Correlation between the FCEAI and diagnostic parameters in chronic enteropathies in 147 cats (2006–2012)

Stefanie Mitze[1]; Katharina Moser[1]; Erik Teske[2]; Wolf v. Bomhard[3]; Christian Stockhaus[1]

[1]Small Animal Clinic Haar, Haar, Germany; [2]Department of Clinical Science of Companion Animals, University of Utrecht, The Netherlands; [3]Speciality Practice for Veterinary Pathology, Munich, Germany

Keywords
FCEAI, IBD, lymphoma, cytology, histology

Summary
Objective: The Feline Chronic Enteropathy Activity Index (FCEAI) has been established as a quantitative index for disease activity in chronic enteropathies in cats. A definite diagnosis is aimed at histology with initial exclusion of extraintestinal causes by laboratory examinations, diagnostic imaging and endoscopy. The study aimed to examine diagnostic parameters and FCEAI in chronic gastroenteropathies. **Materials and methods:** A retrospective case review of 147 cats with chronic enteropathies was performed. In all patients, the FCEAI was established and endoscopy performed including biopsies and duodenal cytology. Histopathologic reports were reviewed for the diagnosis of lymphoma and architectural changes (epithelial integrity, villi/gland atrophy, intestinal crypt atrophy, lymphangiectasia, epitheliotropism/infiltration of intraepithelial lymphocytes). A cytopathologic score (CS) and histopathologic score (HS) regarding lymphocytic intestinal infiltration were assigned. Statistical dependency analysis was used to determine correlations between the FCEAI, lymphoma, architectural changes, CS, HS, serum concentrations of cobalamin, folate and albumin. **Results:** The 147 cats consisted of predominately European Shorthair cats (n = 126), were mostly castrated (n = 127) and had a mean age of 9.8 (1–17) years. For the proven lymphoma group (12.2%; n = 18) and the non-lymphoma group a mean FCEAI of 7.3 (4–17) and 6.6 (2–13), respectively, was established. The FCEAI showed a low correlation with the CS ($p = 0.010$; $R = 0.22$) and intestinal villous atrophy (n = 121; $p = 0.035$; $R = 0.19$). Cats with a CS of 0 had a significant lower FCEAI score ($p = 0.015$) than cats with all other CSs. The histo- and cytopathologic scores were highly related ($p < 0.001$; $R = 0.43$). The gastric intraepithelial lymphocytic infiltration (n = 131) was significantly correlated to serum folate ($p = 0.014$; $R = –0.56$) and albumin ($p = 0,048$; $R = –0.20$). **Conclusion:** The FCEAI showed only a few correlations. Not only the grade of inflammation, but also the histologic architectural changes are of importance.

