Question

Which of the following is a vector for Rocky Mountain Spotted Fever?

- Ixodes pacificus
- Dermacentor variabilis
- Rhipicephalus sanguineus
- Ornithodoros coriaceus

Explanation - The correct answer is **Dermacentor variabilis**, also known as the American dog tick. This is known to transmit RMSF in the east. Dermacentor andersoni, the wood tick, is in the western US. Rhipicephalus sanguineus transmits Ehrlichia canis. Ixodes pacificus transmits Lyme disease.

Question

You are a practicing veterinarian in sunny California when a 5-year old female spayed Doberman arrives at your clinic with anorexia, lethargy, depression, and weight loss. On physical exam you notice several nodular and draining skin lesions. There is lymphadenopathy, and you detect a cough. Further examination reveals uveitis.

You question the owner and he mentions that he and his dog are originally from the Ohio River valley. You perform cytology on fine needle aspirates that you obtained from the skin nodules and enlarged lymph nodes. What organism do you expect to find?

- Cryptococcus neoformans
- Blastomyces dermatitidis
- Streptococcus
- Histoplasma capsulatum
- Sporothrix schenckii

Explanation - The correct answer is Blastomyces dermatitidis. You can come to this diagnosis by thinking about the clinical findings and travel history, which are both characteristic for blastomycosis. On cytology you can expect to see a 5-20 micrometer diameter thick, refractile, double-contoured cell wall, and broad-based budding organism. Transmission is a result of spores inhaled from the environment which form yeast in the lungs and then disseminate through the blood and lymphatics. Itraconazole is usually the drug of choice for uncomplicated disease.

Histoplasmosis usually occurs in the Ohio, Mississippi, and Missouri river valleys, but skin and ocular lesions occur uncommonly. Usually, you will see GI involvement, especially large bowel. Usually, with histoplasmosis you will see large numbers of small round bodies with a basophilic center in mononuclear phagocytes from your sample.

Blastomycosis

Histoplasmosis

Question

Which of the following is most likely to be the vector for Lyme disease?

- Dermacentor variabilis
- Amblyomma americanum
- Ixodes pacificus
- Rhipicephalus sanguineus
- Dermacentor andersoni

Explanation - The correct answer is Ixodes pacificus. Ticks acquire the infection at any stage and are most likely to get it from the white-footed mouse, Peromyscus leucopus. Dermacentor variabilis and Dermacentor andersoni are known to transmit Rocky Mountain Spotted Fever. Amblyomma americanum may transmit canine granulocytic ehrlichiosis which is caused by E. ewingii and Anaplasma phagocytophila. Rhipicephalus sanguineus is known to transmit Ehrlichia canis.

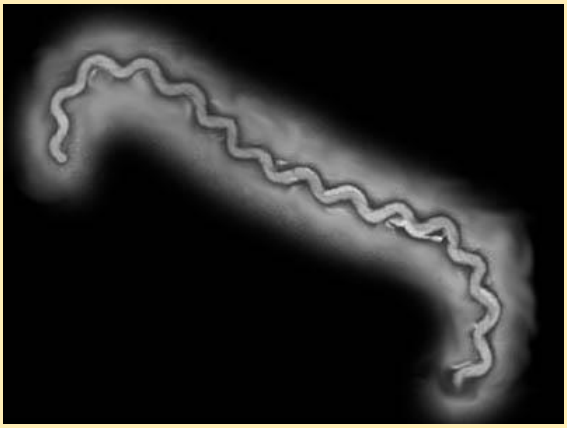
Lyme disease is one of the most common tick-borne in the world. It is caused by a spirochete species of the **Borrelia burgdorferi** group. Dominant clinical feature in dogs is **polyarthritis**. More serious complications include damage to the kidney, and rarely heart or CNS disease.

Question

Which of the following organisms is best visualized under dark field microscopy?

- Mycobacterium
- Aspergillus
- Leptospira
- Rickettsia
- Ehrlichia

Explanation - The correct answer is leptospira. The causative agent of leptospirosis is a gram negative organism that stains poorly, if at all. Dark field microscopy is the best way to identify this organism. Leptospira also grows very slowly. There are 7 serovars out of over 220 that tend to cause disease in animals.



Question

Which are the most common serovars now thought to play a role in canine leptospirosis?

