



## Lyme Disease & Co-Infections

by Sharlene Peterson

**CLASS: M240**

**After completing the test, email the Test Answer Sheet to [healthschool@icloud.com](mailto:healthschool@icloud.com).**

1. Lyme disease is:
  - (A) a multi-system inflammatory disease
  - (B) the most common viral infection in the U.S.
  - (C) an infection caused by the same spirochete that causes syphilis
2. The following *Borrelia* species are known (according to the CDC) to cause Lyme disease in the United States:
  - (A) *B. garinii* and *B. mayonii*
  - (B) *B. burgdorferi* and *B. afzelii*,
  - (C) *B. burgdorferi* and *B. mayonii*
  - (D) *Borrelia recurrentis* and *B. burgdorferi*
3. **True or False:** *Borrelia burgdorferi* is easy for technicians to identify. The spirochetes are fairly large, stay in the blood for long periods of time, and the spiral shape is obvious.
4. Lyme neuroborreliosis/neuroinflammation is likely the result of:
  - (A) typical biotoxins produced by the *Borrelia* spirochetes
  - (B) atypical, pleomorphic and cystic forms of *Borrelia burgdorferi*.
  - (C) the genetic exchange between our natural flora and *Borrelia burgdorferi*
5. **True or False:** It is possible that *B. burgdorferi* has the ability cross the placenta and infect the unborn child like the spirochete that causes syphilis.
6. **True or False:** After a *Borrelia* infection, a person develops complete immunity and will not get reinfected.
7. Even a slight vitamin deficiency can compromise the body's ability to fight infections. "One of the best antibacterial, antifungal and antiviral agents still considered is \_\_\_\_\_, due to its rapid penetration of phospholipid membranes and its oxidative damage to bacterial proteins, nucleotides and fatty acids".
  - (A) Vitamin A
  - (B) Magnesium
  - (C) Iodine

8. Doxycycline is the most prescribed antibiotic for Lyme disease. When this antibiotic is combined with iodine it produces additive effects against spirochetes and biofilm. Additive anti-spirochetal effects were also observed when doxycycline was used with \_\_\_\_\_.
- (A) folate, calcium, and rosmarinic acid
  - (B) vitamin D3, vitamin C, and vitamin B6
  - (C) Vitamin C, Vitamin D3 and rosmarinic acid
9. **True or False:** Around 20-30 percent of children with Lyme disease will NOT develop a rash that is pink in the center and a deeper red on the surrounding skin. The children who do develop the rash may be misdiagnosed as having hives, eczema, sunburn, poison ivy or flea bites.
10. According to the National Institute of Allergy and Infectious Diseases, the term 'chronic Lyme disease (CLD) is being used to describe symptoms in people who have no clinical or diagnostic evidence of a past or present *B. burgdorferi* infection in addition to those who have been diagnosed. "Experts" use the term \_\_\_\_\_.
- (A) Post Treatment Chronic Lyme Disease
  - (B) Post Treatment Lyme Disease Syndrome
  - (C) Post Endotoxin Lyme Disease Syndrome
11. **True or False:** Newer research has determined that *B. burgdorferi* produces Lipid A and other chemical structures characteristic of endotoxins. *B. burgdorferi* produces lipopolysaccharides (endotoxin), and its genome encodes effectors that might act as toxins.
12. Co-infections that are considered clinically relevant include the *Bartonella* species, *Yersinia enterocolitica*, *Chlamydomphila pneumoniae*, *Chlamydia trachomatis*, and \_\_\_\_\_
- (A) *Borrelia*
  - (B) *Mycoplasma*
  - (C) *Dermacentor*
13. **True or False:** *B. burgdorferi* persister cells are a dormant form of the bacteria, can survive extended periods of time, and are not affected by commonly used antibiotics.
14. **True or False:** Inflammation is a normal response when pathogens are first detected by the body and it helps fight the infection. Chronic inflammation is also part of the healing response. It leads to the creation of quinolinic acid (neuroprotective) to protect the nerves in the body.

15. Lyme \_\_\_\_\_ affects both the peripheral and the central nervous systems. Peripheral Lyme neuroborreliosis results in nerve root inflammation, which can cause pain, sensory loss, and weakness. neuroborreliosis
- (A) co-infection
  - (B) resistance
  - (C) neuroborreliosis
16. Mitochondrial cells are known as the powerhouses of the cell because they convert energy from carbohydrates and fats to adenosine triphosphate (ATP). ATP is the form of energy used by cells. This conversion requires \_\_\_\_\_.
- (A) coenzyme Q (CoQ10)
  - (B) co-mineral Q (CoQ10)
  - (C) both (A) and (B)
17. After *Borrelia* spirochetes have entered the body, they need to find a place to reside and reproduce. A prime location for these activities is within the \_\_\_\_\_ tissue of the skin, heart, joints, and central nervous system. connective
- (A) kidney
  - (B) connective
  - (C) lung
18. **True or False:** Lyme disease can lead to dry ligament fibers, damage collagen fibers, cause ruptured tendons, skin conditions, dislocation of vertebrae, prolapsed intervertebral discs, carpal tunnel, diverticulitis in the colon, conjunctivitis, and inflammation of the optic nerve and structures in the eyes.
19. **True or False:** *Mycoplasma pneumoniae* causes walking pneumonia and respiratory illnesses but it is also associated with childhood encephalitis, rheumatoid arthritis, and is clinically relevant co-infection in Lyme disease.
20. *C. jejuni* infections in developed countries are usually \_\_\_\_\_. *C. jejuni* infections trigger both innate and adaptive immune responses that result in **longterm inflammation**. This subclinical inflammation is connected to enteric dysfunction (EED), which **reduces both absorption of nutrients and barrier function** (increases intestinal permeability/leak gut) in the small intestine.
- (A) fatal (death)
  - (B) uncommon (rare)
  - (C) asymptomatic (no symptoms)

