

footprints

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Principles of Vaccination

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INTRODUCTION

Medical decisions about vaccine selection and protocols have become more complex.

Selecting vaccine products and recommending vaccine programs are among the most

complicated of medical decisions facing the veterinarian. The reasons are numerous: continued evolution of our understanding of the immune system; increased value of animals to the owner/client; improved medical record systems, and longer animal life-spans allowing the emergence of chronic sequellae. Improved understanding

of infectious diseases, the strengths and limitations of the biologic regulatory approval process, and of adverse events associated with vaccination, also complicate decisions required for best patient care.

The Council on Biologic and Therapeutic Agents (COBTA) has studied the issues of



vaccinology and immunology for the last two years. This study included a review of the scientific literature and interactive testimony with four expert groups including academic, regulatory, industry, and practitioner experts. Topics included safety, efficacy duration of immunity, research and development of vaccines, vaccine licensing, product labeling, adverse events and adverse event reporting, governmental oversight of manufacturers, and legal issues associated with medical procedures.

Vaccines have played a significant role in enabling people and animals to live longer and healthier lives in this world filled with microbial pathogens. Vaccine products vary in efficacy and safety.

Modern science continues to learn more about the immune system and to develop strategies and technology for safer and more efficacious vaccines. Thorough evaluations of the risks of the disease, and those potentially associated with the vaccine, compared to the benefits of vaccination for the patient, are necessary in crafting optimal health recommendations that include vaccination.

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Conclusions

COBTA concludes that there currently exists inadequate data to scientifically determine a single best protocol for vaccination or revaccination. Advances in antigen science, adjuvant function, impacts of different vaccine carrier solutions, and the immune system's acute and chronic reactions to stimulation, are impressive, but there remain gaps in our understanding. The body of knowledge about the variability of genetics within a breed or species, and the resulting impacts on an individual patient's response to vaccine or associated adverse reactions, is increasing but remains insufficient to make general recommendations. COBTA believes that variation in our patients and their lifestyle, and between the individual vaccine products available, requires a customized approach to vaccination recommendations to best match the variation in the patients presented for immunization.

The practitioner and client must make best patient care decisions where there exists a valid veterinarian-client-patient relationship. Vaccine decisions require a thorough and ongoing review of scientific information and expert opinion of this constantly evolving area to properly prepare the customized vaccine recommendations animal patients require.

The one-year revaccination frequency recommendation found on many vaccine labels is based on historical precedent and United States Department of Agriculture regulation, not on scientific data. Even in those cases where scientific data was submitted to qualify the label claim, the data generated does not resolve the question about average or maximum duration of immunity.

There is evidence that some vaccines provide immunity beyond one year. Revaccination of patients with sufficient immunity does not add measurably to their disease resistance, and may increase their risk of adverse post-vaccination events. Vaccination is a potent medical procedure with both benefits and associated hazards.

It is not currently possible to determine the immune status of a patient relative to all the infectious diseases of concern without conducting a challenge test. Serology does not predict a patient's immune status for most diseases. For those diseases where serology has predictive value of a patient's immune status, the variation within and between laboratories renders the procedure generally unreliable.

Adverse events may be associated with the antigen, adjuvant, carrier, preservative, or a combination thereof. Possible adverse events include failure to immunize, anaphylaxis,

immunosuppression, autoimmune disorders, transient infections, and/or long-term infected carrier states. In addition, a causal association in cats between injection sites and the subsequent development of a malignant tumor is the subject of ongoing research. The role of genetic predisposition to adverse events needs further exploration and definition.

Vaccine program goals include providing optimal immunity against clinically relevant diseases the patient is at-risk to contract, while minimizing the potential for adverse events.

Multiple sources of information can be of value to practitioners in their review of vaccine and infectious diseases, including scientific data and opinion from experts, species and specialty groups, manufacturers, and government agencies. All sources of scientific information and expert opinion need to be carefully and critically considered to properly prepare the customized vaccine programs animal patients require.

Principles of Vaccination

1. Vaccination is a potent medical procedure associated with both benefits and risks for the patient. Adverse events, including some that are potentially severe, can be unintended consequences of vaccination.
2. The proper application of vaccines to animal populations has enhanced their health and welfare, and prolonged their life-spans. The risks to animal health from non-vaccination are significant.
3. The goal for a vaccination program is to prevent disease and thereby promote optimal patient, herd, and/or public health.
4. Different patients require different vaccines and vaccination programs.
5. Unnecessary stimulation of the immune system does not result in enhanced disease resistance, and may increase the risk of adverse post-vaccination events.
6. Vaccination protects a population of animals by providing a level of resistance to a disease in those individual patients that are able to respond. Vaccination does not protect every individual patient even when they are properly vaccinated.
7. Disease carriers, including animals that shed the infectious agent but do not show signs of illness, are local sources of infection for susceptible animals. Sufficient immunity within a population of animals is an important component of preventing high rates of disease. Programs targeting immunization of unvaccinated animals are critical to disease control.
8. Knowledge of immunology and vaccinology, including associated benefits and risks, and the pathobiology of infectious diseases, are necessary to implement an effective