- icterohemorrhagiae, canicola, grippotyphosa
- Bratislava, canicola, icterohemorrhagiae
- Grippotyphosa, pomona, bratislava
- Pomona, bratislava, icterohemorrhagiae

Explanation - The correct answer is grippotyphosa, pomona, and bratislava. Icterhemorrhagiae and canicola were the most common serovars isolated in the past. The leptospires penetrate mucous membranes or abraded skin and multiply in the blood stream and spread to organs. The antibody response usually limits the response to the renal tubular epithelial cells. Clinical signs include anorexia, pyrexia, vomiting, dehydration, PU/PD, anuria or oliguria. The standard diagnostic test is the **microscopic agglutination test (MAT);** be careful when interpreting titers. Remember, leptospirosis is zoonotic.

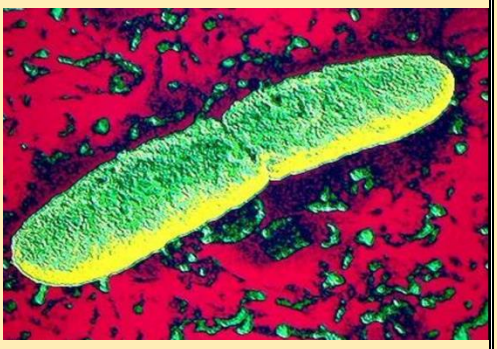
Question

A dog presents to your clinic for fever and lymphadenopathy. You perform an aspirate and see large, bipolar staining coccobacilli. The owner mentions that he saw his dog eating a rat a few days ago. What is causing the dog's illness?

- Yersinia pestis
- Pasteurella multocida
- Staphylococcus aureus
- Francisella tularensis

Explanation - The correct answer is **Yersinia pestis**. In order to make this determination remember that Yersinia pestis is usually transmitted to cats and dogs as a result of ingesting infected rodents or via bites from the prey's fleas. Dog and cat fleas are poor vectors of Plague.

Dogs usually recover and you may lance the "**buboes**" and flush it, but dispose of organic material properly.



Question

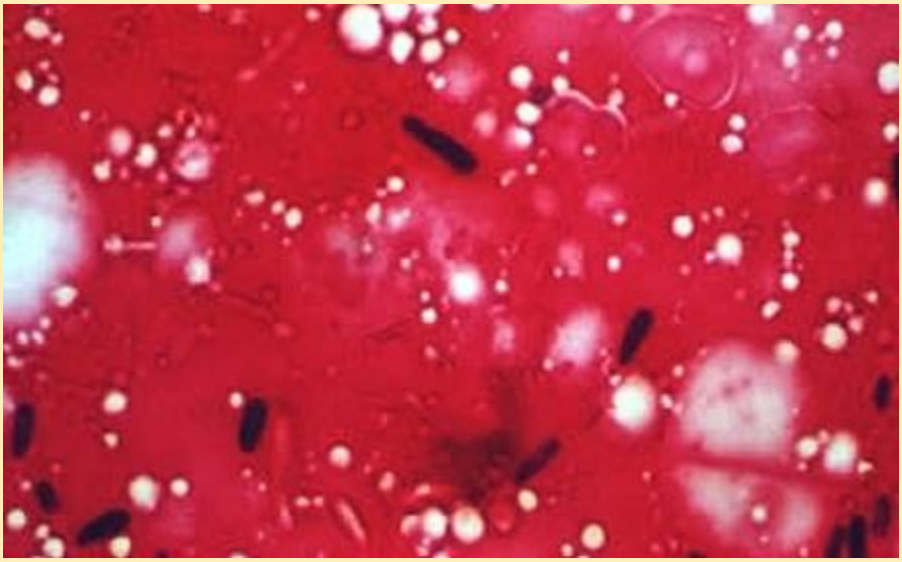
Which of the fungal infections is considered contagious, either to other animals or to man (zoonotic)?

- Coccidioidomycosis
- Sporotrichosis
- Aspergillosis
- Cryptococcosis
- Blastomycosis

Explanation - The correct answer is Sporotrichosis. All of these fungal diseases can infect both animals and people. However, they are not considered contagious (not to be confused with infectious) with the exception of Sporothrix. This is because they are mainly acquired from the environment, and transmission from animal to animal is rare. Sporothrix, especially in cats, is a high risk to veterinarians and care should be taken to limit contact with exudates and lesions in cats.

Aspergillus is generally considered a ubiquitous fungus that causes infection due to host factors such as immunosusceptibility or certain breed predilections. Cryptococcus is also not a contagious disease (do NOT confuse this with cryptosporidium, which is very contagious and zoonotic as several of my colleagues can attest to profusely). Cryptococcus infection occurs from inhalation of the yeast from the environment, frequently avian habitats, as it survives ideally in pigeon

droppings. Essentially, histoplasma, blastomyces, and Coccidioides are also all environmental diseases as well and not considered contagious.



