

Mycoplasma infection of the middle ear in three cats

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Background – *Mycoplasma* spp. are commensal organisms found in association with the mucus membranes of all mammalian species and are implicated in bacterial infections of many different locations. *Mycoplasma* spp. as a primary pathogen associated with otitis media in cats has not been reported.

Objectives – To describe three cats with *Mycoplasma* infection of the middle ear associated with various underlying disease processes.

Animals – Three client-owned cats.

Methods – Clinical examination, aerobic culture of the middle ear and computed tomography or magnetic resonance imaging of the skull.

Results – *Mycoplasma* spp. were grown on aerobic culture from the middle ear of three cats. In Case 1, concurrent neoplasia of the bulla was identified. *Mycoplasma* alone was cultured in Case 2 and *Mycoplasma* was grown in addition to *Bordetella* in Case 3. Case 1 was euthanized, Case 2 responded to *Mycoplasma* targeted therapy and Case 3 responded to *Bordetella* targeted therapy.

Conclusions and clinical importance – *Mycoplasma* infections of the middle ear may be clinically important and require targeted treatment in some cases.

Introduction

Mycoplasma is a genus of fastidious bacteria that lack a cell wall. They are commensal organisms, found in association with the mucus membranes of all mammalian species.¹ Because *Mycoplasma* bacteria are commonly isolated from the respiratory and urogenital tract, their role in disease has been difficult to elucidate; however, they have been implicated in a number of diseases in cats, including keratoconjunctivitis, upper respiratory tract disease, lower respiratory tract disease, soft tissue infections, meningoencephalitis and arthritis.^{2–4} Most often *Mycoplasma* spp. act as secondary pathogens when other more virulent bacteria or viruses are present, or when the animal is in an immunosuppressed state due to systemic disease or medications.²

Otitis media is an uncommon disease in cats that can arise from auditory canal dysfunction, local extension of otitis externa, neoplasia or, rarely, haematogenous spread.⁵ Cats also can develop otitis media secondary to upper respiratory tract infections and sinonasal disease. *Mycoplasma* spp. associated with otitis media in cats has not been reported.

The purpose of this paper is to describe three cats with *Mycoplasma* spp. infections of the middle ear associated with various underlying disease processes.

Case details

Case 1

A 13-year-old male castrated domestic short hair cat was presented for evaluation of mandibular lymph node enlargement and a retrobulbar mass noted during dental prophylaxis. Three months previously, the cat was noted to have nasal discharge. Multiple courses of antibiotics had been prescribed previously, including amoxicillin and clavulanic acid (Clavamox®, Zoetis; Florham Park, NJ, USA), cefovecin (Convenia®, Zoetis), clindamycin and ampicillin. The cat's clinical signs improved temporarily; however, the cat ultimately developed progressive nasal discharge and hyporexia. On presentation, examination of the cat revealed a large, firm mass in the area of the right mandibular lymph node extending caudodorsal behind the right ear. Additionally, there was a corneal ulcer present in the right eye. This finding was suggestive of right-sided facial nerve paralysis; however, other causes of corneal ulceration, such as rubbing from pruritus or other trauma, could not be ruled out.

A complete blood count (CBC) revealed a mild anaemia (haematocrit 32.2%, reference range 34–38%) and mature neutrophilia ($18.05 \times 10^3 \mu\text{L}$, reference range $2–9.2 \times 10^3 \mu\text{L}$). A blood chemistry sample revealed mild hyperglobulinaemia of 4.9 g/dL (reference 2.8–4.8 g/dL). Thoracic radiographs revealed sternal and cranial mediastinal lymphadenopathy. A computerized tomography (CT) scan of the tympanic bullae revealed a fluid-attenuating, mildly enhancing soft tissue lesion within the right tympanic bulla extending into the horizontal external ear canal, with multifocal lysis of the osseous bulla.

