



# Prevalence of external ear disorders in Belgian stray cats

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## Abstract

**Objectives** Feline otitis externa is a multifactorial dermatological disorder about which very little is known. The objective of this study was to map the prevalence of external ear canal disorders and the pathogens causing otitis externa in stray cats roaming around the region of Ghent, Belgium.

**Methods** One hundred and thirty stray cats were randomly selected during a local trap–neuter–return programme. All cats were European Shorthairs. This study included clinical, otoscopic and cytological evaluation of both external ears of each cat. Prospective data used as parameters in this study included the sex, age and body condition score of each cat, as well as the presence of nasal and/or ocular discharge, and the results of feline immunodeficiency virus (FIV) and feline leukaemia virus (FeLV) Snap tests.

**Results** Remarkably, very few (sub)clinical problems of the external ear canal were found in the stray cat population. *Malassezia* species was by far the most common organism found in the external ear canals of the 130 stray cats. A total of 96/130 (74%) cats were found to have *Malassezia* species organisms present in one or both ears based on the cytological examination. No correlation was found between the parameters of sex, age, body condition score, the presence of nasal and/or ocular discharge and FIV and FeLV status, and the presence of parasites, bacteria or yeasts.

**Conclusions and relevance** This study provides more information about the normal state of the external ear canal of stray cats. The ears of most stray cats are relatively healthy. The presence of *Malassezia* species organisms in the external ear canal is not rare among stray cats.

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## Introduction

Otitis externa is defined as inflammation of the external ear canal. This condition is only rarely seen in both stray and domestic cats. The diagnosis is usually made by clinical examination in combination with direct otoscopic examination and cytology of otic exudates.<sup>1,2</sup>

Very little data concerning the prevalence and incidence of otitis externa in cats have been published. Recently, a study in domestic cats in the UK mentioned a prevalence of feline otitis of 19%. However, no information about the diagnostic methods used or the size of the study population was reported.<sup>3</sup> A Romanian study declared a prevalence of 2% in a population of 4572 domestic cats.<sup>4</sup> Older studies report a prevalence of otitis externa in domestic cats to be between 2% and 10%.<sup>5–7</sup>

Evaluating ear health in stray cats may contribute to improving the knowledge of regional pathogens causing otitis externa in both stray and domestic cats. More information about this matter will lead to the improvement of animal welfare.

The aim of this study was therefore to map the prevalence of otic changes and the pathogens causing otitis externa in stray cats roaming around the region of Ghent, Belgium. Possible predisposing factors such as sex, age, body condition score (BCS), the presence of nasal and/or ocular discharge, feline immunodeficiency virus (FIV) and feline leukaemia virus (FeLV) status, and microorganisms identified during otoscopic and cytological examination of the ear were included in this study.<sup>8</sup>

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## Materials and methods

### Sampling, cytological evaluation and data collection

In association with the Belgian Faculty of Veterinary Medicine of Ghent University, the City of Ghent invests in a trap–neuter–release programme for stray cats. This study includes the data of 130 of these stray cats.

The presence of wounds (yes or no), alopecia (yes or no), crusts (yes or no) and erythema (yes or no) on the pinnae was recorded on dedicated sheets. However, differentiation between self-trauma or lesions caused by external trauma was not recorded.

Otosopic evaluation included evaluation of the status of the eardrum (visible or not; translucent or opaque; curved or not; intact or ruptured), the appearance of the cerumen (translucent, white, yellow, light brown or dark brown) and the condition of the external ear canal (pink or red, stenosis or not, ulcerations or not and presence of a mass or not).

Samples for cytological evaluation were obtained by inserting a cotton swab (one per ear) into the external ear canal and gently rubbing it against the surface of the vertical part of the canal with the aim of collecting debris. Each cotton swab was rolled out on two clean microscope slides, evenly distributing a thin layer of material.

One slide per ear was not stained but suspended with mineral oil and covered with a cover slip. The other slide was stained with a Diff-Quik stain.

The unstained slide was scanned under the microscope at low power ( $\times 100$ ) for the presence and number of ear mites (*Otodectes cynotis* and *Demodex* species).

The Diff-Quik-stained slide was inspected first at low power ( $\times 100$ ) (in order to identify the areas of interest for this investigation) and subsequently under high power ( $\times 400$ ) to evaluate six different high-power dry fields for the presence and number of bacteria (cocci and rods) and yeasts (*Malassezia* species), leukocytes (neutrophils and macrophages), melanin and saprophytes. The presence and number of epithelial cells (nucleated or not), desquamated epithelial cells and hair were evaluated in the first three high-power dry fields. Cytology is a common method used for identifying *Malassezia* species.<sup>9–11</sup> All cytological samples were evaluated by the same person.