Schlüsselwörter
FCEAI, IBD, Lymphom, Zytologie, Histologie

Zusammenfassung
Gegenstand: Der Feline Chronic Enteropathy Activity Index (FCEAI) wurde als quantitativer Index für die Entzündungsintensität bei chronischen Gastroenteropathien der Katze entwickelt. Eine Diagnose wird durch Ausschluss extraintestinaler Erkrankungen anhand von Labor- und bildgebenden Untersuchungen, Endoskopie und Gewebediagnostik erzielt. Die Studie hatte zum Ziel, die Korrelation von diagnostischen Parametern und FCEAI bei chronischen Gastroenteropathien zu evaluieren. **Material und Methoden:** Retrospektive Studie bei 147 Katzen mit chronischen Gastroenteropathien und endoskopisch gewonnenen Bioptaten für die zytologische/histologische Untersuchung. Histologische Befunde wurden auf Entzündungszellintensität und Architekturveränderungen (Epithelintegrität, Villi-/Drüsenatrophie, Kryptenatrophie, Lymphangiektasie, Epitheltropismus/intraepitheliale Lymphozyten) untersucht. Bezüglich der lymphoplasmazellulären Zellinfiltration wurden der zytopathologische (ZG) und histopathologische Grad (HG) berücksichtigt. Zur Ermittlung der Korrelation zwischen FCEAI, Architekturveränderungen, ZG, HG und Serumkonzentration von Cobalamin, Folat und Albumin diente eine statistische Dependenzanalyse. **Ergebnisse:** Bei den 147 Patienten handelte es sich vorwiegend um Europäisch-Kurzhaar-Katzen (n = 126), meist kastriert (n = 127) mit einem mittleren Alter von 9,8 (1–17) Jahren. Der durchschnittliche FCEAI betrug 7,3 (4–17) für die Lymphomgruppe (12,2%; n = 18) und 6,6 (2–13) für die Nichtlymphomgruppe. Der FCEAI zeigte eine niedrige Korrelation mit dem ZG ($p = 0,010$; $R = 0,22$) und der Villiatrophie des Dünndarmepithels (n = 121; $p = 0,035$; $R = 0,19$). Katzen mit einem ZG von 0 hatten einen signifikant niedrigeren FCEAI ($p = 0,015$) als Tiere mit alle anderen ZG. Zwischen HG und ZG bestand eine hohe Korrelation ($p < 0,001$; $R = 0,43$). Die intraepitheliale lymphozytäre Zellinfiltration des Magens (n = 131) war signifikant mit der Folat- ($p = 0,014$; $R = –0,56$) und Albuminkonzentration ($p = 0,048$; $R = –0,20$) korreliert. **Schlussfolgerung:** Der FCEAI korrelierte nur teilweise mit anderen Parametern. Neben dem Entzündungsgrad sollten Architekturveränderungen der Darmwand berücksichtigt werden.

Correspondence to
Dr. Stefanie Mitze
Tierklinik Haar
Keferloher Strasse 25
85540 Haar
Email: stefanie1mitze@hotmail.com

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Introduction

In cats chronic enteropathies are defined by persistent or intermittent symptoms, such as vomiting, diarrhea, weight loss and possibly changes in appetite and activity, which exist over at least 3 weeks. The causes are manifold and cannot reliably be differentiated clinically. For diagnosing a chronic gastrointestinal disorder, the initial approach is the exclusion of non-gastrointestinal diseases which includes laboratory tests and diagnostic imaging. A final diagnosis is aimed at histopathology and specimens can be acquired endoscopically or surgically. In order to estimate disease activity in chronic enteropathies, the Feline Chronic Enteropathy Activity Index (FCEAI) was established (16). Chronic enteropathies in cats consist mainly of two forms, including inflammatory bowel disease (IBD) and food-responsive enteropathies (FRE). IBD is defined histologically according to the predominant cell infiltrate, which is most commonly of lymphocytic-plasmacytic nature. It is important to exclude extraintestinal diseases, FRD and intestinal small cell lymphocytic lymphoma, which are very challenging to differentiate from IBD (20, 21).

Histopathology, including immunohistochemistry and preferably PCR for antigen receptor rearrangement (PARR), is the only way to differentiate between chronic inflammation and small cell lymphoma. No reports are presently known about correlations between the FCEAI and certain laboratory findings and histopathology. Therefore, a complete evaluation of these diagnostic parameters might be useful in every patient. In the current study we examined if the FCEAI correlates with cytology and specific histological architectural changes, in addition to a correlation between clinical signs and findings in cytology and possibly endoscopy. Furthermore, we wanted to assess a connection between serum concentrations of cobalamin, folate or albumin and architectural changes, as well as cytology.

Materials and methods

Study design

In this retrospective study medical records of the Small Animal Clinic Haar of the years 2006–2012 were reviewed for cats with chronic gastrointestinal signs, in which upper gastrointestinal endoscopy was performed for diagnosis. Signalment (age, sex and breed), clinical signs and results of blood work were noted. Disease duration was defined as chronic if gastrointestinal signs persisted for more than 3 weeks and acute if they lasted less than 3 weeks. Only chronic cases, in which a definitive histopathologic diagnosis had been established, were included.

