

AAVMC/APTR One Health Interprofessional Education

Zoonotic Infections



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Objectives

- Recognize common zoonotic infections
- Understand the treatment of common zoonotic infections
- Enabled to counsel patients/owners on preventing common zoonotic infections.



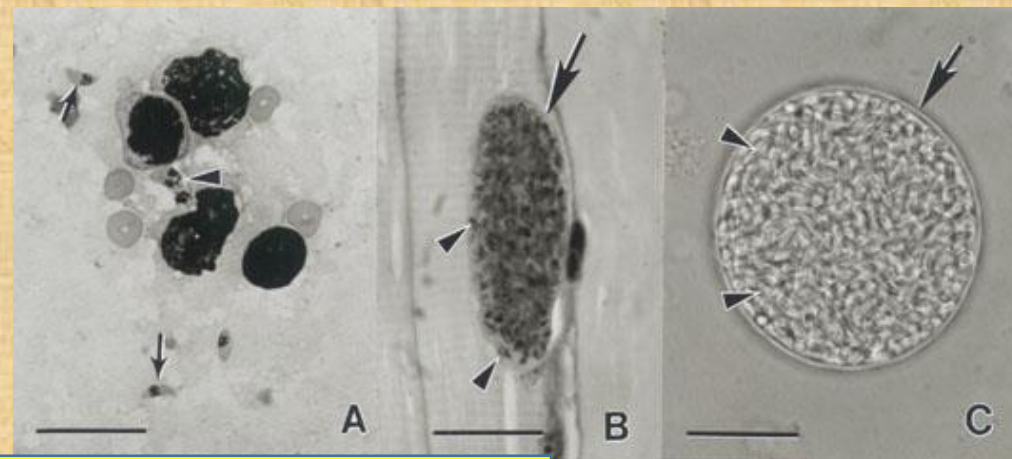
Zoonotic Infections Discussed

- Toxoplasmosis
- Cat scratch disease
- Leptospirosis
- Worms
- Tinea (ringworm)
- Mites/Scabies
- MRSA
- Rabies (in animal bites lecture)

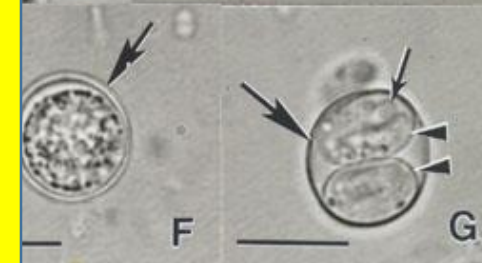


Toxoplasmosis

- Caused by a parasite (*Toxoplasma gondii*)
- Prevalent worldwide
- Carried by cats and is passed in their feces
- Sporulation takes 1-5 days
- Cats shed oocysts for 2 weeks
- Oocysts can survive for years in the environment
- Antibody testing of cats has little to no public health value.



Toxo is not infectious until it sporulates! Cleaning/scooping the litter box daily will minimize the risk of toxo exposure.



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Toxoplasmosis

- Approximately 20% U.S. seropositive
- Most asymptomatic
- 750 deaths attributed to toxoplasmosis each year
- **Eating undercooked meat accounts for >50% of infections**
(2rd leading cause of foodborne deaths in the U.S.)
- Highest risk: immunocompromised, young, fetus, pregnant

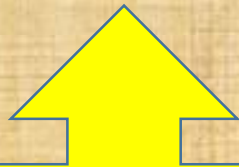


European countries can be as high as 60-85%.

If you like your meat a little on the rare side, you are at risk.

