

Coccidian and viral infections in cats

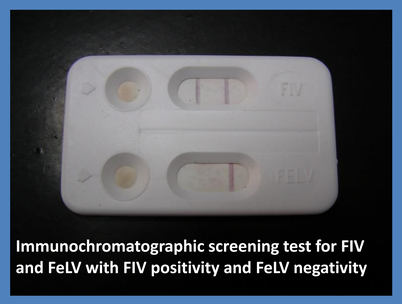
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ABSTRACT

Toxoplasma gondii and *Neospora caninum* are worldwide spread coccidian parasites which can cause serious illnesses in immunosuppressed animals. Toxoplasmosis is also important zoonosis. Cats and other felids are only known definitive hosts of *T. gondii* and only felids can shed oocysts into the environment. Feline immunodeficiency virus (FIV), feline leukemia virus (FeLV) and feline panleukopenia virus (FPV) are important viral infections which can lead to clinical diseases or to immunosuppression and predisposition to other infections. The aim of this study was to determine mutual influence of feline viral and protozoan infection on manifestation of clinical signs. We investigated 111 cats from the Slovenian and Czech shelter houses and veterinarian clinics. Antibodies to *T. gondii* and *N. caninum* were detected by indirect Enzyme-Linked Immuno Sorbent Assay in 24 (**21.6%**) and 7 (**6.3%**) cats, respectively. Antibodies to FIV and antigens to FeLV and FPV were detected by immunochromatographic screening tests in 12 (**10.9%**), 6 (**5.4%**) and 4 (**3.6%**) cats, respectively.

Co-infection was observed in 10 cats (9%): *T. gondii* and FIV in 6 cats, FIV and FeLV in 2 cats, *T. gondii* and FeLV in one cat. One kitten with diarrhea and gastrointestinal clinical signs showed co-infection of *T. gondii*, *N. caninum* and FPV. In total, 49 (44%) cats showed some clinical signs and in 30 (61%) of them one or more protozoan and/or viral infections was found.



Immunochromatographic screening test for FIV and FeLV with FIV positivity and FeLV negativity

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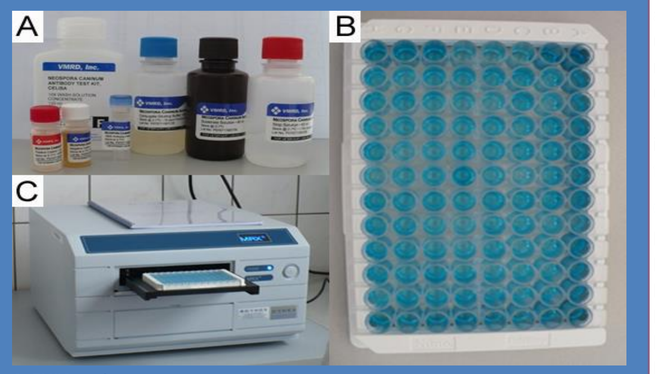
INTRODUCTION

Toxoplasma gondii and *Neospora caninum* are protozoan parasites with a world-wide distribution[4], causing serious illnesses. Toxoplasmosis is usually asymptomatic, but it can lead to severe clinical manifestation in immunosupressed animals. Prevalence of *T. gondii* infection varies according to the life style of cats. It is generally higher in feral cats that hunt for their food than in domestic cats[2]. Cats of any age, breed or sex can die of toxoplasmosis. Clinical signs could be variable, including unspecific signs[2,3]. Concurrent infection with certain feline viruses (FIV, FeLV, FPV, etc.) can affect *T. gondii* infection in cats, but there is no significant evidence for any association among these infections[2]. Retroviral-associated immunosuppresion may be a risk factor for active toxoplasmosis in infected cats[1].

MATERIALS AND METHODS

In total, health condition of **111 cats** (*Felis silvestris f. catus*) from the Slovenian and Czech shelter houses (n = 94) and veterinarian clinics (n = 17) were checked. Blood samples and rectal smears were collected.

Sera were used to detect antibodies to *T. gondii* and *N. caninum* by Enzyme Linked Immuno Sorbent Assay (ELISA kit ID Screen *T. gondii* Indirect Multi-species and ELISA kit ID Screen *N. caninum* Indirect Multi-species, respectively), according to the manufacturer´s instructions (IDvet, Grabels, France). Optical densities were measured spectrophotometrically at 450 nm. The ratio of optical densities of examined sera to mean OD of a positive control was calculated as sample/positive control (S/P%), according to the formula: S/P (%) = (OD sample/OD positive control) × 100. Samples with S/P (%) ≥ 50% were classified as the positive. Immunochromatographic screening tests were used for detection of FIV antibodies and FeLV antigen (Rapid FIV Ab and FeLV Ag Test Kit, respectively, BioNote, Republic of Korea) from serum samples. antigen of FPV was detected from rectal smear (Antigen rapid FPV Ag test kit, Bio Note).



