Drug resistance remains uncommon in Candida (1,239 international isolates)

<table>
<thead>
<tr>
<th>isolates</th>
<th>fluconazole (%)</th>
<th>micafungin % resistant</th>
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</thead>
<tbody>
<tr>
<td>Candida species</td>
<td></td>
<td></td>
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<tr>
<td>C. albicans</td>
<td>50.0</td>
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<tr>
<td>C. glabrata</td>
<td>17.4</td>
<td>6.5</td>
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<tr>
<td>C. parapsilosis</td>
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<tr>
<td>C. tropicalis</td>
<td>9.8</td>
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<tr>
<td>C. krusei</td>
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<tr>
<td>Total % resistant</td>
<td></td>
<td>3.9</td>
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</table>

Reality: the two most common non-albicans species, C. glabrata and C. parapsilosis, don't appear more resistant in randomized clinical trials.

C. glabrata
- ampho B: 40%
- micafungin: 60%
- fluconazole: 30%
- anidulafungin: 20%
- ampho B: 30%

C. parapsilosis
- ampho B: 50%
- micafungin: 60%
- fluconazole: 30%
- anidulafungin: 20%
- ampho B: 30%
**#1**

Blood cultures of this patient are likely to grow which of the following:

A. Gram negative cocci  
B. Gram positive cocci  
C. Gram negative bacilli  
D. Gram positive bacilli  

**Correct answer:** A

**Answer:** This patient has purpura fulminans, usually due to Neisseria meningitidis; less often other organisms.

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**#2**

This patient with profound, prolonged neutropenia had the rapid onset of fever and these painful skin lesions. The most likely test to reveal the etiology is:

A. Blood culture  
B. Punch biopsy  
C. Serum galactomannan  
D. Blood PCR  

**Answer:** B

**Rationale:** This is ecchyma gangrenosa, usually due to a mould, Pseudomonas aeruginosa or occasionally another Gram negative bacillus. Blood cultures are rarely positive with aspergillosis or mucormycosis but may be positive with fusariosis or bacteria. Immediate punch biopsy with culture, Gram stain and impression smear using Calcofluor stain for hyphae can be done in hours while waiting for blood culture results.
#3
Extension of his patient’s sphenoid sinusitis is likely to result in which physical finding

A. Monocular blindness  
B. Facial numbness  
C. Dysconjugate gaze  
D. Bell’s palsy

Answer: C

Rationale: This patient has extension into the cavernous sinus, as can be seen from the carotid artery in the upper portion of the sinus. Cranial nerves 3, 4, and 6 traverse the cavernous sinus and lead to early oculomotor palsy. The optic, fifth and seventh nerves do not traverse the cavernous sinus so monocular blindness, facial numbness and Bell’s palsy are not seen.

#4
This young lady’s hot tub rash was most likely due to which of the following organisms:

A. Aeromonas  
B. Pseudomonas  
C. Stenotrophomonas  
D. Staphylococcus aureus

Answer: B

Rationale: Pseudomonas can cause a follicular rash in exposed skin after hot tub bathing, often localized under the swim trunks. Staphylococcal folliculitis is more purulent and usually in areas with hair, particularly with shaving, not bathing. The other organisms do not cause folliculitis.
#5
This soft tissue gas in a patient with neutropenia and adenocarcinoma of the colon is most likely due to which organism:

A. Clostridium septicum
B. Fusobacterium necrophorum
C. Bacteroides fragilis
D. Eikenella corrodens

Answer: A

Rationale: Clostridium septicum. Gas formation is a common development in clostridial myonecrosis and is not seen with the other bacilli listed. C. septicum is notable for causing bacillemia and metastatic lesions in immunosuppressed patients.

#6
This 31-year-old woman with prolonged neutropenia developed the sudden onset of fever, shock, and severe pain and rash in her leg, extending over 24 hours. Soft tissue film showed no gas. The most likely organism is:

A. Staphylococcus aureus
B. Clostridium perfringens
C. Streptococcus pyogenes
D. Aspergillus fumigatus

Answer: C

Rationale: Streptococcus pyogenes. Necrotizing fasciitis should be suspected and urgent surgical consultation obtained. Clostridial myonecrosis may not show gas early in the course but is less likely in the absence of a portal of entry. Neither S. aureus or Aspergillus would progress this rapidly.
This lung biopsy shows cells that stain pinkish-red with Mayer’s mucicarmine stain.

The most likely organisms is:

A. Blastomyces dermatitidis  
B. Histoplasma capsulatum  
C. Paracoccidioides brasiliensis  
D. Cryptococcus neoformans

**Answer: D**

**Rationale:** Mucicarmine stain is helpful in confirming that a yeast in tissue is a Cryptococcus, though not all cryptococcal cells on a pathology slide will stain clearly positive.

