

Deafness

in Dogs and Cats

By Hans Andersen

As pet owners we share our lives with our cats and dogs. We call them for meals and expect them to come; we talk to them and expect a response. Sound is our most important medium of communication with our pets. So deafness in a pet can be profoundly isolating for the animal and very frustrating for its owner.

How can I tell if my pet is deaf?

Well, it often isn't easy! Dogs and cats that are completely deaf are difficult to rouse from sleep. They do not respond to loud noises and may have an abnormal bark or miaow. However partial deafness or total deafness in just one ear is much harder to assess.

There is only one objective test that can accurately define hearing loss in pets. This is the BAER test.

A headphone is used to deliver an acoustic signal as a series of clicks. The neural impulses generated are recorded as small changes in electrical activity by a specialized machine via three fine sub-dermal scalp electrodes placed in specific sites under the skin of the cat or dog's head. It can be done consciously in a cooperative pet but sedation or even general anaesthesia may be required. Puppies can be tested from four weeks of age.

This is widely used to screen puppies of at-risk breeds in the United Kingdom. There are over 60 breeds of dogs in which congenital deafness occurs as an inherited condition.

Unfortunately the BAER test is only available for pets in New Zealand at Massey University Vet Clinic

A Simple Screening Test for Deafness

The dog or cat must be relaxed, in a private room with no other distractions. Stand one to two metres behind the pet and say its

name, ring a bell or blow a whistle. A positive response is your pet turning its head, twitching one or both ears, a 'startle' reaction, or a momentary pause from panting.

However there are many problems interpreting this test.

- ✦ Any vibration, visual or smell cue may stimulate a response.
- ✦ Both ears may twitch and swivel even if your pet is completely deaf in one ear.
- ✦ Dogs and cats quickly become used to auditory stimuli, so repeating the test may result in a lack of responsiveness.

Overall, this technique can detect dogs and cats that are profoundly deaf in both ears, but it is not very helpful for those that are partially deaf.

Congenital deafness

Congenital deafness nearly always has a strong heritable component. The whiteness gene in cats, the extreme piebald gene in Dalmatians, the merle gene in Border Collies, Shelties and the Australian Cattle dog, are all associated with a very high incidence of deafness.

These genes all suppress melanocytes, the cells responsible for producing dark pigment in the skin and in the iris. Of course, no one realised as they selected for these coat colours, that melanocytes

are vital in maintaining the balance of the fluid environment that nourishes the fine cochlear hair cells that conduct sound in the middle ear. This is why white hair coat and blue (non-pigmented) eyes are especially associated with deafness. Dalmatians with black patches have less risk of producing pups that are deaf than those with black spots. Unfortunately, spots are favoured in the show ring, and so deafness is selected for. In the United Kingdom 22 percent of Dalmatians are deaf. We do not know the numbers in New Zealand. The mode of inheritance is complex and pups can be deaf in one or in both ears. Breeding from deaf dogs is not advised.

Acquired Deafness

Deafness can be acquired in many ways. There can be problems of the sound conduction system - the ear canals, the tympanic membrane, the ossicles and the middle ear space - that transmits the sound through to the inner ear. These are called conductive problems. They are common and they are the problems that we can often do something about.

If the problem is deeper - in the cochlea,

the auditory nerve or in the central auditory system in the brain - then it is called sensori-neural. These have very few options for treatment. They include old-age degenerative deafness.

Causes of Deafness in Cats and Dogs

The most common cause of acquired deafness is blocking of the ear canals with wax plugs. This is easily diagnosed by your vet and easily treated with ear cleansing solutions.

Cats will sometimes have their ear canal completely blocked by a benign growth called a polyp. These grow from the lining of the middle or inner ear and extrude through the ear drum, filling the ear canal. There is no apparent pain and because usually only one side is affected, no apparent deafness. Affected cats are presented because the owner has noticed a bad smell, a discharge from the ear, or the cat is tilting its head to one side. The treatment is surgical removal and is usually successful.

Barley grass seeds commonly get into dogs' ears. Because of their barbed tip

More facts about hearing in animals

Most of us believe that dogs and cats have better hearing perception than we have. However sophisticated testing using Brainstem Auditory Evoked Response (BAER) techniques has shown that dogs and humans have similar low frequency hearing thresholds. The frequencies to which dogs are most sensitive are a little higher than humans. Humans can hear a wide range of frequencies from 20 to 20,000 hertz (Hz = cycles per second) and we hear best at 3000Hz. Dogs can hear frequencies up to 47000 Hz and hear best at 8000 Hz. This may be why using a higher pitched tone of voice is so effective when training your dog. It is also the reason dogs respond to a high-pitched whistle that we cannot even hear.

Generally speaking, smaller species of land mammals can hear higher frequencies than larger species. This is thought to help them localise sound. Sound localisation depends on detecting the difference in arrival time of sounds to each ear as a localisation clue. This is easier for species with larger heads. The smaller the sound waves are in comparison to the head, the easier it is to differentiate location.

Having erect, mobile ears appears to help localisation. We have all seen the movement of the ears of horses, rabbits, and to a lesser extent, dogs and cats, in response to an unusual sound. Surprisingly, the long droopy ears of some dog breeds do not interfere with the sensitivity of their hearing at low or high frequencies.