- vaccination program. Consideration of exposure, susceptibility, potential severity of disease, efficacy and safety of the vaccine, any potential public health concerns, and the owner's preferences are appropriate.
9. Only those veterinarians with valid veterinarian-client-patient relationships are in position to make recommendations customized to the needs of the individual patient(s) and owner/client.
 10. Revaccination recommendations should be designed to maintain clinically relevant immunity while minimizing adverse event potential.
 11. Additional information, including vaccine-specific scientific data on minimum, average, and maximum duration of immunity is desired to craft optimal revaccination frequency recommendations.
 12. Vaccines, including polyvalent products, should be selected to include only those antigens appropriate for the specific risk needs of the patient, thereby eliminating unnecessary immune system stimulation and lowering potential risks of adverse events.
 13. Multiple dose vaccine vials must be carefully managed to:
 - minimize the potential for delivering inappropriate levels of antigen or adjuvant
 - optimize the potential for maximum potency of the antigens present
 - and minimize the opportunity for contamination with extraneous microbes or chemicals
 14. Veterinarians should consider creating a core vaccine program, intended for use in the majority of animals in their practice area. Core vaccines are those that protect from diseases that are widely distributed in the region, virulent, and highly infectious, thereby posing a risk of severe disease. Core vaccines are efficacious and exhibit patient benefit: risk ratios high enough to warrant their use, and/or are of significant public health significance, or required by law.
 15. Veterinarians should consider creating a non-core vaccine program, intended for a minority of animals in their practice area. Non-core vaccines are those that target diseases that are of limited risk in the region, and/or represent less severe threats to infected patients, and/or vaccine benefit: risk ratios are too low to warrant the use of these products in all circumstances, and/or scientific information is inadequate to evaluate these products. Veterinarians and owners/clients need to carefully consider the benefits and risks of using these vaccine products on an individual basis.
 16. Information about the benefits and risks of vaccination are important to owners' decisions about individual vaccine selection and vaccination program choices.
 17. USDA licensed products have had the manufacturer's claims about vaccine performance substantiated by a variety of testing methods. Careful evaluation of labels and other information is necessary to compare and contrast between the available products.
 18. There is a critical need for more fully developed, scientifically based, and statistically valid evaluation of vaccine products to provide practitioners with a basis for developing vaccination programs that maximize benefits and minimize associated risks for the patients under their care.
 19. Current adverse event reporting systems need significant improvement in the capture, analysis, and reporting of adverse events. Practitioner commitment to adverse event reporting, and timely access for practitioners to current analysis of adverse event data, are essential to providing optimal patient care.
 20. There is potential legal liability for all medical procedures including vaccination.

Vaccine Licensing

Biological agents are regulated by the USDA, not the Food and Drug Administration, and thus are not subject to those regulations that address extra label use. Veterinarians can legally use vaccines in a discretionary manner.

USDA licensing at the full approval level provides a baseline standard for efficacy, safety, purity, and potency, but the clinical need (relevancy) or usefulness (applicability) of a product are not assured by the licensing process. The USDA must approve labels for biological products. However, current labels frequently contain revaccination interval recommendations based on historical precedence and regulation rather than scientific data, may fail to adequately inform practitioners about optimal use of the product, and the testing methods may be inadequate to identify rare but relevant safety concerns.

Labels on licensed vaccines make different claims and should be carefully studied when evaluating products. Claims may, for example, declare the product (a) prevents infection, (b) prevents disease, or (c) results in a decreased number or a decreased intensity of clinical signs. Each of these claims represents a different level of performance outcome that might be important in selection of a specific vaccine.

USDA approved products licensed under the conditional approval process have demonstrated a reasonable expectation of efficacy. Autogenous vaccines have no demonstrated efficacy.

Chapter 1

Zoonotic ascarids and hookworms: Your role in preventing human disease

Your veterinary team plays a critical role in preventing the transmission of zoonotic diseases from pets to people. Here's what you need to know about the latest research and proven treatment guidelines. By Peter M. Schantz,

Learning objectives:

After you complete this course, you should be able to:

- Understand and discuss the zoonotic potential of roundworms and hookworms.
- Understand the role of the veterinary professional in prevention of zoonotic transmission.
- Understand and discuss the human health risks.
- Understand and discuss zoonotic diseases that are transmitted by roundworms and hookworms.
- Understand and discuss the potential risk of *Toxocara* species wildlife transmission to clients and patients.

Test your current knowledge

Do you understand the most common zoonotic infections associated with pets? Before studying this chapter, take this pre-test to check your awareness of ascarids and hookworms. Answers can be found on page 20.

True False

1. Ascarids (roundworms) and hookworms of dogs and cats have long been recognized as potentially causing human disease.
2. Stool examinations are a reliable method to detect worms in young puppies.
3. Deworming puppies, kittens, and their mothers is the most effective method to avert disease in pets and prevent environmental contamination.
4. The larvae of *Ancylostoma braziliense* and *Ancylostoma caninum*, common hookworms of dogs and cats, cannot penetrate the skin of humans.
5. Puppies have a high prevalence of *Toxocara* infection because they acquire infections from their mothers, which transfer larvae prenatally or via milk.