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This 40-year-old dentist presented with pain and swelling in his elbow of three days duration. He had full range of motion in the elbow despite discomfort on motion. He was afebrile. This is most likely:

A. Olecranon bursitis  
B. Cellulitis  
C. Septic arthritis  
D. Tophaceous gout

**Answer: A**

**Rationale:** Olecranon bursitis, usually due to Staphylococcus aureus, is distinguished from septic arthritis by not restricting range of motion. Localization to the olecranon bursa area is unlikely for cellulitis or gout.
#9

If this patient's blood culture were positive, which of the following would be most likely?

A. Streptococcus anginosus  
B. Enterococcus faecalis  
C. Streptococcus agalactiae  
D. Staphylococcus aureus

**Correct answer: C**

**Rationale:** S. agalactiae (Streptococcus group B)  
Erysipilis can be due to Streptococcus groups A, B, C, or G but not enterococci or S. anginosus. Cellulitis with bacteremia in this location would be unlikely due to Staph aureus.

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#10

This previously healthy 35 year old Maryland woman had the sudden onset of fever, convulsions and confusion after leaving her office in July. The most likely organism is:

A. West Nile virus  
B. Eastern equine virus  
C. Herpes simplex virus  
D. Varicella zoster virus

**Answer: C**

**Rationale:** A lesion in the medial portion of the temporal lobe is seen shortly after onset in nearly all cases of herpes simplex encephalitis and not in the other entities.
#11
Finding an acid fast bacillus in a nasal smear is most consistent with.

A. rhinoscleroma  
B. rhinosporidiosis  
C. Leishmaniasis  
D. lepromatous leprosy  

**Answer: D**

**Rationale:** Patients with lepromatous leprosy often have acid fast bacilli in their nasal smear. In endemic countries nasal mucosa along with skin snips from selected sites are sampled to classify leprosy as lepromatous and to determine the bacillary load. Leishmania, rhinoscleroma and rhinosporidiosis are not acid fast.

#12
This indolent skin lesion on the hand and forearm is most consistent with infection with which of these mycobacteria:

A. M. chelonae  
B. M. marinum  
C. M. abscessus  
D. M. ulcerans  

**Answer: B**

**Rationale:** M. marinum is the only Mycobacterial species with lymphatic spread.
#13
This 25-year-old U.S. college student from India presented with progressive thoracic back pain of three weeks duration. The most likely portal of entry is

A. lung  
B. gastrointestinal tract  
C. skin  
D. paranasal sinus

Answer: A

Rationale: Vertebral osteomyelitis in this patient is more likely tuberculosis (lung) than brucellosis or actinomycosis (GI tract). No source of staphylococcal sepsis, such as injection drug use, was included in the question.

#14
Patient’s with this condition are most prone to which of these serious complications

A. hemoptysis  
B. brain abscess  
C. spread to contiguous bone  
D. spread within the lung

Answer: A

Rationale: Massive hemoptysis is an infrequent but potentially lethal complication of fungus ball of the lung. Spread of the fungus, usually Aspergillus, beyond the cavity is extremely rare.
This otherwise healthy patient with a chronic leg ulcer is most likely to have:

A. Common variable immunoglobulin deficiency
B. Lupus erythematosus
C. Hepatitis C
D. Ulcerative colitis

Answer: D

Rationale: This is a typical lesion of pyoderma gangrenosa. The most common underlying disease is ulcerative colitis and may precede the onset of bowel disease.
A 27-year-old African-American female office worker from Washington, D.C., presented with 3 weeks of increasingly severe midabdominal cramping nonradiating pain, associated with nausea and occasional emesis the past two days. No fever had been noted.

She had been diagnosed 2 months earlier with HIV, with a viral load of 861,000 and a CD4 of 8. She was begun on trimethoprim-sulfamethoxazole prophylaxis, and emtricitabine/tenofovir, darunavir and ritonavir for her HIV, all of which she stated were taken regularly.

On exam she was afebrile, had an obese, distended abdomen with slight tenderness, no rebound and good bowel sounds. Laboratory work was unremarkable except that her viral load had fallen to 54,000 and her CD4 had risen to 72.

The CT is shown. Surgical consultation felt laparotomy was unnecessary and percutaneous needle aspiration was declined by radiology.

Based on the CT scan and clinical presentation, which of the following empiric interventions would be the best option in this patient given the inability to obtain a tissue sample?

A. Empirical therapy for mycobacterium avium complex (MAC)
B. Empirical therapy for tuberculosis
C. Empirical therapy for histoplasmosis
D. Stop all the antiretrovirals
E. Change darunavir to lopinavir

Answer: A
**Rationale:**

The clinical presentation is most consistent with immune reconstitution syndrome from Mycobacterium avium mesenteric lymphadenitis. Some clinicians might opt to wait to see if this resolves without therapy for MAC, but since she has never been treated for MAC, the best option for those listed would be A.

The CT shows necrotic nodes surrounding the mesenteric artery. Neither tuberculosis nor histoplasmosis present with such flagrant mesenteric lymphadenitis, though a biopsy is indicated to confirm the diagnosis. Stopping antiretroviral therapy for immune reconstitution syndrome (IRIS) is not recommended. There is no reason to change darunavir to lopinavir.