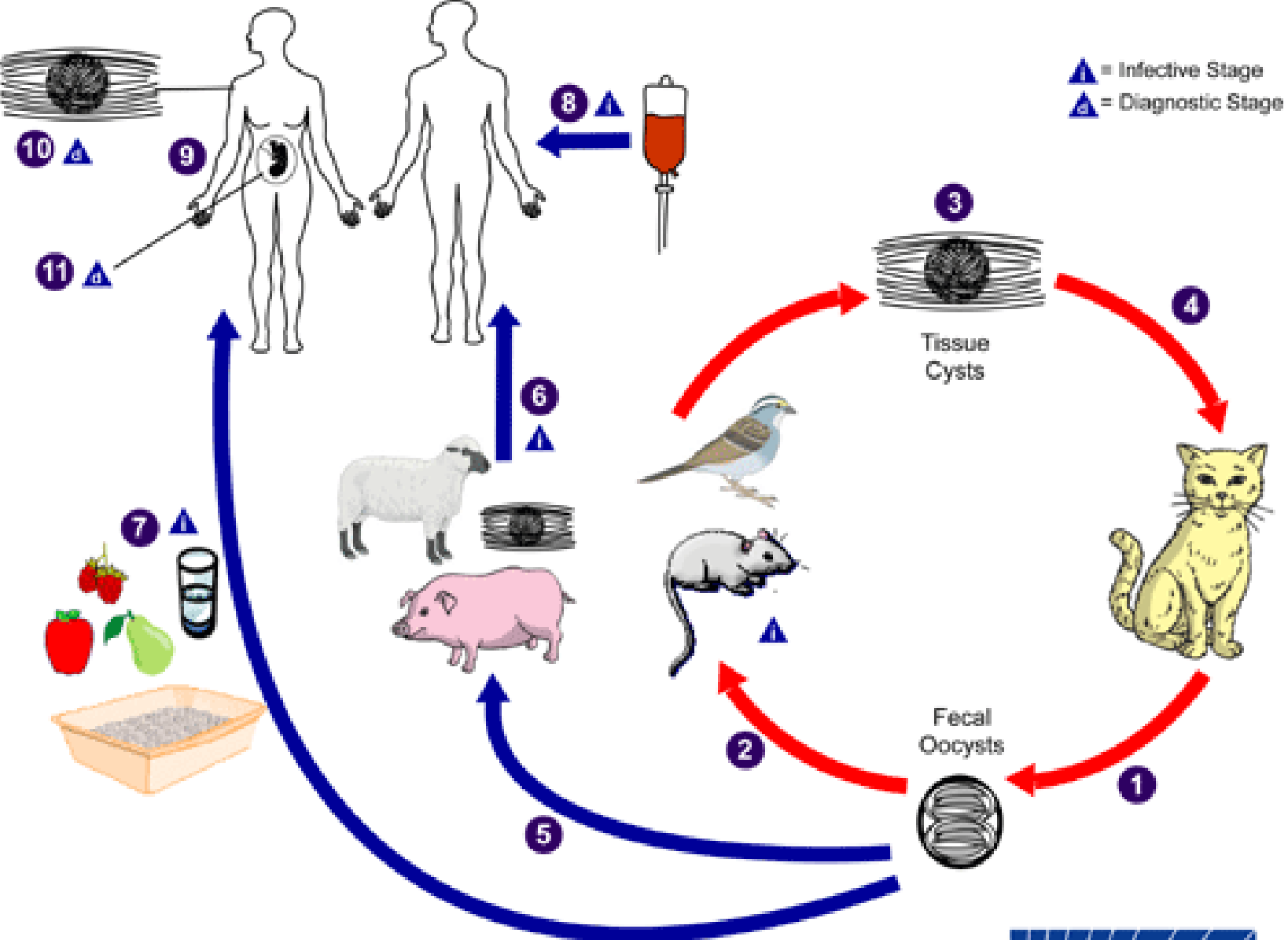
Toxoplasmosis Infection

- Most are asymptomatic
- Symptoms: swollen glands, muscle aches and flu-like symptoms
- Severe infections can damage the brain, eyes, and other organs
- Can be acute or latent infection

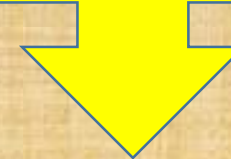


Latent infections most commonly happen in
acquired immunodeficiency
(HIV, starting immunosuppressant medications, etc)





Even a 100% indoor cat can be exposed to toxo. This one's a good mouser!



Congenital Toxoplasmosis

- 400-4000 annually in the U.S.
- Sequelae
 - Death
 - learning disabilities (1-2%)
 - chorioretinitis (4-27%)
- Most infants are asymptomatic
- classic triad
 - Chorioretinitis
 - Hydrocephalus
 - intracranial calcifications
- Infection during pregnancy
 - Spiramycin
- Newborn infection
 - Pyrimethamine, sulfadiazine, and leucovorin



This lesion would not be seen without a slight lamp unless you are very through with your exam.

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Toxoplasmosis

Animal Infections

- Most cats are asymptomatic
- Pulmonary
 - Diffuse interstitial to alveolar patterns or pleural effusion
- Ocular
 - Anterior/posterior uveitis
- CNS
 - Behavioral changes, blindness, ataxia, seizures
- Treatment in Cats
 - No approved treatments
 - Sulphonamides, trimethoprim, pyrimethamine, and clindamycin, either alone or in combination have been used

Toxoplasmosis

Animal Infections


- Treatment
 - Ocular: clindamycin
 - CNS: clindamycin or sulfanamide + pyrimethamine



Toxoplasmosis Prevention

Safety Tips if pregnant (SOR IIIB)

- Cook meats thoroughly
- Wash fruits and vegetables
- Wear gloves when gardening
- Have non-pregnant person (if possible) change litter box daily
- Wear gloves when cleaning litter box
- Wash hands
- Keep cats indoors
- Avoid adopting or handling stray cats
- Feed cats only canned or dried commercial cat food
- Do not bring a new cat into your house that might have been fed raw meat



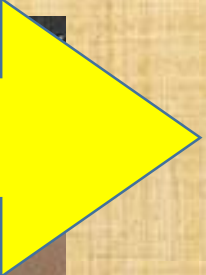
There is minimal risk from your cat if you follow these recommendations!

Little risk if already seropositive.

- No recommendation for routine testing of pregnant women or occupational exposure
- Data shows veterinarian seropositive rate equal to the general population
- Some data for testing HIV patients and those undergoing bone marrow transplant

Cat Scratch Fever





The flea is the definitive host. Get rid of the flea and no longer at risk for cat scratch disease. Regularly use your veterinarian recommended flea and tick control.

In some areas, fleas are now resistant to certain flea and tick prevention. Check with a local expert.

