

Deafness

Basics

OVERVIEW

- Partial or full loss of ability to hear sound in one or both ears
- Two forms of deafness have been identified: (1) “sensorineural deafness” caused by damage to the cochlea (the spiral-shaped portion of the inner ear that contains nerve endings necessary for hearing), cochlear nerve, or hearing pathways (known as “auditory pathways”), and (2) conduction deafness caused by inability to conduct sound vibration through external to inner ear structures

GENETICS

- Exact genetic mechanism for congenital (present at birth) deafness is not known
- Association has been seen between merle or piebald coat pigmentation genes and deafness, recessive alleles affect skin, hair, iris, back of the eye (“ocular tapetum”) and portions of the hearing mechanism of the ear (“cochlea”)
- Those dogs with a single copy of the merle gene have a 3.5% chance of deafness, and those with two copies have 25% chance



SIGNALMENT/DESCRIPTION OF PET

Species

- Dogs
- Cats

Breed Predispositions

- More than 90 breeds of dog have breed-related congenital (present at birth) cochlear degeneration; the “cochlea” is the spiral-shaped portion of the inner ear that contains nerve endings necessary for hearing; “degeneration” is the gradual deterioration, leading to loss of function of an organ or part of the body
- Breed-related congenital (present at birth) cochlear degeneration is seen in breeds that have a large amount of white pigmentation associated with merle or piebald genes, except for the Doberman pinscher, Puli and Shropshire terrier
- Congenital (present at birth) deafness in one or both ears, noted by 6 weeks of age, has been seen in the following breeds—prevalence rates are for Catahoula leopard dog (63%), dappled dachshund (55%), Dalmatian (30% in US, 18% in the UK), Jack Russell terrier (4%), Australian cattle dog (15%), bull terriers (11%, 20% if white), English setter (8%), English cocker spaniel (7%), border collie (2.4%), whippet (1.3%), and others
- Dogs with blue iris color have a higher likelihood of having congenital (present at birth) deafness than other dogs; the “iris” is the colored or pigmented part of the eye—it can be brown, blue, green, or a mixture of colors
- Cavalier King Charles spaniel has an inherited predisposition to a condition called “primary secretory otitis media”
- Cats with white hair coat and blue irises have a higher likelihood of deafness than other cats (20.2%)

- Purebred white cats that carry the Siamese gene for blue eyes have a lower likelihood of deafness than other cats
- Acquired deafness may occur in any breed or age dog, more common when the iris is blue colored

Mean Age and Range

- Congenital (present at birth) sensorineural deafness—present by 6 weeks of age
- Acquired (condition that develops sometime later in life/after birth) deafness—any age; more common in senior dogs due to degenerative changes associated with chronic infection, drugs toxic to the ear (“ototoxicity”), cancer, overexposure to loud noises, anesthesia side effect, age changes, narrowing or blockage of the canal or eardrum rupture associated with polyps or chronic external ear infections

SIGNS/OBSERVED CHANGES IN THE PET

- Deafness involving only one ear (known as “unilateral deafness”) is difficult for most owners to identify; thus, most pets brought to clinics for hearing problems have deafness involving both ears (known as “bilateral deafness”)
- Deafness involving both ears (bilateral deafness)—pet does not respond to people calling his/her name or rattling of the food dish; often startled easily; may have increased response to vibration and/or visual cues

CAUSES

- Genetic cause most likely in newborns
- Sensorineural deafness involves the cochlea, cochlear nerve, and hearing pathways) Acquired (condition that develops sometime later in life/after birth) cochlea and cochlear nerve damage—infections; tumor or cancer of the bony structure of the ear or the nerve; trauma; medications (administered by mouth or injection [known as “systemic administration”] or directly into the ear [known as “topical administration”]), or poisons
- Antibiotics—aminoglycosides; polymyxin; erythromycin; vancomycin; chloramphenicol
- Antiseptics—alcohol (ethanol); chlorhexidine; cetrимide
- Chemotherapy drugs—cisplatin
- Medications to remove excess fluid from the body (known as “diuretics”)—furosemide
- Heavy metals—arsenic; lead; mercury
- Miscellaneous—products used to break down waxy material in the ear canals (waxy material known as “cerumen”; products known as “ceruminolytic agents”); propylene glycol; salicylates
- Middle ear polyps

Conduction Deafness (Sound Waves Do Not Reach the Nerves of Hearing)

- Inflammation of the outer ear (known as “otitis externa”) and other external ear canal disease (such as narrowing of the ear canal, presence of tumors, or ruptured ear drum)
- Inflammation of the middle ear (known as “otitis media”)

RISK FACTORS

- Merle, piebald gene, or white coat color
- Long-term (chronic) inflammation of the outer, middle, or inner ear (otitis externa, media, or interna)
- Use of certain medications that are toxic or damage the nerves of the ears (known as “ototoxic drugs”)
- General anesthesia

Treatment

HEALTH CARE

- Directed toward acquired (condition that develops sometime later in life/after birth) causes
- Congenital (present at birth) deafness is irreversible
- Inflammation of the outer, middle, or inner ear (otitis externa, media, or interna)—medical or surgical approaches depend on extent of disease, bacterial culture and sensitivity test results and response to antibiotics, and x-ray (radiograph) or other imaging technique findings
- Conduction problems in which sound waves do not reach the nerves of hearing (conditions that involve the external ear canal or ear drum may lead to conduction problems)—may improve as inflammation of the outer or middle ear (otitis externa or media) resolves

ACTIVITY

- Restricted to avoid possible injury (for example, a deaf dog cannot hear an approaching car)
- Environment—may need to control for pet's protection

SURGERY

- Surgery may be indicated in cases where the ear canal is narrowed severely or blocked or when a tumor or inflammatory mass that develop from the middle ear or eustachian tube (nasopharyngeal polyp) is present
- Surgery may be indicated in some cases of inflammation of the middle ear (otitis media) to drain the middle ear (procedure known as “bullae osteotomy”)

Medications

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive

- None for congenital (present at birth) deafness
- Treat infection or inflammation of the outer, middle, or inner ear (otitis externa, media, or interna)—treatment may include antibiotics, steroids, medications to kill ear mites (*Otodectes*), or medications to treat fungal infections; antibiotics should be selected based on bacterial culture and sensitivity testing

Follow-Up Care

PATIENT MONITORING

- As needed for management of infection or inflammation of the outer, middle, or inner ear (otitis externa, media, or interna)

POSSIBLE COMPLICATIONS

- Depend on underlying cause
- Trauma (such as being hit by a car) if pet is not kept in a safe environment

EXPECTED COURSE AND PROGNOSIS

- Depend on underlying cause
- Congenital (present at birth) deafness is irreversible

Key Points

- Loss of ability to hear sound in one or both ears
- Deaf pets require patience, specialized training, and extra protection from traffic
- Congenital (present at birth) deafness is irreversible