Of course, a variety of cultures and serologies should be performed to attempt to identify the causative organism, but in this case none are likely to be positive.
#17
A 19-year-old college student presented to the student health service with a sore throat and fever of three days’ duration. He had not previously sought medical care because it was “dead week,” studying for final examinations.

Today, the rash shown in the photo appeared. It was nonpruritic. Except for a temperature of 101°F, some tonsillar exudates bilaterally and the rash, his examination was normal. A rapid strep test was negative so a throat culture was obtained and treatment withheld. The next day the culture was reported as having no beta-hemolytic streptococci.

The most likely bacterial cause would be which of the following:

A. Gram negative coccus  
B. Gram positive bacillus  
C. Gram negative bacillus  
D. Weakly acid fast bacillus

**Answer: B**

**Rationale:** Arcanobacterium haemolyticum causes a scarlet fever-like picture in young persons but without poststreptococcal sequelae. Illness is typically mild so that efficacy of macrolide therapy, which should be effective, is difficult to document. Growth of this diphtheroid-like organism is a little slower than Streptococcus pyogenes, often not being recognized until 48 to 72 hours after inoculation. The negative throat culture for Streptococcus pyogenes of this patient with pharyngitis is against the diagnosis of scarlet fever. The rash is also atypical, with no “strawberry tongue” and “circumoral pallor” suggestive of scarlet fever.
This two chest CTs taken a week apart, were from a patient with allogeneic bone marrow transplantation, acute graft versus host disease and fever not responding to antimicrobial agents.

A. Dirt in the potted plant in his room  
B. His oral flora  
C. Hospital food  
D. Intravenous catheter

**Answer: A**

**Rationale:**

A severely immunosuppressed patient who develops localized pulmonary infiltrate with a dense center and no air bronchogram should be suspected to have aspergillosis or, less commonly, mucormycosis. A hazy border, called a “halo sign” is particularly suggestive. Cavitation of the lesion, often as the patient’s immunosuppression lessens, is also typical. These mold live in decaying vegetation and soil, entering the body by inhalation into the lung or paranasal sinu, or occasionally cause skin lesions at the site of minor trauma.
These painful recurrent lip and mouth lesions are from a woman with prior painful labial ulcers, arthritis of the knee and decreased vision in one eye.

The most likely diagnosis is:

A. Reiter's syndrome  
B. Antiiphospholipid syndrome  
C. Systemic lupus erythematosus (SLE)  
D. Behcet's

Answer: D

**Rationale:** Recurrent painful ulcers in the mouth, lips or genitalia should suggest Behcet's syndrome, a clinical entity that can include skin lesions, iritis or uveitis, and pathergy, which is an inflammatory response to mild skin trauma. Reiter's syndrome or acute reactive arthritis, is a combination of recurrent episodes of arthritis, conjunctivitis and urethritis. Other manifestations include keratoderma blennorrhagica, which are hard nodules on the soles or palms, uveitis and painless ulcers on the tip of the penis. Antiphospholipid syndrome is characterized by venous thromboses in unusual sites but no mucosal lesions. SLE may cause arthralgias but not recurrent oral ulcers.
This 35-year-old Peruvian woman with chronic myelogenous leukemia in blast crisis was admitted for allogeneic hematopoietic stem cell transplantation from her sister. On admission, this extensive painful rash was found on the gluteal area of both buttocks.

She complained that the area had been painful for several days.

She was afebrile but weak and markedly granulocytopenic from prior chemotherapy.

The most likely diagnosis is which of the following:

A. Herpes zoster
B. Herpes simplex
C. Ecthyma gangrenosa
D. Aspergillosis
E. Sweet’s syndrome

Answer: B

Rationale: This lesion is due to Herpes simplex virus. Herpes simplex, unlike herpes zoster, can spread by local inoculation and present, as in this case, on both sides of the midline. Skin that is moist, such as intertriginous areas, are particularly susceptible to inoculation.

This patient was febrile, sweating, and lying long periods on her back. In the process she inoculated herpes simplex from an inapparent lesion, probably genital, into the skin of her back.

This lesion does not resemble ecthyma gangrenosa, an infection usually due to hematogenous dissemination to one or several sites of Pseudomonas aeruginosa, Aspergillus or an agent of mucormycosis. These lesions are initially red, then purple and finally necrotic in the center from invasion of dermal blood vessels. Ecthyma gangrenosa can be hematogenous or locally inoculated in granulocytopenic patients. With hematogenous lesions the patients are critically ill. With local inoculation, the patient is often not septic.

