Canine herpesvirus-1 is a varicellovirus of the subfamily Alphaherpesvirinae with a host range restricted to domestic and wild canids.\(^1\) Canine herpesvirus-1 is biologically and molecularly related to several animal and human alphaherpesviruses of ocular importance, including HSV-1, HSV-2, varicella-zoster virus, FHV-1, and BHV-1.\(^2,3\) Clinical disease manifestations and severity during primary infection with these viruses, including CHV-1, are age dependent. Fetal and neonatal primary infections with CHV-1 result in severe disseminated disease, characterized by multiorgan hemorrhagic necrosis, and are often fatal.\(^4\) Current evidence suggests that primary CHV-1 infections in adult canids are frequently subclinical or cause localized or mild respiratory tract, genital, or mucosal disease.\(^5,6\) As is characteristic of the alphaherpesviruses, lifelong latent CHV-1 infection is established in neurons of sensory ganglia and lymphatic tissues during initial exposure in canids surviving primary infection.\(^7,8\) Reactivation of these latent infections results in viral shedding and may be subclinical or associated with disease recrudescence, including genital and ocular disease.\(^9–11\) Ocular lesions reported with naturally acquired recrudescence CHV-1 disease include dendritic ulcerative keratitis and conjunctivitis.\(^11\)

Canine herpesvirus-1 has a worldwide distribution and high prevalence of exposure in domestic dog populations.\(^7,12\) The clinical features and pathogenesis of primary CHV-1 infection in neonatal dogs have been extensively studied,\(^4,13\) but infections of adult dogs have been the subject of few investigations.\(^5,6\) The objectives of the study reported here were to determine whether experimental ocular CHV-1 infection is associated with...
clinical disease in immunologically naïve adult dogs and to characterize the ocular lesions, viral shedding, and serologic response associated with primary CHV-1 ocular infection in dogs.

Materials and Methods

Animals—All protocols were approved by the Animal Care and Use Committee of Cornell University and were conducted in accordance with the Association for Research in Vision and Ophthalmology Statement for the Use of Animals in Ophthalmic and Vision Research. Twelve specific pathogen–free (CHV-1–free) Beagles were used, including 8 sexually intact males and 4 sexually intact females. Each dog had negative test results for CHV-1 on 2 consecutive SN assays, bilateral conjunctival swab specimen virus isolations, and bilateral conjunctival swab specimen CHV-1 PCR assays performed at 8-week intervals prior to the study. Dogs were 18 months of age, with body weights ranging from 10.6 to 13.6 kg, at the beginning of the study. Prior to the initiation of the study, results of CBCs, serum biochemical panels, and urinalyses were unremarkable for each dog.

Dogs were randomly assigned to be inoculated with CHV-1 (infection group; n = 8) or virus-free media (control group; 4). All dogs in the infection and control groups were further assigned to 1 of 4 subgroups on the basis of administration of a corticosteroid 48 hours prior to inoculation and corneal microtrephination at the time of inoculation. Therefore, dogs in the control or infection groups were mock or virally inoculated, respectively, following subconjunctival corticosteroid administration only, corneal microtrephination only, both subconjunctival corticosteroid administration and corneal microtrephination, or no treatment (Figure 1). Regardless of subgroup, dogs in the infection and control groups were housed in separate rooms in noncontiguous facilities. Dogs in the infection group were maintained individually in runs separated by a minimum of 121 cm, and direct contact between dogs was prevented for the duration of the study. Dogs in the control group were maintained together in a single large pen. Strict bioisolation was maintained throughout the study for all personnel in contact with all dogs (ie, hazardous material suits, gloves, boot covers, and foot baths were used). Dogs were acclimated to housing facilities for 4 weeks prior to initiation of the study.

Virus and control inoculation—A CHV-1 field strain isolated from corneal samples of a dog with dendritic ulcerative keratitis treated at the Cornell University College of Veterinary Medicine Hospital for Animals was used for all inoculations. The strain was confirmed to be CHV-1 by use of immunofluorescence, electron microscopy, and gene sequencing as described.11 A stock culture of the CHV-1 isolate was grown in low-passage canine kidney cells in minimum essential medium–E5 with 10% fetal bovine serum,5% serum replacement solution,2% penicillin-streptomycin solution, 1% amphotericin B solution, and 1% gentamicin sulfate solution. Harvested virus was quantified by use of a standard TCID50 assay in 96-well plates with 8 wells inoculated for each dilution. Titers were calculated by use of the Reed-Muench method on a per-milliliter basis. Final CHV-1 concentration was 10⁶ TCID₅₀/mL. Virus-free medium (minimum essential medium–E with 10% fetal bovine serum, 5% serum replacement solution, 2% penicillin-streptomycin solution, 1% amphotericin B solution, and 1% gentamicin sulfate solution) was prepared identically as for the CHV-1 titration to be used for control group inoculations.

