

ALL ABOUT EARS

Understanding health and disease of the canine ear.

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The perfect canine ear hears every command right on cue and delivers those commands to the brain for immediate (and obedient) reaction. It never requires grooming, cleaning or medical treatment. In fact, the only attention the perfect ear ever needs is frequent petting. After all, the perfect canine ear is, well, perfect!

But in reality, almost all canine ears fall short of this ideal, and many owners face periodic ear problems in their dogs. These problems can be minimized, however, by regular observation and by seeking prompt medical treatment as soon as problems occur.

Anatomy of the Ear

The canine ear, an organ of hearing and balance, is divided into three portions: external, middle and internal.

The familiar ear flap, or pinna, is part of the external ear, along with the ear canal. Functioning as a sort of cartilaginous funnel, the pinna receives sounds and transmits them to the eardrum (tympanic membrane) via the ear canal. Canine pinnas vary in shape and form depending on the breed, from small and erect to large and pendant.

The ear canal is also made of cartilage, and extends inward in a vertical and horizontal direction until it terminates with the eardrum. Secretory glands are present in the skin which lines the ear canal, except near the eardrum. Some breeds also have hair follicles in this area, and thus have hirsute ears.

The region of the middle ear begins with the eardrum. Behind the eardrum are the auditory ossicles, small bones which transmit sounds from the eardrum to the inner ear. Most of the middle ear is an air-filled cavity lying within an open bony structure called the tympanic bulla. The opening of the Eustachian tube, a short canal which connects the middle ear with the oral cavity, is found within the rounded tympanic bulla.

The deepest part of the canine ear, the internal ear, is responsible for both hearing and equilibrium. Some of the structures in the internal ear convert sounds into nerve impulses, which are then sent to the brain. Other structures transmit impulses which help the brain orient the rest of the body in space.

Pinna Problems

As the outermost structure of the ear, the pinna is the likeliest candidate for an injury. It's not uncommon to see pinna lacerations, especially in dogs with large or pendulous ear flaps. Most lacerations result from fights, sharp vegetation, and self-trauma.

Because the ear has a rich blood supply, copious bleeding may follow a pinna injury, especially if the dog proceeds to shake its head. Severe head-shaking or scratching may also result in a hematoma, a large, soft, blood-filled swelling that occurs when small vessels rupture within the cartilage of the ear flap. Hematomas can build rather suddenly, and though not life-threatening in themselves and amenable to surgical repair-can involve virtually the entire ear flap.

Other problems of the pinna include bacterial, fungal and parasitic infections that often occur in conjunction with lesions on other parts of the body. For instance, the ear margins are a

preferred site of infection by the *Sarcoptes mangle* mite (though a localized form of *Demodex* mite may infect the pinna area alone). Hypersensitivity, endocrine and immune-mediated diseases may affect the pinna as well as other body areas. Additional information about these diseases will be discussed later in this article.

Otitis Externa, Media and Interna

Otitis is the medical term used to describe inflammation or infection of ear structures. Otitis may occur in the external, middle and/or internal portions of the ear.

Otitis externa is one of the most common conditions treated by veterinarians. At one time, it was thought to be caused primarily by microorganisms. Recent studies, however, have shown that it almost always occurs secondary to some predisposing factor or other disease state. Common examples of predisposing factors are conformation of the ear canal, frequent wetting of the canal, foreign bodies, parasites and trauma.

Ear type is an important factor in the incidence of otitis externa among breeds. The pendulous ear conformation found in many breeds, particularly spaniels and retrievers, actually restricts air circulation within the ear canal. The canals relatively small diameter and downward sloping direction also allow secretions to accumulate and clog the passageway.

Moisture in the ear canal, which is normally a region of high humidity, softens the epithelial lining of the canal and stimulates increased secretion by local glands. This sets up an environment which favors proliferation of microorganisms that normally reside in the ear. (Low numbers of a variety of organisms live inside the ear canals of most healthy dogs. *Staphylococcus intermedius*, *Mircrococcus* species, and occasionally coliforms, are the most common bacteria isolated from normal ears. The yeast *Malassezia canis* is another common inhabitant of normal canine ears which, given the correct circumstance, can overgrow.) Sources of moisture include environmental humidity, frequent baths, and swimming.

Other potential irritants to the ear are foreign bodies-typical examples are plant awns, foxtails, dirt, matted hair and dried wax- and ear mites. The saliva of these microscopic parasites provokes an intense allergic response in some dogs. Secondary microbial infections are common complications of ear mite infestations. Another parasite, the spinous ear tick of dogs (found in the Southwest) may also cause a severe inflammation. Occasionally, sarcoptic and demodectic mites may infect the ear canal and lead to otitis externa.

