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I V S INSIGHTS IN VETERINARY SCIENCE
ISSN 2576-9510

Research Article

# Complications of External Otitis in Horses

**Schusser GF[1]*, Kuhlmann CHR[2] and Scheidemann W[2]**

[1]Large Animal Medicine Department, At the Tierkliniken 11, 04103 Leipzig, University of Leipzig, Germany

[2]Horse Hospital, Karthaus Veterinary Competence Center, Weddern 16 C, 48249 Dülmen, Germany

## Abstract

The physiological removal of foreign bodies in the horse's external ear canal is best achieved by head-shaking. However, external otitis in the horse induces moderate to severe pain: therefore, the horse does not shake his head. The causes of external otitis are dust, water in the external ear canal, keratin, and ceruminous debris. The clinical symptoms are ear discharge, skittishness, facial nerve paresis, and/or head tilt. After the horse has been sedated, the most important diagnostic procedure is the endoscopy of the cartilaginous and osseous part of the external ear canal, including the evaluation of the transparency of the tympanic membrane. The clinical complications of external otitis are hearing loss, facial nerve paresis, head tilt, hypertrophy of the *tympanostylohyoideum*, and corneal ulcers. The most important treatment is soaking up the exudate in the osseous part of the external ear canal using small cotton balls which are held by the foreign body forceps of the endoscope. Based on the results of the culture of exudate and the antibiogram, an antibacterial drug must be administered orally for 3 to 4 weeks. At this time, an endoscopy of the external ear canals and guttural pouches also has to be done. Based on the outcome of the endoscopy, endoscopic and clinical investigations have to be performed six months later as well. Only 7/19 horses had a normal osseous part of the external ear canal with a transparent tympanic membrane, including normal hearing measured by the brainstem auditory-evoked response after one month of treatment.

**More Information**

**Submitted:** May 11, 2024
**Approved:** May 20, 2024
**Published:** May 21, 2024

**How to cite this article:** Schusser GF, Kuhlmann CHR, Scheidemann W. Complications of External Otitis in Horses. Insights Vet Sci. 2024; 8: 012-014.

**DOI:** 10.29328/journal.ivs.1001041

***Address for correspondence:** Schusser GF, Large Animal Medicine Department, At the Tierkliniken 11, 04103 Leipzig, University of Leipzig, Germany, Email: schusser@vetmed.uni-leipzig.de

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**Keywords:** External otitis; Complication; Facial nerve paresis; Head-tilt; Hypertrophy; Tympanostylohyoideum; Corneal ulcer

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## Introduction

External otitis is caused by dust in the stable, sweating during exercise, blood from head trauma or external parasites, keratin, and ceruminous debris [1]. Following exercise, riders or owners often splash water into the horse's external ear canal. Sebum, water, or blood, together with the normal keratin and ceruminous debris of the external ear canal, form a sticky mass that can induce an obstruction at the entrance to the osseous part of the external ear canal. The normal accumulation of desquamated keratin scales, caused by epithelial migration from the tympanic membrane, forms a ring of cell debris around the lateral opening of the osseous part of the external ear canal [2]. The normal removal of foreign bodies (bedding material) or dry keratin and ceruminous debris from the cartilaginous part of the external ear canal is achieved by shaking the head. This is the only self-cleaning procedure available to horses. If the keratin scales and ceruminous debris or blood cannot be removed from the external ear canal, bacteria of the microbiome in the auricula and the cartilaginous part can induce an *otitis externa exsudativa*. More often *Staphylococcus spp*. was cultured from the exudate of the inflamed osseous part [3]. The aim of this study is to describe the diagnosed complications induced by external otitis in horses.