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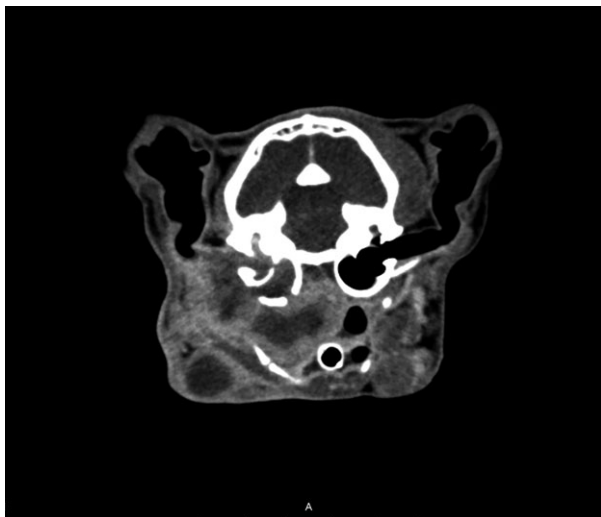


Figure 1. Computed tomography revealing fluid-attenuating, mildly enhancing soft tissue filling the right tympanic bulla and extending into the horizontal external ear canal, with multifocal lysis of the osseous bulla.

Additionally, there was a large abscess associated with the right tympanic bulla extending cranially along the ventral aspect of the skull and a suspect abscessed mandibular lymph node. Lastly, there was bilateral, nonerosive rhinitis, suspected to be either inflammatory or allergic in nature (Figure 1).

An exploratory modified total ear canal ablation (TECA) procedure was performed. Due to postoperative complications of severe swelling and mass infringement of the airway, the cat was euthanized. Biopsy of the bulla, soft tissue ear canal mass and regional lymph nodes were consistent with lymphoma. Additional characterization, such as immunohistochemistry, was not performed. Culture of purulent material from the abscess yielded pure moderate growth of *Mycoplasma* spp. Subsequent PCR and sequencing identified *Mycoplasma felis*.

Case 2

A 9-year-old male castrated Maine Coon cat was presented for evaluation of neurological signs consistent with facial nerve paralysis (inability to blink orprehend food) and Horner's syndrome (third eyelid protrusion, miosis). CBC, serum chemistry and urinalysis were unremarkable. Magnetic resonance imaging (MRI) of the brain revealed a suspect soft tissue mass in the right horizontal external ear canal and fluid accumulation within the right tympanic bulla.

Video otoscopy was performed under general anaesthesia. There was a soft tissue mass visible in the horizontal canal. Biopsies were taken and submitted for histopathology, which revealed suppurative inflammation and granulation tissue. A swab sample from the middle ear was submitted for bacterial culture. Pending culture, the cat was treated with 19 mg/kg amoxicillin and clavulanic acid (Clavamox®, Zoetis) twice daily. Aerobic culture revealed pure moderate to heavy growth of *Mycoplasma* spp. Further speciation was not performed. The cat was treated with 7.5 mg/kg pradofloxacin (Veraflox®, Bayer; Shawnee Mission, KS, USA) once daily. The cat's signs

dramatically improved over the following month; however, the owners elected for TECA of the right ear because the diagnosis of neoplasia could not be excluded with previous biopsy results. The right ear canal and bulla were submitted for histopathology and revealed mild ceruminous gland ectasia with mild chronic lymphoplasmacytic otitis externa. Antibiotic administration was continued for an additional 3 weeks. At the 4 week recheck, all of the cat's signs had resolved with the exception of miosis of the right pupil. There was no recurrence of clinical signs at 1 year post-procedure.

Case 3

An 8-year-old male castrated Siamese cat was presented for an ataxic event after a recent dental procedure. The cat had previously been diagnosed with upper respiratory and dental disease. CBC revealed a mature neutrophilia ($9.44 \times 10^3/\mu\text{L}$). Serum chemistry revealed hypoalbuminemia (2.5 g/dL, reference range 3–4.3 g/dL), hyperglobulinemia (7.5 g/dL) and elevated total protein (9.5 g/dL, reference range 6.5–8.6 g/dL). A urinalysis was unremarkable. The cat was anaesthetized and MRI was performed to pursue causes of generalized ataxia. MRI revealed fluid accumulation in both middle ears with no evidence of inner ear or intracranial involvement.