Prospective data used as parameters in this study included the sex, age and BCS of each cat, as well as the presence of nasal and/or ocular discharge and the results of FIV and FeLV Snap tests (IDEXX Laboratories). Age was estimated and classified into three categories:  $<6$  months, between 6 months and 2 years, and  $>2$  years. These parameters could be possible predisposing factors of otitis externa.<sup>8</sup>

In this study, the presence of parasites, bacteria, yeast, light- or dark-brown appearance of the cerumen, a red-coloured external ear canal, neutrophils and nucleated epithelial cells, as well as wounds, alopecia, crusts and

erythema of the pinna, were considered to be signs of otitis externa.<sup>12</sup>

## Results

### Demographical data and clinical signs

The frequency of the possible predisposing factors of otitis externa – sex, age and BCS of each cat, as well as the presence of nasal and/or ocular discharge and the test results of FIV and FeLV Snap tests – can be found in Table 1. No correlation was found between the parameters and the presence of parasites, bacteria or yeast.

### Examination of the pinnae

Thorough examination of the pinnae revealed cats with wounds 13/130 (10%), alopecia 10/130 (8%), crusts 12/130 (9%) and erythema 1/130 (1%).

### Otosopic examination

The tympanic membranes could be assessed in 105/130 (81%) cases. Otoscopic examination revealed that in cats where the tympanic membrane could be visualised the eardrum was intact in 105/105 (100%), not curved in 104/105 (99%) and translucent in 95/105 (90%) cases.

The majority of the 130 cats had cerumen of the same colour in both ears. Light-brown-coloured cerumen was present in 40 cats. Translucent cerumen was present in 28 cats. White, yellow and dark-brown-coloured cerumen occurred in approximately equal amounts of, respectively, 18, 16 and 16 cats. Together with light- or dark-brown cerumen other changes of the ear canal – such as the presence of parasites, bacteria, yeast, light- or dark-brown appearance of the cerumen, a red-coloured external ear canal, neutrophils, nucleated epithelial cells, as well as wounds, alopecia, crusts and erythema of the pinna – could be found in 40/56 (71%) of the cases.

### Cytological evaluation

*O. cynotis* was only discovered in 3/130 (2%) cats. In all three cases the ear mites were present bilaterally.

A total of 96/130 (74%) cats were found to have *Malassezia* species present in one or both ears based on the cytological examination. *Malassezia* species were present bilaterally in 49/96 (51%) cats and unilaterally in the remaining 47/96 (49%) cats (24% and 23%, left and right, respectively). Cats in which *Malassezia* species were present were sometimes also presented with other changes in the ear canal and/or pinnae. In 90/96 cats – uni- or bilaterally presented with *Malassezia* species – an average of three or fewer *Malassezia* species organisms were found per high-power dry field (Table 2). An average of more than three *Malassezia* species organisms per high-power dry field was found unilaterally in 3/96 cats and bilaterally in an additional three cats (Table 3). These six cats were diagnosed as having uni- or bilateral *Malassezia* species otitis, purely based

**Table 1** Frequency of possible predisposing factors of otitis externa in the population of stray cats used in this study

Variable	Category	Cases (n = 130)	%
Sex	Male	61	47
	Female	65	50
	Unknown	4	3
Age	<6 months	10	8
	6 months to 2 years	67	52
	>2 years	36	28
	Unknown	17	13
Body condition score	1–3	12	9
	4–6	107	82
	7–8	10	8
	Unknown	1	1
Feline immunodeficiency virus	Yes	13	10
	No	117	90
Feline leukaemia virus	Yes	6	5
	No	124	95
Nasal discharge	Yes	10	8
	No	120	92
Ocular discharge	Yes	13	10
	No	117	90

**Table 2** Cats presented with *Malassezia* species (mean of <3/high-power field) together with other changes in the ear canal and pinnae (n = 90)