## Materials and methods

The history of the referred 19 horses was head-tilt, ataxia, keratitis, ear paresis, no reaction when called, becoming frightened, and/or ear discharge. The breeds included 6 Warmbloods, 4 Haflingers, 3 Tinkers, 3 Island Horses, 1 Quarter Horse, 1 Appaloosa, 1 Pony; 9 mares, 8 geldings, 2 stallions: the age 13.5 years (median, 4 min, 24 max). All horses were examined based on a general and neurological investigation plan. The horses were sedated using detomidine (Detomidin ad us. vet., 20 µg / kg b.w. i.v., Cepesedan RP, CP-Pharma, 31303 Burgdorf, Germany) before endoscopy of the external ear canals and the guttural pouches. A hygienically perfect and flexible endoscope with a diameter tip of 7 or 5.9 mm was used. The debris in the cartilaginous and osseous parts of the external ear canal was graded based on the tripartite grading system described by Sommerauer, et al. 2013 [4]. The tympanic membrane was characterized using the normal and abnormal criteria of the tympanic membrane described by Blanke, et al. 2014 [3]. The *tympanostylohyoideum*, the junction between *tympanohyoideum* and *Processus styloideus,* and the tympanic bulla medial of the junction were evaluated in the guttural pouch. A sterile cotton ball held by the foreign-body forceps of the endoscope was used to collect the exudate

of the osseous part for both the bacterial culture and the antibiogram.

## Results

The clinical and endoscopic results are listed in Table 1. The cultured bacteria of the exudate from the osseous part were: *Staphylococcus aureus, Staphylococcus delphinii, Streptococcus intermedius, Streptococcus dysgalactiae ssp. equisimilis, Acinetobacter baumannii.* The most effective antibacterial drug was enrofloxacin (5 mg/kg b.w., p.o./d) which was administered for three to four weeks. The anti-inflammatory drug flunixin meglumine (1.1 mg/kg b.w., p.o./d) was included. If a progressive improvement occurred after two weeks, a half dosage was administered. The most important part was the removal of the exudate from the osseous part by soaking up the exudate with small cotton balls which were held by the foreign-body forceps of the endoscope. This procedure was performed every second day during the first week, and after this every 3rd to 4th day until the 3rd to 4th week of treatment. The goal was to see the tympanic membrane. However, in severely inflamed osseous parts of horses with left-sided external otitis, the tympanic membrane was not seen because the epithelium of the osseous part was severely swollen and the osseous part was occluded (Table 1). Nine horses with external otitis suffered also from facial nerve paresis on the same side and one horse had it on both sides. Nine horses had a head tilt to the side of external otitis. Horses with facial nerve paresis had ulcerated cornea or *keratitis sicca* based on reduced production of tear fluid. These horses were treated with carbomer eye drops three times a day. A horse with bilateral facial paralysis (bilateral ear paralysis, ptosis of the upper eyelid, ulcerated cornea) was euthanized on the owner's recommendation. Six horses with right-sided external otitis and one horse with right-sided external otitis including facial nerve paresis and head tilt (with right-sided facial nerve paresis and moderate hypertrophy of the *tympanostylohyoideum*) were healed and discharged after four weeks. Three horses with left-sided external otitis and eight horses with external otitis including facial nerve paresis and head-tilt (six with left-sided facial nerve paresis and two with right-sided facial nerve paresis, severe hypertrophy of the *tympanostylohyoideum*) were discharged only following improvement of the external otitis but no improvement of the facial nerve paresis, head-tilt and hypertrophic *tympanostylohyoideum* after one to three weeks based on the owner's request.

## Discussion

Horses with *otitis externa exudativa purulenta* have moderate to severe pain based on facial expression. A horse with this disease does not shake his head in order to expel the exudate from the external ear canal. A direct application of any drug into the external ear canal results in a mixture with the dirty material of the external ear canal which induces severe inflammation in this region. Therefore, the most important part of the treatment is the removal of the exudate by soaking it up the exudate with small cotton balls using foreign-body forceps through the working canal of the endoscope [5]. The goal is to see the tympanic membrane endoscopically in the first two weeks of treatment. The antibacterial drug administered has to be effective in the inner ear as well [6]. This drug has to penetrate the blood-brain barrier, especially this is important for horses with head tilt (vestibular syndrome). Bacteria in the exudate in the osseous part can move through the middle ear to the inner ear and labyrinthitis can be caused. This labyrinthitis can induce a vestibular syndrome with head tilt [7]. The *canalis facialis* is separated by a thin bone lamella from the *meatus acusticus externus*. This thin bone lamella could be damaged by the purulent exudate in the osseous part of the external ear canal. Neuritis of the facial nerve can cause a deficit of facial muscle activity and reduced tear production with induction of

