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## ***Helicobacter* spp. infection and gastric lesions in domestic and stray cats**

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**AKHTARDANESH, B., S. JAMSHIDI, F. SASANI, M. MOHAMMADI, S. BOKAEI,  
T. Z. SALEHI: *Helicobacter* spp. infection and gastric lesions in domestic and stray  
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### **ABSTRACT**

Gastritis is a common finding in dogs with 35% of the dogs investigated for chronic vomiting and 26% to 48% of asymptomatic dogs affected. However, the true prevalence in cats is yet to be determined. This study aimed to determine the prevalence of chronic gastritis in domestic and stray cats. The total rate was estimated as 66.6%. Thorough histopathological studies revealed no significant association between the occurrence of chronic gastritis and age and sex in either stray or domestic cats. Gastritis was significantly more prevalent in the antrum than the gastric body and only chronic non-specific gastritis was diagnosed. The most common types of chronic non-specific gastritis were atrophic (26.3%), lympho-plasmacytic (24.6%) and hypertrophic (15.8%), respectively. In chronic gastritis cases, fibrosis and lymphoid follicles were seen in 42.1% and 31.6% of the subjects respectively, but no significant associations were observed between the type of non-specific chronic gastritis, fibrosis and occurrence of lymphoid follicles. The prevalence of gastric erosion and ulcers in cats was 19.2% and 3.5%, respectively, and there was no significant association between chronic gastritis occurrence and gastric ulceration or erosions. Cytological examination revealed GHLO colonization in 63.15% of the antrum and 77.19% of the gastric body, with no correlation with non-specific chronic gastritis in the studied subjects.

**Key words:** cat, gastroscopy, histopathology, gastritis, cytology

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## Introduction

Chronic vomiting is a common gastrointestinal complaint in dogs and cats, and is often linked to chronic gastritis, but histologically verified chronic gastritis is a poorly documented entity in these species (GUILFORD and STROMBECK, 1996).

Various classifications of chronic gastritis have been used, including etiological and histological classification, which have overlapping clinicopathologic features. Etiologic classification is possible if the primary cause is identified, such as food allergy, non-steroidal anti-inflammatory drugs (NSAID), or uremia. However, in most cases of chronic gastritis the main cause remains unknown (GUILFORD and STROMBECK, 1996). On the other hand, since *Helicobacter* infection has been implicated in human chronic gastritis the presence of *Helicobacter* in feline gastric biopsy specimens has raised the question of its potential causal role in feline chronic gastritis too (NORRIS et al., 1999).

Some reports have also demonstrated a significant association between *Helicobacters* and chronic gastritis occurrence in the fundus and corpus of cats (HAPPONEN et al., 1996).

Histological features evaluated for classification of chronic gastritis include the type and amount of cellular infiltrate, the area of mucosa affected, and its topography (GUILFORD and STROMBECK, 1996). According to the dominant cell-type, chronic gastritis may be divided into non-specific (mononuclear cells), eosinophilic (eosinophils) and granulomatous (histiocytic) types. Three different types that have been described based on histological appearance of nonspecific gastritis are lympho-plasmacytic, atrophic, and hypertrophic (HAPPONEN et al., 1996).

The main purposes of this study were: 1) to determine the prevalence of chronic gastritis and its different types in cats; 2) identification of other gastric pathological changes such as erosion, ulcer, fibrosis, etc. that may occur in combination with chronic gastritis; 3) determination of the relationship between gastric *Helicobacter*-like organisms (GHLO) infection and gastritis occurrence in infected cats.

## Materials and methods

*Admission and isolation of cats.* In this study two groups of cats were studied. In the first group, 27 pet cats (aged six months or older, both sexes included) living in different regions of Tehran province were admitted. Informed consent was obtained from each pet cat owner. A detailed questionnaire was completed for each admitted cat. Inclusion criteria for pet cats were asymptomatic in terms of vomiting, diarrhoea, anorexia, or mass loss for at least 6 months prior to the study.