	Bilaterally	Unilaterally left	Unilaterally right
<i>Malassezia</i> + light- or dark-brown colour of the cerumen	17 (19)	9 (10)	11 (12)
<i>Malassezia</i> + erythematous ear canal	0 (0)	1 (1)	0 (0)
<i>Malassezia</i> + nucleated epithelial cells	6 (7)	14 (16)	17 (19)
<i>Malassezia</i> + neutrophils	5 (6)	16 (18)	20 (22)
<i>Malassezia</i> + pinnal crusts	4 (4)	5 (6)	7 (8)
<i>Malassezia</i> + pinnal erythema	0 (0)	0 (0)	1 (1)
<i>Malassezia</i> + pinnal wounds	1 (1)	4 (4)	4 (4)
<i>Malassezia</i> + pinnal alopecia	4 (4)	7 (8)	6 (7)

Data are n (%)

on the number of *Malassezia* species organisms present. Cats with a positive FIV or FeLV status were not presented with more *Malassezia* species than FIV- and FeLV-negative cats. A total of 8/13 (61%) FIV-positive cats and 3/6 (50%) FeLV-positive cats (one cat tested both FIV- and FeLV-positive) were uni- or bilaterally presented with *Malassezia* species organisms vs 77% presence of *Malassezia* species organisms in the 112 cats with a negative Snap test. In 7/8 cats with FIV and *Malassezia* species organisms present, an average of three or fewer

*Malassezia* species organisms were found per high-power dry field. The remaining FIV-positive cat (which also tested FeLV-positive) was diagnosed with unilateral *Malassezia* species otitis (mean of >3 *Malassezia* species organisms per high-power field). In 2/3 FeLV-positive cats with *Malassezia* species organisms present in the ears, an average of three or fewer *Malassezia* species organisms were found per high-power dry field, whereas the third cat (which also tested FIV-positive) had unilateral *Malassezia* species otitis.

**Table 3** Number of cats presented with *Malassezia* species (mean of >3/high-power field) together with other changes in the ear canal and pinnae

	Bilaterally	Unilaterally left	Unilaterally right
<i>Malassezia</i> + light- or dark-brown colour of the cerumen	5/6	0/6	0/6
<i>Malassezia</i> + erythematous ear canal	0/6	1/6	0/6
<i>Malassezia</i> + nucleated epithelial cells	0/6	2/6	1/6
<i>Malassezia</i> + neutrophils	1/6	1/6	1/6
<i>Malassezia</i> + pinnal crusts	0/6	0/6	1/6
<i>Malassezia</i> + pinnal erythema	0/6	0/6	0/6
<i>Malassezia</i> + pinnal wounds	1/6	0/6	0/6
<i>Malassezia</i> + pinnal alopecia	1/6	0/6	0/6

Cocci were found unilaterally in 10 cats, of which two cats with a high number of cocci (20 and 44 cocci vs two or four cocci in the other eight cats) also showed other changes in the ear canals and/or pinnae. Rods were found unilaterally in two other cats, in both only a minimal number of rods (one and six, respectively) were present.

Melanin clumps (maximum three per ear) were present bilaterally in 29/130 (22%) cats and unilaterally left and right in 25/130 (19%) and 33/130 (25%) cats, respectively. Only low amounts of melanin clumps were reported.

Saprophytes (maximum six per ear), visualised as brown hyphenated structures, were present bilaterally in 50/130 (38%) cats and unilaterally left and right in 20/130 (15%) and 22/130 (17%) cats, respectively. Further identification of these saprophytes was not performed. Thirty-five of those cats also showed other changes such as the presence of parasites, bacteria, yeast, light- or dark-brown appearance of the cerumen, a red-coloured external ear canal, neutrophils and nucleated epithelial cells, as well as wounds, alopecia, crusts and erythema of the pinna. And, finally, desquamated epithelial cells were present bilaterally in 45/130 (35%) cats and unilaterally left and right in 24/130 (18%) and 26/130 (20%) cats, respectively.

## Discussion

The aim of this study was to gain more information about the normal state of the external ear canal of stray cats. Very little information about this subject can be found, making it difficult to compare the results of this study with literature. Furthermore, the existing studies concerning otitis externa in cats sampled domestic cats, not stray cats.<sup>3-6</sup>

We assumed that a lot of (sub)clinical problems of the external ear canal would be present in the stray cat population, as compared with domestic cats, owing to the lack of human intervention and more contact with other animals, which increases the probability of pathogen transmission.

