



Canine Herpes

VIRUS AS A GENITAL INFECTION IN THE DOG

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Contrary to common belief among dog breeders, an increasing number of studies on reproductive problems and puppy deaths in dogs clearly indicate that comparatively few are, in fact, caused by genital infections. The most often implicated genital infectious agents in the dog are *Brucella canis*, *Canine Herpesvirus*, and the commensal bacteria beta-hemolytic streptococci, *Escherichia coli*, various *Pasteurella* species and staphylococci. The commensal bacteria are so called opportunistic pathogens, meaning that in healthy individuals, they constitute the normal microbiome, but they may cause disease

in individuals, which for some reason have a compromised immune system or suffer from an unrelated disease. The circumstance that these opportunistic bacteria are found both in dogs with reproductive problems and in those with a normal reproduction means that the decision on when it is meaningful to take a bacterial sample from the genitalia and how to interpret the result is crucial. Much is to say about this, and especially the risks and complications involved in treating healthy dogs with antibiotics. In this article, however, I will focus on the Canine Herpes virus.

Canine Herpes virus (CHV1)

The family of Herpes viruses may cause disease in many species of animals, including humans. Characteristic for this group of viruses is that after an acute infection, the virus will remain in the body in a resting state and can be re-activated in connection with all kinds of stress. Well known in humans is the stress-related flare up of lip ulcers caused by Herpes Simplex.

Canine Herpes Virus 1 (CHV1) only occurs in dogs. This virus is widespread in the dog population in many parts of the world, and between 40% and 88% of tested dogs have been found to have antibodies against CHV1, which shows that they, at some time, have been infected with this virus (Krogenaes et al., 2012; 2014).

In dogs older than 12 weeks, mild respiratory disease is the most common clinical sign. However, adult dogs that become infected with CHV1 may also develop inflammation of the sclera of the eye and an infection of the genital tract – sometimes with small blisters in the vaginal or preputial mucosa. Abortions have been seen in pregnant bitches after experimentally induced infection, but it is unclear whether that occurs also in connection with natural infections. CHV1 is also a part of the kennel cough complex.

In contrast, to that in adults, for young puppies up to 2 to 3 weeks of age, CHV1 is an acute life-threatening disease. Puppies can become infected in the uterus during pregnancy, or in connection with parturition. It usually takes 6 to 10 days from when the puppies are infected until they begin to show clinical signs. They then usually die within 1 to 3 days. A first sign that something is wrong with the litter is that the puppies are restlessly moving around and frequently vocalizing, and that they will not suckle. Usually, all the puppies in the litter will become infected and the mortality rate is high. If some of the infected puppies survive, they may later develop locomotion problems, or become blind or deaf, because of damage to the brain, or they may have poor kidney or liver function.

CHV1 is most commonly spread via the upper airways, when dogs are sniffing or coughing, or spread via saliva, urine, or vaginal discharges, but it can also be spread when dogs are mating. It does not survive outside the body for more than about 24 hours, and it is sensitive to most disinfectants. The risk of it spreading via clothes and shoes, therefore, is small, although it is always a good idea to be careful.

The canine herpes virus grows very slowly, multiplying only once per 24 hours and is, therefore, not very infectious. The kennel that becomes infected with CHV1, however, can be hit quite hard over a period of time, until most of the dogs have become infected and have developed antibodies against CHV1. This may take 6 months or more, depending on the circumstances.

When a dog or bitch is infected by CHV1 for the first time, it will take 2 to 3 weeks before the increase in antibodies has reached a level that is high enough for the virus to stop multiplying, and eventually transform into its latent form. The CHV1 can only infect other dogs during its actively multiplying phase. Consequently, after 2 to 3 weeks the individuals that have been infected by CHV1 for the first time will no longer spread the disease to other dogs. The antibody level will then slowly diminish over time, sometimes over several years. If the same dog is infected by CHV1 again this will induce a booster effect, and this time it will take just 2 to 3 days for the antibody response to reach the level when the virus is inactivated and stops multiplying, and the dog no longer is shedding the virus and, thus, will not spread the infection to other dogs.

Consequently, only newly infected dogs spread CHV1 to other dogs, and only during the phase when the virus is actively multiplying, which is 2 to 3 weeks if it is the first infection or only for 2 to 3 days in a dog that has been infected before.

Thus, if a male dog that has never developed antibodies to CHV1 mates a bitch that is in the active stage of virus multiplication, that male, in case he becomes infected (which is not always the case), can pass the virus on during the next 2 to 3 weeks. If a male dog that has previously been infected by CHV1 mates a bitch that is in the active stage of virus multiplication, the virus can be spread by the male only during the next 2 to 3 days.

