

# “Eye Can’t Hear You”

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## Introduction:

Diseases of prey species are often very subtle and can be difficult to determine the underlying factors of disease.<sup>6</sup> A good example of this is Otitis media/interna in Guinea pigs. The underlying agent is often difficult to find for many different reasons. The foremost reason is that Guinea pigs are prey species and they exhibit the associated behaviors as such. This behavioral component is aimed towards disguise of disease and injury.<sup>6</sup> Therefore, their behavior is important to understand when looking for underlying disease. Another reason is Otitis media/interna in Guinea pigs can present with subtle and varying clinical signs that can be quite confusing and frustrating at times.<sup>1,6</sup> The final reason that make prey species, such as Guinea pigs, difficult to diagnose disease in is that there is very little information on diseases of exotic animal species.<sup>2</sup>

Guinea Pigs with underlying otitis media/interna will often present initially with ocular disease. The most common presentation is corneal ulceration with epiphora.<sup>6</sup> As the disease progresses 50% of cases may develop Horner's syndrome.<sup>6</sup> Further adding to the confusion is that many Guinea pigs with otitis media/interna have or will develop upper and/or lower respiratory disease from the causative agent.<sup>2,6</sup> There are numerous causative agents that contribute, the most common agents are bacterial. The primary agents of concern are *Bordetella bronchiseptica*, *Streptococcus zooepidemicus*, *Streptococcus pneumoniae*, *Pasteurella*, *Micrococcus*, and *Actinobacillus species*.<sup>2</sup> Of these agents *B. bronchiseptica* and *Strep* species contribute to more than 60% of otitis media/interna cases in Guinea pigs.<sup>2</sup> Diagnosis of the causative agent is not commonly achieved as obtaining a representative bacterial sample is an intrusive procedure. Therefore, diagnostics typically include radiographs of the tympanic bulla and lungs as well as a thorough otoscopic examination.<sup>6</sup> Treatment is often done without

bacterial isolation and response to therapy determines the necessity for further, more intrusive, diagnostics.<sup>2,3</sup>

Prognosis is highly variable as it is dependent on response to initial therapy, chronicity, severity of disease, clinical signs, owner compliance, and the pathogen causing disease.<sup>2,6</sup> Fortunately, those cases that are caught early and respond to treatment tend to have a good prognosis. Conversely, those that are chronic and are associated with more severe infections are poor to grave and may require more aggressive medical and surgical therapies.<sup>2,6</sup>

### **History and Presentation:**

Guinea pigs that are from an inbred genetic lineage are nearly 50% more likely to develop otitis media/interna.<sup>1</sup> Currently, there are no studies which show a breed, age, or sex predilection. Studies have shown that Guinea pigs that are housed with other species, such as rabbits, are at a much greater risk of contracting *B. bronchiseptica*.<sup>2,5,6,7</sup> This is attributed to Guinea pigs' increased susceptibility to *B. bronchiseptica* and rabbits being known carriers of this pathogen.<sup>2,5,6,7</sup> Poor husbandry and nutritional deficiencies are the most common causes of otitis media/interna.<sup>2,5,6</sup>

This disease has variable presentations dependent on the chronicity and severity.<sup>2,6</sup> The most common presentation of this disease is corneal ulceration with epiphora due to facial nerve paralysis.<sup>3</sup> This is often the sole initial finding; however, ear droop, lip droop, facial asymmetry, ptosis, and collapse of the nostril of the affected side may be present in conjunction.<sup>2,4,6,7</sup> Inflammation of the area surrounding the vestibulocochlear nerve may bring about the development of Horner's syndrome. Horner's Syndrome presents with clinical signs of head tilt, circling, leaning or falling toward the affected side, general incoordination, or spontaneous

horizontal nystagmus with the fast phase away from the affected side.<sup>2,4</sup> It is not uncommon for otitis media/interna to have bilateral presentation, which can make diagnosis difficult due to conflicting clinical signs as the disease can also manifest as a subclinical infection.<sup>6</sup>

### **Pathophysiology:**

The pathophysiology of otitis media/interna in Guinea pigs has not been fully described in the literature. The location of original infection would also change the pathophysiology of the disease as some infections begin as otitis media/interna, upper respiratory infection, or lower respiratory infection.<sup>6,8,9</sup> Another confounding factor is that the disease, though most commonly of bacterial etiology, can be of viral, fungal, or neoplastic origin.<sup>6,8,9</sup>

A proposed model for the pathophysiology of disease has been described. In this model, poor husbandry due to decreased temperature of housing, increased humidity, and poor cleanliness of the animal's environment lead to opportunistic infection of the upper respiratory tract mucosa.<sup>8,9</sup> The most likely infectious agent is one of two bacteria, *streptococcus spp.* or *Bordetella bronchiseptica*.<sup>8,9</sup> It is proposed that the infection would then ascend through the Eustachian tube into the middle ear causing otitis media/interna.<sup>1,8,9</sup> Chronic subclinical infection or acute severe infection could then lead to inflammation and sclerotic osteotic changes surrounding the stylomastoid foramen, the area at which the facial nerve exits the skull.<sup>1,4,8,9</sup> The associated inflammation impedes the ability for sympathetic nerve impulses to the auricular, palpebral, and buccal branches of the facial nerve resulting in ear droop, lip droop, facial asymmetry, ptosis, and collapse of the nostril of the affected side.<sup>4,8,9</sup> Disruption of the vestibulocochlear causing head tilt, circling, leaning or falling toward the affected side, general incoordination, or spontaneous horizontal nystagmus with the fast phase away from the affected side.<sup>1,4</sup> If left untreated this infection could ascend into the brain leading to meningitis,

meningoencephalitis, abscesses, and death.<sup>4</sup> The extent of pathology dictates treatment modalities.<sup>6,8,9</sup> The host's inflammatory response and site of infection are responsible for the pathology seen.<sup>4,6,8,9</sup>