Video otoscopy and myringotomy were performed bilaterally and swab samples of the middle ear were submitted for cytology and aerobic culture. Cytology revealed many neutrophils with no evidence of infectious organisms or neoplastic cells. Culture of the right ear had light growth of *Bordetella bronchiseptica* and moderate growth of *Mycoplasma* spp. Further speciation was not performed. Culture of the left ear grew approximately 50 colonies of *B. bronchiseptica*. The cat was treated with 18 mg/kg of amoxicillin and clavulanic acid (Clavamox®, Zoetis) twice daily for 6 weeks. This antibiotic choice was based on the presumption that *Mycoplasma*, which is not typically susceptible to this drug class, was present as a secondary pathogen and would resolve with treatment of the *Bordetella*. The cat had complete response to treatment with no recurrence of clinical signs at 1 year post-procedure. Response to *Bordetella* targeted therapy in this cat suggests that *Mycoplasma* may not have been clinically important in this case.

Discussion

Although middle ear neoplasia and otitis media are well recognized in cats, to the best of the authors' knowledge, there is no published information implicating *Mycoplasma* spp. as a clinically important organism in feline otitis media.^{6,7}

In the present case series, *Mycoplasma* spp. were cultured unilaterally in three cats. As the Eustachian tube connects the pharynx to the middle ear, one might expect colonization of normal flora within the bulla. A previous study described the presence of *Mycoplasma* spp. in the bulla of two of 24 normal cats via PCR.⁸ Additionally, some types of bacteria were found in 100% of grossly normal bulla evaluated, suggesting that the bulla epithelium is commonly exposed to the normal bacteria of the pharynx via the Eustachian tube. In another study,

recovery rates of *Mycoplasma* spp. from pharyngeal swabs from cats with and without pulmonary disease were 35% and 39%, respectively, suggesting that *Mycoplasma* spp. are normal inhabitants of the oropharynx of cats and secondary invaders of the lower airway.⁹ With inflammation, there is decreased ciliated epithelium propulsion and/or Eustachian tube dysfunction (e.g. from neoplasia or sinonasal disease), favouring the development of otitis media. One study, evaluating the prevalence of select infectious agents in inflammatory nasopharyngeal polyps, revealed that 13.3% of samples were PCR-positive for *Mycoplasma* spp.⁸

In Case 1 of our series, histopathology confirmed lymphoma of a bulla mass. Cases of otitis media secondary to lymphoma of the middle ear have been documented previously; however, no information on secondary infectious processes was provided.^{7,10} Malignant middle ear tumours of the cat are rare. The most commonly reported feline aural tumours include squamous cell carcinoma, lymphoma, ceruminous gland adenocarcinoma and fibrosarcoma.^{6,7} Little information is available with regards to secondary infections in these cases.

Cases 2 and 3 of our series are examples of primary, non-neoplastic otitis media. Although Case 3 had a history of upper airway disease, we do not have a definitive answer for what led to the otitis media in either case. Otitis media secondary to sinonasal disease seems plausible as neither cat had evidence of otitis externa or neoplasia, and haematogenous spread appears to be rare.⁵

Bulla effusion and positive *Mycoplasma* spp. culture were confirmed in all three of our cases. The effusion appeared to be clinically relevant as all three cats were presented for neurological signs and/or Horner's disease. The relevance of the recovery of *Mycoplasma* spp. by culture or PCR remains to be elucidated. Accepted treatment for *Mycoplasma* spp. is with macrolides, fluoroquinolones and tetracyclines.^{1,2,11} Unfortunately, due to the abrupt euthanasia of Case 1, no antimicrobial therapy was initiated and response to therapy could not be interpreted. Case 2 was refractory to empiric therapy; however, the cat responded to therapy targeted towards

Mycoplasma spp. Case 3 responded to therapy targeted towards *Bordetella*, indicating that *Mycoplasma* spp. may have been an opportunistic organism and not clinically important.