The **FCEAI** was determined before endoscopy, as already described (16), using the variables of clinical symptoms such as attitude/activity, appetite, vomiting, diarrhea, and weight loss, each scored 0–3. **Blood results** were collected and scored as 0 for being normal and either 1 for being increased for the parameters total protein, alanine aminotransferase and alkaline phosphatase or 1 for being decreased for the parameter phosphorus. In addition, values of serum cobalamin and serum folate were noted. Measurements of serum cobalamin and folate concentrations were performed using the chemiluminescence immunoassay and considered normal between 200–1680 pg/ml and 13–38 ng/ml, respectively (IDEXX, Germany). **Endoscopic mucosal lesions** were recorded and scored as 0 if normal or 1 if the presence of atypia such as increased granularity, friability, ulcers or erosions or all three were listed (16). Additionally to atypia an increased bleeding tendency was noted and scored accordingly (0–1 with 0 = bleeding within normal limits, 1 = increased bleeding tendency).

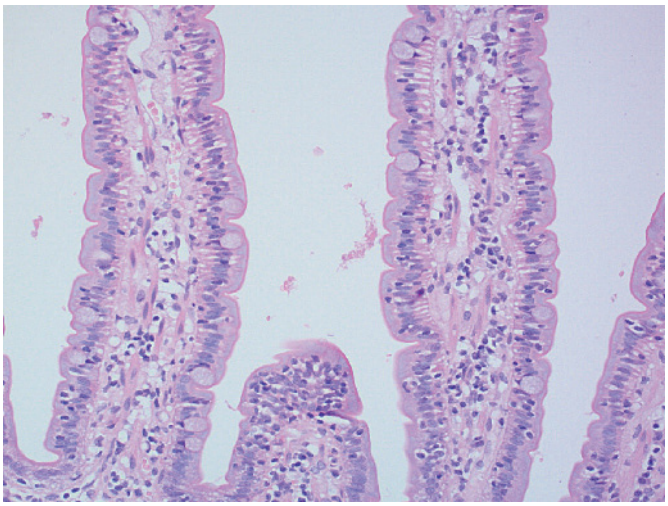

Fig. 1 Normal duodenal specimen of a cat (H&E staining, 20x).
Abb. 1 Unauffälliges Duodenumpräparat einer Katze (HE-Färbung, 20x)

Sonography (Vivid 7 Dimension® GE Healthcare, Munich, Germany; linear and convex transducer, 8–14 MHz) was performed on every patient, without sedation before endoscopy.

Endoscopy was conducted with a flexible video endoscope (Video Gastroduodenoscope, 9.8 mm optics, length 140 cm, Karl Storz®, Tuttlingen, Germany). Biopsies were taken with standard smooth-edged, non-fenestrated biopsy forceps (2.2 mm). From each anatomic area a minimum of four samples were obtained under visual control for histopathological evaluation. At least two or more additional small intestinal tract samples were used for creating cytological smears using the squash smear technique (25) and stained with Diff-Quick® (Labor+Technik®, Berlin, Germany).

Histopathological assessment of the lamina propria infiltration of the small intestine with lymphocytes and plasma cells was performed by specialized board certified pathologists (▶Fig. 1, ▶Fig. 2, ▶Fig. 3). Histopathological assessment of the infiltration of the lamina propria of the small intestine with lymphocytes and plasma cells was based on the templates provided by the WSAVA International Gastrointestinal Standardization Group (5, 34) and named in this article as histopathologic score (0–3; 0 = physiologic, 1 = mild, 2 = moderate, 3 = severe). In order to properly compare the cytopathologic score with the histopathologic score, inter-