As a veterinary professional, you're on the front line helping to prevent the transmission of zoonotic disease agents from pets to people. Clients see you as a trusted source of information for their pets, and they seek advice about potential zoonotic disease risks of pet ownership and how to avoid them. Physicians also are concerned about pets as potential sources of infections; however, they are unlikely to know their patients' pet ownership status until after disease transmission has already occurred—then it's too late for prevention! Because you occupy an influential position in helping prevent zoonotic disease, you should continually upgrade your knowledge of these diseases, including the risks for infection and how to help prevent them.

To illustrate your role in preventing human disease, let's review the current status of two well-known parasitic agents of zoonotic disease: ascarids (*Toxocara species*), also known as roundworms, and hookworms (*Ancylostoma species*). Ascarids and hookworms of dogs and cats have long been recognized as potentially causing human disease (*Figures 1a and 1b*).

Understanding ascarids (roundworms)

oxocaral larva migrans, or infection by the common ascarid worms of dogs and cats, is a common zoonotic infection associated with pets in the United States and other industrialized countries.¹ The Centers for Disease Control and Prevention (CDC) estimates this infection causes hundreds of unilateral blindness cases and uncountable numbers of less permanent forms of illness in children annually in the United States.^{2,3} About 45 years ago, when *Toxocara* worms were first discovered to cause human disease, most of the knowledge of how to prevent it became apparent.⁴ Its continuing importance as a cause of zoonotic infection is somewhat disconcerting, especially given the availability of safe and effective drugs to eliminate these infections in pets.

As a veterinary professional, you're ideally positioned to limit transmission of toxocariasis. Some surveys suggest that the prevalence of intestinal helminth infections in dogs has declined during the last 20 years;^{5,6} however, this conclusion is misleading. Those studies are from university veterinary clinics, where most canine patients are referrals and likely to have been previously treated with anthelmintic drugs. Intestinal helminths remain prevalent in dogs and cats that have not been treated, as seen in the study we performed on shelter dogs in

Atlanta. This study confirmed that ascarids, hookworms, whipworms, and flea-transmitted tapeworms remain prevalent in these dogs, the majority of which had spent time in or around human households. In dogs 7 weeks to 3 months old, prevalence of *Toxocara* infection was nearly 100%. Although 80% of dogs 6 weeks old or younger had worms in their intestines, only 20% were positive for *Toxocara* eggs on stool examination, illustrating why young puppies must be treated. Stool examinations are not reliable in young puppies because worms often are not fully mature. Common reasons for false-negative stool examination results include poor technique or insufficient fecal material.⁷

A recent national survey found that intestinal helminths are prevalent in dogs and cats that have not been previously treated with anthelmintic drugs. The study examined 6,458 fecal specimens from animal shelters nationwide and discovered that 52% of dogs sampled in the Southeast and 36% of dogs sampled nationally harbored either *Toxocara canis*, *Ancylostoma* species, or *Trichuris vulpis*.⁸

Puppies have a high prevalence of *Toxocara* infection because they acquire infections from their mothers, which transfer larvae prenatally or via milk (Figure 2).⁹ Unless anthelmintic treatments are administered before 4 weeks of age, puppies will contaminate the environment, because female worms become fully mature and produce eggs when puppies are 3 weeks of age.¹⁰ These eggs remain infective in most environments for months or even years.

Surveys by the AVMA estimate that more than half of American households own dogs or cats, or both." This fact, combined with high rates of *Toxocara* infection in these pets, could produce widespread environmental contamination with *Toxocara* eggs, thus serving as a potential source of infection for people, particularly children whose play habits put them most at risk.^{2,3}

The disease produced by *Toxocara* infection depends on how many larvae are ingested, the frequency of reinfection, and other factors still poorly understood.¹² The majority of human infections with *Toxocara* larvae are well tolerated, even asymptomatic; however, a proportion of infected persons develop larva migrans syndromes that may be either systemic or confined to the eye. When a larva invades the eye, known as an ocular larva migrans, it may leave the person partially or totally blind in that eye. According to CDC data, a minimum of 750 cases of ocular larva migrans occur every year in

Figure 1a



Figure 1b



Figure 2



1a and 1b. Adult and immature ascarids (roundworms) have been recognized as potential causes of human disease.

2. Puppies may acquire infections from their mothers; larvae may be transmitted prenatally or via milk.

Deworm puppies:

- Start at 2 weeks of age
- Repeat at 4, 6, and 8 weeks of age

Deworm kittens:

- Start at 6 weeks of age
- Repeat at 8 and 10 weeks of age

the United States. When a person ingests soil contaminated with an infected dog's feces, that person may experience symptoms of nausea, fever, edema, and even seizures. Annual cases of this illness, known as visceral larva migrans syndrome, are much greater than ocular larva migrans; however, the CDC's estimates are imprecise.³

Several serologic surveys of children and adults show that exposure to *Toxocara* was more common than the CDC was aware.² The principal risk factors for infection include the presence of a household dog, particularly a puppy, in the person's household within 6 months of onset of illness.¹³ When combined with pica behavior, like eating dirt, the statistical association becomes strong. Many pet owners don't know that pets might carry illnesses that may be transmitted to people.¹³ While pet owners are well-informed about rabies and the need to vaccinate pets, their knowledge of it (her zoonotic risks is minimal or misinformed.¹⁴ With proper education, pet owners can take simple precautions that protect their families and pets (see Chapter 2 for a list of precautions).

