

Pets, poop and parasites

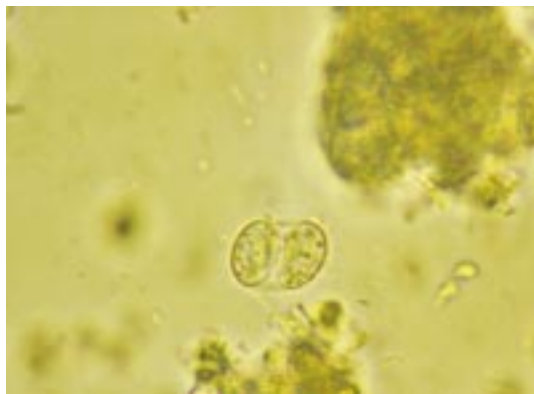
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There are millions of domestic pets in the world. But what threats to human health do they pose, and what can we do to minimize the risks?

More than 50% of all households in the English-speaking world keep one or more animals as pets. Dogs and cats are the most common, with almost 60 million in the USA and 14 million in the UK. Other frequently owned household pets include rabbits, rodents, birds, fish and insects. In recent years, a trend in the ownership of more exotic pets, including non-human primates, exotic mammals, birds, reptiles, amphibians, fish and arthropods as household companions, has emerged.

Pets can have a positive impact on society. There is increasing scientific evidence demonstrating that responsible pet ownership can lead to reduction in the morbidity and mortality associated with heart disease, can substantially reduce health problems and can result in fewer visits to the doctor. For example, exercising dogs on a lead also exercises the owner. Other known benefits include reduction in the feelings of loneliness and a lowered frequency of psychological disturbances among pet owners.

Pets also harbour infections which can be transmitted to susceptible human hosts. It has been estimated that over 30 diseases (bacterial, viral, parasitic and fungal) transmitted to man are pet-associated. Cataloguing a comprehensive list of zoonoses is not the remit of this article which will focus on some of the commoner eukaryotic endoparasitic infections of dogs and cats transmitted to man in pet faeces.



RIGHT:
A sporulated *Toxoplasma gondii* oocyst in a sample of cat faeces.
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● Protozoa

Toxoplasmosis. The coccidian parasite *Toxoplasma gondii* requires two hosts to complete its life cycle. Only felines act as definitive hosts and they excrete the transmissive stage (oocyst) for a period of 7–20 days following a primary infection, which they acquire from eating infected prey or, less commonly, from ingesting infectious (sporulated) oocysts. Oocysts sporulate 1–5 days after excretion and remain viable in the environment for ≥ 12 months. *T. gondii* infects a broad range of intermediate, warm-blooded hosts, including man, livestock, feral animals and birds, where the parasite multiplies asexually to become quiescent in various

tissues, including muscles.

Toxoplasmosis can be acquired in the following ways:

- after ingestion of tissue cysts, in raw or undercooked meat;
- after ingestion of sporulated oocysts in soil/sand (or faecally soiled cat litter), unwashed vegetables or water;
- congenitally, when tachyzoites (rapidly multiplying vegetative cells) from an infected mother pass into the developing foetus.

Congenital toxoplasmosis can result in a range of conditions from clinically unaffected to individuals with hydrocephalus, mental retardation, cerebral calcification and inflammatory eye disease (retinochoroiditis). Severe infection can cause foetal and perinatal death. Occasionally, toxoplasmosis can be acquired from infected organ transplants.

Infections are frequently subclinical, but symptoms include a flu-like illness and/or swollen glands (neck, armpits and groin). The incubation period is 1–3 weeks: 10–23 days after eating undercooked meat and 5–20 days in an outbreak associated with cats. Immunity is long-lasting, the degree of immunity being dependent on age, exposure and immunological status. Tissue cysts may become reactivated in the immunocompromised, for example during immunosuppressive drug therapy or in AIDS sufferers. Toxoplasmosis can be severe in such individuals, with widespread dissemination. It is the most common cause of focal brain lesions in AIDS patients. In immunocompetent individuals, treatment is rarely necessary. Sulphadiazine and pyrimethamine can be considered if illness is severe or protracted, in cases of congenital infection, active ocular disease or AIDS. In the 'at risk' infected pregnant woman, spiramycin is recommended throughout the confinement to minimize the risk of transferring the parasite across the placenta to the developing baby.

