

CASE REPORT

Companion or pet animals

Auricular cutaneous T-cell lymphoma, subtype mycosis fungoides and otitis externa/media in a domestic rat (*Rattus norvegicus forma domestica*)

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Abstract

An adult female, entire domestic rat (*Rattus norvegicus forma domestica*) presented with swollen auricles and incoordination. The rat was diagnosed with bilateral otitis externa. Radiographs of the skull revealed bilateral otitis externa/media. Bacterial culture of a swab from the external ear canals identified large numbers of *Pasteurella pneumotropica* as well as fewer *Streptococcus merionis*, *Bacteroides fragilis* and *Fusobacterium* spp. Microscopic examination of a deep skin scraping and a core needle biopsy of the pinnae diagnosed lymphoma. The animal was euthanased after being treated unsuccessfully symptomatically for 10 days. Postmortem examination revealed a cutaneous T-cell lymphoma, mycosis fungoides, associated with bilateral otitis externa/media and metastases into several lymph nodes, thymus and lungs. Cutaneous T-cell lymphoma has not been reported in pet rats to date. Lymphoma should be considered as a differential diagnosis in rats presented with swelling of the pinnae.

KEYWORDS

lymphoma, otitis, pet rat, *Rattus norvegicus forma domestica*

BACKGROUND

In this case report, the authors described the clinical presentation, imaging features as well as postmortem examination of cutaneous T-cell lymphoma (CTCL) in a pet rat.

CTCL are a heterogenous group of epitheliotropic and non-epitheliotropic lymphomas with primary manifestations in the skin, mucocutaneous junctions and oral mucosa.¹ Mycosis fungoides (MF) is the most common cutaneous epitheliotropic T-cell lymphoma in domestic animals, especially dogs, horses and cats.^{2,3} In contrast to humans, MF in animals presents as an aggressive disease that progresses from cutaneous patches to larger masses and ultimately causes local and distant metastases as well as leukaemia (Sezary syndrome).⁴

Spontaneous lymphomas have been reported in different laboratory rat strains,^{5–9} but only one report mentioned a distinct CTCL in a laboratory-held marsh rice rat (*Oryzomys palustris*).⁷ This is the first report of an epitheliotropic T-cell lymphoma, subtype MF, in a pet rat.

CASE PRESENTATION

A 250 g, 14-month-old, female, entire domestic rat (*Rattus norvegicus forma domestica*) was presented to the small animal clinic, Freie Universität Berlin, due to progressively swollen auricles and ataxia.

On physical examination, the animal was alert, but was running repeatedly in circles to the left side. The rat's pinnae, nose and skin of the anus were swollen and reddened. Both external ear canals were filled with purulent material (Figure 1); therefore, otoscopic examination was not possible. No signs of pruritus or respiratory disease were obvious.

INVESTIGATIONS

For further diagnostic workup, the animal was sedated with midazolam (0.5 mg/kg subcutaneous [SC], Midazolam, Boehringer Ingelheim, Germany) and butorphanol (1 mg/kg

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SC, Butorgesic, CP-Pharma Handelsgesellschaft, Germany). Radiographs of the skull in lateral and dorsoventral projection were performed. Both tympanic bullae were filled with soft tissue opaque material and the osseous walls were thickened (Figure 2). These findings were consistent with bilateral otitis media.

Cytological examination of a deep skin scraping of the pinnae, taken while the patient was still sedated, revealed many large lymphocytes with prominent nucleoli, and a presumptive diagnosis of lymphoma was made (Figure S1). Histopathological examination of a core needle biopsy of the ears, which was taken the following day under sedation (as previously described), identified a uniform population of large lymphocytes with prominent nucleoli and epitheliotropism, and confirmed the diagnosis of epitheliotropic lymphoma.

Microbiological examination of a swap of the external ear canals revealed large numbers of *Pasteurella pneumotropica* and fewer *Streptococcus merionis*, *Bacteroides fragilis* and *Fusobacterium* spp. *Pasteurella pneumotropica* tested sensitive for enrofloxacin.