Many of these conditions cause a great deal of pain and itching, and dogs will commonly traumatize themselves by pawing and scratching at their head in distress. Medical attention is necessary to ease the dog's discomfort and solve the underlying problem.

A number of different systemic diseases can also ultimately affect the ear canal. Perhaps the most common are allergic diseases such as atopy (inhalant allergic disease), food allergy and flea allergy.

As many as half of all dogs with atopic dermatitis develop chronic otitis externa as part of their disease. This otitis, which may be complicated by secondary bacterial or yeast infection, usually results in severe itching. Many dogs with food allergies develop ceruminous (waxy) otitis externa. In fact, this otitis may be the only observable sign of the patient's initial problem. Some dogs with flea bite hypersensitivity also develop otitis externa, though fleas may be present anywhere on the dog's body.

Endocrine-related otitis is often accompanied by seborrhea in the dog, and the presence of this waxy secretion frequently contributes to otitis. Hypothyroidism is the most common endocrine cause of chronic otitis externa; others include Sertoli cell tumors and ovarian imbalances.

Several immune-mediated diseases are also associated with otitis, which are known to cause lesions on the pinna. Examples of such diseases are systemic and discoid lupus erythematosus, pemphigus foliaceus, and pemphigus erythematosus. These immune-mediated diseases almost always involve lesions on other parts of the body as well.

Lastly, other potential causes of otitis externa include tumors, though this is uncommon, and anal sac disease, fever and the canine distemper virus.

If otitis becomes chronic, the skin lining the ear canal thickens and the outer layer may ulcerate. The diameter of the ear canal may narrow and eventually become obliterated by proliferating bone tissue. Eventually, the eardrum may rupture and permit infection to spread to the middle and inner ears.

Otitis media (infection of the middle ear) most frequently occurs as an extension of otitis externa. In some cases, the infection may ascend to the middle ear through the Eustachian tube or result from blood-borne micro-organisms. An infection of the inner ear, otitis interna, may result from otitis media, systemic infection or meningitis. Other causes include trauma, neoplasia and the administration of antibiotics which are toxic to ear structures.

Most dogs with otitis externa exhibit head shaking and/or pawing and scratching at the ears. The ears themselves may appear red or swollen and have an abnormal odor. A yellow or brown discharge may be obvious on the inner surface of the pinna and within the canal opening.

Dogs with otitis media may have any of the preceding signs plus a head tilt, hearing loss, and/or paralysis of structures of the face (e.g. the lips, eyelids or ears). Some dogs have constricted pupils, drooping eyelids and protruding third eyelids, a collection of signs commonly known as Horner's syndrome.

All the signs of otitis media, plus a nystagmus (rapid, abnormal pupillary movements) typically accompany otitis interna, along with incoordination and apparent nausea. Otitis interna can be life-threatening because the infection can spread from the inner ear to the brain.

Because otitis is often due to underlying factors, veterinarians begin searching for clues with a thorough history and a complete physical exam. The history may reveal an environmental cause (frequent bathing or swimming) or indicate the nature of an underlying disorder. A complete physical exam may likewise reveal evidence of systemic disease. If such evidence is found, a blood sample may be drawn for analysis. Other laboratory tests may be performed as indicated by the physical examination findings and results of the blood screen.

The ears should be systematically evaluated, both with and without the use of an otoscope, starting with the pinna and the surrounding region. If only one ear appears suspicious, the normal ear will be examined first. When ears are extremely painful, it may be necessary to sedate or anesthetize the dog before continuing.

Canine ears aren't like human ears in that the canal forms a distinct bend before it reaches the eardrum. For that reason, veterinarians need to gently pull the pinna up to straighten the ear canal while inserting the otoscope. In this way, any secretions, swelling, inflammation or structural abnormalities of the vertical canal become visible as the cone descends toward the horizontal portion of the canal.

If the ears contain excessive debris and secretions, it may be necessary to do some cleaning at this point in order to visualize deeper structures. Before this is accomplished, a small sample may be obtained to examine for ear mites or microorganisms. Sterile samples may also be collected for bacterial or fungal culturing as well as antibiotic sensitivity testing.

Visualization of the ear canal is not complete without an examination of the eardrum. A normal canine eardrum looks like a smooth, translucent, pearly membrane. Cloudiness, opacity,

bulging or color changes may indicate an extension of the ear canal disorder to the eardrum or problems in the middle ear. Ruptures should not be apparent.

If otitis media is suspected, radiographs may be taken to look for changes in structures of the external and middle ear. In particular, radiographs of the tympanic bullae are desired to determine whether the middle ear infection has spread to inner ear structures.

Another part of the physical examination of a dog with signs of middle or inner ear disease is a neurological evaluation to detect possible brain involvement.

Types of Therapy

Successful treatment of otitis depends on diagnosis and treatment or correction of the predisposing factors or underlying systemic disorders. This includes the identification of the micro-organisms, parasites or foreign bodies which may be involved, and a thorough cleansing of the ears to remove debris from the pinna and ear canal.