A: ELISA conjugates
B: ELISA microplate with samples and reagences
C: ELISA reader

RESULTS

	All cats	Positive to:					
		T. gondii	FIV	FIV + *T. gondii*	FeLV	*N. caninum*	FPV
Clinical signs	111 (100%)	24 (22%)	12 (11%)	6 (5%)	6 (5%)	7 (6%)	4 (4%)
Gastrointestinal diseases	18 (16%)	16%	17%	17%	0%	29%	**100%**
Upper respiratory tract infection	17 (15%)	33%	**50%**	**50%**	33%	14%	25%
Anorexia and weight loss	16 (14%)	21%	**58%**	**67%**	17%	0%	25%
Generalised lymphadenopathy	8 (7%)	17%	42%	**50%**	17%	0%	25%
Lower respiratory tract infection	8 (7%)	20%	33%	**50%**	0%	0%	25%
Neurological abnormalities	8 (7%)	8%	8%	17%	0%	29%	25%
Dermatitis or dermatosis	6 (5%)	0%	17%	0%	17%	0%	0%
Renal failure	3 (3%)	4%	17%	17%	0%	0%	0%
No clinical signs	**56%**	42%	17%	17%	**67%**	43%	0%
No. of cats with clinical signs	**49 (44%)**	**14 (58%)**	**10 (83%)**	**5 (83%)**	**2 (33%)**	**4 (57%)**	**4 (100%)**

Table: Clinical signs in cats from the Slovenian and Czech shelter houses and veteinarian clinic



Typical clinical signs in kitten with co-infection of FIV and *T. gondii*

Antibodies to *T. gondii* and *N. caninum* were detected in 24 (**21.6%**) and 7 (**6.3%**) cats, respectively. Antibodies to FIV were detected in 12 cats (**10.9%**). Antigen to FeLV and FPV were proved in 6 (**5.4%**) and 4 (**3.6%**) cats, respectively.

Co-infection was proved in 10 (**9%**) cats:

- ❑ *T. gondii* + FIV in 6 cats (5.4%)
- ❑ FIV + FeLV in 2 cats (1.8%)
- ❑ *T. gondii* + FeLV in 1 cat (0.9%)
- ❑ *T. gondii* + *N. caninum* + FPV in 1 kitten (0.9%)

Clinical signs were found in 49 (**44%**) of 111 cats (Table).

One or more protozoan and/or viral infections were found in 30 (**61%**) of cats with clinical symptoms. The clinical signs were found out in four (100%) FPV positive cats. The kitten with co-infection of *T. gondii*, *N. caninum* and FPV showed diarrhea and other gastrointestinal clinical signs, the same signs as in other FPV positive cats. These symptoms are typical for feline panleukopenia caused by FPV.

Ten FIV positive cats (83%) showed clinical signs such as anorexia and weight loss (58%), upper respiratory tract infection (50%), pneumonitis (33%), generalised lymphadenopathy (42%), renal failure (17%), dermal problems and neurological abnormalities (8%).

Clinical signs were more serious and acute in case of co-infection of FIV and *T. gondii*. Four cats (67%) had to be euthanased for the bad health condition.

Clinical signs in 6 (**5.4%**) cats with FIV and *T. gondii* co-infection

- ❑ anorexia and weight loss (67%)
- ❑ upper respiratory infection (50%)
- ❑ pneumonitis (50%)
- ❑ generalised lymphadenopathy (50%)
- ❑ renal failure (17%)
- ❑ neurological symptoms (17%)
- ❑ no clinical signs (17%)

Clinical signs were observed in 4 (57%) *N. caninum* positive cats and in 14 (58%) *T. gondii* positive cats.

Neurological clinical signs were found out in two *T. gondii* and in two *N. caninum* positive cats.

Two FeLV positive cats showed unspecific clinical signs like conjuctivitis, dermatosis, cachexia and generalised lymphadenopathy.

CONCLUSION

- FIV-associated immunosuppresion with current *T. gondii* infection may be a risk factor for manifestation of clinical disease in infected cats. Co-infection FIV with *T. gondii* led to serious clinical signs: anorexia and weight loss (67%), pneumonitis (50%), generalised lymphadenopathy (50%), neurological abnormalities (17%), renal failure (17%) and GIT disorders (17%).
- FPV positive cats showed clinical symptoms typical for Feline panleukopenia: diarhea and GIT disorders. Co-infection was not associated with relevance of clinical signs.
- FeLV and *N. caninum* positivity was not associated with cat´s health statut.

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