half) of the pups may die.

Q: What happens when the puppies are exposed after whelping?

Healthy puppies born to a naive bitch can become infected with the herpesvirus through contact with secretions from other dogs, either via direct contact with other dogs or with humans who are carrying infected material on their hands.

If they are exposed shortly after birth (within hours) or up to three weeks after whelping, a high percentage of the litter will usually die following varying periods of clinical signs.

These signs include depression, loss of interest in nursing and passing soft, yellow-green feces. The puppies cry persistently and show discomfort during abdominal palpation. Despite the continued activity associated with crying, restlessness and shivering, there is no elevation of body temperature.

Furthermore, the puppies may have a nasal discharge (clear, cloudy or bloody) as well as small bruises on their mucous membranes. Occasionally, a rash is observed on their bellies and groin areas. Fluid-filled bumps are sometimes present in the mouths and on the genital areas. Sick puppies lose consciousness and have seizures just before death, which usually occurs within 24 to 48 hours after the onset of clinical illness.

In general, the younger the litter, the higher the mortality rate. By the time the puppies are three weeks of age, they should be capable of developing their own protective immune response to a herpesvirus infection. To prevent sick puppies from spreading the virus to littermates, breeders should segregate them as soon as abnormal signs are noted and seek the advice of a veterinarian.

Q: Should the surviving puppies be bred?

If they are reproductively sound and in good health, there is no reason associated with herpesvirus that prevents these dogs from being bred. Regardless of prior exposure, I always recommend consulting a veterinarian to assist in determining the health status of dogs prior to breeding, throughout pregnancy and during the first six weeks after whelping.

Q: If a bitch loses one litter to herpesvirus, will future litters be affected, too?

Herpesvirus is generally believed not to be a recurrent problem; this bitch's subsequent litter would be safe because she will thereafter be immune to active infection. Whenever possible, breeders should try to ascertain the cause of a puppy's untimely death.

Q: How can breeders confirm that herpesvirus caused the death of the litter?

This is a very important point, since there are other causes of puppy mortality besides herpesvirus. A diagnosis of canine herpesvirus disease usually is made by a pathologist. After a puppy has died, keep its body refrigerated (to prevent tissue decomposition) until your veterinarian can send it to a laboratory, where its internal organs (lungs, liver, kidneys and spleen) will be analyzed for lesions, and if necessary, a virus isolation test will be performed. A serum sample from the bitch can be used as an indirect measure of exposure to canine herpesvirus, but it should not be used as the sole indicator for a puppy's death.

Q: What are the clinical symptoms of the disease in adult dogs?

Canine herpesvirus infection in adult dogs is usually subclinical; i.e., there are no signs. However when symptoms do occur, they are most commonly observed in dogs younger than two year of age that have not had prior exposure to the virus. In that case, there are three types of signs to look for.

The first sign is associated with the respiratory system--more specifically, a mild, clear nasal discharge and conjunctivitis. This is the least severe form of the disease, but it is the most infective, because these dogs are actively shedding virus concurrent with their clinical signs. In fact, the virus may be present in nasal secretions for up to three weeks.

The second form involves the genital organs. Infected bitches develop raised bumps on their vaginal mucosa, but they show neither discomfort nor vaginal discharge--even those bitches that have aborted their litters or had stillbirths due to the herpesvirus. In addition, some bitches have fluid-filled vaginal lesions during the onset of proestrus; these lesions then regress during anestrus. Infected males show similar lesions over the base of the penis and preputial reflection, and they may have a preputial discharge. The genital form of canine herpesvirus is rare in the United States, as are abortions and still births due to the virus.

The last sign, of course is reproductive failure in the form of abortion, stillbirth or neonatal death.

Q: How are sick dogs treated?

Treatment for canine herpesvirus disease revolves around 1) caring for the puppy or puppies in distress and 2) caring for the littermates that are not yet showing clinical signs.

Sick puppies may be treated with intraperitoneal or subcutaneous injection of hyperimmune dog serum; however, treatment is not likely to be successful. Treatment of the remaining puppies includes separation from the bitch and tube-feeding with a milk replacer. These puppies may need to receive a broad-spectrum antibiotic and fluid electrolyte replacement therapy if any sign of clinical disease is observed. The puppies should be kept under a heat lamp that maintains their body temperature of 39 degrees Centigrade (102.2 degrees Fahrenheit).