- *Bartonella henselae*
- Bitten or scratched by an infected cat
- Also shown to be directly transmitted from a flea or ticks bite
- Annual incidence: 9.3 per 100,000
- About 25,000 case annually in U.S.
- 4 – 6% seropositive in the U.S.
- Peak incidence: fall and early winter
- 40% of cats carry *B. henselae* (up to 90% cat <1 y/o)
- Cats are usually asymptomatic
- Flea dirt (feces)

Cat Scratch Disease Diagnosis

- Many are asymptomatic or have very mild symptoms
- LAD (90%) develops in ~2 weeks
- Fever (33%), headache, fatigue, and a poor appetite
- Splenomegally (12%, 50% children)
- Rare: bacillary angiomatosis and Parinaud's oculoglandular syndrome (2-3%)
- Immunocompromised patients at highest risk



Cat Scratch Disease – Treatment (Humans)

Reaction to endotoxin-like products released by the death of harmful microorganisms during antibiotic treatment.

Symptoms: fever, chills, headache, tachycardia, hypotension, myalgia, flushing

Classically seen in treatment of syphilis

green, or eye if untreated)

R IIB)

250mg qd x4

x4)

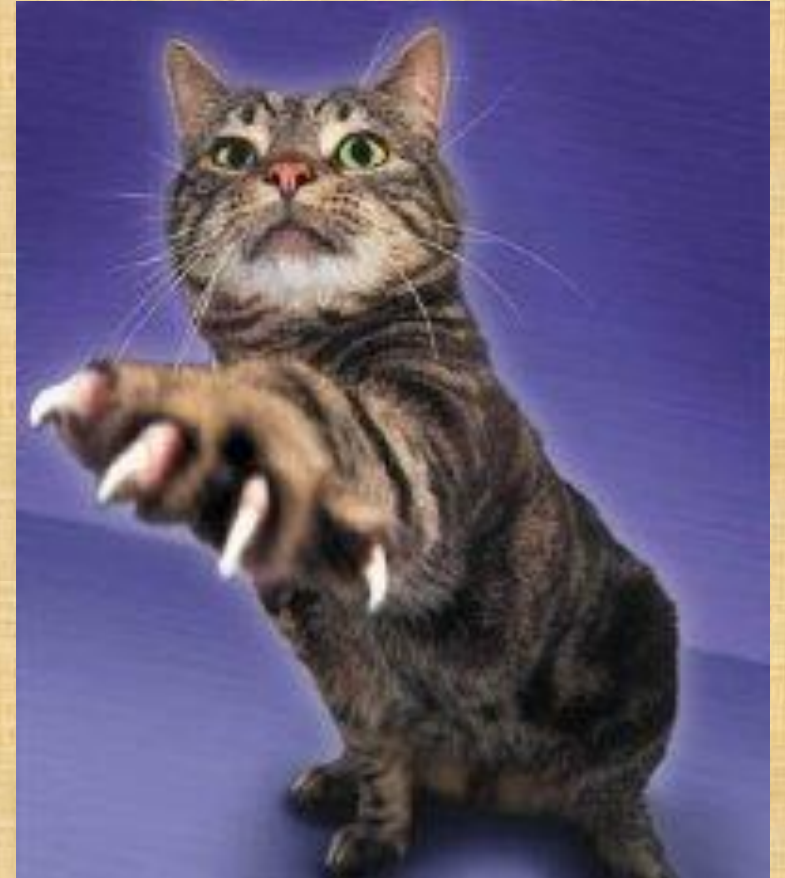
- Trimethoprim-sulfamethoxazole: DS BID (8/40 mg provided BID)
- Ciprofloxacin 500mg BID
- **Jarisch-Herxheimer reaction can happen**



Cat scratch disease

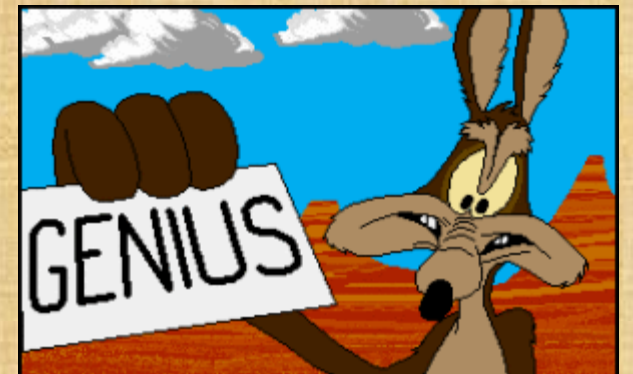
Animal Infections

- Cats
 - Usually asymptomatic
 - Fever, anorexia, non-specific
 - Diagnosis
 - Serology only indicates past exposure
 - Blood and tissue culture (expensive)
 - Treatment
 - Difficult
 - 1st line: Doxycycline administered at 10 mg/kg, PO, q12–24 h or amoxicillin–clavulanate at 22 mg/kg, PO, q12 h for 7 days
 - If not improving: azithromycin (10 mg/kg, PO, daily for 1 week followed by q48 h) or a fluoroquinolone



Cat Scratch Disease Animals

- Dogs
 - Usually tick transition
 - Coyote reservoir
 - Usually different type of *Bartonella*
 - Symptoms: non-specific
 - Fever, polyarthritits, endocarditis, hepatitis
 - Diagnosis:
 - Serology is more helpful; neg does not rule out
 - PCR best test
 - Treatment:
 - Doxycycline and azithromycin





Cat Scratch Disease Prevention

- Avoid "rough play" with cats
- Immediately Wash cat bites and scratches
- **Control fleas!**