TREATMENT

The animal was treated symptomatically with meloxicam (0.5 mg/kg orally [PO] once a day [SID], Metacam, Boehringer Ingelheim, Germany) and metamizol (65 mg/kg PO thrice a day [TID], Novaminsulfon-ratiopharm Tropfen, Ratiopharm, Germany), enrofloxacin (10 mg/kg PO SID, Baytril, Bayer Health Care, Berlin, Germany), as well metoclopramid (0.5 mg/kg PO TID, Emeprid, Ceva, Germany) to improve quality of life.

OUTCOME AND FOLLOW-UP

The animal's clinical condition deteriorated over the next 10 days. Both ears were severely swollen, and the rat was in poor general condition. The owner declined further treatment and the animal was humanely euthanased.

Computed tomographic imaging and postmortem examination confirmed a bilateral soft tissue opacity in the tympanic bullae and the external ear canals consistent with a diagnosis of bilateral otitis externa/media (Figure 3).

There was severe swelling of both pinnae and the surrounding skin, enlargement of multiple lymph nodes (submandibular, retropharyngeal, axillar and popliteal) and the thymus contained a tan, soft mass (Figures S2 and S3). There were similar foci in the lungs. Histopathologically, in section of skin from the pinna, nose and perianal region medium to large size lymphocytes diffusely infiltrated in the superficial to mid-dermis and multifocally infiltrated the epidermis and epithelium of adnexal structures. Within the epidermis, these lymphocytes formed multifocal cavities filled with lymphocytes, Pautrier's microabscesses (Figure 4a). A diagnosis of a cutaneous epitheliotropic lymphoma was made and immunophenotyping was performed to reach a final diagnosis. Immunohistochemically, the neoplastic lymphocytes were positive for CD3 (T-cell marker) (Figure 4b) and negative for CD45R (B-cell marker) (Figure S4), thereby confirming a diagnosis of MF. The grossly enlarged lymph nodes and the thymus were diffusely effaced by dense infiltrates of medium-to-large size

LEARNING POINTS/TAKE HOME MESSAGES

- Lymphoma should be considered as a differential diagnosis in rats presented with diffuse swelling of the pinnae and may be associated with secondary inflammation.
- Mycosis fungoides is the most common cutaneous epitheliotropic T-cell lymphoma in domestic animals.
- In contrast to humans, mycosis fungoides in animals presents as an aggressive disease that progresses from cutaneous patches to larger masses, and ultimately causes local and distant metastases as well as leukaemia.



FIGURE 1 Inflamed left ear with purulent material occluding the ear canal of a 14-month-old, female domestic rat with cutaneous epitheliotropic T-cell lymphoma and otitis

lymphocytes. Similar lymphocytes multifocally infiltrated the lungs and there was a concurrent moderate, multifocal, acute bronchitis.

Both middle ear canals were diffusely filled with purulent exudate, consistent with a diagnosis of otitis media.

DISCUSSION

CTCL is an uncommon disease in animals.^{10,11} It only accounts for approximately 5% of all canine lymphomas¹⁰ and is infrequently diagnosed in cats,¹² horses,¹³ rabbits^{14,15} and hamsters.¹⁶ With a share of 50%, MF is the most common subtype of CTCL in human patients¹⁷ and is also the most frequent subtype observed in dogs.¹⁸ Even though the occurrence of CTCL in humans has been observed in association with various infectious agents and chronic inflammation¹⁹ and one study in dogs reported an association between CTCL and atopic dermatitis,²⁰ a true correlation has not been shown,¹¹ leaving the aetiology of CTCL largely unknown.⁴

For rats, only a single case report of CTCL, subtype MF, in a marsh rice rat (*Oryzomys palustris*) has been published.⁷ As in our case, both pinnae of the animal were affected, and the lymphoma had disseminated to the liver and spleen.⁷ MF has been reported in various locations of the skin in



FIGURE 2 Radiograph of the skull of a 14-month-old, female domestic rat (dorsoventral projection) with cutaneous epitheliotropic T-cell lymphoma and otitis: thickened osseous wall and filling with soft tissue opaque material of both tympanic bullae (↑)