Understanding hookworms

The larvae of *Ancylostoma braziliense* and *Ancylostoma caninum*, common hookworms of dogs and cats, may penetrate the skin of human hosts as well as the preferred canine and feline host. When people have contact with soil or sand contaminated by the feces of dogs and cats infected with hookworms, they can develop progressive linear eruptive lesions, a syndrome called cutaneous larva migrans, or creeping eruption (Figure 3). Prolonged migration of larvae in the skin causes progressive linear eruptive lesions.

Most infections are seen in people who have crawled beneath a raised building to work on plumbing or electrical wiring, or in sunbathers unfortunate enough to recline on wet sand contaminated by hookworm larvae. Ordinarily, lesions are self-limiting, and the intense itching subsides progressively and completely within a few weeks. In cases of mass infection, larvae may penetrate into deeper tissues, such as the case of a man who developed pulmonary symptoms and larval invasion of the skeletal muscles in association with severe cutaneous larva migrans. Visceral larva migrans syndrome, ordinarily associated with *Toxocara* infection, also has been recognized with *A. caninum*, causing pneumonitis, chest pains, cough, and pulmonary radiographic changes. Partial blindness, called corneal opacities, associated

with *Ancylostoma* type larvae also has been observed.

Recent reports from the United States and Australia also relate *A. caninum* to intestinal manifestations in people. Patients developed isolated digestive symptoms, such as abdominal pain of variable intensity, diarrhea, abdominal distention, weight loss, and rectal bleeding. Colonoscopy or laparotomy findings included a feeding or an attached hookworm in every case and either intestinal obstruction, mucosal ulceration, or peritonitis. In six patients, the worm was identified as *A. caninum* (Figure 4). All worms were immature, and the females were not producing eggs. Worms were located in the lower gastrointestinal tract (terminal ileum, cecum, transverse colon, and rectum). Patients recovered completely after removal of the hookworm.

Presumed canine hookworm infections from two young children with eosinophilic enterocolitis have been reported recently in the southern United States. The children were treated successfully with mebendazole. Such infections probably occur commonly in the United States but are unlikely to be diagnosed correctly because of lack of awareness.

Your role in prevention

To assess methods that would lead to preventing diseases caused by zoonotic roundworms (toxocariasis and ancylostomiasis), the CDC surveyed practicing veterinarians in 1979 and 1989. Unfortunately, veterinarians' recommendations to pet owners are less than ideal to prevent transmission.^{15,16} Less than half of surveyed veterinarians took the preventive, or prophylactic, approach to treating roundworms. When asked at what age they recommend first examination or treatment for intestinal worms, only a third of veterinarians said at 4 weeks of age or less, which is the timing necessary to efficiently prevent excretion of *Toxocara* eggs. Another third of surveyed veterinarians recommended examinations or treatments beginning at 7 or more weeks of age, increasing the likelihood that environmental contamination occurred for at least a month before the puppy was examined. These surveys show that many veterinarians are ambivalent about discussing the potential zoonotic hazards of roundworms and hookworms with clients.

Deworming puppies, kittens, and their mothers is the most effective method to avert disease in pets and prevent environmental contamination because they have the highest worm burdens, are most vulnerable to the ill effects of these

Figure 3



Figure 4



3. Child with cutaneous larva migrans. Prolonged migration of hookworm larvae in the skin causes lesions known as creeping eruption. (Courtesy of James Castner, University of Florida.)

4. *Ancylostoma caninum* has been linked to human disease in both the United States and Australia.

infections, and are the main sources of infective stages. Preventive treatments in puppies and kittens must be initiated shortly after birth. You should give anthelmintic drugs repeatedly to puppies at 2, 4, 6, and 8 weeks of age. Because prenatal infection does not occur in kittens, egg excretion begins later than in puppies, and cats' acquisition of roundworms and hookworms is comparatively less in most U.S. areas, you should start preventive treatments at 6 weeks of age and repeat at 8 and 10 weeks in kittens. Nursing mothers need treatment concurrently because they often develop infections at the same time as their offspring. The earliest treatments require that you provide clients with medications to administer to their pets at home. You can help prevent round-worm and hookworm infection in older dogs and cats with periodic treatments with drugs whose efficacy is limited to intestinal nematodes, or you can prescribe treatment based on the results of periodic stool examinations. In areas where heartworm infection is enzootic, you can

prescribe heartworm preventives that also work effectively for roundworm and hookworm treatment and control.

eterinary professionals can choose from several anthelmintic drugs that are safe and effective against round-worms, hookworms, and other intestinal helminths of dogs and cats. Anthelmintic drugs are available in tablet, granule, liquid, and other formulations. Manufacturers recommend single or multiple daily doses and periodic or continuous administration. Select a drug based on the efficacy for the range of helminth species prevalent in your area. For treatment of very young puppies, use an anthelmintic drug approved for nursing puppies (2 to 3 weeks of age). The drug should have a range of efficacy that includes both roundworms and hookworms (unless one or the other of these species is not present in your area).