Leptospirosis

- Long, thin motile spirochetes
- 100-200 cases annually in the US
(about half the human cases in Hawaii)
- Reinstated as a nationally notifiable disease in 2013
- Direct transmission between mammals
- Indirect transmission via contact with *Leptospira* contaminated water or soil
- Outbreaks and sporadic cases
 - May be associated with floods

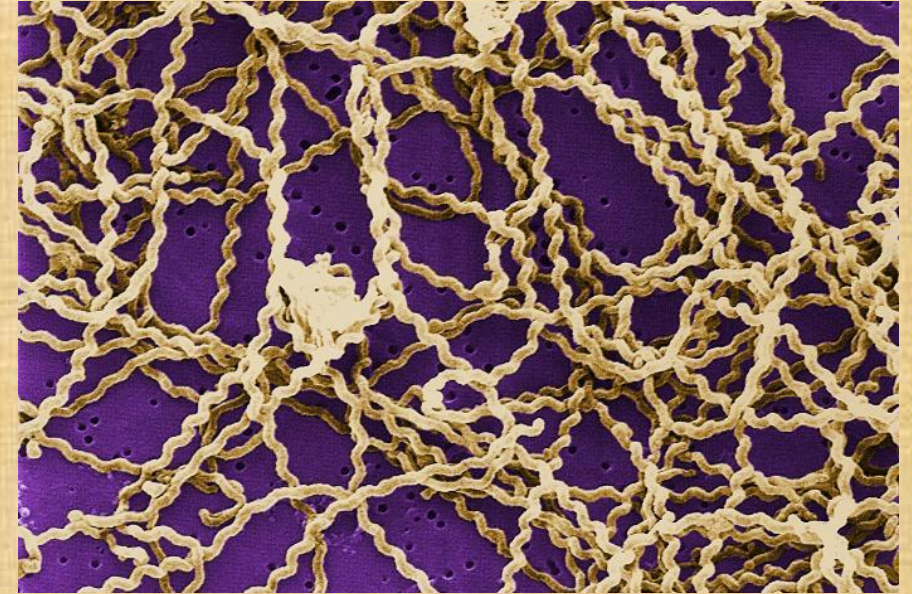


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Leptospirosis

- Clinical Manifestation
 - Incubation period ~7 days (2-29)
 - Fever, headache, chills, myalgias, vomiting, jaundice, anemia, and sometimes a rash
 - Conjunctival suffusion.
 - If untreated, can develop kidney damage, meningitis, liver failure, and respiratory distress, and death (1-5%)
 - Serious icteric form (Weil's disease)
- Diagnosis
 - Dark field microscopic agglutination test (MAT)
 - *Leptospira*-specific IgM (sensitive and specific)



Leptospirosis – Animals



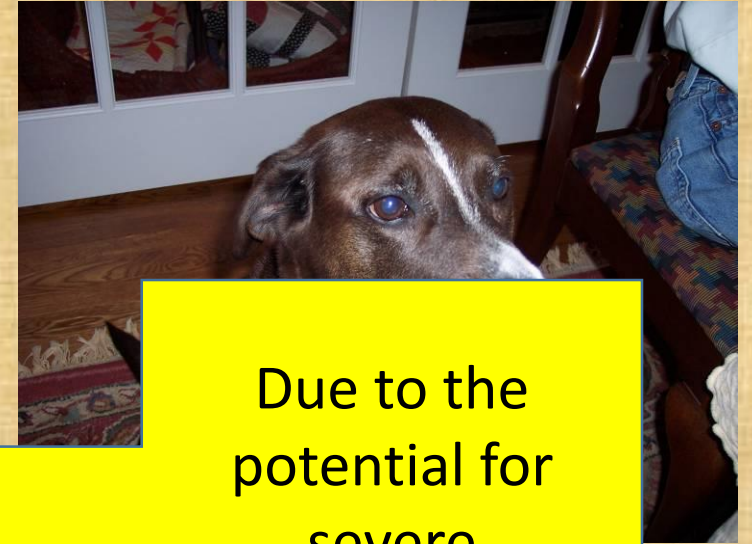
- Classically: Liver and renal failure
- Dog:
 - Any with unknown renal failure should be considered
 - Fever and muscle tenderness/reluctance to move early in infection
 - Uveitis, conjunctivitis
 - Respiratory distress and leptospiral pulmonary hemorrhage syndrome (LPHS)
- Horses: can cause acute renal failure, abortion, uveitis

Leptospirosis

Humans

- Treatment

- Most self limited
- Treat all symptomatic patients (SOR IIB)
- Doxycycline 100 mg PO twice daily
(shortened illness by 2 days, prevents urine shedding)
- Ceftriaxone 1 g every 24 hours
- Penicillin 6 million units daily



Due to the potential for severe complications.

Leptospirosis Animals (Dogs)

- Treatment

- doxycycline 5 mg/kg PO or IV q12h for 2 weeks
- If vomiting precludes doxycycline:
 - ampicillin, 20 mg/kg IV q6h
 - Followed by doxycycline for 2 weeks after GI symptoms improve
- Consider intermittent hemodialysis or continuous renal replacement therapy for severe uremia
- Owner Education
 - Avoid contact with urine and clean contaminated surfaces with household disinfectants
 - Keep infected dog from urinating in standing water



Leptospirosis

- Prevention
 - Vaccinate Animals
 - Avoid stagnant or contaminated water for both humans and pets
 - Rodent control measures
 - Doxycycline prophylaxis
(200 mg qwk for 2-3 wks and at the end of exposure)



Suputtamongkol, Y, Niwattayakul, K, Suttinont, C, et al. An open, randomized, controlled trial of penicillin, doxycycline, and cefotaxime for patients with severe leptospirosis. Clin Infect Dis 2004; 39:1417.

