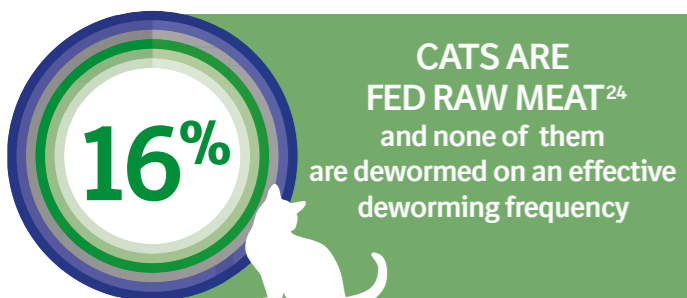
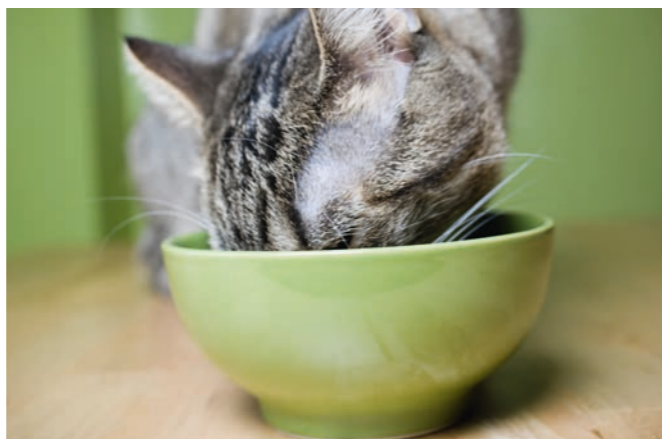


EATING UNDERCOOKED, RAW MEAT OR FISH CAN EXPOSE CATS TO WORM INFESTATIONS



Pet owners should ensure that the meat has been frozen to -18°C for at least 7 days or cooked for 10 minutes (inner temperature: 65°C) to kill potential parasitic life stages before offering it to their cats.



Even though carcasses are inspected, parasitic infestations may not be detected in every case. Chicken and beef meat can be contaminated by *Toxocara cati*. Ingesting raw meat is another way for cats to get infected with *Toxoplasma gondii*. Similarly, undercooked or raw fish can be contaminated by viable metacercariae of liver flukes, *Opisthorchis felineus*.