Thirty stray cats (aged six months or older, both sexes included) were entrapped from different locations of Tehran province. Inclusion criteria for both domestic and stray cats were normal physical examination and blood count.

*Gastrocopy and sampling.* Twelve-hour fasting cats were anesthetized with acepromazine (0.1 mg/kg, im) and thiopental sodium (nesdonal, 25-30 mg/kg, i/v, given until effective). Gastroscopy was performed with a 4.9-mm diameter pediatric bronchoscope (VET-VU/Swiss). The entire stomach was inspected for any and all gross findings including erythema (redness), erosion (irregular surface irritation), ulcer (focal deep crateriform lesions) and presence of gastritis that was defined with friability or ease of damage to mucosal layer and hypertrophy (edematous rugal folds) or atrophy (ability to observe the sub mucosal vessels). To avoid gastric perforation, biopsies were not taken from ulcerative locations and frequency of ulcers reported only via gastroscopy and not histopathology.

Biopsy forceps were used to obtain pinch biopsies from the body (greater curvature) and antral regions (incisura to pyloric sphincter) of the stomach. From each location two-biopsy samples were prepared. One biopsy specimen was used for cytology and the other was immersed in 10% neutral buffered formalin for histological studies.

*Histopathology.* Formalin-fixed gastric biopsy specimens were embedded in paraffin and sectioned to a 5 µm thickness. Sections were then stained with hematoxylin-eosin and scored separately for the following parameters: presence or absence of gastritis, lymphoid follicles, erosion and/or ulcer and fibrosis (using ×400 magnification).

Lympho-plasmacytic gastritis was defined as infiltration of lymphocyte and plasma cells that vary widely in severity without any mucosal changes. Atrophic gastritis was characterized by thinning of gastric mucosa and reduced numbers of gastric glands, along with increased numbers of lymphocytes and plasma cells. Hypertrophic gastritis was characterized by mucosal proliferation due to hypertrophy and hyperplasia of the glandular epithelium, accompanied by variable amounts of inflammatory cells (GUILFORD and STROMBECK, 1996).

The following grading system was used to count lymphoid follicles (×100 magnification): +1 (one lymphoid follicle), +2 (2 to 3 lymphoid follicles) and +3 (>3 lymphoid follicles).

*Cytology.* Impression smears of gastric mucosa of antrum and body was prepared on an air-dried slide, followed by methanol fixation, and stained with Giemsa for detection of colonization density of Gastric *Helicobacters* (×1000 magnification).

Degree of GHLO colonization (the mean of ten microscopic fields at ×400) was recorded as follows: (0) No organism, (+1) mild: less than 10 bacteria in each field, (+2) moderate: between 10 to 50 bacteria in each field, (+3) severe: more than 50 bacteria in each field.

*Statistical analysis.* The results from different diagnostic methods were collectively studied with SPSS program version 11. McNemar's test was used to compare the prevalence of gastritis, erosion-ulcers and GHLO infection between antrum and body samples.

Correlation between GHLO infection and gastritis occurrence, erosion-ulcer formation with presence of gastritis and erosion-ulcer formation with GHLO infection status were evaluated by one-tailed Fishers test.

Chi square test was used for determination of correlation between the prevalence of gastritis and age, sex and type of cats, differences between the prevalence of GHLO infection in stray and domestic cats and the severity of gastritis with GHLO infection status.