21. **True or False:** The nerve fibers in MS patients have scar tissue/sclerosis where the myelin has “disappeared”. This is termed demyelination. In Lyme neuroborreliosis (encephalomyelitis) there may be no imaging abnormality, or findings that suggest neuritis, meningitis, myelitis, or encephalitis. White matter lesions are not a prominent feature of Lyme encephalomyelitis.
22. **True or False:** A broad range of psychiatric reactions have been associated with Lyme disease (when it invades the CNS) including paranoia, dementia, schizophrenia, bipolar disorder, panic attacks, major depression, anorexia nervosa, and obsessive-compulsive disorder.
23. **True or False:** There is a high rate of tick-borne illness found in Pediatric Bipolar Disorder (PBD) patients. Mean age at PBD diagnosis was 7.3 years. This finding should be considered irrelevant and most likely a coincidence.
24. The most common nutritional deficiencies associated with extreme, ongoing fatigue are: Iron, B12, B6, CoQ10, iodine, vitamin C, and \_\_\_\_\_ vitamins A, D, E and K. The most common systems that contribute to ongoing fatigue include the hypothalamic-pituitary-adrenal axis (HPA axis), thyroid function and the liver.
- (A) water-soluble
  - (B) fat-soluble
  - (C) non-essential
25. **True or False:** Some cases of Lyme disease are misdiagnosed as mononucleosis and some EBV cases are misdiagnosed as Lyme disease.
26. **True or False:** The liver’s primary role is detoxification of environmental toxins. New research has revealed that the liver is unable to clear pathogens from the blood and does not function as part of the immune system.
27. HPA axis dysfunction increases the risk of depression, anxiety, digestive and sleep problems, headaches, weight gain or loss, and heart disease. Fatigue, \_\_\_\_\_ weakness, excessive free radicals, mitochondrial dysfunction and increased levels of pro-inflammatory cytokines are also associated with HPA axis dysfunction.
- (A) muscle
  - (B) mental
  - (C) will-power

28. Vitamin \_\_\_\_\_ deficiency has multiple effects on the pituitary-thyroid axis. It has a role in regulating thyroid gland metabolism, metabolism of thyroid hormone in peripheral tissues, and the production of thyroid stimulating hormone (TSH) in the pituitary.
- (A) supplement
  - (B) A (includes retinol, retinal, retinoic acid, and several provitamin A carotenoids)
  - (C) K (includes retinol, retinal, retinoic acid)
29. **True or False:** Edema is protein-rich interstitial fluid building up in the tissues. This buildup triggers inflammation, swelling, fibrosis (scarring from tissue damage), and increases the risk of soft-tissue infections.
30. **True or False:** In addition to seeking out connective tissue, a primary destination of a *B. burgdorferi* spirochetes is the lymphatic system where they accumulate in the lymph nodes. Lymphadenopathy, swollen lymph nodes, is a common sign of an acute infection with *B. burgdorferi*.
31. **True or False:** Half of all monocytes in the body are stored in the gastrointestinal tract. Monocytes are a type of white blood cell that can engulf a solid particle (bacteria, viruses, nutrients, etc.).
32. **True or False:** The gastrointestinal tract contains gut-associated lymphoid tissue (GALT) and includes the appendix, Peyer's patches, and lymphoid follicles. Small lymphoid nodules can be found throughout the intestinal tract.
33. The mucosa that lines the small intestine is covered with fingerlike projections called villi. There are blood capillaries and special \_\_\_\_\_ capillaries, called lacteals, in the center of each villus. While the blood capillaries absorb most nutrients, it is the lacteals that absorb the fats and fat-soluble vitamins and deliver them to the bloodstream.
- (A) artery
  - (B) vein
  - (C) lymph
34. \_\_\_\_\_ cells located in the liver are a type of macrophage that capture and break down old, worn out red blood cells. They also capture bacteria and contain neutrophils to clear bacteria from the bloodstream. Most bacteria that enter the bloodstream are taken up and eliminated within the liver, including *Borrelia* spirochetes.
- (A) Kupffer
  - (B) Lymphatic
  - (C) Red blood

35. **True or False:** Vitamin C maintains the intracellular antioxidant network which mainly consists of glutathione and vitamin E but, it also requires vitamin A. Vitamin C is also considered an anti-inflammatory molecule.
36. **True or False:** Selenium is an antioxidant that increases inflammation in the liver. The main pro-oxidant enzymes include dismutases such as superoxide dismutases (SOD), catalases, and selenium-dependent glutathione peroxidases.
37. **True or False:** Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver disease in the U.S. Approximately 40% of adults and over 10% of children and adolescents (six million children!) have NAFLD and up to **50% have no symptoms or vague symptoms like fatigue, lethargy, and occasionally itching.**
38. Resveratrol occurs in two isoforms: \_\_\_\_\_. Trans-resveratrol is more biologically active. Resveratrol in any form is quickly metabolized which leads to low levels in the blood in a short time after entering the body. It would be best to take smaller doses 2-3 times per day rather than one large dose.  
(A) prim and trans  
(B) cis and trans  
(C) both (A) and (B)
39. **True or False:** Protease supplements/systemic enzymes reduce inflammation and work with NAC to disrupt biofilm formations, help clear clot-forming fibrin, and reduce edema.
40. **True or False:** Silver is an important required mineral in the human body. When colloidal silver is taken as a supplement, up to 99 percent of the dosage is stored in the tissues.

End of Test