In conclusion, culturing mycoplasma from the middle ear, especially in a pure culture, may represent a primary pathogen and require targeted therapy.

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Résumé

Contexte – *Mycoplasma* spp. sont des organismes commensaux trouvés en association au niveau des membranes muqueuses de toutes les espèces de mammifères et sont impliqués dans les infections bactériennes de nombreuses localisations différentes. *Mycoplasma* spp. En tant que pathogène primaire d'otite moyenne chez le chat n'a pas été rapporté.

Objectifs – Décrire trois chats atteints d'infection de l'oreille moyenne à *Mycoplasma* associée à des maladies sous-jacentes différentes.

Sujets – Trois chats de propriétaires.

Méthodes – L'examen clinique, la culture aérobie de l'oreille moyenne et un scanner ou une IRM du crâne ont été réalisés.

Résultats – *Mycoplasma* spp. a poussé sur culture aérobie de l'oreille moyenne des trois chats. Dans le cas 1, une néoplasie concourante de la bulle a été identifiée. *Mycoplasma* seul a été cultivé dans le cas 2 et *Mycoplasma* associé à *Bordetella* a poussé dans le cas 3. Le cas 1 a été euthanasié, le cas 2 a répondu à un traitement ciblant *Mycoplasma* et le cas 3 a répondu à un traitement ciblant *Bordetella*.

Conclusions et importance clinique – Les infections à *Mycoplasma* de l'oreille moyenne peuvent être cliniquement importantes et nécessiter un traitement ciblé dans certains cas.

Resumen

Introducción – *Mycoplasma spp.* son organismos comensales encontrados en asociación con las membranas mucosas de todas las especies de mamíferos y están implicados en infecciones bacterianas de muchas localizaciones diferentes. *Mycoplasma spp.* como patógeno primario asociado con la otitis media en gatos no ha sido previamente descrito.

Objetivos – Describir tres gatos con infección por *Mycoplasma* del oído medio asociado a diversos procesos patológicos subyacentes.

Animales – Tres gatos de propietarios privados.

Métodos – Examen clínico, cultivo aeróbico del oído medio y tomografía computarizada o resonancia magnética del cráneo.

Resultados – Se cultivó *Mycoplasma spp.* en cultivo aeróbico del oído medio de tres gatos. En el caso 1 se identificó una neoplasia concurrente de la bulla. *Mycoplasma* por sí solo se cultivó en el caso 2 y *Mycoplasma* se cultivó junto con *Bordetella* en el caso 3. El caso 1 fue eutanasiado, el caso 2 respondió a tratamiento dirigido frente a *Mycoplasma* y el caso 3 respondió a tratamiento dirigido frente a *Bordetella*.

Conclusiones e importancia clínica – Las infecciones por *Mycoplasma* del oído medio pueden ser clínicamente importantes y requerir tratamiento específico en algunos casos.

Zusammenfassung

Hintergrund – *Mycoplasma spp.* sind Kommensale, die an den Schleimhäuten aller Säugetierspezies vorkommen und als Verursacher bakterieller Infektionen an vielen verschiedenen Körperstellen gefunden werden. *Mycoplasma spp.* als Primärpathogen im Zusammenhang mit einer Otitis media bei Katzen wurde bisher nicht beschrieben.

Ziele – Eine Beschreibung von drei Katzen mit einer *Mycoplasma* Infektion des Mittelohrs, die mit verschiedenen zugrundeliegenden Prozessen auftrat.

Tiere – Drei Katzen aus Privathaushalten.

Methoden – Klinische Untersuchung, aerobe Kultur des Mittelohrs und eine Computertomografie sowie eine Magnetresonanztomografie des Schädels.