## Results

Regarding histopathologic examination, the total rate of chronic gastritis in cats was 66.7%, but only 26.3% of cats showed macroscopic signs of gastritis via gastroscopy (Table 1). Based on McNemar's test, gastroscopy and histopathologic examinations can not be used interchangeably in diagnosis of chronic gastritis ( $P < 0.001$ ). Also, the histopathological results indicated that there was no significant association between age, sex and occurrence of chronic gastritis in either stray or domestic cats ( $P > 0.05$ ). McNemar's test showed that gastritis was significantly more prevalent in the antrum than gastric body ( $P < 0.05$ ). Every case was diagnosed as a chronic non-specific form of gastritis with no eosinophilic, or granulomatous type of gastritis detected. The most common types of chronic non-specific gastritis were atrophic, lympho-plasmacytic and hypertrophic, respectively (Table 1, Fig. 1). No significant differences were observed in stray vs. domestic animals based on type of chronic gastritis except for hypertrophic gastritis, which was significantly more prevalent in stray cats (23.3%) than domestic (7.4%) ones (Fig. 5). Prevalence of gastric erosion and ulcers (Fig. 2) in cats was 19.2% and 3.5%, respectively. Fishers test revealed no significant association between chronic gastritis occurrence and gastric ulceration or erosions syndrome. In chronic gastritis, fibrosis was present in 42.1% of cases and lymphoid follicles were also diagnosed in 31.6% of cases (Fig. 3), but according to Chi-Square test analysis no significant association was observed between type of non-specific chronic gastritis, fibrosis and lymphoid follicle occurrence. Giemsa staining in cytology examination revealed a GHLO infection rate of antrum, and body as 63.2% and 77.2% of

Table 1. Comparative frequency of different kinds of gastritis in domestic and stray cats via gastroscopy and histopathology

Diagnostic method	Gastritis type				
	No Gastritis	Lympho plasmacytic	Atrophic	Hypertrophic	Total
Gastroscopy	42 (73.7%)	- (0.0%)	10 (17.5%)	5 (8.8%)	57 (100%)
Histopathology	19 (33.3%)	14 (24.6%)	15 (26.3%)	9 (15.8%)	57 (100%)

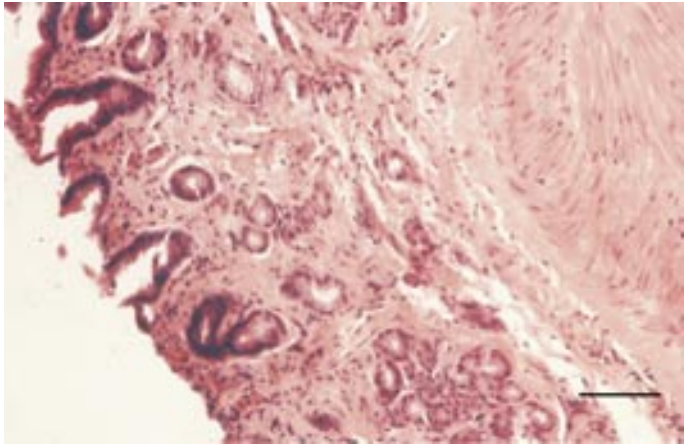


Fig. 1. Chronic atrophic gastritis: Atrophy of villi, parietal cells combined with infiltration of mononuclear cells and interstitial fibrosis. H&E,  $\times 400$ , scale bar = 200  $\mu\text{m}$

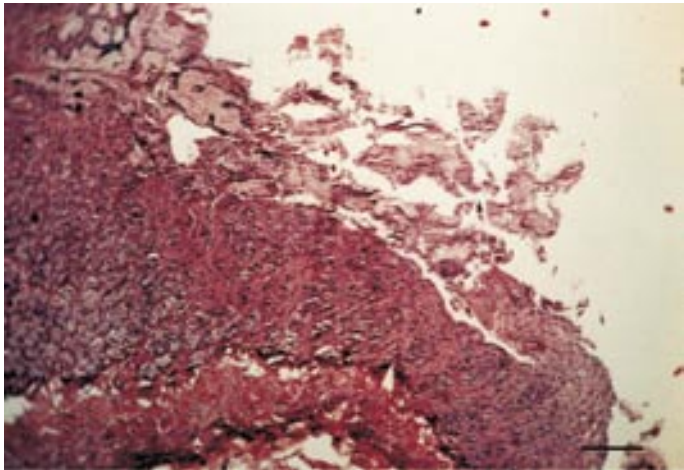


Fig. 2. Mucosal necrosis and erosion combined with superficial gland hyperactivity and mucus hypersecretion, H&E,  $\times 100$  scale bar = 200  $\mu\text{m}$