Everett, ED. Treatment and prevention of leptospirosis.

Takafuji, ET, Kirkpatrick, JW, Miller, RN, et al. An efficacy trial of doxycycline chemoprophylaxis against leptospirosis. N Engl J Med 1984; 310:497.

Skyles J, et al. 2010 ACMIM small animal consensus statement on Leptospirosis: diagnosis, epidemiology, treatment, and prevention. J Vet Intern Med. 2011 Jan; 25(1): 1-13.

Worms

- *Baylisascaris procyonis*
 - Raccoon round worm
 - Often fatal
 - severe CNS disease
 - Ocular larva migrans
- *Avoid contact with raccoons*
 - Have a professional get rid of raccoons and clean up raccoon latrines.



Toxocariasis (Roundworms)

- Dogs (*Toxocara canis*), Cats (*T. cati*)
- 10,000 human cases annually in U.S.
- 20% of adult dogs, 80% of puppies are infected
- Human infection
 - Eggs are not initially infective (2-4 wks in soil)
 - Children 1-5 highest risk
 - Severe: Malaise, irritability, fever, hepatomegaly, pruritic cutaneous lesions, respiratory symptoms



Toxocariasis

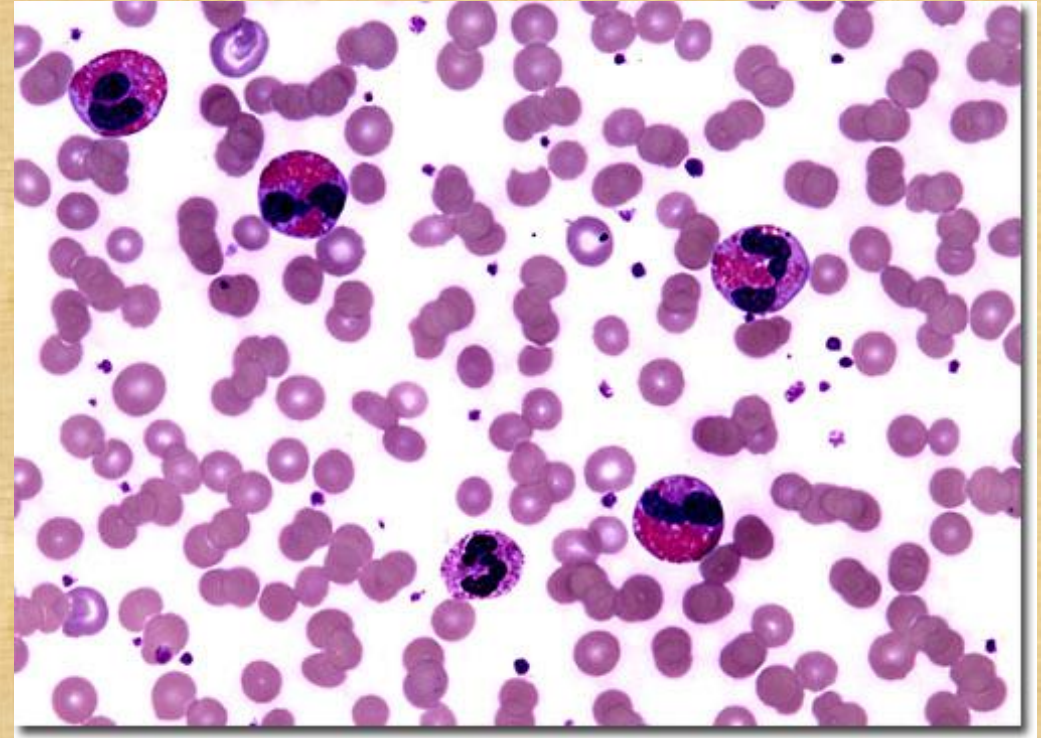
Ocular, visceral, or cutaneous larva migrans

- Ocular larva migrans
 - Causes inflammation and scarring of the retina
 - 700 people per year experience permanent partial loss of vision.
 - Symptoms: Strabismus and failing vision



Toxocariasis

- Diagnosis
 - Leukocytosis with eosinophilia
 - ELISA antibody assay (not good for OLM)
 - Tissue biopsy (rarely done)
 - Stool studies in animals



Toxocariasis

Treatment

- Humans
 - Self limited
 - Severe cases:
 - Albendazole 400mg BID
 - Mebendazole 100-200mg BID
- Animals
 - Drugs approved for treatment of *Toxocara* infections in dogs and cats are fenbendazole, milbemycin oxime, moxidectin, selamectin (*T. cati* only), piperazine, and pyrantel pamoate
 - Puppies and kittens should be routinely dewormed at 2, 4, 6, and 8 weeks of age