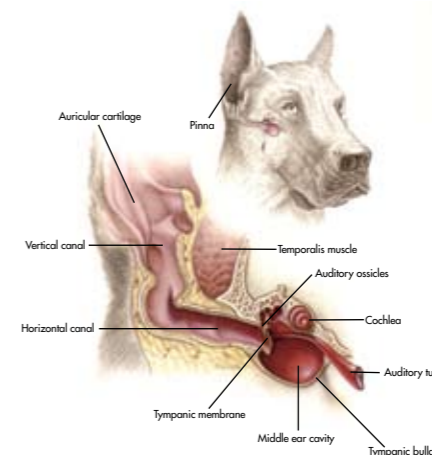
Curious fact: the tympanic membrane (ear drum) in a Chihuahua averages 30mm². This is not much different to a St Bernard's at 55mm², even though the St Bernard weighs 30-40 times more. No difference in hearing ability has been documented between dog breeds.



Above: Hans' old dog Jeet enjoys his walks on Nelson's Back Beach but his deafness and poor vision mean he can easily lose contact if he falls more than 20-30m behind, or there is a change of direction - frustrating for both Jeet and Hans.

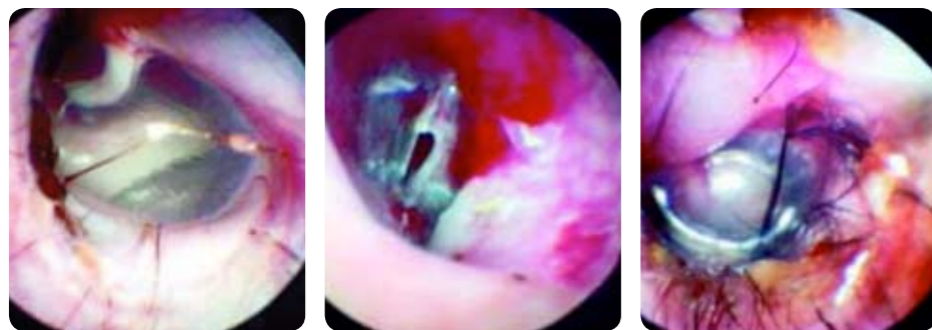
Basic Facts about the ear and hearing

The ear is divided into an outer, middle and inner ear. The outer ear consists of the pinna, canal and the tympanic membrane, or ear drum. The middle ear consists of an air filled cavity in which three small moveable bones, the ossicles, transmit sound vibrations from the ear drum to the inner ear. The inner ear consists of the cochlea and the vestibular or balance apparatus. The cochlea is a tightly coiled, fluid filled tube, a few millimetres in diameter, whose function is to convert the mechanical vibrations into nerve impulses. There are about 15,000 hair cells arranged along the length of the cochlea. When these move in response to sound vibrations, they generate nerve impulses which then travel to the brain to produce the sensation of hearing.



Vibrations are measured in cycles per second. The units of measurement are called Hertz (Hz). The faster the rate of vibration, the higher the frequency and the higher the pitch of the sound.

Photo credit: Hill's Atlas of Veterinary Clinical Anatomy



Left: Normal ear drum in a dog. It is translucent, like a fishscale.

Middle: This ear drum is clearly ruptured. This is often seen with barley grass seeds in the ear.

Right: The ear drum is bulging outwards and is discoloured, because inflammation in the inner ear has caused a build-up of fluid.

Photo credit: Waltham focus.

they migrate inwards, penetrating the ear drum and causing severe ear problems. Even after removal, chronic infections may persist, causing hearing loss.

Infections of the ear are more common in dogs than cats. In many dogs the underlying cause is allergy to pollens or house mite dust. The inflamed ear canals produce more wax and this in turn supports the growth of yeasts and bacteria. Several of the common bacteria involved in ear infections - Staphylococci, Streptococci and Pseudomonas - produce exotoxins that can damage the inner ear once they get past the ear drum.

In fact the inner ear is very sensitive to a broad range of chemicals, including many that are in ear preparations used to treat ear problems. The presence of an intact ear drum is critical for protecting the inner ear. It is very important for us as vets to be sure the ear drum is intact before we prescribe medications for ear problems. Often sedation is needed to allow gentle cleansing with saline solutions before the eardrums can be seen.

Chronic allergy and infections also damage ears by causing thickening of the tissues that line the ear canals. In severe cases this blocks the canals and impairs hearing.

Early diagnosis and effective treatment is critical in all of these problems to minimise the risk of acquired deafness. Most of the above problems can be cured or managed effectively, but any hearing loss that has occurred is thought to be irreversible.

Does exposure to loud noise cause deafness in dogs?

There is no published research to support this, though we are all aware that chronic exposure to excessive noise can be associated with deafness in humans.

Early diagnosis and effective treatment of ear problems is critical to minimise the risk of acquired deafness

There is anecdotal evidence that gundogs and kennelled dogs may have increased rates of deafness.

Old age deafness

This is a very common disorder of dogs. It appears to be less common in cats, but that is possibly because we don't expect the same degree of responsiveness and obedience from our cats! This is a degenerative problem of the inner ear, with cells dying off in the spiral ganglion, the start of the auditory nerve. The diagnosis is made by examining the ears to rule out the other causes of hearing loss.

What are the consequences of hearing loss?

We have already mentioned the significant social isolation that occurs for the pet. There are also safety issues. Pets can no longer hear traffic noise, and though it may be possible to keep them off the road, older pets are often run over in their own driveway. Bad hearing and poor mobility are a dangerous combination.

There can also be safety issues for humans. Deaf pets can readily be startled and may respond with reflex aggression. There can be training difficulties too. At the earliest signs of deafness it is helpful use new training cues. Examples include exaggerated body movements to attract their attention, flicking the outside light on and off to call the pet in at night.

Hans Andersen is the editor of Paws for thought, and the owner of Halifax Veterinary Centre in Nelson.

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