Sporothrix schenckii, tissue smear, Gram stain, high power. Note the characteristically cigar-shaped yeasts.

Question

A 5 year old, male neutered, West Highland White Terrier presents for the skin lesions seen in the picture below. He has a history of lethargy and poor appetite. The lesions partially responded to antibiotics initially, but then began to progress again. You take a biopsy of the skin which shows cutaneous blastomycosis. What is the next most important diagnostic test?

- Thoracic radiographs
- Blastomyces antibody titer
- Abdominal radiographs
- Deep skin scraping
- Blastomyces antigen test

Explanation - Blastomycosis is caused by a dimorphic fungus and generally occurs in the Missouri, Mississippi, Tennessee, and Ohio river valleys. Pulmonary involvement occurs in the majority of cases, so thoracic radiographs are an important step to staging the patient. Other organs that can be affected include the lymph nodes, eyes, bones, central nervous system, and urinary tract.

Abdominal radiographs are not very sensitive to detect involvement with internal organs. Abdominal ultrasound, if available, would be preferred over abdominal radiographs.

Antibody tests are neither sensitive nor specific and are not very useful once a diagnosis is already made.

Question

Which of the following is most likely to infect and cause dermatitis in a child walking barefoot through a field?

- Dirofilaria immitis
- Ancylostoma spp.
- Toxocara spp.
- Trichuris vulpis
- Dipylidium caninum

Explanation - The correct answer is Ancylostoma spp. Ancylostoma caninum, the dog hookworm, can infect a human by penetrating skin. It can cause dermatitis via cutaneous migration of the parasite. Toxocara is a roundworm that causes visceral larval migrans.

Question

Zoonotic diseases commonly carried by raccoons include rabies and _____.

- Echinococcus
- Baylisascaris
- Toxocara
- Trichinella

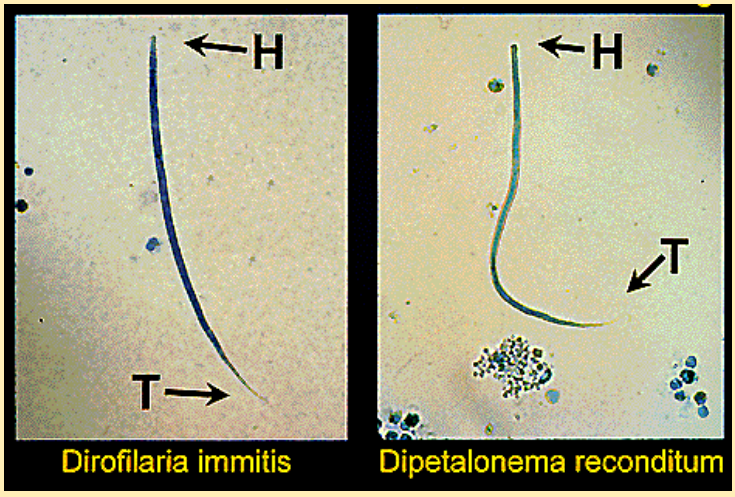
Explanation - The correct answer is **Baylisascaris**. Baylisascaris procyonis is an ascarid parasite of raccoons that causes mild signs in raccoons but can undergo aberrant migration in humans and cause fatal central nervous system signs.

Question

A 2-year old male castrated Beagle presents for vomiting and diarrhea. The blood smear for a CBC shows microfilariae in the peripheral blood. Which of the following parasites must be ruled out?

- Uncinaria stenocephala
- Dipetalonema reconditum
- Strongyloides stercoralis
- Filaroides osleri

Explanation - The correct answer is Dipetalonema reconditum. Dipetalonema reconditum is a blood parasite that looks similar to the microfilariae of Dirofilaria immitis, the agent of Heartworm disease. The two parasites must be differentiated because Dipetalonema reconditum is not pathogenic and is therefore not treated. Uncinaria stenocephala, Strongyloides stercoralis, and Filaroides osleri would not be found in the blood.



Question

A vaccinated Pomeranian dog arrives at your clinic after biting a human. What should happen to the dog?

- Euthanize the dog and test for rabies
- Vaccinate the dog immediately and quarantine for 45 days
- Vaccinate the dog immediately and quarantine for 10 days
- Confine the dog and observe it for 10 days
- Vaccinate the dog after 6 month quarantine

Explanation - The correct answer is confine pet and quarantine for 10 days. With a healthy, vaccinated dog, the 10 day confinement period can be carried out in the owner's home. You would only need to euthanize and test if the dog is an unvaccinated stray. If the dog was not up-to-date on vaccinations, you would either euthanize and test or quarantine for 10 days in an approved facility.