Dogs in the subconjunctival corticosteroid subgroups received 10 mg of methylprednisolone acetate solution6 subconjunctivally in the right eye only. Injections were performed with a 25-gauge needle following the installation of a single drop of topical ophthalmic anesthetic. The corticosteroid bleb was placed under the dorsal aspect of the bulbar conjunctiva, adjacent to the conjunctival fornix. After 48 hours, inoculations then were performed in all dogs by use of 0.2 mL of CHV-1 solution (infection group) or 0.2 mL of virus-free medium (control group). Prior to inoculation, each dog was sedated with hydromorphone (0.1 mg/kg), acepromazine (0.1 mg/kg), and glycopyrrolate (0.004 mg/kg) administered IV. Dogs not assigned to microtrephination subgroups were inoculated by use of the ocular drop method,11 which was performed by applying the inoculum directly onto the corneal surface of the right eye only, followed immediately by gentle manual massage of the closed eyelids for 60 seconds. The microtrephination technique was performed as originally described.15 Sterile glass capillary tubes1 with an internal diameter of 1.1 mm were loaded by capillary action with the inoculum. Capillary tubes were aligned perpendicular to the corneal surface of the right eye only and then gently pressed against the corneal epi-

Figure 1—Illustration of the design of a study of experimental primary ocular CHV-1 infection in adult dogs. OD = Right eye.
the lamella with simultaneous rotation of the tube end to produce small rings of slight epithelial damage, while simultaneously flooding the ocular surface with inoculum. A single trephination was made in the axial portion of the cornea and 2 in each of the 8 meridians to create 17 inoculation sites/cornea. Immediately following microtrephination, the eyelids were manually held closed for 60 seconds and gently massaged.

**Clinical examination**—Complete physical and ophthalmologic examinations, including slit-lamp biomicroscopy, indirect ophthalmoscopy, Schirmer tear testing, and corneal application of fluorescein and rose bengal stains, were performed on each dog prior to initiation of the study. Ophthalmologic examination of both eyes via slit-lamp biomicroscopy, before and after application of fluorescein and rose bengal stains, was performed daily for the first 21 days after inoculation, every other day for the following 14 days, and then at PIDs 63, 119, and 224. Corneal stain was thoroughly flushed from the ocular surface with sterile eye wash solution following examination. A modified herpesvirus ocular disease clinical scoring system was used to quantify examination findings. The following ocular variables were scored: blepharospasm (0 = none, 1 = mild, 2 = moderate, and 3 = severe), conjunctival hyperemia (0 = none, 1 = mild, 2 = moderate, and 3 = severe), chemosis (0 = none, 1 = mild, 2 = moderate, and 3 = severe), ocular discharge (0 = none, 1 = mild, 2 = moderate, and 3 = severe), conjunctival ulceration (0 = none, 1 = mild, 2 = moderate, and 3 = severe), corneal epithelial ulceration (0 = none, 1 = punctate ulcerations, 2 = 1 or more dendritic ulcerations, and 3 = geographic ulcerations). The minimum total clinical score possible with this system was 0, and the maximum total clinical score possible was 15. Physical examinations were performed every other day during the first 35 days after inoculation and then at PIDs 63, 119, and 224.

**Virologic sample collections**—Conjunctival swab specimens were collected from both eyes on PIDs 0, 3, 5, 7, 10, 15, 21, 28, 35, 63, 119, and 224 for CHV-1 PCR assay and virus isolation. Following clinical scoring, dry swabs were vigorously brushed across the dorsal and ventral conjunctival fornices of each eye of all dogs. Separate swabs were used for the right and left eyes. Swabs for virus isolation were immediately placed in sterile tubes containing viral transport medium (ie, Leibovitz L-15 medium’ with 0.25% bovine serum albumin solution, 1% amphotericin B solution, and 1% gentamicin sulfate solution) and processed within 2 hours after collection. Swab specimens for PCR assay were stored in sterile tubes at –80°C for up to 5 days prior to analysis. Serum for CHV-1 SN titers was collected on PIDs 0, 7, 14, 21, 28, 35, 63, 119, and 224. Blood samples were collected into tubes with EDTA anticoagulant on PIDs 0, 3, 7, 14, 21, 28, 35, 63, 119, and 224 for buffy coat extraction and CHV-1 PCR assay. Blood samples were centrifuged for 10 minutes at 6,000 × g, and buffy coat and serum samples were manually extracted, snap frozen in liquid nitrogen, and stored at –80°C until analysis.