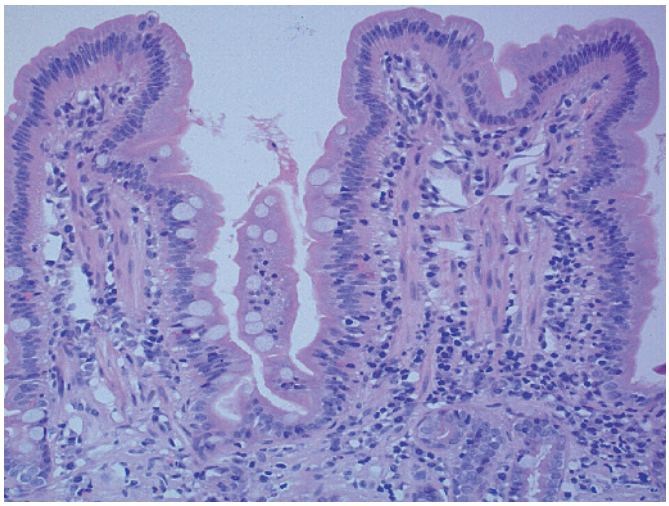

Fig. 2 Duodenal specimen of a cat displaying moderate lymphoplasmacytic inflammation with villous blunting and fusion (H&E staining, 20x).

Abb. 2 Duodenumpräparat einer Katze mit moderater lymphoplasmazellulärer Entzündung sowie Zottenverkürzung und -fusion (HE-Färbung, 20x)

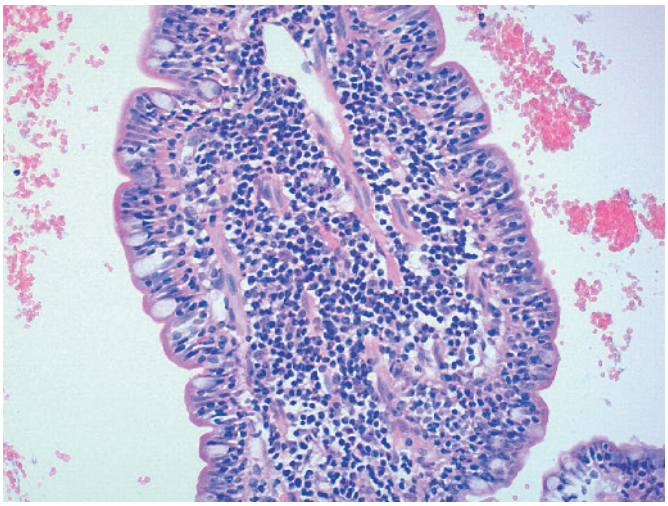

Fig. 3 Specimen of the small intestine of a cat displaying a lymphocytic lymphoma (H&E staining, 20x).

Abb. 3 Dünndarmpräparat einer Katze mit einem indolenten Lymphom (HE-Färbung, 20x)

mediate histopathologic scores were assigned by one board certified pathologist as follows: 0 = physiologic, 1 = mild infiltration under the surface epithelium, 2 = mild to moderate infiltration between epithelium and glands, 3 = moderate infiltration between glands, 4 = moderate to severe infiltration, which may infiltrate glands and occupies large portions of the lamina propria, 5 = severe infiltration with disruption of glandular structure. Furthermore, the intestinal cytopathologic score was determined for at least two additional small intestinal biopsy samples, as already described (25) using the squash smear technique for preparation of cytological slides. Classification was made by examining the severity of subepithelial lymphocytic-plasmacytic infiltration. Scores were assigned by one cytologist only, reaching from 0–5: 0 = physiologic, 1 = mild infiltration beneath the epithelial layer (only a thin and fragmentary additional layer), 2 = mild to moderate infiltration beneath the epithelial layer (thin but continuous additional layer), 3 = moderate infiltration beneath the epithelial layer (one or two additional layers), 4 = moderate to severe infiltration beneath the epithelial layer (two or three additional layers), 5 = severe infiltration beneath the epithelial layer (more than three additional layers). The histopathologic reports were additionally reviewed for architectural changes of stomach and intestine, such as epithelial integrity, villous and gland atrophy, intestinal crypt atrophy, lymphangiectasis, epitheliotropism/infiltration of intraepithelial lymphocytes (0–1; 0 = no abnormality detected, 1 = abnormality present).