The answer choice to vaccinate the dog immediately and quarantine for 45 days would be recommended if the dog were bitten by an animal that was rabid or suspected to be rabid.

Question

This dog has been on chronic steroid therapy and has now developed this lesion seen in the photograph. Biopsy results of the skin show a broad based budding organism. What is your diagnosis?

- Cryptococcosis
- Coccidioidomycosis
- Blastomycosis
- Aspergillosis

Explanation - The correct answer is blastomycosis. Finding a broad-based budding organism is specific to blastomycosis. This dog is likely to have a travel history to the Ohio River valley. Being on chronic steroids resulted in immunosuppression and acquiring subsequent infection.

Question

A 4-year old male neutered mixed breed dog presents for a one-month history of weight loss, coughing, and limping. The owner recently noticed swelling and draining wounds on his legs (see image). The dog is on flea and tick preventative and heartworm preventative. The dog recently moved with the owner from Mississippi. The dog has a temperature of 103F. His lungs sound harsh

and no murmurs are ausculted. Multiple nodules are felt under the skin along his legs; a few of which are draining a yellow to clear material that is not malodorous. His blood work shows a monocytosis, neutrophilia, low albumin, and elevated globulins. What is contraindicated?

- Glucocorticoids
- Cytology of discharge
- Animal-human interaction
- Radiographs
- Biopsy

Explanation - Based on physical exam findings, bloodwork, and history, fungal infection should be the primary differential. This is blastomycosis, a fungus whose spores are found predominantly throughout Ohio, Mississippi, and Tennessee. Spores are typically inhaled causing pulmonary disease before disseminating throughout the body. Commonly affected organs include the skin, bones, eyes, lymphatic system, and lungs. Less commonly affected organs can include the prostate, mammary glands, heart, and CNS.

Diagnosis can often be made on cytology of draining wounds. Biopsy of affected areas can also demonstrate organisms. AGID and antigen testing can detect Blastomycosis as well; however, you may have false negative AGIDs with early infection and the urine antigen test can be cross-reactive with Histoplasmosis.

Treatment can be difficult and includes antifungals, often long term, and NSAIDs. Glucocorticoids

are often contraindicated as they may cause further immunosuppression. Some studies have shown that brief use of intravenous dexamethasone in the face of life threatening dyspnea during treatment with anti-fungals may be beneficial, but this is currently still under scrutiny.

Zoonotic transmission is generally low in living animals. Few reports of infection through dog bites have been reported. Necropsies of infected animals have resulted in infections through needle sticks, cuts, or inhalation. Warn owners the disease is an environmental pathogen, and can cause infection in people living in endemic areas.

Radiographs may show osteomyelitis of bones and nodular to diffuse interstitial patterns in the lungs. Pulmonary signs can mimic metastatic lesions. Severity can indicate overall prognosis.

Question

What is the best rabies vaccination protocol for a dog?

- Vaccinate at 1.5 months, then every 1-3 years
- Vaccinate at 3 months and then every 1-3 years
- Vaccinate at 6 months, booster at one year, then every year
- Vaccinate at 3 months, booster one year later, then every 1-3 years

Explanation - The correct answer is vaccinate at 3 months, booster one year later, then every 1-3 years. You should not give a rabies vaccine earlier than three months because you run the risk of having interference with maternal antibodies.

Question

Which of the following agents results in cutaneous larval migrans in humans?

- Hookworms
- Whipworm
- Roundworms
- Tapeworms

Explanation - The correct answer is hookworms. When Ancylostoma comes in contact with unprotected skin, the infective larvae penetrate the epidermis but generally cannot penetrate the basement membrane. They therefore migrate aimlessly, and the disease is usually self-limiting in humans.

Question

What zoonotic parasite is known to affect the eyes of children?