**Sample preparation and automated nucleic acid extraction**—Five hundred microliters of filtered PBS solution was added to the microcentrifuge tube containing each conjunctival swab, then tubes were vortexed for 10 seconds, inverted, and centrifuged at 16,000 × g for 5 minutes. The supernatant and swab were removed, and the cell pellet was used for the nucleic acid extraction. Nucleic acid extraction was performed by use of an automated nucleic acid extraction system according to the manufacturer's instructions.

**Quantitative real-time PCR assay and viral load determination**—All samples were analyzed for the presence of the canine GAPDH gene to determine the efficiency of nucleic acid extraction.16 The real-time PCR assay used for CHV-1 detection was designed by the Lucy Whittier Molecular and Diagnostic Core Facility (Davis, Calif) and targeted part of the glycoprotein B gene (Genbank accession No. AF361073). Each PCR reaction contained 20× primer and probes for the respective system, with a final concentration of 400nM for each primer and 80nM for the probes and the commercially available PCR mastermix containing 10mM Tris-HCl (pH, 8.3), 50mM KCl, 5mM MgCl₂, 2.5mM deoxynucleoside triphosphates, 0.625 U recombinant thermostable DNA polymerase/reaction, 0.25 U of uracil N-glycosylase/reaction, and 5 µL of the diluted CDNA sample in a final volume of 12 µL. The samples were placed in 384-well plates and amplified in an automated fluorometer.1 Standard amplification conditions were used as follows: 2 minutes at 95°C, 10 minutes at 95°C, 40 cycles of 15 seconds at 95°C, and 60 seconds at 60°C. Fluorescent signals were collected during the annealing temperature, and threshold cycle values were determined with a threshold of 0.08 and baseline values of 3 to 16. The viral load (number of viral copies) of samples with positive results was calculated as described.16

CHV-1 SN assay—All serum samples were analyzed concurrently in the same session. Test sample, high-positive control, low-positive control, and negative control sera were heat inactivated in a 56°C water bath for 30 minutes. Test medium (50 µL of minimum essential medium–E with heat-inactivated 10% fetal bovine se-

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*Figure 2—Mean ± SE total ocular disease clinical scores for inoculated (gray bars; n = 8) and noninoculated (black bars; 4) eyes of adult dogs with experimentally induced primary ocular CHV-1 infection.*
rum and 2% penicillin-streptomycin solution) was added to plate wells along with 50 µL of test sample, and 2-fold serial dilutions were performed. The working dilution of virus (100 TCID₅₀/50 µL) and back titrations of 10⁻¹, 10⁻², and 10⁻³ dilutions were prepared and added to test wells. Plates were incubated for 1.5 hours at 37°C. Canine skin SV-40 cells were added to the wells and incubated for 3 days in a 37°C humidified 5% CO₂ incubator. An inverted microscope was used to examine wells for cytopathic effect, and antibody titers were calculated.

Virus isolation—Isolations were performed with A-72 canine cells and a laboratory-developed canine skin cell line in minimum essential medium—E with 10% fetal bovine serum, 5% serum replacement solution, 2% penicillin-streptomycin solution, 1% amphotericin B solution, and 1% gentamicin sulfate solution. Cultures were incubated at 37°C, checked at 24-hour intervals for cytopathic effect, subcultured every 5 to 7 days, and held for 21 days. Cell cultures with cytopathic effects typical of CHV-1 were stained with anti–CHV-1 polyclonal antiserum conjugated to fluorescein isothiocyanate to confirm viral identification.

Statistical analysis—To facilitate data analysis and interpretation, ocular clinical disease scores were

![Figure 3](image-url)

Figure 3—Photographic views of the inoculated (A, C, E) and noninoculated (B, D, F) eyes of 1 adult dog with experimentally induced primary ocular CHV-1 infection. A, B = Prior to infection. C, D = PID 5. E = PID 7. F = PID 10.
summarized into 1 dichotomous variable; dogs that received at least 1 score > 0 (ie, dogs with conjunctivitis, keratitis, or both) were coded as 1, and dogs that had all scores equal to 0 (ie, dogs with no evidence of conjunctivitis or keratitis) were coded as 0. This variable was used as the dependent variable for a mixed logistic regression model fitted by use of a software program. The following variables were used as independent variables: study group, inoculation method, and preinoculation subconjunctival corticosteroid administration. Furthermore, the animal identification number was added to the model as a random effect to control for the repeated-measures nature of the study. A second mixed logistic regression model was also fitted by use of the software program; the dependent variable for this model was ocular viral shedding (detected or not detected by virus isolation), and the same independent variables were used in this model. Descriptive statistics were determined with a software program. A value of P ≤ 0.05 was considered significant for all comparisons.