Sweet’s syndrome would not likely be this extensive, would not likely but on the buttoc, and would not characteristically occur in a neutropenic patient. Sweet’s syndrome is characterized by abrupt onset, characteristic pathology, and may be associated with fever and leukocystosis. The lesions tend to be smaller and painful.
This is the pruritic rash on the arm of an 18-year-old councilor at a summer camp in northern Michigan. He and another fellow camp councillor developed this rash after swimming in the lake at the camp a few days previously. The young campers who also went swimming with him did not develop the rash. This was their first year at camp but the two councilors had both attended camp last year.

Which of the following organisms is the most likely cause of this rash?

A. Leptospira species  
B. Pseudomonas species  
C. Borrelia species  
D. Schistosome species

Answer: D

Rationale: This is swimmer’s itch, due to swimming in water contaminated with avian schistosomes. The cercaria burrow into the skin and die. Persons previously exposed have an intense allergic reaction to the tiny schistosomes. In the case cited above, the councilors from the prior year were sensitized from swimming in contaminated water the prior summer.

Humans are not the preferred host for these parasites, and thus the cercaria cannot migrate to the liver or genitourinary tract as with Schistosoma mansoni, hematobium, japonicum etc. Swimmers itch can be seen in many areas of the US. No specific treatment is indicated. Antihistamines and topical steroids are useful. Symptoms abate after 1-2 weeks. Superinfections of the abraded skin with bacteria can occur.
A 38-year-old man who refused therapy for his far advanced HIV was admitted for inanition, weakness, profound weight loss and chronic diarrhea.

His intestinal biopsy shows which of the following organisms:

A. Cyclospora cayetanensis
B. Microsporidium africanus
C. Enterocytozoon bieneusi
D. Cryptosporidium parvum
E. Rhodococcus equi

Answer: C

Rationale: The tiny organisms within the cytoplasm are in the wrong location and of the wrong size for Cyclospora or Cryptosporidium but are the agents of microsporidiosis, an infection caused by species of Enterocytozoon and Encephalitozoon. There are 1200 species of microsporidia, all obligate intracellular parasites of vertebrates and invertebrates. But none of the genus Microsporidium are known to infect humans, despite the name, microsporidiosis. Patients with AIDS are uniquely susceptible to microsporidiosis with E. bieneusi being the most common agent and presenting as diarrhea and weight loss. There is no known effective therapy of E. bieneusi infection, other than restoring immune function with highly active antiretroviral therapy.
This 22-year-old female from Atlanta presented because of fever and pain her right lower leg of two days duration. The right achilles tendon area was so painful she could not bear weight on the right leg.

She had been previously healthy, working as a nurses aid, was single, and recently had acquired a new sexual partner. She had had low grade abdominal pain and loose stools a week prior to onset, which she attributed to eating food at a church picnic.

On exam, she had a temperature of 102°F and a red, tender area over the right achilles tendon area, with marked pain on ankle flexion. There was a red, slightly tender lesion over the left pretibial area.

Among the following possibilities, which is the most likely cause of her illness?

A. Acute reactive arthritis
B. Neisseria infection
C. Chlamydia infection
D. Yersinia infection
E. Psoriasis

Answer: B

Rationale: The patient is likely to have disseminated gonococcal infection causing her tendonitis. Gonorrhea is the only option listed here associated with tendonitis, although the others could be associated with arthritis. Patients usually do not have apparent genitourinary manifestations, and develop some combination of skin lesions, polyarthralgias, and polyarthritis that is asymmetric and involves small or large joints. The classic patient is a woman who is pregnant or menstruating.

Reiter’s syndrome, now more commonly called acute reactive arthritis, would be less likely associated with tendonitis. Yersinia and Chlamydia do not cause tendonitis.
An 18-year-old male had the acute onset of sore throat, followed in two days by high fever. On presentation in the emergency room he was acutely ill, with a temperature of 105°F. Chest x-ray, followed by the CT shown here, showed a nodule in the left lower lung field. Swelling and tenderness in the right anterior cervical triangle led to the CT with IV contrast shown here.

Blood cultures were likely to reveal which of the following:

A. Aerobic Gram positive rod  
B. Aerobic Gram negative rod  
C. Anaerobic Gram positive rod  
D. Anaerobic Gram negative rod  
E. Endemic mycosis

Answer: D

Rationale: This patient has Lemierre's disease, as shown by the clot partially obstructing the internal jugular vein and lung nodule of the septic embolus. Lemierre's begins with a sore throat with high fever. Infection extends from the tonsillar area to the internal jugular vein, causing septic phlebitis, bacteremia and septic emboli to the lung, sometimes followed by empyema.

The organism is almost always a Fusobacterium species, all anaerobic Gram negative rods, usually Fusobacterium necrophorum. Most Fusobacterium isolates are susceptible to beta-lactams, metronidazole and clindamycin.

Not all patients have swelling in the anterior cervical triangle, as did this patient, and is some the pharyngitis has begun to respond to antimicrobial therapy while the septic phlebitis is progressing.

Peritonsillar abscesses may be seen on imaging of some patients.
#25
This 55-year-old woman from Honolulu had been receiving prednisone in doses of 20-60 mg for uveitis when she developed a series of indolent red lesions on her right arm, left arm and right shin.