Toxocariasis

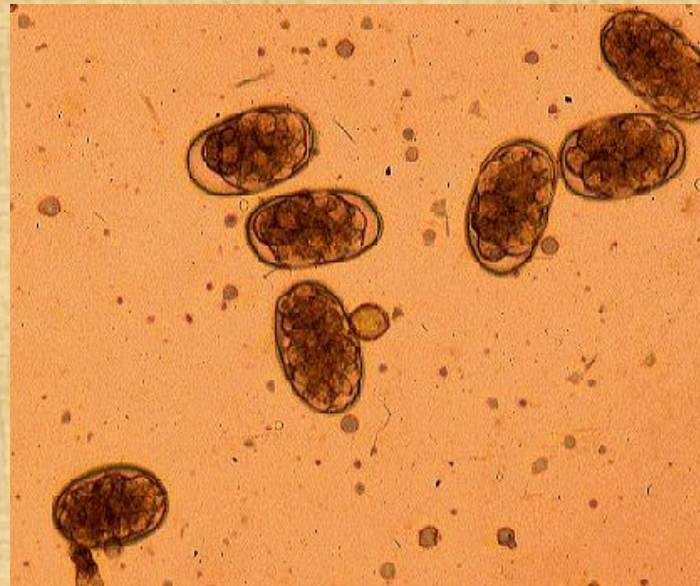
- Prevention
 - Regular veterinary care
 - Wash your hands after playing outside or with pets
 - Do not allow children to play in areas that may be soiled with pet or other animal stool.
 - Clean your pet's living area at least once a week.
 - Avoid uncovered sand boxes.
 - Wash hands immediately after use of a sand box and keep child's hand out of their mouth while playing in the sand or dirt.
 - Teach children not to eat dirt or soil (Pica)

Most worms are fecal oral transmission



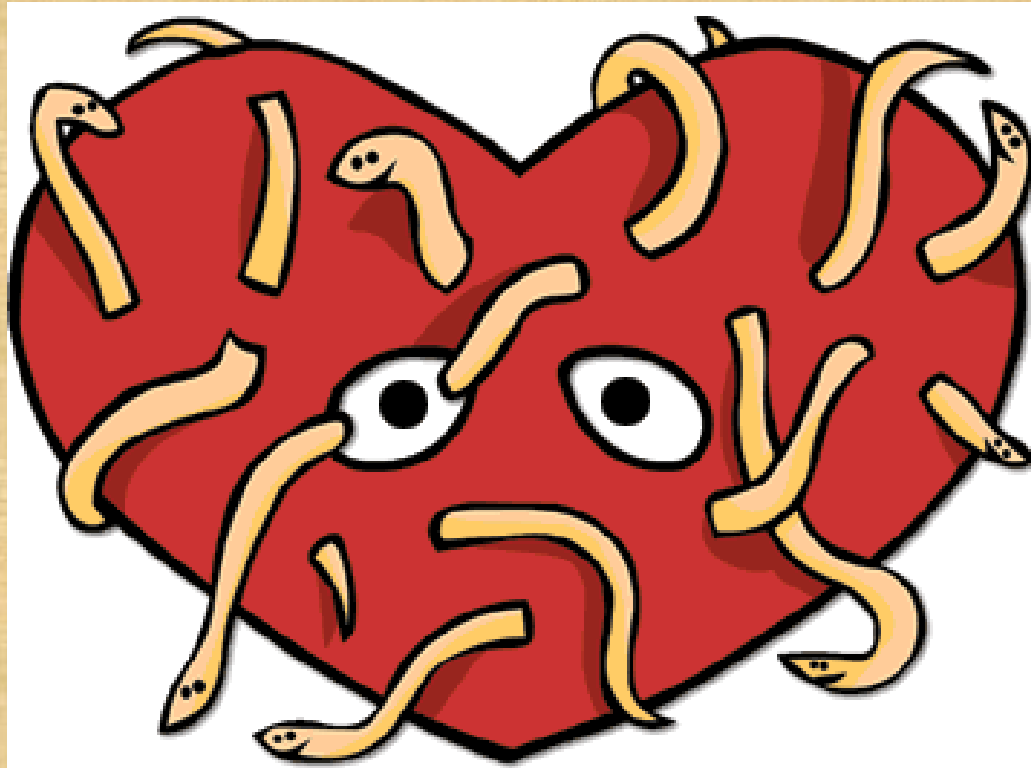
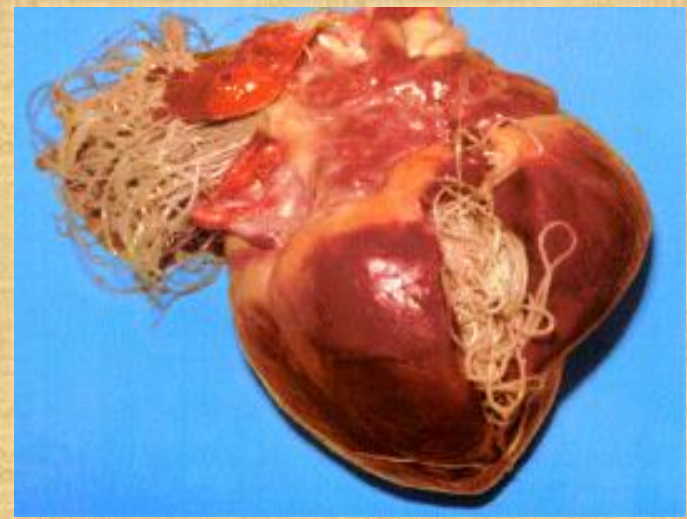
Hookworm

- *Ancylostoma caninum*
 - Cutaneous larva migrans/Eosinophilic enteritis
 - Animals: anemia, GI signs, cutaneous larva migrans (hookworm dermatitis), respiratory illness



Worm Prevention

- Use your **heartworm meds** to prevent other worms!