Cryptosporidiosis. *Cryptosporidium parvum* is a coccidian parasite with a life cycle involving both asexual and sexual reproductive cycles which it completes within the intestine of an individual host. Oocysts are infective when excreted in the faeces. Symptoms include flu-like illness, diarrhoea, malaise, abdominal pain, anorexia, nausea, flatulence, malabsorption, vomiting, mild fever and weight loss. *C. parvum* can cause self-limiting diarrhoea in the immunocompetent and protracted, life-threatening diarrhoea in the immunocompromised. *C. parvum* infects the intestinal tract of numerous mammalian hosts, including pets. The oocyst is environmentally robust and can remain viable in moist, dark microenvironments for ≥ 12 months. Transmission is mainly from person to person, although waterborne transmission is well documented. Transmission from pets has also been documented. There is no effective chemotherapy for cryptosporidiosis.





LEFT:
Numerous spherical endogenous stages of *Cryptosporidium parvum* within an enterocyte in the small intestine of a young lamb.
PHOTO COURTESY DR DAVID BUXTON, MOREDUN RESEARCH INSTITUTE, EDINBURGH

BELOW:
What threats to human health do our pets pose?
PHOTO JANICE MEEKINGS, SGM

Giardiasis. The flagellated protozoan *Giardia intestinalis* parasitizes the upper small intestine of man and its life cycle is completed within an individual host. *Giardia* exists in two distinct morphological forms; the reproductive, pear-shaped trophozoite and the environmentally resistant cyst, which is the transmissive stage excreted in the faeces. The acute phase of giardiasis, characterized by flatulence with sulphurous belching and abdominal distension with cramps, is usually short-lived. Diarrhoea is frequent and watery and becomes bulky later. In the chronic disease stage, malaise, weight loss and malabsorption (vitamins A and B₁₂, D-xylose and disaccharidases) frequently occur. Cysts are infectious soon after excretion and are environmentally robust, remaining viable in moist, dark micro-environments for about 3 months. As with *C. parvum*, person to person and waterborne transmission are well documented. The significance of zoonotic transmission remains unclear although domestic pets, livestock, feral and wild mammals have been implicated in the transmission of giardiasis to people. The frequency of human infection directly attributable to animals has yet to be ascertained. Treatment is uncomplicated with several drugs available, including nitroimidazole compounds (quinacrine and furazolidone).

● Cestodes

Echinococcosis. *Echinococcus granulosus* and *Echinococcus multilocularis* are primarily pastoral diseases, as the life cycle includes various (predominantly herbivorous) intermediate hosts. *E. granulosus* and *E. multilocularis* have different intermediate hosts. The adult parasite lives in the small intestine of dogs and the transmissive stage, the egg, is excreted in faeces. Eggs are extremely robust, surviving low temperatures (2.5 years at 2 °C; 54 days at -26 °C) and drying. When ingested by an intermediate host, the larval stage (oncosphere) enters the bloodstream and is trapped, normally in the liver (and lungs for *E. granulosus*), by capillary filtering.

Here they develop into 'hydatid' cysts. The life cycle is completed by predation of infected intermediate hosts. Humans are also intermediate hosts in whom the larval hydatid stage develops. Symptoms depend on the number and distribution of hydatid cysts and include hepatomegaly (enlargement of the liver) with obstructive jaundice, with secondary spread to lungs, brain and bone. Eosinophilia (an abnormal increase in the number of certain white blood cells) is often present. Treatment options include surgery to remove cysts and albendazole which reduces cyst mass.

Dipylidiasis. The life cycle of the dog and cat tapeworm, *Dipylidium canium*, involves two hosts. Flea larvae ingest tapeworm eggs which develop to the infective larval (cysticercoid) stage in the flea within 18–30 days. Motile proglottids (reproductively mature segments of the tapeworm), containing eggs, are passed in faeces and can adhere to anal hairs. These do not survive drying for more than 1–2 days. The life cycle is completed following ingestion of the infected flea and development of the adult tapeworm in the intestine. Cysticercoid larvae in infected fleas, when ingested accidentally by humans, can develop into adults in the intestine, particularly in crawling infants. Infections are uncommon and often asymptomatic, but symptoms include abdominal pain, diarrhoea and an itching anus, with excretion of the motile proglottids, resembling rice grains, in faeces.