They were not painful, occasionally drained a drop of serosanguineous fluid and enlarged over the course of several weeks. She was afebrile and had a normal physical exam except for uveitis and the lesions.

Her chest CT scan is normal. There was no response to two weeks of cephalexin.

Which one of the following diagnoses would be the most likely?

A. Sporotrichosis
B. Erythema nodosum
C. Leprosy
D. Non tuberculous Mycobacterium
E. Nocardiosis

Answer: D

Rationale: Since these lesions are disseminated (right and left arms, right shin) this is a different syndrome than someone who develops sporotrichoid lesions on one arm or leg.

Mycobacterium chelonae can cause lesions on multiple skin sites with the absence of deep lesions or systemic symptoms. The portal of entry is usually unknown.

Sporotrichosis can cause hematogenous lesions from a pulmonary portal in immunosuppressed patients but skin lesions are rarely the only sign.

Erythema nodosum over so many sites is uncommon.
Leprosy lesions are not this localized or papulonodular

#26
This 67-year-old man was brought to the hospital by the police in Washington DC in because he was sleeping on a grate in bitter cold weather and, when asked to move along by the police, began muttering incoherently. In the emergency room he was combative and had to be restrained. He was admitted for observation and had numerous skin lesions such as the one shown.
Which of the listed tests is most likely to be informative?

A. Wet mount of skin scraping  
B. Fungal culture of skin scraping  
C. Acid fast smear of skin scraping  
D. Serum VDRL  
E. HIV ELISA

Correct answer: A

Rationale: The crusted, extensive skin lesions are typical of Norwegian scabies, a condition usually found in immunosuppressed patients, raising the possibility that this man has AIDS. The diagnosis is best made by wet mount scraping. The Sarcoptes scabiei and their feces are abundant in the lesions. Although this man may have HIV infection, this would not explain the lesions. Skin lesions of secondary syphilis. Mycobacterium marinum and Mycobacterium chelonae are never hyperkeratotic, like the lesions shown.
A 51-year-old Panamanian woman, living in the United States for 30 years, returned to the United States from visiting family in a residential area near Panama City for two weeks. On the second day home, she had the onset of fever, headache, muscle ache, and retrobulbar pain. She had some nausea but no GI diarrhea or constipation. The symptoms persisted, but she did not seek medical attention until the third day of illness, when a petechial, non pruritis rash appeared on her arms and upper chest.

The home she stayed at in Panama was in the city, had no pets. Children and adults in the family were healthy.

Examination was negative except for fever of 102°F, rash and two tender occipital lymph nodes. No nuchal rigidity. Labs revealed a WBC of 1.6 with a normal differential and no atypical lymphs, platelets 168,000, Normal blood chemistries and chest x-ray

The most likely source of infection is:

A. Food
B. Mosquito
C. Fleas
D. Another human
E. Animal urine

Correct answer: B

Rationale: This is the typical rash of dengue, which appears after several days of fever, myalgia and headache. Thrombocytopenia is often present in the sicker patients and can be of diagnostic aid, but was not present in this lady.

Leukopenia is common and was present here.

Dengue is more of an urban disease than malaria, due to the ability of the Aedes aegypti mosquito to breed in small urban pools of water, as in old auto tires, near human habitation and to bite in the daytime, particularly in the early morning and late afternoon.

The incubation period is usually 4-7 days but can be up to 14 days.

This patient was not exposed to animal urine and the rash and leukopenia is against the diagnosis of leptospirosis. Rat fleas can spread murine typhus but that infection is less common in Panama and the rash is usually more subtle. The rash of typhoid from contaminated food, called rose spots, is much less extensive than the diffuse rash shown here.
A 23-year-old nurse, 8 weeks pregnant, sought advice from her obstetrician. For the past two weeks she has been taking care of a hospitalized child with sickle cell disease and aplastic crisis. For the past five days she has had low grade fever, headache, the mildly pruritic rash shown here and aching joints with stiffness in her hands and feet.

She had all the usual childhood vaccinations, was taking no medications, lived alone with her husband, and had no pets.

The object of concern for her unborn infant would be which of the following:

A. Deafness  
B. Hydrops fetalis  
C. Thrombocytopenia  
D. Congenital heart disease  
E. Mental retardation

**Answer: B**

**Rationale:** Patients with chronic hemolytic diseases, such as sickle cell disease, are susceptible to chronic Parvovirus B19 infections (also called Erythrovirus B19) and can shed virus in their secretions, presenting risk of infection to their contacts.

Although many adults have serologic evidence of infection, previously uninfected pregnant women may transmit the virus to the fetus.

Arrest of erythrocyte production leads to severe anemia and congestive heart failure in the fetus. Intrauterine transfusion may salvage the pregnancy but fetal loss is a serious risk.