Samples which were definite or suspicious for lymphoma were further examined by **immunohistochemistry**. CD3 antibodies were used as a marker for T lymphocytes and CD20 antibodies for B lymphocytes (CD3, DAKO, Glostrup, Denmark; CD20, Thermo Scientific, Waltham, MA, USA). Antibody binding was detected by a horseradish peroxidase labelled detection system (DCS, Hamburg, Germany).

Statistical analysis

For the statistical analysis a commercially available standard statistic software (SPSS statistics 23, IBM Corp. New York, USA) was used. Normal distribution of data was assessed using the Kolmogorov-Smirnov test. The continuous parameters of the various groups were examined with the non-parametric Kruskal-Wallis test and the Mann-Whitney test. The correlation between scores was performed by the Pearson Spearman's correlation test. For testing differences in clinical signs, in correlation to histopathologic and cytopathologic scores, the Chi-square test with Spearman's correlation coefficient was used.

The FCEAI was used to correlate between the cytopathologic score, the histologic score and the architectural changes, as well as the proven lymphoma group. The architectural changes were additionally correlated to albumin, folate and cobalamin concentrations. The clinical signs were correlated with the cytopathologic score and endoscopic findings. A p-value < 0.05 was considered to be significant.

Results

The 147 cats included mainly European Shorthair cats (n = 126), but also cats of the following breeds: Persian (n = 6), Maine Coon (n = 5), British Shorthair (n = 3), Norwegian Forest Cat, Sacred Birman (n = 2, respectively), Chartreux, Egyptian Mau, and Ragdoll (n = 1, respectively). There were 73 male and 74 female cats, of

which 65 and 62 were castrated, respectively. They had a mean age of 9.8 years (range 1–17). In 18 cats biopsies had been taken, which were CD3+ and CD20–, proving lymphoma via immunohistochemistry (▶Fig. 3, ▶Fig. 4). In 14 additional cases lymphoma was suspected.

Clinical signs: Results of the correlation of clinical signs, endoscopic findings and cytopathologic score are listed in ▶Table 1. Vomiting was weakly (p = 0.001; R = 0.28) correlated to the presence of atypia in the stomach. Diarrhea and weight loss were statistically significantly, but clinically insignificantly correlated with the cytopathologic score (p = 0.035; p value of R = 0.035 and p = 0.003; p value of R = 0.003, respectively).

FCEAI: For the proven lymphoma group and the non-lymphoma a median FCEAI of 7.3 (range 4–17) and of 6.6 (range 2–13) was established, respectively. FCEAI and the cytopathologic score were weakly (p = 0.010; R = 0.22) correlated. Cats with a cytopathologic score of 0 had a significantly lower FCEAI (p = 0.015) than cats with all other cytopathologic scores. Interestingly, the FCEAI showed no correlation to the architectural changes in stomach and intestine and the histopathologic score (p = 0.227; R = 0.23), except for the intestinal villous atrophy (p = 0.035; R = 0.19).

Endoscopy: In 94 patients six or more samples (range 6–12) were taken from at least four to five locations for histopathology. In 21 patients only five adequate samples and in 32 animals four adequate biopsy samples per location were obtained. A definite diagnosis could be established in all of them. In general two samples were taken additionally for creating cytological slides. For further correlations see ▶Table 1.

Cytopathologic score: The cytopathologic score was related to the histopathologic score (p < 0.001; R = 0.43). A clinically insignificant correlation was observed between the cytopathologic score and the FCEAI (p = 0.010; R = 0.22) and between the cytopathologic score and the clinical signs (see above and ▶Table 1). Cobalamin, folate and albumin concentrations did not correlate profoundly with the cytopathologic score.