Based on the frequency of round-worm and hookworm infection in puppies and kittens and the difficulties of diagnosing these infections early, you should take a preventive approach to treatment. Severe disease and even death may occur before roundworms and hookworms become fully mature and begin producing eggs and, therefore, cannot be diagnosed by stool examinations. Because many puppies and kittens are not brought to a veterinarian before 6 to 8 weeks of age, delaying treatment means infections will manifest and result in environmental contamination with eggs or larvae. Finally, because young animals acquire new infections continuously from their mothers' milk and the environment and many worms are not yet fully fully mature, fecal examinations are often falsely negative in puppies and kittens.

Given our knowledge of zoonotic diseases and the availability of safe and effective anthelmintic drugs, there is no excuse for not preventing the spread of infection. As a veterinary professional, you can teach clients about zoonotic diseases and explain how to help protect their pets with preventive medication, fecal exams, and strategic deworming.

The preventive approach to controlling intestinal parasites also can generate practice income. Surveys confirm that more than 80% of dog owners and 62% of cat owners visit their veterinarians at least once per year, and pet owners look to you as the major source of pet health information.¹⁷ Discussing parasite control and zoonotic diseases helps you strengthen your relationships with clients.¹⁸ You can show concern for the family and demonstrate that you have the knowledge and services to protect the health of pets as well as family members.

References

1. Stehr-Green JK, Schantz PM. The impact of zoonotic diseases transmitted by pets on human health and the economy. *Vet Clin North Am Small Anim Pract* 1987;17:1-15.
2. Glickman LT, Schantz PM. Epidemiology and pathogenesis of zoonotic toxocarosis. *Epidemiol Rev* 1981;3:230-250.
3. Schantz PM. Toxocara larva migrans now. *Am J Trop Med Hyg* 1989;41 (suppl):21-34.
4. Beaver PC, Snyder MD, Carrera GM, et al. Chronic eosinophilia due to visceral larva migrans. *Pediatr* 1952;9:7-19.
5. Greve JH, O'Brien SE. Prevalence of intestinal parasites in Iowa dogs—A comparison between 1965-68 and 1988. *Iowa State University Vet* 1989;51:24-25.
6. Jordan HE, Mullins ST, Stebbins ME. Endoparasitism in dogs: 21,583 cases (1981-1990). *J Am VetMedAssoc* 1993;203:547-549.
7. Schantz PM, Moorhead AR, Dickerson JW, et al. Intestinal parasites are common in pound dogs in Fulton County, Georgia. *Proc Ann Mtg Am Assoc Vet Parasitol* 1994; No. 80, San Francisco.
8. Blagburn BL, Lindsay DS, Vaughan JL, et al. Prevalence of canine parasites based on fecal flotation. *Comp Contm Educ VetPract* 1996;18:483-509.
9. Parsons JC. Ascarid infections in cats and dogs. *Vet Clin North Am Small Anim Pract* 1987;17:1307-1339.
10. Barriga OO. A critical look at the importance, prevalence, and control of toxocarosis and the possibilities of immunological control. *Vet Parasitol* 1988;29:195-234.
11. U.S. Pet Ownership 6- Demographics Sourcebook, American Veterinary Medical Association, 1997;1-135.
12. Glickman LT, Schantz PM. Epidemiology and pathogenesis of zoonotic toxocarosis. *Epidemiol Rev* 1981;3:230-250.
13. Schantz PM. Toxocara larva migrans now. *Am J Trop Med Hyg* 1989; 41(suppl): 21-34.
14. Fontaine RE, Schantz PM. Pet ownership and knowledge of zoonotic diseases in Dekalb County, Georgia. *Anthrozoos* 1989; 3:45-49.
15. Kornblatt AN, Schantz PM. Veterinary and public health considerations in canine roundworm control: A survey of practicing veterinarians. / *Am VetMedAssoc* 1989; 177:1212-1215.
16. Harvey JB, Roberts JM, Schantz PM. Survey of veterinarians' recommendations for treatment and control of intestinal parasites in dogs: Public health implications. / *Am VetMedAssoc* 1991;199:702-705.
17. U.S. Pet Ownership and Demographics Sourcebook, American Veterinary Medical Association 1997;1-135.
18. Pritchard WR. Some implications of structural change in veterinary medicine and its impact on veterinary education. *J Am Vet MedAssoc* 1993;203:361-364.

Pre-test answers:

1. True
2. False
3. True
4. False
5. True

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Chapter 2

Zoonotic diseases: The human health perspective

Although more than 100 zoonotic infections exist, you need to educate clients about the most common culprits: bite-related, gastrointestinal, and skin-related diseases. It's also important to discuss precautions for immunosuppressed people. By Andrew J. Schuman, MD

Test your current knowledge

Is your veterinary team properly educating clients about zoonotic diseases that can be transmitted from pets to people? Before studying this chapter, take this pre-test to check your awareness of common zoonotic diseases. Answers can be found on page 25.