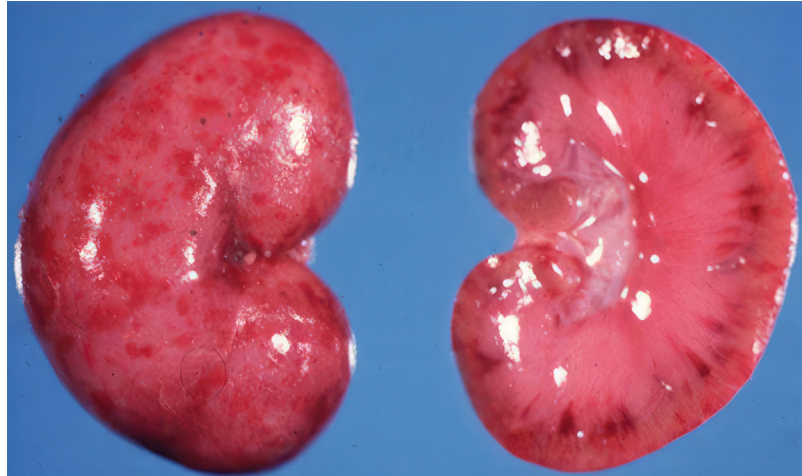
If a bitch, which has never developed antibodies to CHV1, is mated to a male that is in the active stage of a CHV1-infection, and thus might spread the virus, this bitch, if infected, will develop a high level of antibodies within 2 to 3 weeks, i.e., in good time before the whelping. The puppies, therefore, will be protected from being infected with CHV1 because the bitch by that time has produced enough antibodies in the colostrum.

Problems mainly occur when a pregnant bitch that does not have antibodies to CHV1 is infected during the last 3 weeks of pregnancy, because the level of antibodies in the colostrum may not have risen enough to protect the puppies from infection. Similarly, puppies that have not received adequate antibodies in the colostrum and are infected during the first 3 weeks after birth are likely to develop fatal disease. These two periods of increased risk for disease from the CHV1 are commonly called 'the 6 critical weeks'.

A bitch that has had a litter of puppies dying from CHV1 will usually have unaffected litters in the future.

In cases of puppy deaths from CHV1, the diagnosis can be made by performing a simple necropsy and looking at the internal organs of the puppy. CHV1-infected organs typically have a speckled appearance, with small red-grey areas of hemorrhage and dead tissue (necrosis). Diagnosing CHV1 in adult dogs is done by analysing the level of antibodies in a blood sample.

CHV1 is a virus and treating the infected puppies with antibiotics is, therefore, not an option. Some attempts have been made to use antiviral medications, but with no well documented effects. CHV1-infected puppies usually succumb within



2 to 3 days after showing the first symptoms. Raising an infected litter in temperatures greater than 35C (95F) used to be recommended but that advice is now outdated as it causes discomfort to the female and has not been proven effective. Since there is no medical cure for CHV1, it is

best to try and prevent introduction of the virus to pregnant females during the critical period prior to and after whelping. For the last three weeks of gestation, pregnant females should be protected from exposure either by a physical separation from other dogs in the family/kennel that are continuing to attend shows/events or by refraining from attending those events during the risk period, which is 3 weeks before and 3 weeks after whelping.

Stress is a strong contributing factor in activating a latent CHV1 infection, and so try to minimize stress to dogs. Bitches that are out on breeding terms should be brought to the kennel in good time, at least 2 to 3 weeks before whelping, so that they can adapt to the environment and to allow their immune system to do its job in the new surroundings.

To avoid problems from CHV1, one strategy is to test all the dogs and bitches in the kennel for antibodies to CHV1 to identify those that have a titer, and especially to identify those that have not already encountered the virus and, thus, are vulnerable to infection and at risk for puppy deaths. If the test shows that all the dogs have antibodies

to the virus, then no other action is necessary. If, in contrast, none of the dogs have an antibody titer (which would be a rare situation), one strategy might be to try to continue to keep the kennel CVH1-free (which would be a challenge), or to vaccinate all the dogs against the virus (CHV1 vaccine is not licensed in the USA). In the majority of kennels, however, the tests will show that there are both dogs with and without titers, with younger dogs usually being the ones without a CHV1 titer. In those situations, the unprotected dogs should be vaccinated against CHV1 (if the vaccine is available in that country) at the time of breeding and again two weeks before whelping. All new introductions should be kept isolated from the other dogs and tested before they are allowed into the kennel.

In a kennel with acute problems from CHV1, a veterinarian might be able to provide so called hyper-immune serum. This is serum collected from a dog with a high antibody titer against CHV1. Such serum can be stored in a freezer, to be used in newborn puppies if the bitch does not have enough antibodies. Some breeders in the USA regularly use commercially available fresh frozen plasma (FFP) orally for newborn puppies within the first 24 hours to ensure they receive high levels of a variety of protective antibodies, regardless of the bitch's colostrum.

A vaccine against CHV1 is available in Europe, and some breeders choose to vaccinate even when they have no reason to expect problems. The vaccine should be given in connection with mating or early in pregnancy and again as a booster 2 weeks before expected whelping. The effect is short, and the vaccinations should, therefore, be repeated when the bitch is mated again. Studies of the protective effects of this vaccine published so far are not entirely clear.

A CHV1 vaccine is not approved in the USA and so breeders depend on naturally developed immunity. Bitches that had a show or performance career prior to being bred rarely have problems because they have antibodies from prior exposure even if they showed minimal to no clinical signs at the time. Bitches with CHV1-infected litters are usually those who had few to no interactions with outside dogs before being bred but then are exposed during the later stage of gestation.



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Catharina is a founding member and Honorary Member of the European Society for Small Animal Reproduction (EVSSAR) and the Swedish Society for Small Animal Reproduction.

Catharina Linde Forsberg has been involved with research into canine reproduction since 1973. Her research results on AI and preservation of dog semen are today used with great success on a global basis and in assisted reproduction of the dog.

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Catharina is also a successful Beagle Breeder since 1968.
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