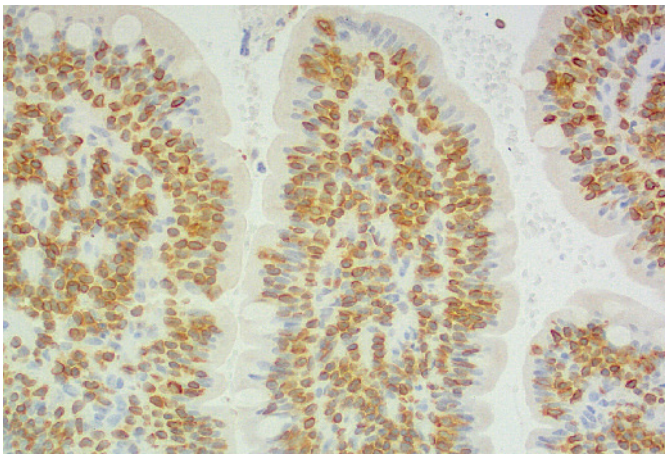

Fig. 4 Specimen of the small intestine of a cat with a lymphocytic lymphoma (same cat as in Fig. 3), immunohistochemical staining of CD3+ cells (20x).

Abb. 4 Dünndarmpräparat einer Katze mit einem indolenten Lymphom (gleicher Patient wie in Abb. 3), immunhistochemischer Nachweis von CD3+ Zellen (20x)

Histopathologic score: As mentioned above, the histopathologic score was moderately related to the cytopathologic score (p = 0.001; R = 0.43) and not to the FCEAI (p = 0.227; R = 0.23). Of all the architectural changes in histology, only villous atrophy (▶Fig. 3) of the intestines was significantly (n = 121; p = 0.035; R = 0.19) associated with the FCEAI.

Cobalamin, folate, albumin: Regarding serum cobalamin, folate and albumin concentrations no significant association could be found concerning the histological architectural changes of the stomach and the small intestine, except for the infiltration of intraepithelial lymphocytes of the stomach (n = 131) with lower folate levels (p = 0.014; R = –0.56) and lower serum albumin levels (p = 0.048, R = –0.20).

Table 1 Correlation between clinical signs, endoscopic findings and cytopathologic score and associated p-values.

Tab. 1 Korrelation zwischen klinischer Symptomatik, endoskopischen Befunden und zytopathologischem Grad mit dazugehörigen p-Werten

	Vomiting			Diarrhea			Weight loss		
	χ^2 p value	R	p value of R	χ^2 p value	R	p value of R	χ^2 p value	R	p value of R
Endoscopic atypia duodenum	0.686	–0.04	0.668	0.990	0.09	0.263	0.319	0.13	0.132
Endoscopic signs of bleeding duodenum	0.630	0.10	0.246	0.279	0.08	0.139	0.094	0.10	0.216
Endoscopic atypia stomach	0.016	0.28	0.001	0.072	–0.01	0.918	0.269	–0.09	0.305
Endoscopic signs of bleeding stomach	0.004	0.14	0.101	0.265	0.10	0.250	0.690	–0.07	0.436
Cytopathologic score	0.488	–0.06	0.511	0.176	0.08	0.035	0.078	0.08	0.003

Discussion

Clinical signs frequently show a poor correlation with the severity of histological changes in gastrointestinal disease, especially in cats (11). A strong correlation with the severity of histological abnormalities and an increased severity of clinical signs would be logical. However, in the present study vomiting was significantly, though clinically weakly correlated to the presence of endoscopic atypia in the stomach. Diarrhea and weight loss showed only weak clinically significant correlations to the cytopathologic score. The reasons for this and the lack of further relations currently remains undetermined, most likely a multifactorial causation is to be expected. Thus, it has again been confirmed that the presence of chronic gastrointestinal signs should routinely prompt histological biopsy. Further studies regarding the value of other diagnostic criteria are still lacking.