True False

- | | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. When discussing zoonotic diseases with clients, you should ask pet owners whether the immune status of any household member has changed since their pets were last seen. |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Researchers estimate that more than 45% of human ringworm is contracted from infected cats and dogs. |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Growing evidence suggests that <i>Giardia</i> can be transmitted from pets to pet owners and vice versa. |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. When a household dog or cat bites a pet owner, physicians often prescribe prophylactic antibiotics because approximately 30% of cat bites and 50% of dog bites become infected. |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. Zoonotic diseases are more commonly encountered in children because they may provoke biting or scratching, go barefoot during warm weather, and may not wash their hands after handling household pets. |

Physicians who care for the varied health needs of adults and children often forget that more than half of U.S. families include household pets as extended family members. Just as human illnesses are transmitted from one family member to another, pets may expose their owners to a variety of zoonotic diseases. When talking with their respective clients, physicians and veterinarians must communicate the potential for transmission of infectious agents from pets to pet owners, and more rarely from owners to pets. Because more than 40% of immunosuppressed individuals, such as those with acquired immunodeficiency syndrome (AIDS) or those undergoing cancer treatment, own a companion animal, the prevention of zoonotic disease is just as important as its timely diagnosis.¹ This chapter describes common diseases transmitted by pets that primary care physicians encounter and discusses your veterinary team's role in educating pet owners about zoonotic diseases.

Communication failures: the scope of the problem

In 1999, two students at the University of Wisconsin School of Veterinary Medicine surveyed hundreds of Wisconsin veterinarians and primary care physicians to determine how frequently each encountered zoonotic diseases in their respective practices, how often they communicated with one another, and what role physicians think veterinary practices should play in zoonotic disease prevention.² The study found:

- Surveyed physicians and veterinarians indicated that they rarely communicated with one another.
- Veterinarians discussed zoonotic diseases with pet owners much more frequently than physicians did, although such discussions were described as weekly rather than daily events.
- Surveyed physicians felt veterinarians should assume responsibility for providing information regarding zoonotic diseases to clients as well as physicians.
- The majority of surveyed veterinarians did not ask pet owners about their immune status.
- Surveyed physicians felt that veterinarians, rather than physicians, should provide information about zoonotic diseases to immunocompromised pet owners.

It's your responsibility

Both pet owners and physicians expect veterinary healthcare teams to educate pet owners about zoonotic diseases. This includes asking pet owners about their health status as well as that of other household members during every visit. Ask pet owners about the health status of other pets and household members, rather than just family members, especially given the varied definitions of family in today's society. Other sick pets at home may provide clues to help you diagnose illnesses, particularly those with contagious zoonotic diseases.

Veterinary team members need to discuss zoonotic diseases and their prevention as part of every pet's examination. Your discussion doesn't have to be lengthy, but it can and should be supplemented with written handouts. Also ask pet owners whether the immune status of any household member has changed since their pets were last seen, and document this information in pets' medical records. Whenever you diagnose a potentially zoonotic disease in a household pet, tell clients about the potential for disease transmission, regardless of the immune status of the pet owner. This is especially important when pet owners indicate that they may be symptomatic as well.

Helminths aren't the only cause of common zoonotic diseases. A wide variety of infectious agents also are culprits. Being familiar with common human zoonoses will help you prevent the spread of zoonotic diseases to healthy and immunocompromised pet owners and also ensure that physicians quickly diagnose and treat zoonotic diseases in people.

Primary care zoonoses

Although more than 100 zoonotic infections exist, primary care physicians see only a handful with regular frequency, including bite-related, gas-trointestinal, and skin-related diseases. As a general rule, zoonotic diseases are more commonly encountered in children because they may provoke biting or scratching, go barefoot during warm weather, and may not wash their hands after handling household pets.³ Let's review common bite-related, gas-trointestinal, and skin-related zoonotic diseases that physicians see.

Figure 1

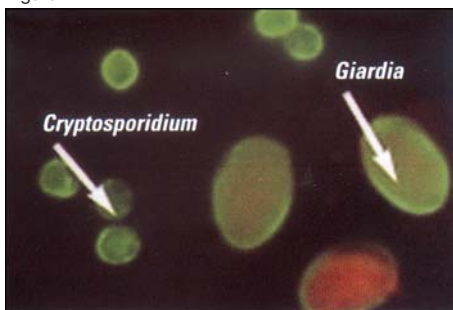


Figure 2



1. Cryptosporidiosis or *Giardia* infection in immunocompromised people may be deadly.

2. Cutaneous larva migrans (creeping eruption).

Animal bites

More than 1 million animal bites occur each year in the United States, with half of them serious enough to warrant medical evaluation and treatment. The majority of victims are children. Dogs are responsible for 80% of reported bites, cats for 10%, and the remainder secondary to household lizards, ferrets, rabbits, and other small animals.⁴ Because ferrets are frequently allowed to roam freely in pet owners' homes and are attracted to the scent of milk, severe facial injuries around the mouths of sleeping infants have been reported. When a household dog or cat bites a pet owner, physicians often prescribe prophylactic antibiotics because approximately 30% of cat bites and 6% of dog bites become infected. Why is the rate higher for cats? Dog bites tend to cause tearing injuries, which can be more easily irrigated and debrided, while cat bites usually produce deep puncture wounds, which are more likely to become infected. Infectious agents cultured from animal bites include *Pasteurella multocida*, *Staphylococcus aureus*, *Staphylococcus intermedius*, as well as anaerobic streptococci.⁴

Given the 100% fatality rate associated with human rabies, most public health authorities recommend giving people a post-exposure rabies prophylaxis regimen of rabies immunoglobulin and a five-dose course of rabies vaccine when stray or unimmunized pets bite a person, especially when the bite is not provoked. As a veterinary professional, you should cooperate with local public health authorities to expedite the diagnosis of the biting animal.