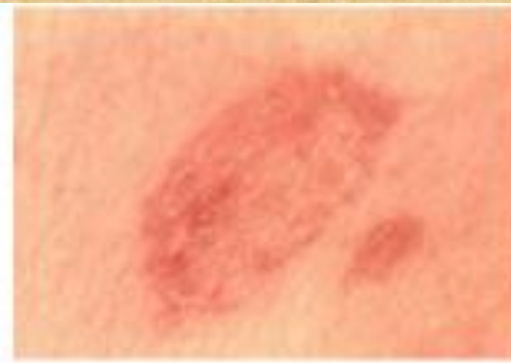


Tinea and pets (Ringworm)

- Caused by a fungus, not a “worm”
- Can be transmitted by pets
- Can be given to pets by people
- Infected animals almost always symptomatic
- Persian cats and Yorkshire Terriers can be frequent asymptomatic carriers



Tinea and pets



Ringworm on the back



Ringworm on the arm



Ringworm on the scalp

- Tinea is everywhere in our environment
- Most human infections are not caused by pets.
- More likely to get it from the gym or a child's school
- Active infections in animals causes areas of alopecia
- Treatment in animals is often long and expensive

Bottom Line: If your pet is not symptomatic, you probably didn't get it from the pet, and the pet does not need treatment!

Tinea Treatment

Humans

- Skin: Topical antifungals
- Scalp: Oral antifungals (Griseofulvin)

Animals

- Definitive diagnosis based on culture/histopath as many things can cause alopecia and look similar to tinea
- Need for systemic therapy
- Topical treatment is not adequate; is palliative at best
- 6-10 weeks of treatment
(up to 6 months in long haired breeds)

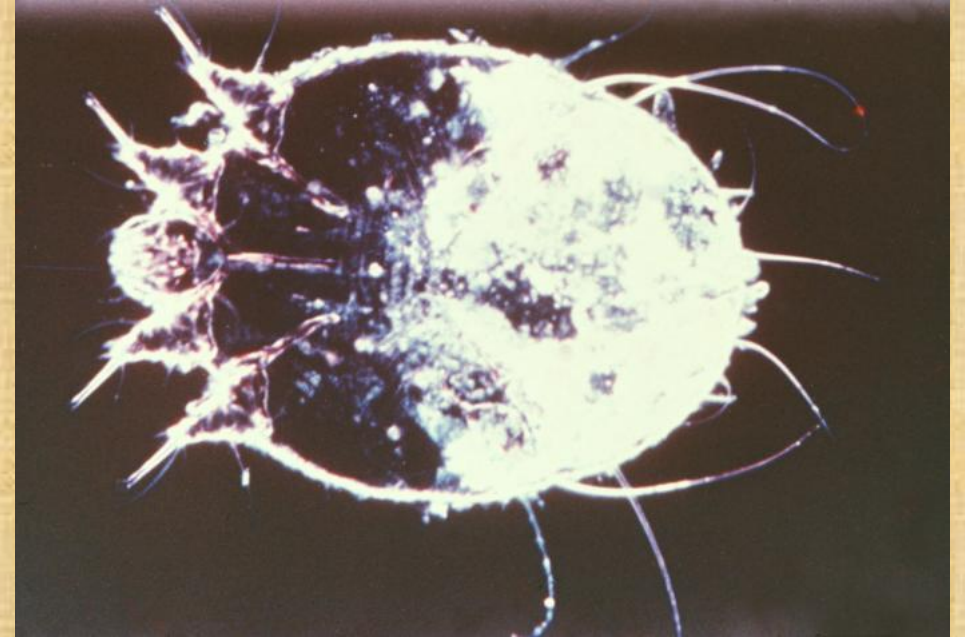


Mites (Mange)

Sarcoptes vs Demodex



- Sarcoptes (Scabies) is zoonotic



Microscopic exam is the only way to differentiate.

Physicians can contact the veterinarian if there is a question about which was diagnosed.

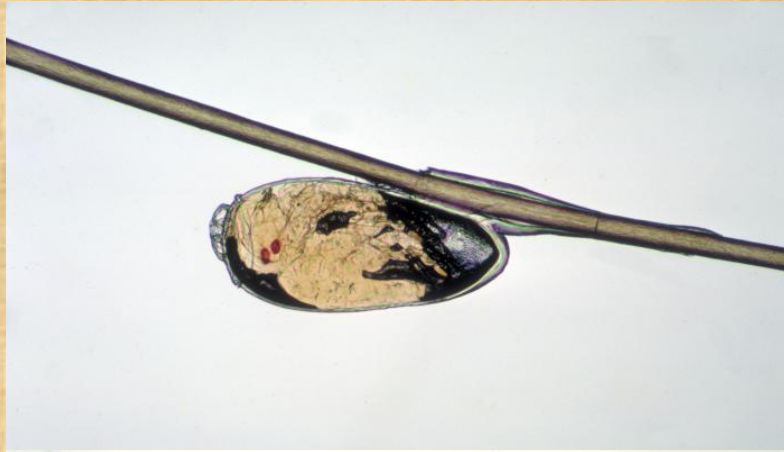
Veterinarians should offer to contact the physician of a client whose pet has been diagnosed with sarcoptes.