In this study the FCEAI was determined retrospectively. For cats with food responsive enteropathies the pretreatment FCEAI has previously been described as being 6.7 and 8.2 in IBD patients (16). To our knowledge no values have been published for cats with lymphoma so far. In the present study a FCEAI of 7.3 was established for the proven lymphoma group and of 6.6 for the non-lymphoma group. This overlap between those two groups and the previously published values is a clear sign of similar clinical, laboratory and endoscopic features between the lymphoma and non-lymphoma group. A differentiation between lymphoma and non-lymphoma groups solely on the basis of the FCEAI seems to be unlikely. It cannot be excluded that the retrospective nature of this study had an impact on the current FCEAI values, especially since the grading of the severity of the clinical signs was based on the history taken by different veterinarians, and the interpretation by the owners.

The FCEAI was correlated to the intestinal villous atrophy (▶ Fig. 3). Since the FCEAI is considered to be an index for disease activity, this correlation and the lack of further correlations cannot be explained completely. Villous and gland atrophy cause malabsorption and finally weight loss and diarrhea. In human medicine partial and complete villous atrophy is permanently discussed as the most frequent typical histological feature in adult coeliac disease (24). The clinical relevance of villous atrophy in veterinary medicine with focus on cats has been given little attention in the literature. One study found a correlation with the number of Enterobacteriacae, *Clostridium* spp. and *E. coli* and the number of clinical signs exhibited (14). The significance as a specific criterion for certain diseases cannot be determined currently. Additional prospective studies might be useful to extrapolate the diagnostic and prognostic significance of architectural abnormalities.

In our clinic the work-up of a patient with chronic gastrointestinal disease routinely includes cytology of small bowel biopsies. Cytology is not a substitute for histology, but provides clinically useful information, is fast and inexpensive. It can be used for establishing a diagnosis (e.g. adenocarcinoma, high-grade lymphoma) and a treatment plan (18, 25). The infiltration of the lamina propria is of importance in establishing a histological diagnosis (5, 27, 33, 34). For this reason, the present cytopathologic score and the histopathologic score were used, focusing on this lamina only. In this study, the histopathologic score had a strong association with the cytopathologic score. Additionally, the cytopathologic score showed a statistically significant correlation to the FCEAI and clinical signs. Considering histology as the gold standard in diagnosing chronic enteropathies, it is surprising that no additional association for the histopathologic score could be found. We believe that cytology as a supplemental tool should be evaluated further for the work-up of a chronic gastrointestinal patient.

Regarding the histological diagnosis of gastrointestinal biopsies, the focus is on the predominant inflammatory cell infiltration, as well as possible architectural changes (5, 34). The latter has been getting more attention recently, since it became evident that certain histological architectural changes, like villous stunting and crypt hyperplasia, are more important for grading the severity of inflammation than only the type and intensity of cellular infiltrates (5, 34). In the present study, the relevant architectural changes were the correlation of the FCEAI with the intestinal villous atrophy, and an increased gastric infiltration of intraepithelial lymphocytes with low serum folate and low albumin levels. In human medicine intraepithelial lymphocytes in the gastrointestinal tract are widely discussed, since they are considered an equilibrium element between protective immunity and the integrity of the present epithelial barrier (4). Furthermore, intraepithelial lymphocytes were described in association with autoimmune disorders, tropical sprue, food protein intolerance, *Helicobacter pylori*-associated gastritis, peptic duodenitis, parasitic and viral infections, as well as the development of intestinal lymphoma (3) and as an early marker for coeliac diseases (8). The impact of intraepithelial lymphocytes on the general body homeostasis is wide, however their specific function in the feline gastrointestinal tract in disease has yet to be identified.

The correlation of folate concentration and gastric intraepithelial lymphocytic infiltration cannot be explained thoroughly since folate is only absorbed in the proximal small intestine. A compensatory mechanism can be assumed, as well bias due to focal pathology, or inaccuracies during sample taking.

Hypalbuminemia has been studied in protein losing enteropathies in dogs and humans and is confirmed as a predictor of negative outcome (1). In dogs the normalization of the Canine Inflammatory Bowel Disease Activity Index (CIBDAI) and albumin concentration within 50 days of initial treatment was correlated to a longer survival time (28). An increased total protein is part of the FCEAI scoring system. Despite several publications for albumin as a marker for acute phase response and acute kidney injury in cats, no correlation to severity of inflammation and negative outcome in feline enteropathies has been reported yet.