You can help prevent dog bites in households with young children with pet-selection counseling. Caution clients with young children about adopting aggressive breeds such as pit bulls, Doberman pinschers, Chihuahuas, chows, bull terriers, rottweilers, and German shepherds. Encourage parents to teach their children to avoid stray animals, supervise young children when they play with pets, and avoid behaviors that may appear threatening to household pets. When bites occur, people may initially contact your veterinary hospital for advice on wound management, but advise them to contact their physicians regarding wound care, evaluation and prophylaxis, and consideration of rabies post-exposure prophylaxis, depending on the circumstance of the bite.⁵

Gastrointestinal illness

Campylobacter jejuni, which is caused by a microaerophilic gram-negative rod, is the most frequently diagnosed human gastrointestinal bacterial infection transmitted from pets. *Campylobacter* infections result from the ingestion of contaminated food or water or from exposure to feces of infected humans or animals, including household dogs, cats, birds, and hamsters. Common symptoms of infection in pet owners include diarrhea (often bloody), abdominal pain, and fever. *Campylobacter* gastroenteritis typically lasts one to two days, but approximately 20% of those affected may have a relapse or prolonged illness.⁶

Another common pet-transmitted human gastrointestinal infection is nontyphoidal *Salmonella*, which causes diarrhea, fever, and abdominal cramps in people. The major reservoirs of nontyphoidal *Salmonella* organisms are animals, including poultry, livestock, reptiles, and pets. Although most frequently transmitted from contaminated food or water, occasional transmission occurs from infected people as well as from pets, especially reptiles such as iguanas, turtles, and geckos. For this reason, reptile owners must be reminded not to wash their pets in the kitchen sink where food can be contaminated during preparation. Attack rates

for nontyphoidal *Salmonella* infections are highest in children and the elderly. Following an infection, people can shed bacteria in stools for 12 weeks or longer, and antimicrobials can prolong excretion. Antibiotic therapy is usually not indicated for people with uncomplicated gastroenteritis caused by nontyphoidal *Salmonella* but is indicated for those with an immunosuppressive illness.⁷

Cryptosporidiosis in immunocompetent humans produces frequent, nonbloody watery diarrhea (Figure 1). Caused by *Cryptosporidium parvum*, a spore-forming coccidian protozoan, the infection can also produce abdominal cramps, vomiting, and fever and may be confused with viral gastroenteritis in children. Although the most common mechanism of infection is transmission from one person to another, infection may be transmitted from either symptomatic or asymptomatic pets, including rodents and reptiles. When immunocompromised humans are infected with *Cryptosporidium*, they may experience chronic severe diarrhea, and some cases are associated with dehydration, malnutrition, and death.⁸

Although *Giardia lamblia* is a recognized cause of diarrhea in dogs and cats as well as in people, many debate whether *Giardia* infections represent true zoonoses. Growing evidence suggests that *Giardia* can be transmitted from pets to pet owners and vice versa.⁹

Physicians and veterinarians often report a symptomatic pet in households where multiple family members have diarrheal illness due to *Giardia*. In such cases, pets as well as human family members need treatment to eradicate giardiasis from the household.⁹

Be aware that these gastrointestinal illnesses often aren't contracted from household pets, rather from contaminated food, water, or other infected individuals. Symptomatic pet owners can easily transmit these agents to pets, although most may be unaware that this is possible. This is a situation where asking pet owners about their health can facilitate the diagnosis and treatment of illnesses in pets.

Zoonotic diseases of the skin

Several zoonotic diseases may give pet owners a variety of rashes. Researchers estimated that more than 25% of human ringworm, called tinea capitis and corporis, is contracted from infected cats and dogs, caused by the organisms *Trichophyton* and *Micro-sporum*. When

ringworm is diagnosed in a pet owner, all household dogs and cats need to be examined and treated when indicated to prevent reinfection. Although the majority of human scabies is caused by the mite, *Sarcoptes scabiei*, subspecies *hominis*, occasionally *S. scabiei*, subspecies *canis*, is acquired from dogs. A typical rash from the *canis* subspecies in people is papular, and it lacks the tracts that are usually seen in the rash secondary to the *hominis* subspecies. In dogs, the *canis* mite produces a skin infection called mange, and these dog owners should be advised to seek medical attention if they develop any suspicious rashes.¹⁰

Hookworms of dogs and cats may cause cutaneous larva migrans (Figure 2). Infection occurs most often in the southeastern United States and among children because their play habits put them in contact with contaminated soil and they may handle infected young pets. Skin lesions consist of raised red serpentine tracts and cause severe itching. A hookworm produces an anticoagulant in its saliva so the host's blood does not clot at the site where the hookworm attaches. If the hookworm moves from one site to reattach itself to another, the first site may continue to bleed, sometimes seriously. In severe cases, larvae migrate through the skin and enter deeper tissues, causing painful muscles and lung disease. Hookworm infections in people also may cause visceral larva migrans.