Results

No abnormalities were detected during initial physical and ophthalmologic examinations. Schirmer tear test results were > 15 mm/min in both eyes of all dogs, and corneal retention of fluorescein or rose bengal stains was not observed in any dog. Corneal epithelial defects resulting from microtrephination had healed by PID 1 in all dogs and appeared as faint epithelial opacities that did not retain fluorescein or rose bengal stain. These corneal opacities disappeared over the following 3 to 4 days in all dogs. A transient increase in ocular disease scores of the inoculated eye was detected at PID 2 in all dogs that received microtrephination in the infection and control groups, but scores returned to near baseline values by PID 3 (Figure 2). This initial increase in ocular scores was presumed to have resulted from iatrogenic ocular trauma associated with the corneal microtrephination procedure because similar transient changes in ocular disease scores were not detected in dogs inoculated by use of the ocular drop method or in the noninoculated eye of any dog.

Clinical ocular disease scores then began increasing at PID 4 in both eyes of dogs in the infection group and peaked at PID 7 in the noninoculated eyes and PID 10 in the noninoculated eyes. All dogs in the infection group had mild to moderate conjunctivitis during this time, characterized by conjunctival hyperemia, chemosis, and mucoid to mucopurulent ocular discharge (Figure 3). Ocular disease scores then slowly decreased over the following 13 days and returned to initial values by PID 35 in all dogs in the infection group. In general, ocular disease scores were higher and increased more quickly in the inoculated eye versus the noninoculated eye of dogs in the infection group. Dogs in the control group did not develop clinically detectable ocular disease at any time during the study after PID 3 (all clinical ocular disease scores = 0), and only control dogs in the microtrephination group had clinical ocular disease scores > 1 during the first 3 days after inoculation. Corneal retention of fluorescein or rose bengal stain was not detected at any time in any dog, and nonulcerative keratitis was not identified at any time during the study. Clinically detectable systemic illness was not detected at any point during the study in dogs from either study group.

Shedding of CHV-1 from the inoculated eye was detected by use of CHV-1 PCR assay in all dogs in the infection group between PIDs 3 and 10 (Figure 4). Two dogs in the infection group also shed virus from the noninoculated eye during this period as detected via CHV-1 PCR assay (Figure 5). Viral loads peaked at PID 5 in both eyes and returned to less than detection limits by PID 15. Virus was never isolated from samples from the noninoculated eye; however, CHV-1 was isolated from samples collected from the inoculated eye of 7 dogs in the infection group on 1 or more days between PIDs 3 and 7 (Figure 6). Virus was isolated on 3 sampling days from 2 dogs, 2 sampling days from 2 dogs,
and 1 sampling day from 3 dogs. Mean ± SD viral load for infection group samples between PID 3 and 10 was 1.1 × 10^6 copies/10^6 cells ± 2.4 × 10^6 copies/10^6 cells for samples corresponding with positive virus isolation assays and 1.2 × 10^6 copies/10^6 cells ± 4.0 × 10^6 copies/10^6 cells for samples corresponding with negative virus isolation assays. Viral DNA was never detected via PCR assay in the buffy coat samples from any dog in either study group. All dogs in the infection group began developing detectable CHV-1 SN antibody titers by PID 7 (Figure 7). Titers peaked at PID 21 and then began to decrease slowly in all dogs. A CHV-1 SN antibody titer was undetectable in 1 dog from the infection group at PID 119, and titers were undetectable in 4 dogs from the infection group at PID 224.

Ocular CHV-1 shedding was not detected via CHV-1 PCR assay or virus isolation at any sampling point during the study in the control group, and no control dogs developed detectable CHV-1 SN titers. Dogs inoculated with CHV-1 were significantly more likely to develop clinical ocular disease (P < 0.001) and shed virus (P < 0.001) than were dogs in the control group. In the infection group, neither preinoculation corneal microtrephination nor subconjunctival corticosteroid administration significantly affected clinical ocular disease scores (P = 0.63 and P = 0.81, respectively) or detection of ocular viral shedding (P = 0.30 and P = 0.72, respectively).