This study reported the prevalence of *O. cynotis* to be 2%. This is in agreement with the 1% detected in an Australian study by Coman et al.<sup>13</sup> and the 2.2% detected in a Portuguese study by Duarte et al.<sup>14</sup> However, the value reported in this study is very different from the 29.4% detected by the Italian study by Perego et al.<sup>15</sup> and the 37% detected by the study conducted in Florida by Akucewich et al.<sup>16</sup> The high variation in values concerning *O. cynotis* can probably be explained by the difference in the living conditions of the cats, included in the studies, according to where the study was conducted.

Otoscopic and cytological evaluation surprisingly revealed that the ears of most of the 130 stray cats were relatively healthy. This is in strong contrast to an Italian study by Perego et al.<sup>15</sup> The results of that study showed a high prevalence of otitis externa in stray cats. The difference in climate of both countries in which the studies were conducted may explain this very different outcome.

*Malassezia* species was found – uni- or bilaterally – in 96/130 (74%) cats in this study. This is consistent with a lot of previous studies. The previously mentioned Italian study,<sup>15</sup> a Spanish study,<sup>17</sup> another Italian study by Nardoni et al.,<sup>18</sup> a Japanese study<sup>19</sup> and a Hungarian study<sup>20</sup> reported prevalences of *Malassezia* species in domestic or stray cats of 50.5%, 58.7%, 49.6%, 82.3% and 48.9%, respectively.

*Malassezia* species are opportunistic organisms that belong to the normal aural microflora and may cause otitis externa. A total of three or fewer *Malassezia* species organisms per high-power dry field is considered to be normal. We found that six cats had more than three organisms per high-power field (uni- or bilateral), indicating an excessive amount of *Malassezia* species present. These cats were labelled as having *Malassezia* species otitis in this study. However, this is just based on the excessive amount of *Malassezia* species organisms in the cytological preparation of the ears – it was not correlated with pruritus or response to therapy. The other changes in the cats diagnosed with *Malassezia* species otitis included a different colour cerumen (5/6 cats), or lesions of the pinnae

consisting of alopecia or wounds (2/6 cats). Remarkably, only one cat had erythema of the ear canal and another cat had neutrophils on the cytological examination of the cerumen. Moreover, these other changes were not significantly different from the changes seen in cats with fewer than three *Malassezia* species organisms per HPF. The clinical relevance of more *Malassezia* species organisms in the ears is unclear and could not be determined as there was no follow-up for the cats in this study. As *Malassezia* species can cause a hypersensitivity reaction, the actual number of yeasts must always be correlated with the complaints of the owner or clinical signs.<sup>21,22</sup>

The presence of melanin can be explained by the skin and coat colour of the cat. Unfortunately, the skin and coat colour of the 130 cats was not recorded. Postinflammatory hyperpigmentation can also be the cause of a higher amount of melanin in the external ear canal.<sup>23</sup> However, postinflammatory hyperpigmentation could not be evaluated in this study, as a complete health history in these stray cats was not obtainable.

The previously reported stray cat studies did not mention the presence of melanin clumps.

The environment and lifestyle of each individual cat can possibly influence the presence of saprophytes. As all 130 cats lived in the region of Ghent we cannot make any assumptions about the influence of the environment. However, we can assume that the age and sex of a cat can affect its lifestyle and therefore influence the presence of saprophytes.

The previously reported stray cat studies did not monitor the FIV and FeLV status of the cats. Previously, and historically, FIV and FeLV have been linked to opportunistic infections, including otitis. However, from the limited number of cats with FIV and FeLV in this study, no such link can be made. Parameters such as sex, age, BCS, the presence of nasal and/or ocular discharge and FIV and FeLV status did not seem to influence the presence of parasites, bacteria and yeast. Either there really was no correlation, or the population of this study was too small. Another study with an even bigger population might bring some clarity. This is in agreement with the Italian study, where only pregnancy was defined as a risk factor for otitis externa.<sup>15</sup> Pregnancy status was not evaluated in this study, making it impossible to make further statements about this possible correlation.

## Conclusions

The external ear canals of most Belgian stray cats in Ghent and the surrounding area are relatively healthy. *O. cynotis* was only discovered bilaterally in 3/130 (2%) cats. Saprophytes (maximum six per ear) were present bilaterally in 50/130 (38%) cats and unilaterally left and right in 20/130 (15%) and 22/130 (17%) cats, respectively. A total of 96/130 (74%) cats were presented with *Malassezia* species organisms. Even though the presence

of *Malassezia* species in the external ear canal is not rare among these stray cats, only six cats were – uni- or bilaterally – diagnosed as having *Malassezia* species otitis, based on the cytological presence of more than three *Malassezia* species organisms per HPF.

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