- Demodex is not zoonotic



LICE IS SPECIES SPECIFIC (Not a Zoonotic Infection)



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MRSA

- Well documented in domestic animals.
- Originated in people.
- Increasing in prevalence.
 - Horses
 - Cats and dogs

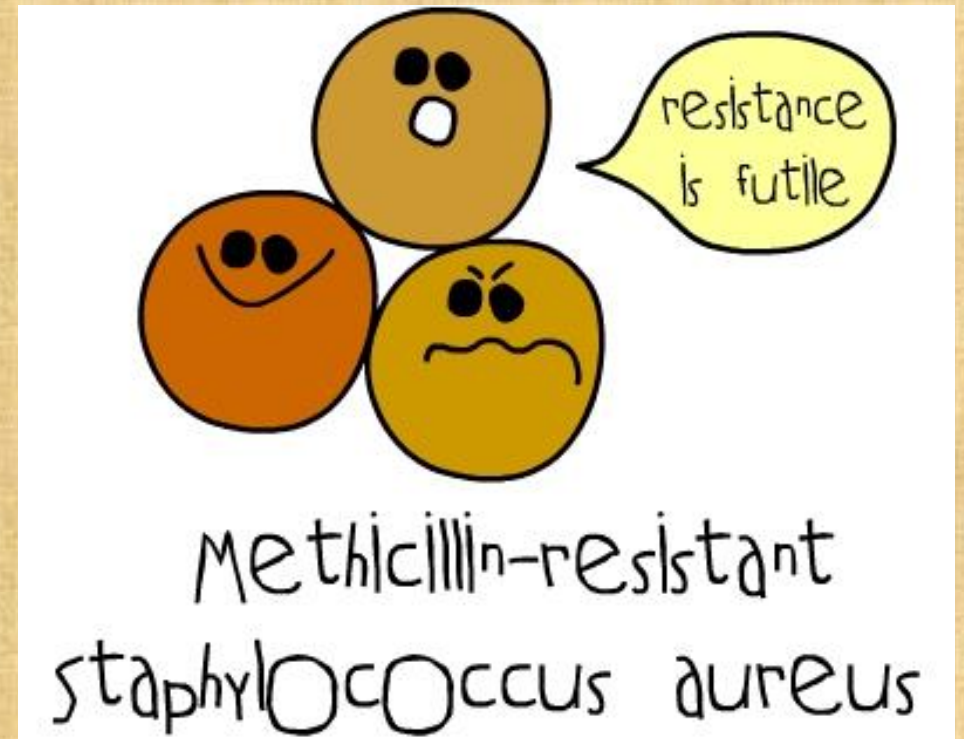


van Duijkeren E, Wolfhagen MJHM, Box ATA, Heck MEOC, Wannet WJB, Fluit AC. Human-to-dog transmission of methicillin-resistant *Staphylococcus aureus*. Emerg Infect Dis [serial on the Internet]. 2004 Dec.

Methicillin-Resistant *Staphylococcus aureus* in Horses and Horse Personnel, Emerg Infect Dis, (11:3), Mar. 2005.

MRSA

- Diagnosis
 - Easily cultured
- Treatment
 - Susceptibilities will guide treatment
 - Sulfa, clindamycin, doxycycline, chloramphenicol
- Prevention
 - **GOOD HAND WASHING!**



Case 1

- A man was admitted to the hospital with pneumonia. It was originally misidentified by as *Pseudomonas luteola* by an automated lab system.
- The man deteriorated and was transferred to a referral hospital and diagnosed with *Yersinia pestis*.
- Upon investigation the man had a dog that recently died with hemoptysis. The dog, a male pit bull terrier aged 2 years, became ill with fever, jaw rigidity, drooling, and right forelimb ataxia. After being hospitalized overnight the dog was euthanized after developing dyspnea and bloody sputum. It was negative for rabies and anticoagulants. After contact with the health department liver and lung tissue from the dog were tested and found to be positive.
- 2 veterinary clinic employees and a close contact to the man had respiratory symptoms and tested positive for *Yersinia pestis*.
- 114 persons had close contact with the dog or one or more of the human patients: 36 in veterinary settings, 58 in human health care settings, and 20 as close personal contacts. 88 of them were recommended to take antibiotic prophylaxis

Case 1 Questions

- From a One Health aspect, what parts to this case went well?
- How could health professionals have worked better together in this case to prevent further spread of the disease?

Case 2

- In 2015 California had a record number of deaths from West Nile virus. (all but 3 of the deaths were in Southern California)
- 45 deaths and 737 cases.
- These were by far the most in the US
- The virus is spread by mosquitoes and has killed many birds as well.

Case 2 Questions

- What are Veterinarians, Physicians, and health professionals role in the detection and prevention of West Nile?
- How can they work together to decrease the spread of West Nile virus?



Summary

- Pets can transmit infections to people
- Simple precautions will minimize risk
- Regular veterinary care is important to minimize risk, including regular vaccinations, flea and tick prevention, and heartworm prevention
- **NEVER** trust The Cat In The Hat