PathMD™: Board Review Letter

Author: Nancy Ciau, M.D. & Barbara Haller, M.D. **Microbiology** Volume 3, Number 5

1. The parasite egg in image 1 was identified. What parasite has a high incidence of being found in association with the one in the image?

a) *Isospora belli*
b) *Entamoeba histolytica*
c) *Giardia lamblia*
d) *Dientamoeba fragilis*

Choice d is correct. The parasite egg in the image is that of *Enterobius vermicularis*. Note the shape resembling a football, the smooth, thin wall, and the absence of opercula. The incidence of *D. fragilis* is nine times higher in patients with pinworm infections, suggesting that *E. vermicularis* eggs may be infected with the flagellate and serve as the chief vector for transfer to humans. (Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Sixth edition. Winn et al. Chapter 22 – Parasitology: Intestinal Protozoa.)

2. The organism in image 2 (Sabouraud dextrose plate) was cultured from lung tissue obtained from an organ transplant patient. What is the organism?

a) *Mucor spp.*
b) *Histoplasma capsulatum*
c) *Aspergillus fumigatus*
d) *Aspergillus terreus*

Choice c is correct. The image is that of a mold with a central blue-green zone and a white peripheral apron which is characteristic of *A. fumigatus*. The other choices don't have this characteristic appearance. *Mucor spp*. (choice a) grows rapidly so that it will quickly cover the entire surface of the plate and may lift the lid of the plate. *H. capsulatum* (choice b) usually appears as delicate cobweblike, gray-white mycelium. *A. terreus* (choice d) has some sort of yellow or brown pigmentation. (Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Sixth edition. Winn et al. Chapter 21 - Mycology. Hyaline molds and hyalohyphomycosis.)

3. The organism present on this older blood agar plate (image 3) was cultured from the CSF of an elderly man who had meningitis. Which of the following is NOT seen with this organism?

a) The colonies are bile soluble.
b) The organism is positive for pyrrolidonyl peptidase (PYR).
c) The organism is sensitive to optochin.
d) Both a and c.

Choice b is correct. In an elderly patient with meningitis, the considerations are *S. pneumoniae* (most likely) followed by *N. meningitis, E. coli,* and group B streptococcus. The image is of *S. pneumoniae.* Note the α-hemolysis (greenish hue) present in the agar which indicates incomplete hemolysis. Since this is from an older plate, in the close-up images, you should see that the colonies have flattened out and appear to have craters. *S. pneumoniae* produces an autolysin that, at the end of the exponential growth phase, causes the colonies to break down. *S. pneumoniae* is a lancet-shaped, gram-positive diplococcus that is typically bile soluble and optochin (P disk) sensitive. Catalase-negative, gram-positive cocci growing in pairs and chains that are PYR positive are *Streptococcus pyogenes* and *Enterococcus spp.* (choice b). While these PYR-positive organisms may cause meningitis, it is less likely, and the α-hemolysis and colonial morphology point to *S. pneumoniae.* (Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Sixth edition. Winn et al. Chapter 13 - The Gram-Positive Cocci: Part II. *Streptococcus pneumoniae*.)

4. Image 4 is that of a test used to presumptively identify a catalase-negative streptococcus with characteristic hemolysis. Which organism is streaked perpendicular (identified by arrow) to the presumptive organism (presumptive - the unknown organism being tested)?

a) *S. aureus*
b) Group A Streptococcus (*S. pyogenes*)
c) Group D Streptococcus
d) *Enterococcus spp.*

Choice a is correct. The image is that of the CAMP test used to identify group B streptococcus. *S. aureus* is streaked along almost the entire diameter of the blood agar plate, and the presumptive GBS is streaked perpendicular to this. Most strains of S. *aureus* produce a β-hemolysin. These β-hemolysins diffuse out into the agar, and the extracellular protein produced by GBS (CAMP factor) diffuses out into the agar. Where these two substances intersect, you observe synergistic hemolysis. (Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Sixth edition. Winn et al. Charts section.)

5. The organism seen in image 5 is that of mycobacterium growing on a plate. Which of following mycobacteria show this morphology?

a) *M. simiae*
b) *M. marinum*
c) *M. szulgai*
d) *M. tuberculosis*

Choice d is correct. The mycobacterium in the image is showing cording. Of the choices, only *M. tuberculosis* can have this appearance, which is due to production of "cording factor." As a matter of fact, all the organisms of the MTB complex can have this appearance. (Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Sixth edition. Winn et al. Chapter 19 - Mycobacteria: Classification of Mycobacteria.)