FIGURE 3 CT scan of the skull (transversal plane) of the 14-month-old, female domestic rat with cutaneous epitheliotropic T-cell lymphoma and otitis. Left and right bulla (*), external ear canals (↓). Note that while left and right bulla as well as left external ear canal are filled with soft tissue opaque material, the right meatus acusticus externus appears unaffected in this image

domestic animals,^{4,18} a predisposition of the pinna has not been described. In contrast to our case, the rat of the previous case report had no clinical signs except mild dehydration and thickened and mildly ulcerated skin of the ears.⁷

Other spontaneously occurring neoplasms affecting the ears of rats have rarely been reported: one case report described a Zymbal's gland carcinoma presenting as an otitis externa in a pet rat²¹; another a spontaneous middle ear adenocarcinoma in a 15-week-old male Crl:CD (SD) rat.²²

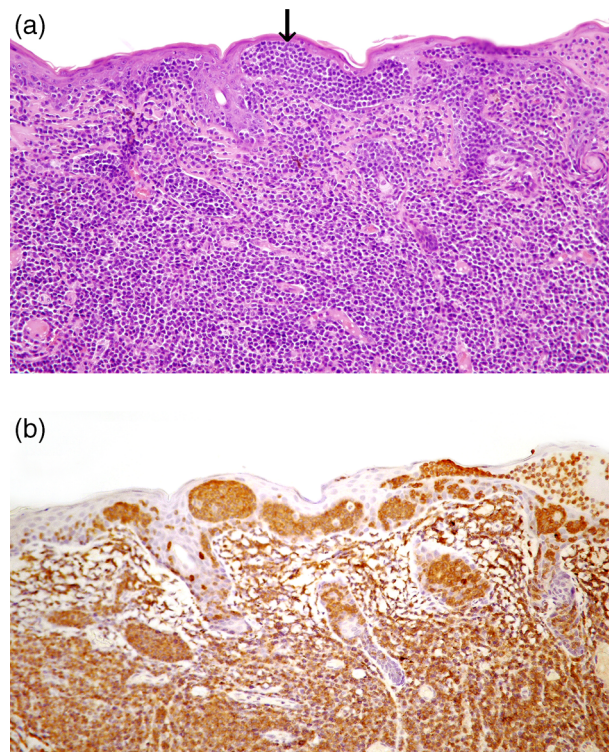


FIGURE 4 (a) Photomicrograph of the skin of the rat's pinna with diffuse infiltration of the dermis by a uniform population of large lymphocytes. Note the marked epitheliotropism consistent with diagnosis of a cutaneous epitheliotropic lymphoma (↓), H&E stain, 400× magnification. (b) Photomicrograph of the skin of the rat's pinna immunohistochemically labelled with CD3 (T-cell marker). The neoplastic cells are diffusely positive for CD3, confirming the diagnosis of an epitheliotropic T-cell lymphoma, mycosis fungoides. DAB, haematoxylin counterstain, 400× magnification

Neoplasms that obstruct the ear canals might promote otitis externa in companion animals.^{23,24} Hence, the development of severe otitis externa in this animal may have been secondary to lymphoma of the pinnae with subsequent development of otitis media. A similar pathogenesis has been suggested in a report of a leiomyosarcoma in a chinchilla with left-sided otitis externa/media/interna.²⁵ It is noteworthy in this context that tumour growth and inflammation occurred bilaterally in both pinnae of this rat.

Otitis externa is a rare disease in pet rats,^{21,23,26} whereas otitis media and otitis interna occur more frequently and can be the result of chronic disease of the respiratory tract with involvement of the middle ear.²⁷ Microbiota of the middle ears in rats with otitis media was found to be only partially different to microbiota of rats with unaffected ears.²⁸ Detection of *Pasteurella pneumotropica* has been correlated with clinically apparent otitis media.²⁸ The animal in our case report had no respiratory symptoms; however, acute multifocal purulent bronchitis was found on histopathological examination. A spread of bacterial infections from the airways to the ears in this case seems possible; however, a descending infection from the middle ear was considered more likely.

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CONFLICT OF INTEREST

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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