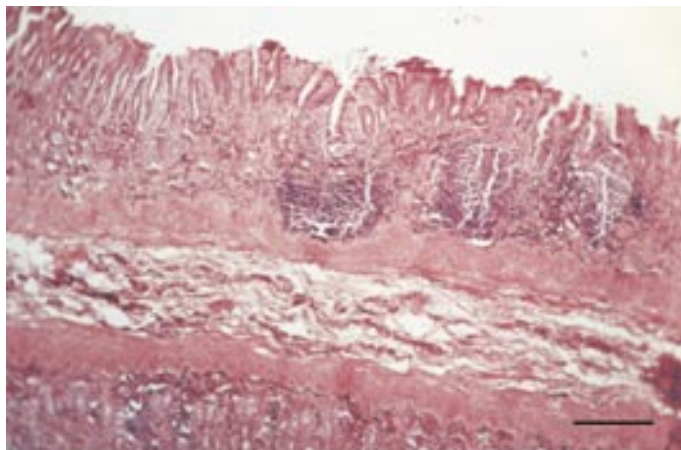


Fig. 3. Lymphoid follicular gastritis: Multiple lymphoid follicles with different infiltrations of lymphocytes are present. H&E,  $\times 400$ , scale bar = 100  $\mu\text{m}$

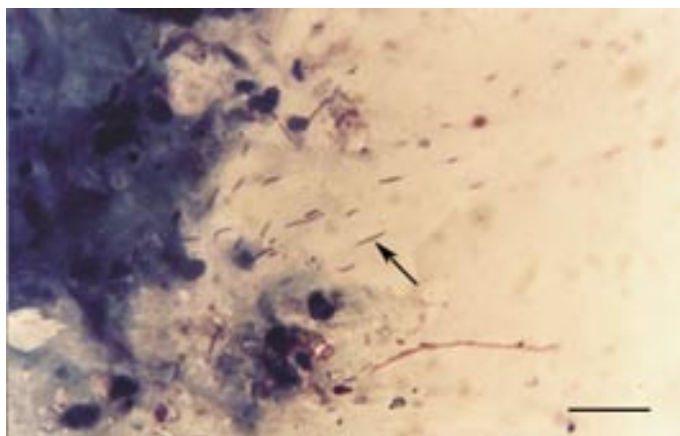


Fig. 4. Cytology: numerous numbers of *Helicobacter* organisms are present. Giemsa,  $\times 1000$ , scale bar = 20  $\mu\text{m}$

cases, respectively. Only large spiral organisms, morphologically resembling *H. felis* or *H. heilmannii* (but not *H. pylori*) were detected in cytology examination (Fig. 4). McNemar's test analysis showed that colonization density of *Helicobacter* organisms in the body was significantly more prevalent than the antrum ( $P = 0.037$ ). On the other hand, Chi-Square test showed no correlation between the presence and degree of *Helicobacter* colonization with non-specific chronic gastritis occurrence and its severity. In one-tailed Fisher test, a trend of correlation between GHLOs infection and lymphoid follicle occurrence was observed ( $P = 0.07$ )