Discussion

Results of the present study revealed that experimental primary ocular infection of adult dogs with CHV-1 was associated with self-limiting conjunctivitis and ocular viral shedding, which occurred without clinically detectable keratitis or systemic disease. Experimental conditions of this investigation may have clinical relevance because natural transmission of CHV-1 frequently occurs by direct contact with infectious mucosal secretions and because the ocular surface is a plausible site of viral exposure and portal of entry.

Despite the ubiquitous presence of latent CHV-1 infections in most canine populations and presumed high primary infection rate among immature dogs,11,12 there is a positive correlation between dog age and CHV-1 seroprevalence in some groups.17 This suggests that naturally acquired primary CHV-1 infection is not restricted to immature dogs. Alphaherpesvirus superinfection (ie, exogenous reinfection of a host with acquired immuno-

Figure 7.—Mean ± SE CHV-1 SN antibody titers for 8 adult dogs with experimentally induced primary ocular CHV-1 infection.
corticosteroids may result from alterations in host immune response and wound healing. Additionally, corticosteroids may modulate infection because of direct effects on virus-host cell interactions. These effects are independent of host immunity and have been detected for both FHV-1 and HSV. However, only some strains of HSV-1 are sensitive to the effects of corticosteroids, and this strain-dependent characteristic is determined by the viral genome. It remains to be determined whether CHV-1 is a corticosteroid-sensitive virus or strains with different corticosteroid responsiveness exist.

Corneal disease was not identified in dogs of this report following healing of traumatic microtrephination lesions. Alpha herpesvirus-induced ulcerative and nonulcerative keratitis can result from direct virus-associated cytopathic effects or immune-mediated mechanisms. Corneal lesions frequently develop following viral reactivation in other host species, but are not considered common during naturally acquired primary infection. Corticosteroid administration and iatrogenic corneal trauma are experimental methods that increase the frequency of corneal lesions during experimental primary alphaherpesvirus infection, but did not result in keratitis in this study. Unique host characteristics, viral factors, or their interactions may contribute to the apparent resistance of adult domestic dogs to alphaherpesvirus keratitis. This hypothesis is also supported by the only clinical report of CHV-1 ulcerative keratitis in adult dogs, in which it was suspected that lesions developed during viral reactivation in immunocompromised animals and not during primary infection.

A study was conducted to evaluate experimental CHV-1 conjunctival inoculation in five 6-week-old seronegative Collies. One dog developed clinically detectable conjunctivitis (ie, serous ocular discharge, chemosis, and hyperemia) in the inoculated eye 3 days after infection, and the other 4 dogs remained clinically normal. All dogs were euthanatized between 2 and 7 days after inoculation. Conjunctival epithelial necrosis and subepithelial infiltration of lymphocytes and macrophages were observed histologically in inoculated eyes of 2 dogs. Ocular histologic findings were normal in the other 3 dogs. The lower frequency of ocular disease detected in the previous study relative to this report and the absence of conjunctivitis in noninoculated eyes might have resulted from differences between the 2 investigations in CHV-1 strain or dose used for inoculation, dog ages and breeds, or study design. The previous study was designed to determine histologic lesions, and details were not provided regarding frequency or method of clinical examination. In the present study, mild conjunctivitis was observed in some dogs, particularly in noninoculated eyes. The subtle lesions could be difficult to identify without magnification provided by slit-lamp biomicroscopy. Additionally, the most pronounced lesions observed in the present study developed at a time after infection beyond which observations concluded in the previous study. Therefore, it is plausible that most dogs in the previous study were euthanatized during the viral prepatent period and may have proceeded to develop conjunctivitis if euthanatized later.