### **Diagnostic Approach:**

The most important step toward a diagnosis is attaining a thorough history and physical examination.<sup>6,8,9</sup> Information regarding the patient's diet, housing, activity, and house mates is extremely important in prey animals such as Guinea pigs as this information can reveal predisposing factors for subclinical otitis media/interna.<sup>6,9</sup> A thorough physical examination and otoscopic exam is paramount when trying to attain a diagnosis of otitis media/interna. It is important to incorporate a comprehensive neurological examination in any patient that has evidence of exposure keratitis or corneal ulceration to determine an underlying cause.<sup>6,7,9</sup>

If primary middle or inner ear disease is suspected, radiography should be performed.<sup>2,4,6,8,9</sup> A lateral and dorsoventral projection of the tympanic bulla will often lead to a diagnosis.<sup>4,6,8,9</sup> Over 95% of patients not exhibiting signs of facial nerve paralysis, Horner's syndrome, or otoscopic abnormalities will have radiographic changes involving the tympanic bulla and are diagnostic for chronic subclinical otitis media/interna.<sup>6</sup> Complete blood count and serum chemistry is of little use unless the clinical signs of the disease are severe.

Ante mortem bacterial culture is seldom performed due to the invasive nature of the procedure; however, it can be done via myringotomy and collection of purulent material within the middle ear.<sup>2,3,5,6</sup> If initial response to treatment is poor then intrusive methods of surgical treatment and bacterial culture collection are warranted; however, these procedures are seldom performed and are accompanied with a poor to grave prognosis.<sup>2,6,9</sup>

## **Treatment and Management:**

Treatment is often multifactorial and dependent on physical examination findings, clinical signs, and response to treatment.<sup>9</sup> Choosing the appropriate antibiotic is paramount and can be challenging at times. Systemic use of  $\beta$ -lactams is contraindicated in Guinea pig species as it causes fatal dysbiosis.<sup>2,8,9</sup> Therefore, the drug of choice is oral chloramphenicol due to its broad spectrum.<sup>2,8,9</sup> Fluoroquinolones such as enrofloxacin are also commonly used in treatment of otitis media/interna in Guinea pigs.<sup>2,8,9</sup> Trimethoprim and sulfamethoxazole has also been shown effective.<sup>4,9</sup> Antibiotic therapy is indicated for 4-6 weeks or longer in some cases.<sup>2,8,9</sup> Recheck physical examinations and history are important in determining the length of antibiotic therapy.

Inflammation and pain management are also crucial when treating otitis media/interna in Guinea pigs. It is recommended to use a cyclooxygenase-2 selective non-steroidal anti-inflammatory drug (NSAID) such as meloxicam.<sup>6,9</sup> This class of drugs is safe to use in Guinea pigs.<sup>9</sup> NSAIDs have a strong anti-inflammatory, antipyretic, and analgesic properties due to inhibition of cyclooxygenase-2, phospholipase A<sub>2</sub>, and inhibition of prostaglandin synthesis.<sup>9</sup> Treatment with NSAIDs is typically long-term and return to normal function of the facial and vestibulocochlear nerves is highly variable.<sup>4,9</sup>

Treatment of corneal ulceration is indicated when present. Ophthalmic formulations of gentamycin, tobramycin, or ciprofloxacin are decidedly efficacious in Guinea pigs.<sup>6,9</sup> Ophthalmic solutions or ointments containing steroids are contraindicated in cases of corneal ulceration.<sup>7</sup> Even in cases where treatment of the corneal ulceration is successful, lifelong supplementation of artificial tears is often indicated.<sup>6</sup> This is due to the persistence of facial and vestibulocochlear nerve dysfunction despite treatment.<sup>9</sup>

There are currently no reports of ante mortem surgical bulla osteotomy for correction of severe recurrent otitis media/interna. Surgical procedures such as bulla osteotomy are considered last recourse and are associated with a grave prognosis.<sup>3,9</sup>

### **Case Outcome:**

In summation, otitis media/interna can be difficult to diagnose and treat but, if caught early in the course of disease, can be well managed. Prognosis is often determined by severity of pathology, clinical signs, and response to treatment. Up to 50% of early cases with minimal clinical signs have been shown to regain facial and vestibulocochlear nerve function after appropriate and aggressive antibiotic and anti-inflammatory therapies.<sup>6,8,9</sup> Patients that don't regain nervous function will require lifelong supplementation of artificial tears.<sup>6</sup> Progression of infection into the meninges or the brain is associated with a grave prognosis.<sup>9</sup>

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