REFERENCES

- Fang, F. et al. (2015) Zoonotic helminths parasites in the digestive tract of feral dogs and cats in Guangxi, China. BMC Veterinary Research, 11(1), 211.
- Loftin, C. M. et al. (2019) Prevalence of endoparasites in northern Mississippi shelter cats. Veterinary Parasitology: Regional Studies and Reports, 18, 100322.
- Sohn, W.-M., & Chai, J.-Y. (2005) Infection status with helminthes in feral cats purchased from a market in Busan, Republic of Korea. The Korean Journal of Parasitology, 43(3), 93–100.
- Takeuchi-Storm, N. et al. (2015) Gastrointestinal parasites of cats in Denmark assessed by necropsy and concentration McMaster technique. Veterinary Parasitology, 214(3), 327–332.
- Wierzbowska, I. A. et al. (2020) The prevalence of endoparasites of free ranging cats (*Felis catus*) from urban habitats in Southern Poland. Animals, 10(4), 748.
- Millán, J., & Casanova, J. C. (2009) High prevalence of helminth parasites in feral cats in Majorca Island (Spain). Parasitology Research, 106(1), 183–188.
- Waap, H. et al. (2014) Parasite communities in stray cat populations from Lisbon, Portugal. Journal of Helminthology, 88(4), 389–395.
- Akucwicz, L. H. et al. (2002) Prevalence of ectoparasites in a population of feral cats from north central Florida during the summer. Veterinary Parasitology, 109(1–2), 129–139.
- Mohd Zain, S. N. et al. (2013) Macroparasite communities in stray cat populations from urban cities in Peninsular Malaysia. Veterinary Parasitology, 196(3), 469–477.
- Thomas, J. E. et al. (2016) Ectoparasites of free-roaming domestic cats in the central United States. Veterinary Parasitology, 228, 17–22.
- Chalkowski, K. et al. (2019) Who let the cats out? A global meta-analysis on risk of parasitic infection in indoor versus outdoor domestic cats (*Felis catus*). Biology Letters, 15(4), 20180840.
- Lilith, M. et al. (2008) Roaming habits of pet cats on the suburban fringe in Perth, Western Australia: What size buffer zone is needed to protect wildlife in reserves? In Too close for comfort: Contentious issues in human-wildlife encounters (Royal Zoological Society of New South Wales, pp. 65–72).
- Wu, F. (2020). When does the cat roam: Temporal patterns of pet cat (*Felis catus*) roaming in Norway. Norwegian University of Life Science, Ås.
- Kays, R. et al. (2020) The small home ranges and large local ecological impacts of pet cats. Animal Conservation, 23(5), 516–523.
- Brown, H. M. (2008) Detection of persistent *Cytauxzoon felis* infection by polymerase chain reaction in three asymptomatic domestic cats. Journal of Veterinary Diagnostic Investigation, 20, 485–488.
- Shaw S. E. et al. (2001) Arthropod-transmitted infectious diseases of cats. Journal of Feline Medicine and Surgery, 3, 193–209.
- Beugnet, F. et al. (2014). Parasites of domestic owned cats in Europe: Co-infestations and risk factors. Parasites & Vectors, 7, 291.
- Carvelli, A. et al. (2016) A cross-sectional survey to estimate the cat population and ownership profiles in a semirural area of central Italy. BioMed Research International.
- Coati, N. et al. (2003) Recent investigation on the prevalence of gastrointestinal nematodes in cats from France and Germany. Parasitology Research, 90(3), S146–S147.
- Kramer, L., & Genchi, C. (2002) Feline heartworm infection: Serological survey of asymptomatic cats living in northern Italy. Veterinary Parasitology, 104(1), 43–50.
- Otero, D. et al. (2018) Environmental contamination with *Toxocara* spp. eggs in public parks and playground sandpits of Greater Lisbon, Portugal. Journal of Infection and Public Health, 11(1), 94–98.
- Mizgajska-Wiktor, H. et al. (2017) Distribution and dynamics of soil contamination with *Toxocara canis* and *Toxocara cati* eggs in Poland and prevention measures proposed after 20 years of study. Veterinary Parasitology, 234, 1–9.
- Giannelli, A. et al. (2017) Lungworms and gastrointestinal parasites of domestic cats: A European perspective. International Journal for Parasitology, 47(9), 517–528.
- McNamara, J. et al. (2018) Survey of European pet owners quantifying endoparasitic infection risk and implications for deworming recommendations. Parasites & Vectors, 11(1), 571.
- Conboy, G. (2009) Cestodes of Dogs and Cats in North America. Veterinary Clinics: Small Animal Practice, 39(6), 1075–1090.
- Eckstein, R. A., & Hart, B. L. (2000) Grooming and control of fleas in cats. Applied Animal Behaviour Science, 68(2), 141–150.
- Beugnet et al. (2014) Occurrence of *Dipylidium caninum* in fleas from client-owned cats and dogs in Europe using a new PCR detection assay. Veterinary Parasitology, 205(1–2), 300–306.
- Beugnet, F. et al. (2005) Use of a mathematical model to study the dynamics of *Ctenocephalides felis* populations in the home environment and the impact of various control measures. Parasite (Paris, France), 11, 387–399.
- Dryden, M. W., & Rust, M. K. (1994) The cat flea: Biology, ecology and control. Veterinary Parasitology, 52(1), 1–19.
- Cadiegues, M. C. et al. (2014) Efficacy of spinosad tablets administered to a colony of 15 indoor cats naturally infested with fleas. Hindawi.
- Murray, J. K. et al. (2015) Assessing changes in the UK pet cat and dog populations: Numbers and household ownership. The Veterinary Record, 177(10), 259.
- Slater, M. R. et al. (2008) Cat and dog ownership and management patterns in central Italy. Preventive Veterinary Medicine, 85(3), 267–294.



TECHNICAL BULLETIN



n°1

WHY CATS ARE PRONE TO MULTIPARASITIC INFESTATIONS: FACTS AND FIGURES

All around the world, untreated cats are often infested by multiple ecto- and endoparasites. Co-infestations are observed in 40-70% of cases¹⁻⁵. Feral cats, because they are free-roaming and have no history of parasiticide use, provide a unique sampling population to estimate the risk of parasite exposure for owned cats:

CATS ARE ROAMERS

When exploring the outdoors, cats are exposed to a large range of external and internal parasites.