Previous research suggests that direct ocular inoculation is not required for development of conjunctivitis during primary CHV-1 infection. During a study of primary CHV-1 genital infection, conjunctivitis was observed clinically and ocular viral shedding was detected in approximately 40% of 4- to 6-month-old Beagles following intrapreputial or intravaginal inoculation. Conjunctivitis was observed approximately 9 days after inoculation and resolved over 4 to 5 days. Conjunctival CHV-1 shedding was detected as early as 4 days after inoculation and for up to 20 days. All dogs also developed self-limiting genital mucositis, CHV-1 SN titers, and genital mucosal viral shedding. Conjunctivitis was detected less frequently and later after inoculation and was of shorter duration than direct ocular inoculation in the present study. If ocular lesions in the previous study resulted from viral spread within the host to anatomic sites distant to the initial site of infection, this implies that viral portal of entry affects severity and duration of disease and viral shedding, but that direct ocular inoculation is not necessary to develop conjunctivitis. Nonocular sites of host entry may result in ocular disease with other alphaherpesviruses, notably HSV-1, in which oral and nasal primary infection can induce ocular lesions following neuron axonal transport of virus to the eyes. In these circumstances, centripetal spread of virus to the brainstem with subsequent centrifugal transport to trigeminal neurons not innervating the inoculation site is proposed. An apparent requirement of this interneuronal mechanism of viral spread is anatomic proximity of neurons, and it may not be applicable to more distant sites. An alternative explanation for conjunctivitis in the primary genital CHV-1 infection study is exogenous viral transmission from genital inoculation sites directly to the eyes, either among dogs or via autoinoculation in individual dogs. Supporting this mechanism, conjunctivitis was not observed in studies of primary CHV-1 infection of domestic dogs between 5 weeks and 6 months of age inoculated via the IP, intranasal, and peroral routes or in adult red foxes inoculated IV and PO.

Hematogenous viral dissemination is an additional potential mechanism for development of herpetic ocular disease following nonocular primary infection. Primary infection with varicella-zoster virus, the prototypical member of the Varicellovirus genus, is associated with a biphasic peripheral blood mononuclear cell viremia. Although of unclear importance in non-neonates, viremia has been detected in healthy and immunosuppressed adult humans after HSV-1 and HSV-2 primary infection and reactivation. In those reports, virus in the blood was leukocyte-associated and HSV-1 replicated and persisted in human leukocytes in vitro. Animal alphaherpesvirus DNA, including that of FHV-1, BHV-1, and equine herpesvirus-1, has also been detected in peripheral blood leukocytes of their respective hosts. Intracellular hematogenous transport is suspected as the primary mechanism of viral dissemination in neonatal systemic CHV-1 infection, and CHV-1 has been isolated fromuffy coats of a small percentage of 5- to 12-week-old dogs following experimental oronasal inoculation. Canine herpesvirus-1 DNA has also been detected in lymphocytes extracted...
from retropharyngeal lymph nodes of mature dogs 2 to 4 months following experimental intranasal, IV, and intravaginal inoculation; however, virus was not identified in bulby coat samples from the dogs. In the present study, CHV-1 DNA was not identified on the selected sampling days in bulby coat samples of any dog following primary ocular infection. This suggests that CHV-1 viremia does not occur in peripheral blood leukocytes of immunocompetent adult dogs during primary ocular infection. Alternatively, CHV-1 viremia may occur with viral loads less than detection limits of the methods used, transiently, or at time points not evaluated, or it may not be leukocyte associated.

Current use of animals to mimic human primary ocular HSV infection include HSV-1 infection in un-natural host animal species (eg, rodents, rabbits, and primates) and host-adapted pathogens (eg, FHV-1 in cats). These techniques typically require experimental host manipulation, such as ocular scarification, to induce infection or are associated with more severe ocular and systemic disease than that detected during naturally acquired human infection. Several characteristics of experimental primary ocular CHV-1 infection in dogs may more closely resemble naturally acquired primary ocular HSV disease in humans. There is no evidence suggesting that ocular trauma is required for establishment of HSV infection in humans. Primary ocular HSV infection in adults is most commonly asymptomatic or results in self-limiting conjunctivitis and blepharitis, whereas keratitis is less frequent. Experimental primary CHV-1 ocular infection in dogs develops without ocular trauma and induces ocular lesions similar to those of humans with primary HSV infection, making this technique potentially useful for comparative studies. Although most primary ocular alphaherpesvirus infections are clinically mild and self-limiting, it is during initial exposure that latent infection is established. Establishment of latency initiates the cycle of recurrent ocular infections in susceptible hosts, and it is this recrudescence disease that is responsible for most of the ocular morbidity attributed to HSV in humans. Accurate representations of primary ocular herpesvirus infection are desirable because prevention of primary infection and establishment of latency are potential and attractive points of therapeutic intervention.

Conjunctivitis develops frequently in adult dogs, and an etiology is often not clinically identifiable. There is a paucity of established viral causes of conjunctivitis in dogs, and CHV-1 should be considered a potential etiology of this condition after other causes are excluded. The clinical importance of primary and reactivated CHV-1 infections in the pathogenesis of ocular diseases of adult dogs has not been determined; however, the high prevalence of this virus within the canine population and established biological behavior of related viruses warrant further study.

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