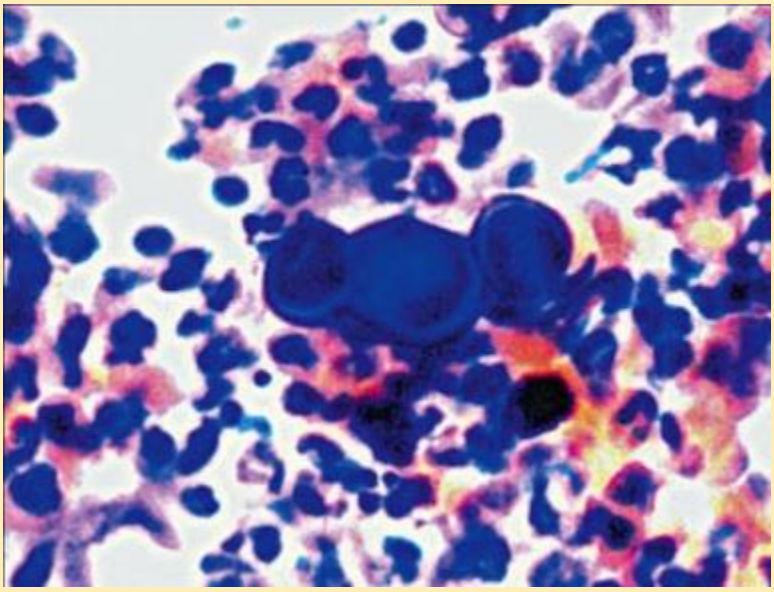
- Whipworm
- Tapeworm

- Roundworm
- Hookworm

Explanation - The correct answer is roundworm. The roundworm, Toxocara canis, is the most common cause of visceral larval migrans in humans. Transmission is usually fecal-oral. Children are known to play in sandboxes where dogs or cats previously defecated and subsequently inoculate their eyes. Puppies may acquire the disease transplacentally.

Question

A 5-year old mixed breed female spayed dog presents with a non-healing wound over the antebrachium. The cytological smear has been made and can be seen below. What is your treatment of choice?



- Amphotericin B for 28 days
- Itraconazole for several months
- Amputation followed by chemotherapy
- Cephalexin for several months
- Marbofloxacin for 28 days

Explanation - In this slide, a broad based budding yeast is visualized. This is characteristic of blastomyces. Cryptococcus displays a narrow based budding. Treatment of fungal organisms is usually long term (minimum 3-5 months) as they are difficult to eliminate. Antibiotics are ineffective against fungi. Occasionally, antibiotics may be prescribed if a secondary bacterial infection is suspected. Amphotericin B (an injectable anti-fungal) is not a first choice because it is associated with a greater degree of side effects, especially nephrotoxicity, and the treatment period offered is too short. In resistant or severe cases, sometimes a course of amphotericin B is

considered. In those cases, a lipid based amphotericin product (such as Abelcet) should be used, and the renal values must be closely monitored.

An ocular exam, chest radiographs, and thorough palpation of local lymph nodes should be performed to ensure there is no other involvement.

Question

A 2-year old male castrated Bull Mastiff with a history of travel in the west coast presents to your clinic for a chronic cough and a recent development of lameness of his right hind limb. On physical exam you notice a draining lesion over the lame region of the right hind limb. You perform chest radiographs and see a diffuse bronchointerstitial pattern which is nodular in some regions. You also identify hilar lymphadenopathy. You suspect that you know what you are dealing with and perform a broncho-alveolar lavage for cytology. Just as you suspected, you see spherules. What is your diagnosis?

- Coccidioidomycosis
- Cryptococcus
- Histoplasmosis
- Aspergillosis
- Blastomycosis

Explanation - The correct answer is Coccidioidomycosis. The travel history and clinical signs are consistent with this answer. Additionally, finding spherules on cytology is pathognomonic for Coccidioidomycosis. Prolonged antifungal treatment will be necessary. Fluconazole is the treatment of choice. Ketoconazole and itraconazole are good choices. With blastomycosis you see broad based budding of the yeast. With Cryptococcus neoformans you will see narrow-based budding.

Question

How is Babesia spp. transmitted?

- It is vectored by the Reduvid bug
- It is vectored by ticks
- It is vectored by mosquitoes
- It is transmitted fecal-orally

Explanation - The correct answer is it is vectored by ticks. Babesia is an intraerythrocytic parasite that is transmitted by infected ticks.

Question

What should be told to owners of dogs that are infected with Echinococcus granulosus?

- The parasite is transmitted by the ingestion of fleas, so the dog should be treated for fleas
- The dog acquired the infection by ingesting a rat or bird
- The parasite is highly pathogenic and causes hydatid cyst disease in dogs, but is not a zoonotic threat to humans
- The parasite causes hydatid cyst disease in humans, which can be fatal

Explanation - The correct answer is the parasite causes hydatid cyst disease in humans, which can be fatal. Echinococcus granulosus is the hydatid tapeworm which is non-pathogenic in dogs but is highly pathogenic to fatal in humans and other intermediate hosts in which a hydatid cyst forms. The infection is acquired in dogs by eating raw sheep meat or viscera infected with the parasite. All dogs suspected of being infected should be treated with praziquantel.