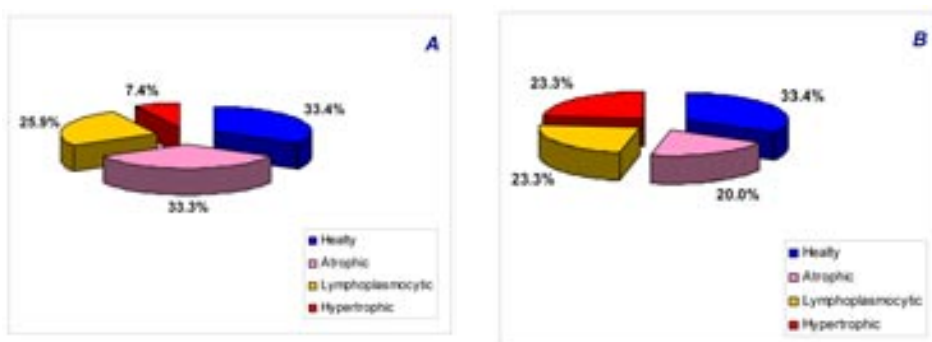


Fig. 5. Relative frequency of different kinds of gastritis in domestic (A) and stray (B) cats

## Discussion

The prevalence of chronic gastritis in asymptomatic dogs is reported as 26% to 48%, although the true prevalence in healthy cats has not yet been determined (ETTINGER and FELDMAN, 2005). In this study 66.7% of cats had chronic gastritis, based on histopathologic examination, and it was more prevalent in comparison with dogs. This is the first report concerning prevalence and type of chronic gastritis in cats.

Chronic gastritis was previously defined as chronic inflammatory changes occurring within the gastric mucosa coexisting with clinical symptoms such as anorexia, weight loss and chronic vomiting, but recent studies suggest that chronic gastritis is very common in asymptomatic dogs and cats (ETTINGER and FELDMAN, 2005). In this study, a specific questionnaire was used for pet cat owners, and no specific abnormality was documented.

VAN DER GAAG and HAPPE (1989) believed since chronic gastritis often occurs in small patchy lesions that small gastric biopsy specimens would not be representative of the entire gastritis, but recent studies recommend obtaining several biopsies in every case of gastritis (KHOURI et al., 2002). Today's extensive use of gastroscopy and biopsy sampling in veterinary medicine has led to a significant increase in the diagnosis and classifications

of chronic gastritis in histopathology. Various gastroscopic features may be interpreted as signs of gastritis, but the significance of such features in relation to histomorphology is uncertain. The macroscopic features recorded in this study were erythema, erosions, hypertrophic rugae in body and presence of visible vessels. In human gastroenterology studies into the relationship between gastroscopic features and histological findings in gastritis revealed that except for the absence of rugae and visible vessels in gastric body (atrophic gastritis), macroscopic features during gastroscopy have very limited value in evaluation of gastritis (REDEEN et al., 2003).

Results of this study showed that although the specificity of gastroscopy in cats (78%) was higher than humans (56%), its sensitivity (40%) was as low as in humans. In accordance with most previous medical studies in humans it must be emphasized that diagnosis of gastritis should only be based on histological examination of the gastric mucosa (REDEEN et al., 2003). Chronic non-specific gastritis is believed to be the most common cause of chronic gastritis in dogs and cats (ETTINGER and FELDMAN, 2005). However, based on results of this study atrophic gastritis similar to humans was the most common type (26.3%) in cats (ETTINGER and FELDMAN, 2005). Human atrophic gastritis was associated with *H. pylori* infection and precedes the development of gastric cancer (EL-OMAR et al., 2000). In other reports this type of gastritis was reported to be infrequent in dogs and cats (ETTINGER and FELDMAN, 2005).

Kato et al. reported that there are sex- and age-related differences in gastritis occurrence in humans (KATO et al., 2004), but there was no significant association between these parameters in either stray or domestic cats.

Based on results of this study and the study by NEIGER et al. (1998) there was no correlation between presence and degree of *Helicobacter* colonization and occurrence of non-specific chronic gastritis and its severity in cats. Controversially, other authors have shown an association between GHLO infections with mild to moderate gastritis, especially in the feline gastric body (OTTO et al., 1994; HAPPONEN et al., 1996).

