Immunology of the Ocular Surface

Brian C. Gilger

The ocular surface immunity is a remarkable combination of the innate immune and adaptive immune systems, designed to prevent microbial invasion while minimizing damage to delicate ocular tissue. The innate immune system uses a variety of methods to minimize microorganism invasion, including mechanical tissue barriers and production of antimicrobial peptides. Tolerance of normal ocular flora is achieved by the presence of a minimal number of professional antigen presenting cells, immunosuppressive substances in tears, and the strategic intra- and intercellular location of the Toll-like receptors. Autoimmune diseases are common on the ocular surface, and with contributions of environmental and genetic factors, autoantigens are presented to the adaptive immune response. Toll-like receptors are the link between the innate and adaptive immune response, and are likely key components of the response of ocular tissue to infectious organisms and in the initiation and perpetuation of autoimmune disease.

Canine Conjunctivitis and Blepharitis

Ma Teresa Peña and Marta Leiva

The eyelids and conjunctiva are immunologically active structures with an extensive presence of blood vessels, lymphatics, and immune cells. Several immune-mediated phenomena can involve these structures either in isolation or in association with systemic clinical features. Immune-mediated blepharoconjunctival diseases are divided into two main categories: primary autoimmune disease in which the disease results from an attack against self-antigens and secondary immune-mediated disease in which the disorder results from exogenous material inducing autoimmune disease. Such causes of secondary immune-mediated disease include infectious agents and drugs. This article reviews the most important autoimmune and immune-mediated eyelid and conjunctival disorders in dogs.
Immunopathogenesis of Keratoconjunctivitis Sicca in the Dog
David L. Williams

Keratoconjunctivitis sicca (KCS), more commonly known as dry eye, is an inflammatory condition of the ocular surface caused by a pathologic reduction in the aqueous component of the tear film. It is seen commonly in the dog and defined as a Schirmer tear test with a reading of less than 10 mm in one minute. While KCS may be caused by neurological disease or drug toxicity, most cases are immune-mediated. Whereas the immunological basis of autoimmune KCS has been extensively investigated in humans and experimental rodent models, little research has been undertaken in the dog. It is hoped that this review spurs further research into the etiopathogenic factors in canine KCS.

Immune-Mediated Canine and Feline Keratitis
Stacy E. Andrew

Although the normal cornea is devoid of vasculature and lymphatics, there are still several immune-mediated corneal conditions that can occur in dogs and cats. An overview of corneal immunology is presented. Diseases of dogs, including chronic superficial keratitis, superficial punctate keratitis, and canine adenovirus endotheliitis, as well as feline diseases, including eosinophilic keratitis and herpesvirus-related conditions, are discussed.

Canine Episcleritis, Nodular Episclerokeratitis, Scleritis, and Necrotic Scleritis
Bruce H. Grahn and Lynne S. Sandmeyer

This article provides a brief review of human episcleritis and scleritis, because the pathogenesis, diagnosis, and treatment of these disorders are perhaps the best understood of all species of animals. The clinical and light microscopic manifestations, therapeutic options, and prognosis for primary and secondary episcleritis and scleritis in dog are also reviewed. The focus of this article is on primary and secondary inflammatory conditions that originate in the episclera and sclera caused by idiopathic or known etiologies.

Anterior Chamber-Associated Immune Deviation
Daniel Biros

The eye possesses a critical method of self-preservation in response to intraocular antigen presentation. Instead of conventional immunity by means of delayed-type hypersensitivity (DTH), the eye participates in a systemic immune response involving the thymus and spleen, ultimately leading to suppression of cell-mediated (T helper 1) immunity. The immune response begins with intraocular capture of antigen by specialized ocular antigen-presenting cells (APCs). These activated APCs then...
migrate preferentially to the marginal zone of the spleen, where they become part of an intricate and highly specific cluster of immune cells. The end result is the emergence of a population of antigen-specific T-regulatory lymphocytes that return to the eye and suppress DTH.

**Canine and Feline Uveitis**  
Wendy M. Townsend

The clinical signs of uveitis occur as a result of inflammation within the vascular coat of the eye, which causes breakdown of the blood-aqueous barrier and blood-retinal barrier. Many infectious and noninfectious causes can incite episodes of uveitis. Although a complete diagnostic evaluation is highly recommended to identify any underlying etiologic agent, many cases remain idiopathic in nature. The goals of therapy are preserving vision, minimizing pain, and halting inflammation.

**Extraocular Myositis in the Dog**  
David L. Williams

Extraocular myositis is a rare condition in the dog and is poorly reported in the peer-reviewed veterinary literature. This case series and review are designed to be of value to those veterinary ophthalmologists seeking to investigate the disease further and also to veterinarians outside the specialty, for whom this may be their first introduction to the disease.

**Antibody-Mediated Retinopathies in Canine Patients: Mechanism, Diagnosis, and Treatment Modalities**  
Sinisa D. Grozdanic, Matthew M. Harper, and Helga Kecova

Antibody-mediated retinopathies may be widely present among the canine population. Early diagnosis and appropriate treatment are essential for visual preservation and reversal of blindness in these patients. The principal purpose of this review is to describe the mechanistic basis, clinical signs, diagnostic methods, and treatment options for retinal diseases causing sudden onset of blindness with absence of typical signs of intraocular inflammation or retinal degeneration—sudden acquired retinal degeneration syndrome and immune-mediated retinitis.

**Orbital Inflammatory Disease and Pseudotumor in Dogs and Cats**  
Alexandra van der Woerdt

Orbital disease is common in dogs and cats. Clinical signs include exophthalmos, protrusion of the third eyelid, and resistance to retropulsion of the globe. This article discusses diagnostic work-up for dogs and cats with signs suggestive of orbital disease. Diagnosis and treatment of nonneoplastic orbital diseases follows. Congenital diseases are discussed
first, followed by inflammatory diseases of the orbit including orbital pseudotumor. Lastly, other less common orbital conditions are addressed.

**Optic Neuritis in Dogs and Cats**
Barbara Nell

The term “optic neuritis” compromises all diseases of the optic nerve that cause primary demyelination and usually manifest themselves as a sudden visual field defect or total loss of vision in one or both eyes. As in man, the cause of optic neuritis is often difficult to determine in the living animal. Neurologic examination, cerebrospinal fluid analysis, and laboratory tests can be normal. Optic neuritis affects dogs far more frequently than other animal species. This article examines the causes of immune-mediated optic neuritis and etiologic differentials in dogs and cats, with comparisons to human beings and laboratory animal models.

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