6. See image 6 of a peripheral blood smear. You obtain the history that this patient lives on the Northeast Coast with her family, and none of them have strayed far from that area. She recently developed fever, malaise, anorexia, and fatigue. What is the most likely diagnosis?

a) *Ehrlichia chaffeensis*
b) Babesia microti
c) *Plasmodium falciparum*
d) *Borrelia recurrentis*

Choice b is correct. It may be very difficult to distinguish *B. microti* from the early ring forms of *P. falciparum* on a peripheral smear if the characteristic Maltese cross (indicating the mature form of *B. microti)* is not identified. While *P. falciparum* (choice c) is certainly a consideration, the fact that this patient hasn't really travelled makes it less likely. Neither E. *chaffeensis* (choice a) nor *B. recurrentis* (choice d) infect red blood cells. With E. *chaffeensis,* a rickettsia-like bacteria, you see organisms (morula) in the cytoplasm of macrophages. *B. recurrentis,* the cause of relapsing fever, is a spirochete that, if seen in blood, is present outside of the red blood cells. (Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Sixth edition. Winn et al. Chapter 20 - Spirochetal infections: Borrelia. Chapter 22 – Parasitology: Blood and tissue parasites.)

7. *Mycobacterium szulgai* has an interesting characteristic. The organism is a _____ @ 25°C and a _____ @ 37°C.

a) non-photochromagen; photochromagen
b) photochromagen; non-photochromagen
c) scotochromagen; photochromagen
d) photochromagen; scotochromagen

Choice d is correct. In the Runyon Classification Scheme, *M. szulgai* is classified as a scotochromagen (at 37°C). Scotochromagens produce pigment in the dark and in the light. Photochromagens produce pigment only in the light and not in the dark. (Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Sixth edition. Winn et al. Chapter 19 - Mycobacteria: Classification of Mycobacteria.)

8. You get a call from a clinician who insists on ordering a "*Legionella pneumophila* antigen" on a urine specimen because the team highly suspects this organism, has already started the patient on treatment, and would like to rapidly confirm their clinical diagnosis; however, you find out that no other microbiology test was ordered. What do you tell the clinician?

a) The urine antigen test is a tedious test that takes several days to perform. Same-day results are not possible. Culture should also be considered.
b) The *Legionella pneumophila* antigen test only detects serogroup 1. A negative urine antigen test does not mean that the patient does not have Legionella. Culture should also be considered.
c) The results of the urine antigen test are affected by therapy; therefore, since the patient has already started treatment, a negative result does not necessarily mean the patient did not have Legionella. Culture should also be considered.
d) The urine antigen test is not really a specific test. There is a lot of cross-positivity with *Streptococcus pneumoniae* in patients who are bacteremic. Culture should also be considered.

Choice b is correct. The *Legionella pneumophila* antigen test only detects serogroup 1. While Legionnaire's disease is mostly caused by this serogroup, the urine antigen test does not detect other serogroups. Sending for routine culture as well as culture on buffered charcoal yeast extract could be valuable, especially if the urine antigen test is negative, to detect the other serogroups as well as possibly another organism entirely. The urine antigen test is a rapid diagnostic test (choice a). The urine antigen test is not affected by therapy and actually may be positive even after successful treatment, especially in immunosuppressed patients (choice c). The urine antigen test is fairly sensitive (80-90%) and rather specific (~99-100%); however, culture is the gold standard but takes at least 2-3 days until there is growth (choice d). (Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Sixth edition. Winn et al. Chapter 10 Legionella: Laboratory diagnosis.)

9. What obvious morphologic characteristic distinguishes *Bacillus anthracis* from *Bacillus cereus*?

a) *B. anthracis* is non-motile.
b) *B. cereus* is non-motile.
c) The spores of *B. anthracis* are present on the terminal ends of the organism.
d) The spores of *B. cereus* are present on the terminal ends of the organism.

Choice a is correct. The Bacillus genera are spore-forming, gram positive rods. Most of these organisms are motile (choice b incorrect), with one notable exception being *Bacillus anthracis*. Neither *B. anthracis* nor *B. cereus* has spore present at the terminal ends of the organism (choices c and d). The spores are either subterminal *(B. anthracis)* or subterminal or central *(B. cereus)*. (Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Sixth edition. Winn et al. Chapter 14 - Aerobic and Facultative Gram-Positive Bacilli: *Bacillus* species and related genera.)

10. Which of the following viruses are non-enveloped?

a) Parvovirus
b) Hepatitis A
c) Papovavirus
d) all of the above

Choice d is correct. Parvovirus and Papovavirus (choice a and c) are DNA viruses while hepatitis A (choice b) is an RNA virus. (Koneman's Color Atlas and Textbook of Diagnostic Microbiology. Sixth edition. Winn et al. Chapter 23 – Diagnosis of Infections Caused by Viruses, Chlamydia, Rickettsia, and Related Organisms.)

Notes for question set:[1]

[1] PathMD strives for the highest quality and accuracy. However, the *PathMD: Board Review Letter* is for review purposes and not meant for clinical decision making. It should not be used in place of review of primary reference texts and the current medical literature. If inaccuracies are identified, please notify us so that a correction may be published. (info@PathMD.com)