Hypertrophic gastritis in the fundic mucosa of dogs and cats was reported as being uncommon (ETTINGER and FELDMAN, 2005). In this study, hypertrophic gastritis was diagnosed in 15.8% of cases, and significantly higher in stray cats vs. domestic. Although parasitologic examination was carried out studied here, this difference may be attributed to *Ollulanus tricuspis* infection that was reported as a risk factor in feline hypertrophic gastritis (VAN DER LINDE-SIPMAN, 1992; ETTINGER and FELDMAN, 2005). In a study by HAPPONEN et al., (1996) chronic gastritis was significantly more prevalent in feline antrum than in other regions, but no gastric ulcers or erosions, macroscopic or microscopic, were detected in any parts of the stomach. In this study gastritis was also more prevalent in antrum ( $P = 0.01$ ) but erosions and ulcers were diagnosed in 19.2% and 3.5% cases, respectively, with no significant association between these lesions and occurrence of chronic gastritis.



Despite humans, in which fibrosis is reported in relation with atrophic gastritis (KHURANA and SINGH, 2003), fibrosis and lymphoid follicles were common findings in cats without any relation to type of gastritis. Gastric lymphoid follicles are commonly observed in adult humans and children infected with *H. pylori* (HANDT et al., 1995). Diffuse lymphoplasmacytic infiltrates with follicle formation, especially in the antrum of *Helicobacter*-infected cats were also reported (HAPPONEN et al., 1996). A trend of correlation between GHLOs infection and lymphoid follicle occurrence was found in this study ( $P = 0.07$ ), which requires further investigation. Based on high prevalence of histopathological changes in gastric mucosa of asymptomatic animals, the clinical significance of such findings should be further questioned. It should also be considered that lack of GI symptoms may be related to mild and non-specific clinical symptoms which may be missed by the owners. Nevertheless, the decision for eradication therapy in such animals should be based on presence and degree of clinical symptoms, regardless of histopathological findings.

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**AKHTARDANESH, B., S. JAMSHIDI, F. SASANI, M. MOHAMMADI, S. BOKAEI, T. Z. SALEHI: Zaraza vrstama *Helicobacter* i razvoj želučanih lezija u domaćih mačaka i mačaka lualica. Vet. arhiv 76, 479-488, 2006.**

**SAŽETAK**

Gastritis je čest nalaz u pasa sa stopom od 35% u onih s kroničnim povraćanjem i 26% do 48% pasa bez znakova bolesti. Taj nalaz upućuju na zaključak da treba istražiti prevalenciju gastritisa u mačaka. Ovo istraživanje poduzeto je radi određivanja prevalencije kroničnog gastritisa u domaćih mačaka i mačaka lualica. Procjenjuje se da se javlja u 66,6% mačaka. Patohistološke pretrage pokazale su da ne postoji značajna povezanost između pojave kroničnog gastritisa te dobi i spola u domaćih mačaka i lualica. Gastritis se značajno češće javljao u antrumu nego u trupu želuca. Dijagnosticiran je bio samo kronični nespecifični gastritis. Najčešće se javljao atrofični gastritis (26,3%), limfo-plazmatski (24,6%) i hipertrofični (15,8%). U 42,1% kroničnih gastritisa ustanovljena je fibroza, a u 31,6% limfoidni folikuli. Nije uočena znatna povezanost između tipa nespecifičnoga kroničnoga gastritisa i fibroze te pojave limfoidnih folikula. Prevalencija želučanih erozija iznosila je 19,2%, a čireva 3,5%. Nije ustanovljena značajna povezanost između pojave kroničnog gastritisa i ulceracija ili erozija. Citološkim pretragama ustanovljena je kolonizacija antruma organizmima sličnima helikobakteru u 63,15% pretraženih mačaka, a želučanog trupa u 77,19% pretraženih mačaka. Nije ustanovljena korelacija s nespecifičnim kroničnim gastritisom.

**Ključne riječi:** mačka, gastroskopija, histopatologija, gastritis, citologija

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