Most pet owners don't know that hookworm infections can be transmitted from pets to people, so you play an important role in prevention by recommending routine deworming of pets and advising parents when a pet is diagnosed with hookworm or other helminthic infections to take appropriate precautions.

Caring for immunocompromised pet owners

Pet owners who have human immunodeficiency virus (HIV) infections or are receiving treatment for cancer are at high risk for contracting zoonotic diseases from their pets. Immunocompromised people may develop more serious illnesses, and zoonotic diseases may even be life threatening. Because of the enormous mental and physical benefits of companion animals for people with serious medical problems, you need to counsel pet owners who are at risk for contracting zoonotic diseases.

The CDC offers helpful guidelines on pet ownership for immunosuppressed patients. These patients should avoid adopting animals less than 6 months of age, especially those with diarrhea. A veterinary professional should evaluate household pets with diarrhea promptly, including examining stool specimens for *Cryptosporidium*, *Salmonella*, and *Campylobacter*. Patients should wash their hands after handling pets, avoid pet feces, and keep away from animals with diarrhea. The risk of salmonellosis also makes reptiles a poor pet choice for these patients. Talk with these patients about the potential risks of cat ownership, such as toxoplasmosis and *Bartonella* infections, in addition to the risks of cryptosporidiosis, salmonellosis, and campylobacteriosis. Risks are lower if an adopted cat is older than 1 year, not permitted to go outdoors, and isn't allowed to hunt or eat raw or under-cooked meat. Patients should avoid activities that may result in cat scratches or bites, should wash cat bites promptly, and should not allow cats to lick open wounds. Good flea control will further reduce the risk of *Bartonella* infection.¹²

Start educating clients today

As a veterinary professional, your responsibilities extend well beyond the routine health care of household pets. Zoonotic disease prevention and education should be a high priority. Routine deworming of young and adult animals will help prevent helminth-related zoonotic diseases, and pet-selection counseling will help families with young children avoid animal bite infections.

Your veterinary team can develop an educational program for staff members and pet owners and create a system to identify clients at high risk for

zoonoses. Lastly, when you diagnose a pet with an infection that has the potential to be transmitted to family members, inform pet owners immediately to facilitate the timely diagnosis of zoonotic diseases by physicians.

References

1. Angulo FJ, Glaser CA, Juranek DD, et al. Caring for pets of immunocompromised people. [Am Vet Med Assoc 1994;205:1711.
2. Grant S, Olsen CW. Preventing zoonotic diseases in immunocompromised persons: the role of physicians and veterinarians. Emerg Infect Dis 1999;5:159.
3. Plaut M, Zimmerman EM, Goldstein RA. Health hazards to humans associated with domestic pets. Annu Rev Public Health 1996; 17:221.
4. Steele RW. Sizing up the risks of pet-transmitted diseases. Contemp Pediatr 1997.
5. Weiss HB, Friedman DI, Coben JH. Incidence of dog bite injuries treated in emergency departments. J Am Med Assoc 1998;271:51.
6. American Academy of Pediatrics Committee on Infectious Diseases: Report of the Committee Infectious diseases, 25th Ed. Elk Grove Village, IL; American Academy of Pediatrics: 196.
7. American Academy of Pediatrics Committee on Infectious Diseases: Report of the Committee Infectious diseases, 25th Ed. Elk Grove Village, IL; American Academy of Pediatrics:501.
8. American Academy of Pediatrics Committee on Infectious Diseases: Report of the Committee Infectious diseases, 25th Ed. Elk Grove Village, IL; American Academy of Pediatrics:223.
9. Farthing MJ. Giardiasis. Gastroenterol Clin North Am 1996; 25(3):493.
10. American Academy of Pediatrics Committee on Infectious Diseases: Report of the Committee Infectious diseases, 25th Ed. Elk Grove Village, IL; American Academy of Pediatrics:506.
11. How to prevent transmission of intestinal roundworms from pets to people. Atlanta, Centers for Disease Control and Prevention/National Center for Infectious Diseases and the American Association of Veterinary Parasitologists, 1996.
12. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention 1997 USPHS/IDSA Guidelines for the Prevention of Opportunistic Infections in Persons Infected with the Human Immunodeficiency Virus June 27,1997. VolL46:1.

Pre-test answers:

- | | |
|----------|----------|
| 1. True | 4. False |
| 2. False | 5. True |
| 3. True | |

The Centers for Disease Control and Prevention (CDC) suggests that you discuss the following with all dog and cat owners:¹¹

- Types of intestinal helminths that infect dogs and cats and the illnesses they cause in pets, including anemia, diarrhea, lethargy, dry or dull hair coat, and stunted growth in young animals
- How intestinal helminths are transmitted to dogs and cats, with special emphasis on helminths acquired through prenatal (*Toxocara canis*) and transmammmary (*Ancylostoma caninum*, *Toxocara cati*, and, to a limited degree, *T. canis*) routes
- How ascarids and hookworms can cause problems in humans, especially children, whose play habits and attraction to pets put them at increased risk
- How infection in both pets and people can be prevented by well-timed prophylactic anthelmintic treatment of puppies and kittens and routine diagnostic examinations or periodic preventive treatment of older pets
- How to collect and dispose of pets' feces, especially in areas where children play
- How to keep children away from areas that may be contaminated by dogs or cats infected with helminths