Ergebnisse – *Mycoplasma spp.* konnten aus den aeroben Kulturen des Mittelohrs der drei Katzen isoliert werden. Bei Fall 1 wurde eine gleichzeitige Neoplasie der Bulla identifiziert. *Mycoplasma* alleine wurde bei Fall 2 kultiviert und *Mycoplasma* wurde gleichzeitig mit *Bordetella* bei Fall 3 isoliert. Der erste Patient wurde euthanasiert, Fall 2 reagierte positiv auf eine auf *Mycoplasma* ausgerichtete Therapie und Fall 3 verbesserte sich nach einer auf *Bordetella* abgezielten Behandlung.

Schlussfolgerungen und klinische Bedeutung – *Mycoplasma* Infektionen des Mittelohrs können klinisch wichtig sein und machen eine zielgerichtete Therapie in einigen Fällen notwendig.

要約

背景 – マイコプラズマはすべての哺乳動物の粘膜に認められる共生生物であり、様々な部位の細菌感染に関与している。主要病原体としての猫のマイコプラズマ性中耳炎はこれまで報告されていない。

目的 – 様々な基礎疾患に伴うマイコプラズマ性中耳炎の猫3頭を報告すること。

供与動物 – 3頭の飼い猫。

方法 – 身体検査、中耳サンプルの好気性細菌培養、および頭部のコンピュータ断層撮影または核磁気共鳴画像法。

結果 – 好気性細菌培養にて、3頭の猫の中耳からマイコプラズマが培養された。症例1では、鼓室胞に腫瘍の同時発生が認められた。症例2では、マイコプラズマのみが培養され、症例3ではマイコプラズマに加えて、ボルデテラも培養された。症例1は安楽死され、症例2はマイコプラズマを対象とした治療に、症例3はボルデテラを対象とした治療に反応した。

結論および臨床的な重要性 – 中耳のマイコプラズマ感染症は臨床的に重要であり、治療を必要とする場合がある。

摘要

背景 – 支原体是所有哺乳動物粘膜上の共生生物, 联合細菌感染, 遍及许多不同位置。但目前尚未报道支原体是猫中耳炎的主要病原体。

目的 – 阐述三只猫中耳感染支原体后, 支原体与各种潜在疾病之间的相关性。

动物 – 三只宠物猫。

方法 – 临床检查、中耳有氧培养、头部的CT或核磁共振。

结果 – 对三只猫中耳进行支原体的有氧培养。病例1确诊并发鼓室肿瘤, 病例2只存在支原体感染, 病例3支原体和博代氏杆菌同时感染。病例1被实施安乐死, 病例2针对支原体治疗有效, 病例3针对博代氏杆菌治疗有效。

结论和临床意义 – 中耳支原体感染在临床上可能具有重要意义, 有些病例需要针对性治疗。

Resumo

Contexto – *Mycoplasma* spp. são microrganismos comensais que habitam as mucosas de todas as espécies de mamíferos e são implicados em infecções bacterianas de diversos locais. *Mycoplasma* spp. como um patógeno primário causador de otite média em felinos ainda não foi relatado.

Objetivos – Descrever três casos de otite média em gatos causadas por *Mycoplasma* spp, associados a diferentes doenças de base.

Animais – Três gatos de proprietários.

Métodos – Exame clínico, cultura aeróbia de secreção oriunda da orelha média e tomografia computadorizada ou ressonância magnética do crânio.

Resultados – *Mycoplasma* spp. foram isolados de cultura aeróbia da orelha média dos três felinos. No caso 1, neoplasia concomitante na bula timpânica foi identificada. No caso 2, somente *Mycoplasma* foi isolado e no caso 3, *Mycoplasma* cresceu juntamente com *Bordetella*. O felino do caso 1 foi eutanasiados. No caso 2, houve boa resposta ao tratamento para *Mycoplasma* e no caso 3, o animal respondeu ao tratamento para *Bordetella*.

Conclusões e importância clínica – Infecções da orelha média por *Mycoplasma* podem ser relevantes e demandar de tratamento específico em alguns casos.