Since the predominant signs in sick adult dogs are respiratory in nature, treatment is symptomatic. However, dogs with clinical signs should be segregated.

Q: What is the incubation period of the virus after infection?

This is a difficult question to answer, because the response varies according to how much virus is acquired and at what age. A good rule of thumb would be four to seven days from the time of infection to onset of clinical signs.

Q: Is there a vaccine?

No vaccine is currently available, so control of this disease is based upon good management programs established to minimize exposure during the six-week "danger period."

Q: Other than sequestering my bitch (and her litter), are there any other preventative measures I can take?

Breeders can also ensure that "natural vaccination" takes place in their kennel by exposing young dogs to older dogs that are thought to have been previously infected with the canine herpesvirus. (Recall that nearly 80 percent of all kennel dogs are thought to have been exposed at some point in their lives.) This action allows pre-breeding dogs to establish their own immunity against herpesvirus. Exposure is usually accomplished after dogs have completed their series of puppy shots.

Natural vaccination may be a "hit or miss" situation; therefore, the more contact young dogs (from three to six months of age) have with older dogs, the more likely they will acquire infection naturally and develop their own active immunity, which should protect them from disease for the remainder of their lives.

Nevertheless, a pre-breeding examination of both the male and female by a veterinarian will help ensure that there are no clinical signs of disease and that the dogs are reproductively sound. Of course, this doesn't negate the importance of minimizing contact with other dogs during the six-week period when the litter is vulnerable to infection, just to be on the safe side.

Q: Won't a simple lab test determine my dog's status?

Recent infection (within the previous four to eight weeks) can be determined by analyzing a serum sample for the presence of virus-neutralizing antibodies. To confirm or rule out viral shedding, you can have a virus isolation test run on a sample of nasal or genital discharge. There are no reliable means of detecting latently infected or subclinical non-shedding animals at this time. However, most breeders do not pursue these tests for every dog they own, so they should consider all dogs that have been exposed to the virus as potential silent carriers and safeguard susceptible bitches in whelp.

In conclusion, if dog owners understand the disease and take the proper precautions, they should not be alarmed about contact with infected or potentially infected animals. Remember that responsible dog ownership means being concerned about all aspects of the health and well-being of dogs, including feeding a nutritious diet, vaccinating dogs on a regular basis and providing a good living environment.

Dr. Evermann is a professor of clinical virology at Washington State University.

TABLE 1: A comparison Between Canine Parvovirus and Canine Herpesvirus

	<u>Canine Parvovirus</u>	<u>Canine Herpesvirus</u>
Type of virus	Parvovirus, single stranded DNA, no envelope	Herpesvirus, double-stranded DNA, envelope

Susceptibility in nature	Resistant in the environment 6 - 12 months. Inactivated by heat, drying and bleach	Susceptible in the environment 6 - 12 days Readily inactivated by heat, drying and bleach
Persistence within the dog	Persists as a subclinical infection in the gastrointestinal tract, shed in the feces intermittently in low quantity	Persists as a subclinical infection in the upper respiratory tract, shed in the respiratory secretions, saliva intermittently in low quantity. May also persist in lymphoid cells as a latent infection with no shedding
Location of viral persistence	Gastrointestinal tract	Respiratory tract
Primary clinical signs	Diarrhea, enteritis, depression, maybe some vomiting. Canine coronavirus infection increases severity of clinical symptoms	Mild upper respiratory distress in dogs 3 weeks of age and older. Neonatal puppies highly susceptible to systemic infections and disease
Management/Vaccination	Good sanitary conditions in dog runs, good nutrition, regular vaccination program in consultation with a veterinarian	Good sanitary conditions, good nutrition. Keep pregnant bitch away from other dogs as much as possible 3 weeks prior to whelping. Humans in contact with dogs should disinfect hands, shoes and clothing so as not to carry the virus to susceptible dogs. Keep puppies away from other dogs as much as possible during first 3 weeks of life
Diagnosis of disease	If canine parvovirus is suspected, prompt segregation is important. Consult with a veterinarian for diagnosis to confirm the cause(s) of the disease	If canine herpesvirus is suspected, prompt segregation is important. Consult with a veterinarian for diagnosis to confirm the cause of the disease

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