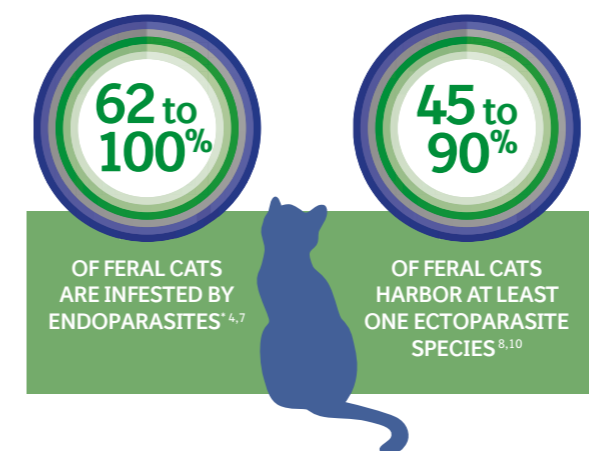
Cats with outdoor access are ~ 3 times more at risk of parasitic infestation¹¹.

Cats spend 35% of their time roaming^{12,13}. Pet owners may think that their cat does not go further than their backyard, instead, their average home-range is about 3.6 hectares. Some cats travel greater distances and go as far as 1 to 8 km away from their home¹⁴, but no need for them to go very far to encounter parasites!

EXTERNAL PARASITES

Frequenting the same places as other cats exposes them to repeated flea infestation, as some locations in the external environment may act as reservoirs, allowing flea pupae survival and emergence of new fleas.

Ticks may be an underestimated threat, even if cat's grooming will remove many of them. Cats are susceptible to tick-borne pathogens such as *Cytauxzoon* spp., *Anaplasma phagocytophilum* or *Ehrlichia* spp. among others^{15,16}. Most of the time, cats will remain asymptomatic, but their health will nevertheless be silently impaired by anaemia or leucopenia. In some cases, they may suffer from acute, deadly forms of tick-borne diseases.



Domestic cats' behavior closely resemble feral cats' one. Therefore, although cared for, a domestic cat is at risk of multiparasitism.



* A necropsy examination was performed to recover helminths.



CATS ARE ROAMERS

When outdoors, cats may interact with conspecifics: ear mites are transmitted by close contact, whether cats are brawling or snuggling. In a European study, **≈ 17% of pet cats were infested with *Otodectes cynotis***¹⁷.



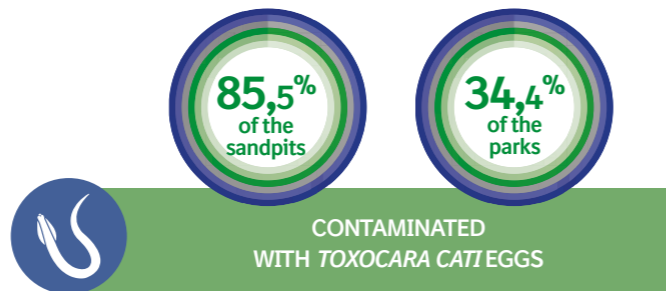
INTERNAL PARASITES

Cats may accidentally ingest eggs or larvae of gastrointestinal worms. Ascarid eggs are very resistant and can persist up to several years in the environment. Roundworms' eggs are the most common ones found in the soil.

In a study, **85.5% of the sandpits and 34.4% of the parks were contaminated with *Toxocara cati* eggs**²¹.

2.5 to 40.7% of cats are infested by roundworms and shed eggs^{21,22}.

2 to 28.3% of cats are infested by hookworms, the source of parasites being soils contaminated by infective stages²³.



CATS ARE HUNTERS



In Europe, 7 client-owned cats out of 10 hunt and catch preys²⁴.

Cats are predators: they usually hunt small preys, such as rodents, lizards and birds, which can play the role of intermediate or paratenic hosts in the life cycle of internal parasites. Cats bring home >3 to 11 prey per month¹⁴. Cats may become infected with the zoonotic protozoan *Toxoplasma gondii* through preying. They are not a direct source for humans, but act as a reservoir. On top of *T. gondii*, after consuming infested intermediate or paratenic hosts, cats can acquire a large number of worms, including hookworms, but most commonly:

ROUNDWORMS

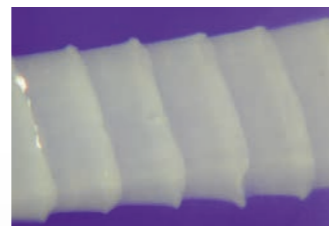
Ascarids are the most common helminths in cats and affect cats of all ages around the world. Adult worms can live up to six months in the cat's small intestine if left untreated.