The other fetal abnormalities are characteristic of congenital rubella (deafness and congenital heart disease), toxoplasmosis (hydrocephalus, retinitis, disseminated disease) or cytomegalovirus infection (disseminated disease)
#29
This soft tissue film of a person’s lower extremity is most consistent with which of the following?

A. Staphylococcal pyomyositis
B. Streptococcus pyogenes necrotizing fasciitis
C. Clostridial myonecrosis
D. Pyomyositis

Answer: C

Rationale: Gas in multiple fascial planes is highly suggestive of clostridial myonecrosis and would not be expected in the other entities listed.

Note that pyomyositis is a primary muscle infection, usually caused by Staphylococcus aureus, and more common in the tropics. However, this can occur after penetrating injury, or vascular insufficiency but would not be associated with soft tissue gas.
This ski lesion is typical of which entity:

A. Purpura fulminans
B. Impetigo
C. Pyoderma gangrenosum
D. Ecthyma gangrenosum

**Answer: D**

**Rationale:** The sharply delimitated border, central necrosis and pale outer border is typical of ecthyma gangrenosum.
This 21-year-old African American male college student in Tucson, Arizona was seen because of low grade fever, malaise and scalp lesions progressing over the past 3 weeks. He had visited Nogales, Mexico with some of his fraternity brothers six months earlier and had sex with a prostitute. About a month ago, he was drunk at a party, fell into a pond and required resuscitation. A skin biopsy is shown below.

The most likely etiologic agent is found in which of the following locations:

A. Pond scum  
B. Dirt  
C. Genital lesions  
D. Bat droppings  
E. Pigeon droppings

**Answer: B**

**Rationale:**

The spherule indicates the diagnosis of coccidioidomycosis. African Americans are a much higher risk of dissemination than Caucasians.

Sites of dissemination prominently include bone, joint, soft tissue, meninges and skin, though other organs may be affected. The source of infection is inhalation from the soil.

Coccidioides spores are extremely resistant to desiccation and heat of summer in the Southwest United States. Arizona has the highest attack rate of coccidioidomycosis, with California coming in second. Tucson is in a highly endemic area.
This 40-year-old crab fisherman working in the Chesapeake Bay waters came in with low grade fever and a painful rash on his hand of three days' duration. He cut his hand several days ago on a crab spine.

The probable organism is which of the following:

A. Curved gram negative rod  
B. Seagull-shaped gram negative rod  
C. Gram positive coccus  
D. Gram positive bacillus

**Answer: D**

**Rationale:** Erysipelothrix rhusiopathiae causes "erysipeloid" lesions following scratches in brackish water. Bacteremia is uncommon, but when it occurs, is usually accompanied by endocarditis.

Erysipelothrix rhusiopathiae is a pleomorphic, gram-positive bacillus capable of causing self-limited soft tissue infection or serious systemic infection. E. rhusiopathiae is widespread in nature, occurring in domestic and marine animals including cattle, chickens, crabs, and fish. Crab pickers are classic, but swine farmers may be more common.

Infection in humans is usually due to occupational exposure. Thus, slaughterhouse workers, butchers, fishermen, farmers, and veterinarians are at risk.

The typical manifestations are localized or diffuse skin lesions, or bacteremia with or without endocarditis.
This 69-year-old male alcoholic went into shock after eating raw oysters.

He most likely was infected with which organism from among the following:

A. Streptococcus  
B. Staphylococcus  
C. Vibrio  
D. Clostridium

Answer: C

Rationale: Vibrio species, usually vulnificus, can cause these rapidly spreading hemorrhagic lesions after ingestion of contaminated poorly cooked shellfish.
This Haitian farmer was visiting his family in the United States when he sought help for this painless firm foot swelling of ten years duration. One slide shows the foot and the other a biopsy of the lesion.

The most likely organism is which of the following:

A. Pseudomonas aeruginosa
B. Burkholderia pseudomallei
C. Staphylococcus aureus
D. Madurella mycetomatis
E. Aspergillus fumigatus

Answer: D

Rationale: Chronic subcutaneous firmly indurated swellings over an extremity should suggest the possibility of mycetoma, particularly if there are draining sinuses. Infection follows introduction of dirt or vegetation into the skin by minor trauma and progresses over many years.

Underlying bone may be invaded, allowing confusion with chronic osteomyelitis, though the firm swelling is unlike osteomyelitis. There is no fever, leukocytosis or even much pain with myetoma.

This infection is caused by a variety of fungi or higher bacteria, all of which form visible colonies, called grains, in the draining sinuses. Drainage is purulent but bacterial superinfection is rare.
This parasite, shown as an egg, was acquired from which source?