Abnormal concentrations of cobalamin and folate were described as resorptive markers in chronic gastrointestinal disease and could be responsible for treatment failure despite initial favorable response to therapy (17). The feline cobalamin homeostasis is

complex, involving the pancreas, liver and intestines. In the present study no correlation could be found between serum cobalamin, folate and the cyto- and histopathologic scores, as well as the histological architectural changes.

Considering the examined parameters, a definite statement regarding a possible prognosis could not be made, as gathering follow-up information would be very difficult, due to the retrospective nature of the study and the setting in a referral hospital. To the authors' knowledge no prognostic studies, in regards to the FCEAI, have been published so far, but due to the clear overlap among the groups a connection seems to be quite unlikely.

There are several limitations in the present study. Firstly, the retrospective nature of the study has its limitations. Secondly, the performance of upper gastrointestinal endoscopy only is a strong limitation, since the most common lymphoma sites in cats are the jejunum, ileum and especially the ileocecocolic junction, which is impossible to reach by gastroduodenoscopy. The addition of lower gastrointestinal endoscopy has been offered to all owners routinely and was declined by all of them. Full thickness biopsies would have been the best to evaluate every part of the gastrointestinal tract and to examine transmural spread to clearly distinguish malignancy. Decisions were made based on practical and financial reasons of the owners.

The small number of biopsies taken for histopathology in some patients are another major limitation. In those, usually around six samples were taken from each anatomic location, of which two were used for creating the cytological slides. We included those 32 patients, since the obtained samples had an adequate quality and a definite diagnosis could be established in all patients by board-certified pathologists.

In addition, the evaluation of atypia and an increased bleeding tendency during endoscopy are very unspecific signs, and were assessed subjectively only. Furthermore, the lack of additional testing in equivocal cases was due to the reluctance of the owners. Immunohistochemistry was performed in 18 cases only, however 17 additional cases were highly suspicious for lymphoma. Immunohistochemistry helps in differentiating between malignant T- and B cells, by staining cell surface markers and thus helps in the differentiation between IBD and lymphoma. The best would be to further add PARR, which confirms clonality, a hallmark of malignancy. The PARR test first became commercially available in the middle of 2012, in Germany, before the end of this study period. Before that, samples had to be sent abroad with cost-intensive investment. Both analyses are not perfect and have several limitations, but they are much more sensitive methods than histopathology alone, in differentiating IBD from lymphoma (5, 26, 29, 33).

In summary, a higher number of present lymphoma patients cannot be excluded at all. Based on the retrospective design of this study, we could not retrieve satisfactorily etiological or prognostic data. Another limitation of our study is the low number of patients with measured folate and cobalamin concentrations, making a full evaluation difficult. No further histopathology of liver and pancreas was performed. It cannot be fully excluded, that gastrointestinal symptoms were related to an unknown pancreatic or hepatic disease, which was missed, as well as a possible connection to feline triaditis.

In conclusion, gastrointestinal diseases in cats are complex and clinical signs overlap. Therefore, there is a need for objective criteria. In principle, an index like FCEAI, which includes the severity of clinical signs, blood work and endoscopic findings, can be considered very useful if supplemented by cytological and histological criteria. Further studies are necessary in order to conclude optimal diagnostic parameters and to understand the importance of histologic architectural changes and the role of cytology. However, the presented examination system, which includes a combination of diagnostic parameters, is suitable for a differentiated evaluation. In future it would be important to know if these parameters are useful for etiological and prognostic interpretation in cats.

Conclusion for practice

The Feline Chronic Enteropathy Activity Index (FCEAI) was described as an index for defining disease severity in chronic enteropathies in cats. In the present study no differentiation with the FCEAI could be made between the lymphoma and non-lymphoma group. Nonetheless, a correlation could be found between cytology and histopathology and this should be examined further.

Conflict of interest

The authors declare that there is no conflict of interest.

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