The initial treatment of choice for many ear problems is a medical approach. Surgical treatment is reserved for most hematomas and for medically unresponsive otitis patients as well as those cases where proliferating tissue or tumors obstruct the ear canal. Surgery may also be necessary to drain the tympanic bullae of secretions.

Medical Therapy

Appropriate medical therapy is consistent with the cause of the ear problem and, if necessary, complements medications used to treat underlying systemic disorders.

Ear mite infections are typically treated with a topical medication containing a parasiticide. Many of these medications also contain an anti-inflammatory agent intended to reduce irritation and pain, as well as an antibiotic, to treat or prevent concurrent bacterial infection. In addition, topical flea powders or sprays should be applied around the ears and neck to kill any mites that have traveled beyond the ear canal. Because ear mites are highly contagious, other animals in the household should be checked for evidence of infestation and treated accordingly. No environmental treatment is necessary.

Ear infestations of *Demodex* and *Sarcoptes* mites are treated in conjunction with the rest of the body. Localized pinna lesions due to *Demodex* mites usually resolve spontaneously.

Bacterial infections are treated with topical antibiotic solutions. A combination product containing an anti-inflammatory agent may be prescribed if irritation and swelling of the ear canal are present. Since many medications used to treat otitis can be damaging to the middle ear, it's important to determine whether the eardrum is intact before selecting an antibiotic.

Topical antifungal preparations will be prescribed when yeast cells or fungi are suspected of contributing to the otitis. Mixed infections require medications to treat both types of organisms.

When dogs have an uncomplicated case of otitis externa arising from atopy, food allergy or other allergic disorders, topical anti-inflammatory medications without an antibiotic ingredient may be prescribed to help ease the dog's discomfort as management of allergy is explored. This also holds true for other cases of ceruminous otitis. Treatment of foreign body otitis includes removal and treatment with an antibiotic preparation to minimize infection.

When the eardrum has ruptured, systemic antibiotics help prevent the spread of infection to the middle ear. High doses of systemic antibiotics are prescribed to treat middle and inner ear infections. Systemic antibiotics and anti-inflammatory agents may also be used to treat chronic otitis and cases where owners are unable to administer topical medications at home.

Surgical Therapy

Surgical correction is the only way to restore an ear with a hematoma to its former appearance. Left alone, most hematomas will resolve on their own (the inciting factor, however, should be identified and resolved), but disfigurement, due to contraction of the ear cartilage, will probably occur.

The surgical technique involves making a long incision over the hematoma to remove the blood clot and promote drainage. To prevent refilling of the defect, rows of sutures are placed through the full thickness of the ear. Many practitioners prefer to bandage the repaired ear to facilitate healing.

Three surgical procedures have been described to treat refractory otitis externa. The first and most common is lateral ear canal resection, in which the outside wall of the vertical canal is excised and a permanent opening is created, improving drainage of the horizontal canal and overall canal ventilation. Vertical ear canal ablation, the second option, involves removing the entire vertical ear canal and reclosing the skin, leaving a small drainage hole at the opening of the horizontal ear canal. Finally, total ear canal ablation removes both the horizontal and vertical ear canals, and recloses the skin. These surgical procedures may also be employed for tumor removal. (Radiation therapy may follow surgery, depending on the type of tumor.)

Surgical management of otitis media and interna is directed at removing debris and improving the drainage of the tympanic bullae.

Prevention

Many canine ear problems are completely preventable, if owners are willing to follow a few simple guidelines.

Perhaps the easiest (and the most valuable) measure is getting to know the normal appearance and odor of the dog's ears. Thereafter, when a change in appearance or odor is noticed, intervention can occur early-before the problem has a chance to grow in scope.

Good grooming is also important. The underside of the pinna and the external opening of the ear canal should be kept free of debris and hair. This is particularly important for pendant ear breeds. If you need to clip this area, first place a small ball of cotton in the opening of the ear canal to prevent clipped hair from falling into the ear and causing an irritation. Hair in the ear canal itself should be plucked out gently.

Dogs that are used for field work or that swim frequently run a higher risk of developing ear disorders due to increased moisture levels in the ear canal. Routine use of otic drying agents or agents which restore normal canal pH after field events or swimming episodes can be beneficial. Such products are available at most veterinary hospitals.

The ear canal is a delicate environment. Shampoo, water, flea sprays, hydrogen peroxide, alcohol and other cleaning agent and many topical ear medications can cause irritation, swelling and pain. Always check with your veterinarian before putting anything in your dog's ears.

Additional Reading: Diseases of the Ear Canal, The Veterinary Clinics of North America. J.R. August (editor). W.B. Saunders Co., 1988.

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