Adults *Toxocara cati*

TAPEWORMS

Their prevalence is often underestimated. Routine veterinary tests, such as faecal flotation may fail to identify tapeworm infestation. Indeed, tapeworm eggs can be found in the cat's faeces only if segments are damaged in transit or after faecal deposit²⁵.



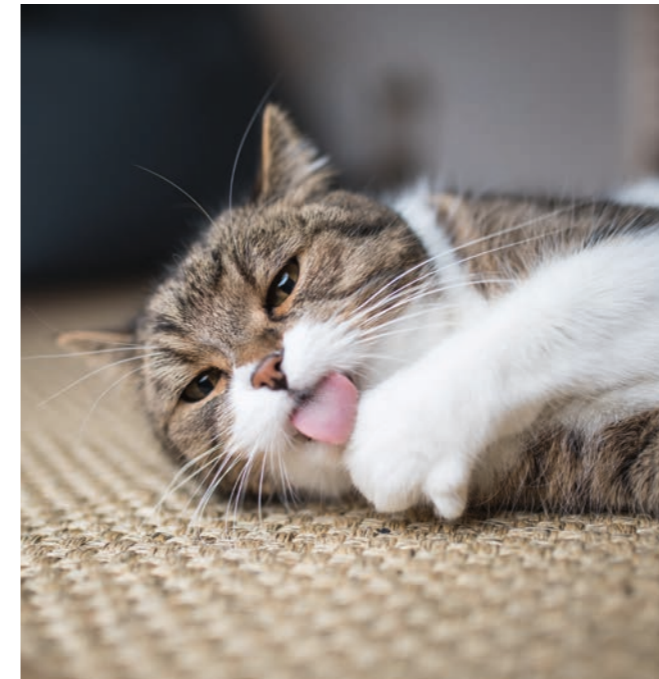
Taenia taeniaeformis proglottids

LUNGWORMS

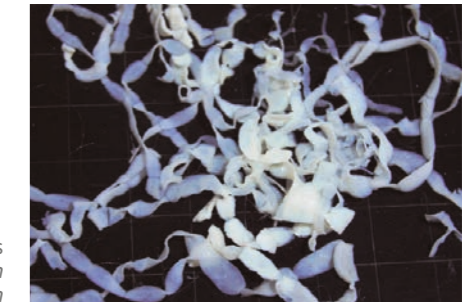
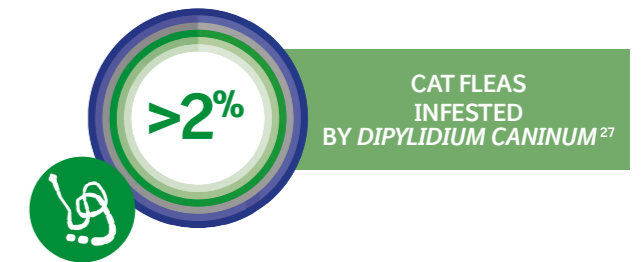
In a recent European study, **one in 10 cats was infested by lungworms**²³, without apparent incidence of the age or other factor.



CATS GROOM



Cats groom one hour a day²⁶. During grooming, cats may ingest fleas - more rarely, lice - that are the intermediate hosts for *Dipylidium caninum* tapeworms.



Mass of *Dipylidium caninum*

WHAT ABOUT PARASITIC RISK IN INDOOR CATS?

Even if indoor cats are less exposed to parasites than free-roaming cats, they may still get infested.

FLEAS

The great majority of the flea population live in the environment as immature stages.

Eggs, larvae and pupae are found in carpets, rugs, cat's bedding and cracks in wooden floors. Pre-emerged fleas in cocoons can persist in the environment several months in the absence of emergence stimuli^{28,29}.

It has been published that strictly indoor cats can be infested with fleas³⁰.



Adult *Ctenocephalides felis*



FLEA POPULATION LIVING IN THE ENVIRONMENT

WORMS

Helminth exposure can happen.

Rodents harbouring parasites can find their way into houses, exposing preying cats to nematode or cestode infestations. Gastrointestinal worm eggs can also be brought indoors under pet owners shoes and are then deposited on the floor, creating a source of infestation for cats.



STRICTLY INDOOR CATS INFESTED BY HELMINTHS¹⁹

ECTO- AND ENDOPARASITES

Other pets can carry parasites indoors.

In multi-pet households, dogs can easily bring parasites back home after a walk, including fleas, ticks, ear mites and worm species common to cats and dogs.



HOUSEHOLDS OWN BOTH CATS AND DOGS^{31,32}