● Nematodes

Toxocariasis. *Toxocara canis*, *Toxascaris leonina* in canines and *Toxocara cati* in felines have all been implicated in human toxocariasis, but the majority of documented evidence favours *T. canis* as the aetiological agent. The life cycle of *T. canis* is complex, involving direct transmission following ingestion of infective eggs, indirect transmission following predation of infected, intermediate hosts and transplacental transmission of larvae to the foetus. The latter ensures that most puppies are infected at birth. Eggs are not infective when excreted in faeces and take up to 3–4 weeks, depending upon the climate, to develop into the infective larva contained within the eggshell. Therefore, recently excreted faeces do not present a risk. In common with many other animals, man is an intermediate host. Humans become infected following accidental ingestion of eggs in the environment. The larvae hatch in the intestine and migrate





ABOVE:
Safe disposal of animal faeces is of primary importance in preventing the transmission of zoonoses.
PHOTO IAN ATHERTON, SGM

through the soft tissues of the body, but do not multiply. There are three clinical syndromes, namely visceral larva migrans (VLM), ocular toxocariasis (OT) and covert toxocariasis (CT), although infection can be asymptomatic. In VLM symptoms include cough and wheezing from pulmonary migration or abdominal pain, hepatosplenomegaly (enlargement of the liver and spleen) and eosinophilia. In OT symptoms include strabismus (squint), chorioretinitis, failing vision and unilateral blindness, and in CT hepatomegaly, cough, sleep disturbances, abdominal pain, headaches and behaviour disturbance. Risk factors include children in the first decade of life with pica (an abnormal craving for unusual food) or geophagia (eating earth), poor hygiene, contact with puppies and playing in areas where dogs and cats defecate. The condition can be treated with anti-inflammatory glucocorticoids and/or anthelmintics (thiabendazole, albendazole, diethyl carbamazine).

Cutaneous Larva Migrans (CLM) – ‘Hookworms’: The pet-transmitted infections are caused by infective, free-living larvae of *Ancylostoma braziliense*, *Ancylostoma caninum* and *Uncinaria stenocephala*. The infective stage of dog and cat hookworms penetrate skin and migrate to become mature, parasitic adults in the canine or feline intestine. Eggs, excreted in faeces, develop into free-living larvae in soil. Human infection is self-limiting: infective larvae of canine and feline hookworms which penetrate human skin rarely become mature adults. CLM is characterized by intense itching at the penetration site and the development of progressive serpentine erythematous tracts and eosinophilia. *T. canis* and *T. cati* have also been implicated in CLM. CLM is not only pet-associated: the syndrome is associated with a variety of skin-penetrating, parasite larvae.

Infective larvae survive in moist, dark, cool microenvironments. They penetrate bare skin, and transmission is associated with occupational and recreational contact (e.g. walking barefoot) with contaminated, shaded, sandy soils, frequented by dogs and cats, in warm moist climates.

● Preventative measures

What can we do to avoid catching any of these infections from our pets? Preventative measures focus upon reducing transmission. Where drug treatment is unavailable, the safe disposal of faeces is the primary measure. Oocyst- and cyst-contaminated litter trays should be cleaned daily, by scooping soiled litter into a sealable polythene bag which is disposed of by incineration. Daily cleaning minimizes the risk of transmitting infection and wearing gloves dedicated to this purpose offers further protection. Wearing protective gloves when gardening also reduces the likelihood of transmission from contaminated soil, etc. Attention to personal and family hygiene after contact

with pets and/or faeces also reduces risk. Pets should be regularly dewormed, with minimum treatments at 2, 6 and 12 weeks of age, and at least 6-monthly thereafter to reduce the parasite burden in faeces.

Education plays a significant role in reducing the risk of infection. Various local government departments, health boards, professional bodies and pet health advocacy and awareness groups provide a valuable service by:

- Promoting responsible pet ownership by optimizing conditions under which pets are kept, encouraging their better discipline, care and behaviour and discouraging irresponsible ownership;
- Encouraging co-operation with, and education of, members of the public by bringing incidence data and transmission routes to their attention and providing information on the risks from excreted faeces – a variety of leaflets on pet zoonoses and options for avoiding contact with pet-associated infectious agents are available on request from such groups;
- Putting risks into perspective by identifying ‘at risk’ groups such as pregnant women and the immunocompromised;
- Increasing the awareness of owning healthy pets, thus reducing the likelihood of pets contracting infections;
- Promulgating byelaws on fouling.

In general, the risk of contracting parasite zoonoses from pets is regarded as low, but avoidable. An understanding of the parasite life cycle, education and responsible ownership minimize risk further. However, minimizing risk from pets will not necessarily lead to a rapid decline in these zoonoses, as the increase in urban strays, feral cats and foxes, which might harbour large parasite burdens, may pose further challenges to our health.

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Further reading

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