A. Fresh human stool  
B. Ingesting contaminated earth  
C. Eating poorly cooked pork  
D. Eating poorly cooked beef

Answer: B

**Rationale:** Ascaris lumbricoides eggs need to mature in the earth before they are infectious. Infections typically are acquired when the egg is shed into the environment in human stool, and another human accidentally ingests the mature egg from dirt or raw produce, which then mature into larvae which penetrate the gut wall, circulate to the lung, ascend the tracheobroncial tree, is swallowed and matures in the GI tract as worms. Human may be symptomatic during migration through the lungs (eosinophilic pneumonia), but the worms in the GI tract usually produce few symptoms in adults, although occasional cases of mild abdominal discomfort or appendicitis occur. Intestinal blockade occurs primarily in children.

If the ascaris ingested is from a dog or cat, the organism penetrates the intestine after ingestion, and enters the blood stream, but cannot complete its life cycle in the organ where it lodges and produces visceral larva migrans due to inflammation in the target organ.
What is the most likely source of the organism seen in this intestinal biopsy?

A. Water  
B. Hamburger  
C. Raspberries  
D. Human hands  
E. Unrefrigerated processed meat

Answer: A

Rationale: Cryptosporidiosis is mostly commonly acquired in the United States through recreational water (waterparks, community swimming pools) or drinking water. The parasites, usually Cryptosporidium parvum or Cryptosporidium hominis, undergo their life cycle in the superficial cytoplasm of intestinal epithelial cells. The photomicrograph shows several oocysts. Once excreted in the feces, only a few oocysts are sufficient to infect another human. The low inoculum and prolonged viability allows water to be the usual vehicle of transmission, not person to person spread. Inhalation infection is unknown and food transmission appears to be uncommon. This parasite can be transmitted in day care from childrens’ feces to day care provider hands and subsequent ingestion.
This MRI came from a 66-year-old male taking hydroxychloroquine and steroids for rheumatoid arthritis for 5 years and who had a three month history progressive right sided weakness and a one month history of progressive aphasia.

He was afebrile.

The most likely cause among the following is:

- A. Herpes virus
- B. Enterovirus
- C. Polyoma virus
- D. Lymphoma
- E. Toxoplasmosis

Correct answer: C

Rationale: Progressive multifocal leukoencephalopathy is a slowly progressing disease of immunosuppressed patients, resembling multiple sclerosis on brain MRI because the majority of the lesions are in the white matter and don’t enhance on MRI or CT with contrast.

Lesions on MRI are white (dense) on T2 imaging. JC, a polyoma virus that causes PML, can be detected in the CSF of many PML patients by PCR. PML has also been reported in patients treated with HIV and efalizumab, belatacept, fludarabine, infliximab, rituximab, mycophenolate, and glucocorticoids. Many such patients had an underlying hematologic malignancy or collagen vascular disease.

The current patient was on long term corticosteroids.

Herpes simplex and enteroviruses can causes acute encephalitis or meningitis but not with this insidious progression and afebrile course.

Toxoplasma lesions are enhancing on MRI, not confined to white matter, favor the basal ganglia and are not so indolent as in this case.
This 16-year-old Navajo child was brought to the Four Corners Hospital in Arizona because of high fever and the lesions shown. He looks quite ill.

His mother thought he might have been bitten by a rat while he was sleeping, because he awoke crying of pain in the abdominal lesion and had seemed to be playing normally the day before. She had seen a dead rat in the garage a few days prior.

On exam, he had a temp of 40C and the lesions seen. Both the lesion and the axillary area was very tender. Gram stain of the skin lesion found no organisms.

The most likely pathogen is which of the following:

A. Streptobacillus moniliformis
B. Spirillum minus
C. Yersinia pestis
D. Eikenella corrodens
E. Pasteurella multocida

Answer: C

Rationale: High fever, a local lesion and a tender swollen lymph node (bubo) with prostration suggests plague, tularemia or a staphylococcal abscess, the latter two not being on the list above. Staphylococcal furuncles would have been at the site of minor trauma and more indolent.

Eikenella and Pasteurella multocida typically do not give a bubo, though they may cause sepsis from a dog or cat bite.

Spirillum minus is a rare disease from rat bites in Japan. This is not seen in the US.

Streptobacillus also causes rat bite fever, without a bubo but often with rash and arthritis.

Plague is important to diagnose because the best drug is gentamicin, not something typically used for skin and lymphatic infection. This child presumably was bitten on the abdomen by a flea from a rat, developed the abdominal lesion, and then the bubo.
The probable source of this infection is which of the following?

A. Female anopheles mosquito
B. Male anopheles mosquito
C. A deer tick
D. A dog tick

Answer: C

Rationale: The organisms are Babesia microti, a hemoprotozoon of rodents, acquired by humans from bites of deer ticks. Babesia have a different developmental form than Plasmodium falciparum, resembling a “maltese cross” which are four dots in a cluster. (See arrow in photo). Infection is often mild but asplenic patients may have severe and even fatal infections.

This distinction based on morphology can be difficult, but this “maltese cross” is typical enough to be testable.
A 36-year-old female who was 2 years post cadaveric renal transplantation for renal failure due to chronic glomerulonephritis presented with fever of five days duration. She had some nausea but no urinary, respiratory or abdominal symptoms. She had presented to an outside hospital three days previously where a chest xray, urinalysis and blood culture had been negative. She was given levaquin but remained febrile with malaise.