**Table 1:** 19 Horses with external otitis and with clinical complications. Endoscopic grading, cartilaginous part: I = skin is visible; II = skin is hardly visible; III = skin is not visible; osseous part: I = junction is clearly contoured, light pink epithelium, visible translucent tympanic membrane; II = junction surrounded by a rim of cell debris, several free ceruminous and cell debris, visible translucent tympanic membrane; III = completely obstructed junction, ceruminous and cell debris including dirt accumulation, tympanic membrane not visible.

| Number of horses | Grading of the debris in the external ear canal | | Tympanic membrane | External otitis | Hypertrophy of tympanostylohyoideum | Head tilt | Facial paresis |
|---|---|---|---|---|---|---|---|
| | Cartilaginous part | Osseous part | | | | | |
| 6 | 5x III/III right<br>5x I/III, left<br>1x III/III right<br>1x III/III left | 5x III/III right<br>5x I/III left<br>1x III/III right<br>1x III/III left | Right not visible,<br>left i.tr.<br>on both sides not visible | 5 horses with right-sided,<br>1 horse on both sides | 5 horses with mild right,<br>1 horse with moderate right | no | no |
| 3 | I/III right<br>III/III left | I/III right<br>III/III left | Right i.tr.<br>left not visible | left-side | 3 horses with severe left | no | no |
| 6 | III/III left<br>II/III right | III/III left<br>II/III right | left not visible,<br>right hardly visible | severe on left side and mild on right side | severe in all horses,<br>left guttural pouch | to left side | left facial nerve paresis |
| 1 | III/III right<br>II/III left | III/III right<br>II/III left | Right not visible,<br>left i.tr. | severe on right side | moderate,<br>right guttural pouch | to right side | right facial nerve paresis |
| 2 | III/III right<br>II/III left | III/III right<br>II/III left | Right not visible, left not visible | severe on right ear,<br>moderate on left ear | severe in both horses,<br>right guttural pouch | to right side | right facial nerve paresis |
| 1 | III/III on both sides | III/III on both sides | On both sides not visible | severe on both sides | moderate in both guttural pouches | no | on both sides facial nerve paralysis |

Note: i. tr.= tympanic membrane intact and transparent

corneal ulcer or keratitis. The continuous treatment of these corneal diseases is very important. The successful treatment of purulent external otitis and corneal ulcer had a duration of four weeks based on the controlled eye investigation and endoscopy. The head tilt disappeared within six months, based on the owner's feedback. The inflamed redness of hypertrophic *tympanostylohyoideum* was not visible after four weeks; however, the hypertrophy was still there. The hypertrophy of the *tympanostylohyoideum* can be induced by cytokines of T-cells which are in the inflamed tissue of the external ear canal. These cytokines act as growth factors in the tissue of the *tympanostylohyoideum* [8]. The most important complication in horses with external otitis is hearing loss or deafness. Horses had moderate to severe conductive hearing loss in the diseased ear, as measured by brainstem auditory-evoked response [9]. Only six horses with right-sided external otitis and one horse with right-sided external otitis including facial nerve paresis and head tilt returned to normal hearing after treatment for a period of one to three months.

A deficit of this study is the lack of endoscopy of external ear canals, brainstem auditory-evoked response investigations, and the endoscopy of guttural pouches in order to determine normal *tympanostylohyoideum* in the remaining 12 horses after their initial examinations, including treatment and the necessary follow-up controls in one to six months.

## Conclusion

Horses with head tilt, ear paresis, keratitis, ear discharge, and/or skittishness have to have the external ear canals and guttural pouches endoscoped. The brainstem auditory-evoked response is an objective test to examine the hearing deficit in horses with external otitis. The complications of external otitis in horses include hearing loss, head tilt, facial nerve paresis, keratitis, and hypertrophy of the *tympanostylohyoideum*. The treatment of *otitis externa exudativa purulenta* involves the removal of the exudate from the osseous part of the external ear canal using small cotton balls applied by foreign-body forceps for soaking up the exudate over a period of one to two weeks!

Based on ethical considerations the authors declare that all investigations and treatments of equine patients were carried out in accordance with standard guidelines in animal care and treatment.

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