Current medications included mycophenylate, sirolimus and prednisone. She had a history of hives with cephalaxin, vancomycin and erythromycin.

Examination found a fever of 39.2C, grade 1 systolic ejection murmur over the left sternal border, and a nontender transplanted kidney in the right lower quadrant. Renal ultrasound of the transplanted kidney was normal. Urine culture grew $10^4-10^5$ E. faecalis, susceptible to ampicillin. Urinalysis found 10 WBC/ul, nitrate and protein negative. WBC was 10,200. Abdominal CT with contrast showed a lobe of the kidney which did not perfuse well with contrast and was swollen. Ampicillin 2 gm IV q 6h was begun but the patient remained febrile the next 24 hours.

Which of the following is the most appropriate management:

- A. CT-guided biopsy of the affected kidney
- B. Add gentamicin
- C. Change ampicillin to daptomycin
- D. Check urine for “decoy” cells of BK virus
- E. Continue ampicillin at same dose

Answer: E

Rationale: The findings are consistent with “lobar nephronia” or acute focal bacterial nephritis. This form of acute pyelonephritis is characterized by edema and inflammation of one or occasionally 2 kidney lobes. If not treated adequately, the affected lobe can liquefy and form a renal cortical abscess. Response to therapy is usually somewhat slower than pyelonephritis and relapse is probably more common if less than three weeks of treatment are given. Response of enterococcal pyelonephritis to levaquin is suboptimal, but may reduce abnormalities of the urinalysis and urine culture. BK viruria causes renal failure but not fever in renal allograft recipients. Daptomycin would not be indicated for an ampicillin-susceptible E. faecalis. Unlike enterococcal endocarditis, addition of an aminoglycoside is not necessary in treating enterococcal urinary tract infection.
A 35-year-old Egyptian male, studying in Boston, was seen because of microscopic hematuria picked up on a routine physical examination. He underwent cytoscopy. A biopsy is shown of his bladder wall, where a roughened, dull surface was found in several areas of the bladder.

He likely acquired this infection from which of the following sources?

A. Wading in the Nile river  
B. Eating poorly cooked lamb  
C. Drinking well water  
D. Insect bite  
E. Eating human stool

Answer: A

Rationale: The eggs of Schistosoma haematobium are recognizable by the spike at the tip, not on the side like Schistosoma mansoni. The eggs originate in the adult schistosome living in a vein of the vesicle or pelvic plexus and migrate into the wall of the bladder, causing hematuria, and are then excreted into the urine. Excreted eggs hatch into miracidia which then infect snails which release motile cercaria. Infection is acquired when wading in water in which infected snails have produced cercaria that swim until they can invade intact skin of the host. Parts of the Nile River have been notable for the population of infected snails and persons with schistosomiasis, both mansoni and haematobium
Which of the following organisms is the most likely cause of this penile lesion of 7 months duration:

A. Human papilloma virus  
B. Haemophilus ducreyi  
C. Treponema pallidum  
D. Klebsiella granulomatis  
E. Chlamydia trachomatis

Answer: D

**Rationale:** This chronic ulcerated penile lesion resembles granuloma inguinale, an infection caused by a bacterium than has not been cultured, named *Calymmatobacterium granulomatis*. Sequencing of the organism has found a close relationship to Klebsiella, hence a renaming as Klebsiella granulomatis. Granuloma inguinale is the classic cause of chronic genital ulcers that become increasingly disfiguring. Syphilis ulcers generally heal within 3-12 weeks. Chancroid can also be chronic but these lesions should be painful.  

Diagnosis is by demonstrating the organisms in macrophages, called Donovan bodies, using Wright-Giemsa stain.

Trimethoprim-sulfamethoxazole or doxycycline are treatments of choice.
This brain section was taken from autopsy of an HIV-infected patient.

The origin of this infection was probably exposure to:

A. Cat stool  
B. Human stool  
C. Mosquitoes  
D. Ticks  
E. Lice

Answer: A

Rationale: The structure is a cyst of Toxoplasma gondii, an infection acquired from ingestion of oocysts in cat stool or cysts in inadequately cooked meat from sheep or cows. Humans do not excrete oocysts in their stool. Insects are not vectors of toxoplasma.

This 44-year-old man with AIDS has an organism in his skin which can spread to which of the following sites:

A. Conjunctiva  
B. Buccal mucosa  
C. Brain  
D. Blood stream  
E. Draining lymph nodes

Answer: A

Rationale: The papule with a shiny center is typical of molluscum contagiosum, an inoculation viral disease seen in immunosuppressed and, less often, in otherwise healthy patients.

Molluscum can spread to other areas of the patient’s skin or conjunctiva by inoculation.

Spread to buccal mucosa would be rare.

Lymphatic spread or hematogenous dissemination to brain or blood stream does not occur.